
Lappeenrannan teknillinen korkeakoulu
Lappeenranta University of Technology

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MERCHANDISING STRATEGIES AND RETAIL PERFORMANCE FOR SEASONAL FASHION PRODUCTS

Acta Universitatis
Lappeenrantaensis 76

ISBN 978-952-214-788-2 (PDF)

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Thesis for the degree of Doctor of Technology to be presented with due permission for public examination and criticism in the Auditorium in the Students' Union Building at Lappeenranta University of Technology, Lappeenranta, Finland on the 19th of March, 1999, at noon.

Acta Universitatis
Lappeenrantaensis
76

ISBN 951-764-300-4
ISSN 1456-4491
Lappeenranta 1999

Lappeenrannan teknillinen korkeakoulu
Monistamo 1999

ABSTRACT

Lappeenranta Univesity of Technology

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Merchandising Strategies and Retail Performance for Seasonal Fashion Products
Lappeenranta, 1999

Key words: retail performance, fashion products, apparel retailing, apparel sourcing, supply chain management, quick response

This study presents mathematical methods for evaluation of retail performance with special regard to product sourcing strategies. Forecast accuracy, process lead time, offshore / local sourcing mix and up-front / replenishment buying mix are defined as critical success factors in connection with sourcing seasonal products with a fashion content. As success measures, this research focuses on service level, lost sales, product substitute percentage, gross margin, gross margin return on inventory and mark-down rate.

The accuracy of demand forecast is found to be a fundamental success factor. Forecast accuracy depends on lead time. Lead times are traditionally long and buying decisions are made seven to eight months prior to the start of the selling season. Forecast errors cause stockouts and lost sales. Some of the products bought for the selling season will not be sold and have to be marked down and sold at clearance, causing loss of gross margin. Gross margin percentage is not the best tool for evaluating sourcing decisions and in the context of this study gross margin return on inventory, which combines profitability and assets management, is used.

The findings of this research suggest that there are more profitable ways of sourcing products than buying them from low-cost offshore sources. Mixing up-front and in-season replenishment deliveries, especially when point of sale information is used for improving forecast accuracy, results in better retail performance. Quick Response and Vendor Managed Inventory strategies yield better results than traditional up-front buying from offshore even if local purchase prices are higher. Increasing the number of selling seasons, slight over-buying for the season in order to avoid stockouts and general reduction of lead times are among the policies that were found to contribute to retail success.

The mathematical and process models presented by this research are universal and can be used in different retail environments as long as the products are seasonal and have a fashion content.

ACKNOWLEDGMENTS

This research has been carried out at the Department of Industrial Engineering and Management at Lappeenranta University of Technology. Professor Pentti Talonen supervised my work and I would like to express my sincere gratitude to him for his continuous support and advice during my work. His instructions contributed immensely to achieving the professional and scientific goals of this research. Professor Markku Tuominen, the head of the Department, gave very useful advice regarding the research methods, for which I am very thankful.

Professor Russell E. King of North Carolina State University, Raleigh, USA, is one of the world's leading experts in apparel sourcing strategies and Quick Response. I am deeply honored that he was willing to review my work. His comments and advice were fundamental in focusing on the core problems and finding correct solutions. His previous research work is widely quoted in this study. Professor Erkki Uusi-Rauva's appraisal was a thorough analysis and criticism of my work and I found his comments very helpful. I am much obliged to Mr. King and Mr. Uusi-Rauva for their reviews.

Professor Ahti Reijonen of Tampere University of Technology urged me for years to start with my dissertation. His continuous push and motivation was the force that got this work started, for which I am much obliged. Professor Pertti Nousiainen, the head of Fiber, Textile and Clothing Science at Tampere University of Technology invited me to work as a special researcher for his Institute during my dissertation work. I would like to thank him for his tireless and continuous support which helped me to complete the work in a relatively short period of time. The financial support of the Federation of Finnish Textile and Clothing Industries is also gratefully acknowledged.

This work includes case studies covering three companies: Kesko Oyj - Vaatehuone, Anttila Oy and KappAhl Ab. Mr. Juha Ahtinen of Kesko organized Mr. Petri Fontell, Ms Eija Väisänen and Ms Leena Hovikari to work with me. Ms Tuula Juvonen was my collaborator at Anttila. Mr. Jan Stegrell and Mr. Peter Karlsson among several other persons helped me at KappAhl. Without the very frank and open-minded attitude of the case study companies' management, and the devoted and tireless effort by the persons mentioned above, compiling the case study data for analysis would not have been possible. Mr. Pentti Hurmerinta, the Managing Director of Reima-Tutta Oy went through my manuscript and from a manufacturer's point of view presented many valuable comments for improving my work. I would like to express my sincere gratitude to everybody involved.

I am much obliged to Mr. Simon Howard for revising and correcting my English. I am very grateful to Mr. Ville Mattila of EA-Projects Ltd concerning his effort and activity in searching suitable reference material from various libraries and, through the Internet, from sources all over the world.

Also I would like to express my gratitude to my family, for their support, patience and understanding during the period of preparing this dissertation.

STRUCTURE OF DOCUMENT

CONTENTS:

GLOSSARY

ABC	Activity based costing
CAD	Computer aided designs
	Cash against documents
CM	Cutting and manufacturing
CMT	Cutting, manufacturing and trimmings
DC	Distribution center
DPP	Direct product profitability
ECR	Efficient consumer response
EDI	Electronic data interchange
EFT	Electronic funds transfer
EOQ	Economic order quantity
FRM	Floor ready merchandise
GM	Gross margin
GMROI	Gross margin return on inventory at cost
GMROI-R	Gross margin return on inventory at retail price
GMROL	Gross margin return on labor
GMROS	Gross margin return on space
JIT	Just in time
L/C	Letter of Credit
OTB	Open to buy
POS	Point of sale
QR	Quick response
RCO	Retailer-sponsored cooperative organization
RONW	Return on net worth
SCM	Supply chain management
SKU	Stock keeping unit
SPM	Strategic profit model
UPC	Unique product code
VAP	Value adding partnership
VMI	Vendor managed inventory
VMS	Vertical marketing system
WIP	Work in progress
WVO	Wholesale sponsored volunteer organization

SYMBOLS

B_{u_n}	Units bought for a season
C_v	Cost of goods sold
d	Average mark-down percentage
D_P	Price difference between offshore and local sources
E	Forecast error percentage
F	Inventory capital costs
i	Interest rate
I_{cl}	Inventory waiting for clearance period
I_{dc}	Inventory at distribution center
I_{END}	End of the season inventory
I_n	Average in-store inventory in units
I_{vc}	Inventory at actual cost
l	Number of clearance periods per year
L_f	Lead time from forecasting to receiving goods
L_{lc}	Lead time from opening Letter of Credit to receiving goods
L_p	Lead time from issuing order to receiving goods
L_{dc}	Lead time from receiving at distribution center to delivery to store
L_b	Lead time from buying process
L_p	Lead time for production process
L_s	Lead time from receiving at store to sale to customer
L_{md}	Lead time from receiving at store to selling at mark-down sale
L_t	Total process lead time
m	Mark-up factor
n	Number of selling seasons per year
P_F	First unit price
R_n	Number of different SKUs in the assortment
s	Service level
S_u	Sales in units
S_v	Sales in value
t	No. of different SKUs in assortment in proportion to total SKUs sold
T_u	Rate of stockturn in units
w_d	Length of replenishment period in weeks
w_s	Length of the season in weeks
z	Substitute buying percentage

SECTION I - INTRODUCTION

1. Background

Retailing in general is a very widely studied subject. A lot of research work as well as books and working papers have been published about this area world-wide. However, retailing of products which are very seasonal and have a high fashion content, such as apparel, seem to be a special case both as merchandise and as an object for research. Relatively little research has been conducted in this specific area. Retailing performance with this type of products is built up on several factors that are difficult to analyze and manage. The unpredictability of fashion trends and consumer preferences is one aspect. Secondly, the life cycles of individual products are short and are becoming shorter when seasonal collections are split into several sub-collections and delivery intervals. Apparel retailing is truly a global business. Products are sourced world wide, from Shanghai to South America, and the leading multi shop retailers have sales networks that likewise cover the whole world (Scheffer, 1994).

Garment retailing was badly hit by the general recession during the first years of the 1990s. Total sales of men's wear was drastically reduced in UK from 1990 to 1992 ("The UK Menswear Market", PB Marketing, 1994). The total consumption of clothing in Sweden went down by 7 % in 1993 (Habit, no. 6/94). Holland as well suffered a decline in outerwear garment sales of 7 % in 1993 ("Men's and Women's Outerwear in the Netherlands", EIU Marketing in Europe, 1994). In Germany the sales of clothing products is not expected to pick up real growth for several years ("Consumer Spending Prospects and Forecasts", EIU Marketing in Europe, 1994,1995). 1993 was the worst ever annual performance for consumer spending in major European economies. Although economies in general started to emerge from the recession after 1993, the consumer sector continued with sluggish or even negative growth. Consumption of apparel products did not follow this upward trend.

	1980-92 annual average	1992	1993	1994	1995	1996	1997
Germany	3.5	5.5	-0.8	-1.1	-0.8	0.7	1.4
France	0.5	-1.3	-2.3	-0.9	1.6	0.9	1.1
Italy	1.5	1.6	-5.8	2.4	1.5	1.8	2.3
Spain	3.0	1.4	-1.2	-0.7	1.6	2.7	1.9
Netherlands	2.5	0.8	-0.9	0.8	1.2	2.8	2.9
Belgium	1.3	-0.6	-2.9	0.9	1.7	1.4	2.1
UK	3.6	3.3	4.8	5.6	1.9	3.0	3.5

Table 1. Annual growth in consumption of clothing and footwear as % change on previous year (EIU Marketing in Europe, 1994, 1995)

These difficult years caused close-downs of numerous retailers. Those left have been forced to find new means of competition, especially regarding prices, product sourcing and marketing mix. Concept shops with style combinations for improved customer satisfaction were created. Cash management and inventory turns became essential as financing was tighter (Alexander, 1997). The rapid development of information technology made it possible to link various retail outlets to the head-quarters for closer and faster control of inventory and sales. But very little has been done in the area of merchandising which, nevertheless, is one of the key areas for retailing success.

The proportion of retailer brands has been on the increase within multi shop retailer chains and department stores. A large number of these products are sourced offshore, mainly from China and long lead times make implementation of Efficient Customer Response (ECR) methods impossible. Only a limited number of apparel retailers use Quick Response (QR) or ECR methodology in their merchandising.

In the mid 1970s I started my career as a management consultant to the apparel industry and trade. My work has been very international and my clientele includes manufacturing, trading and retailing firms in five continents. During this period I have been involved in downgrading and relocating the European garment and textile industry and organizing sourcing operations in South East Asia, Africa and beyond. Numerous industry sector studies, market research projects and retail strategy assignments have provided a close view of the whole value chain of apparel products from the offshore manufacturer to the consumer. Merchandising strategies and their impact on retail success is an important area that deserves to be analyzed further. With this research I aim at contributing a new angle to the apparel business which, in turn, will hopefully stimulate further research and study.

2. Scope of Research

This research analyzes apparel merchandising strategies and their impact on retail performance. The focus is on the profitability and success of the retailer. Offshore strategy, Quick Response, ECR as well as Vendor Managed Inventory (VMI) strategy as different ways of sourcing are analyzed in terms of their impact on retail performance. The objective is to define estimates for performance measures which can be used as tools for selecting merchandising strategies for seasonal fashion products.

The success and performance of a firm can be studied from an internal or external point of view. Microeconomic theory looks at company performance from an internal perspective and aims at measuring success with accounting ratios and the amount of profit (Naylor, Vernon, 1969). Operating costs, profits and cashflow impacts are usually presented in the form of traditional accounting information. The external point of view studies the firm as part of its environment and success depends largely on the firm's ability to deliver the service outputs required by end users as cost effectively as possible (Stern, El-Ansary, 1992).

A firm or an organization possesses capabilities and assets. Assets are the resources accumulated over a period of time. They can be measured in terms of money. Capabilities are the intangible routines and practices of an organization, the way of doing business. They are valuable to the company but they have no price or value in money terms. In market-driven organizations market sensing, customer linking and channel bonding are specifically emphasized capabilities (Day, 1994). Customer satisfaction, flexibility and the speed of reaction are the competitive advantages that a firm aims at. But not at any cost, since assets and financial resources are limited.

Successful performance of a fashion goods retailer obviously depends on a number of internal and interfunctional transactions which are managed by various strategies. Selection of a successful strategy for merchandising, i.e. "planning and promotion of sales by presenting a product to the right market at the proper time", as defined by Webster's Encyclopedic Unabridged Dictionary (1996), is one of the key strategic areas. Stern and El-Ansary (1992) list seven dimensions that can be used for evaluating the performance of a member in a value chain: sales performance, financial performance, competence, compliance, growth, adaptability and customer satisfaction. In fashion goods retailing, presentation of a product to the right market at the proper time is crucial. The products must be sourced ahead of the season and purchase decisions are often made under uncertainty. A merchandising strategy that reduces this uncertainty is of special value.

3. Research Problem

Due to low manufacturing costs purchase prices are attractive when buying from offshore. But lead times are long and the buyer is forced to give his order four to six months prior to starting of the season. This is risky when operating with seasonal and fashionable products. The earlier one must predict fashion trends the higher the risk for forecast errors. Due to long delivery times orders cannot be corrected and replenishment is not possible when sourcing offshore.

Under Vendor Managed Inventory strategy the manufacturer produces garments according to the buyer's plan before the selling season. Only part of the buyer's plan is shipped prior to the season and replenishment orders are given in regular intervals. The point of sale (POS) information is not used for planning production. Although the retailer receives the goods gradually and according to actual sales, production of garments held in stock by the vendor may have been based on wrong assumptions.

With a Quick Response (QR) strategy only part of the seasonal capacity is manufactured and delivered in advance. The remaining part is produced on the basis of POS information and delivered according to actual demand. Purchase prices with VMI and QR strategies are higher compared to offshore sourcing. But the purchases may correspond better with the actual demand in the market, and as result a higher share of merchandise can be sold without mark downs or discounts. Turnaround of stock is also faster.

The following questions are used for defining the research problem:

1. What are the measures that can be best used for evaluating the success of merchandising strategy for apparel products?

2. Which are the critical success factors in merchandising of seasonal fashion products?

3. Which sourcing strategies should be used in order to achieve optimum retail performance?

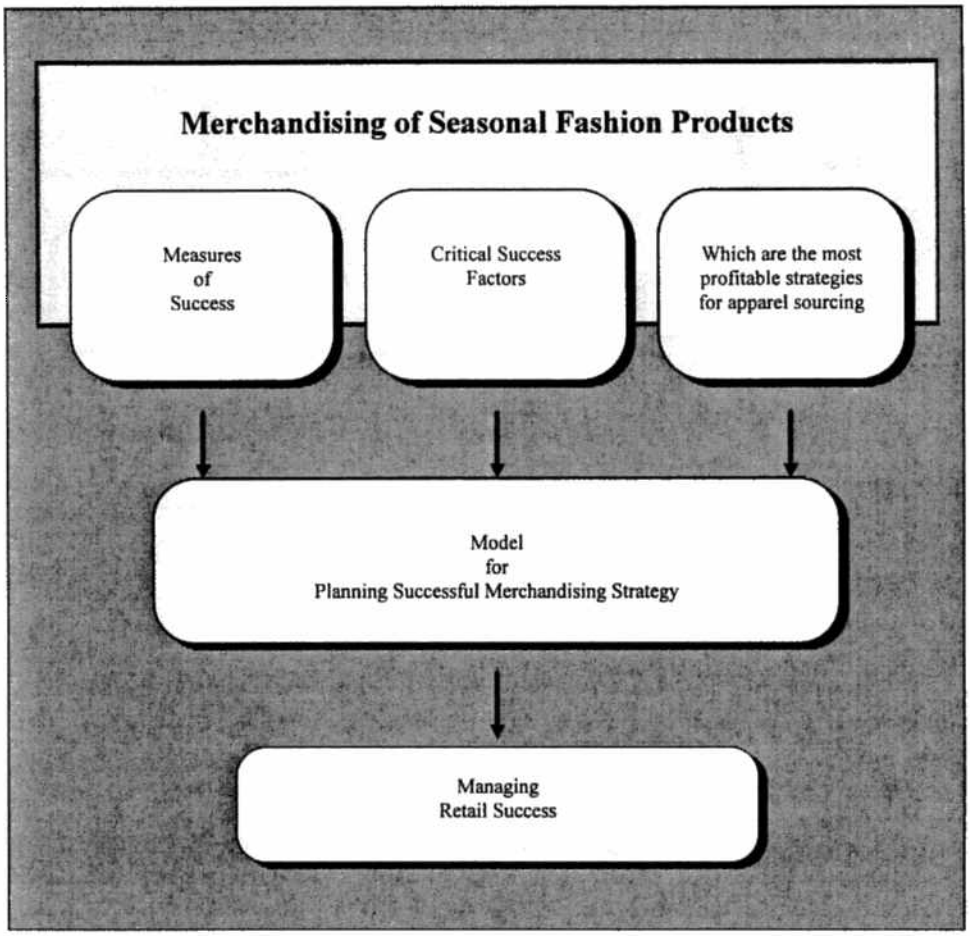


Figure 1. Illustration of the research problem

4. Limitations

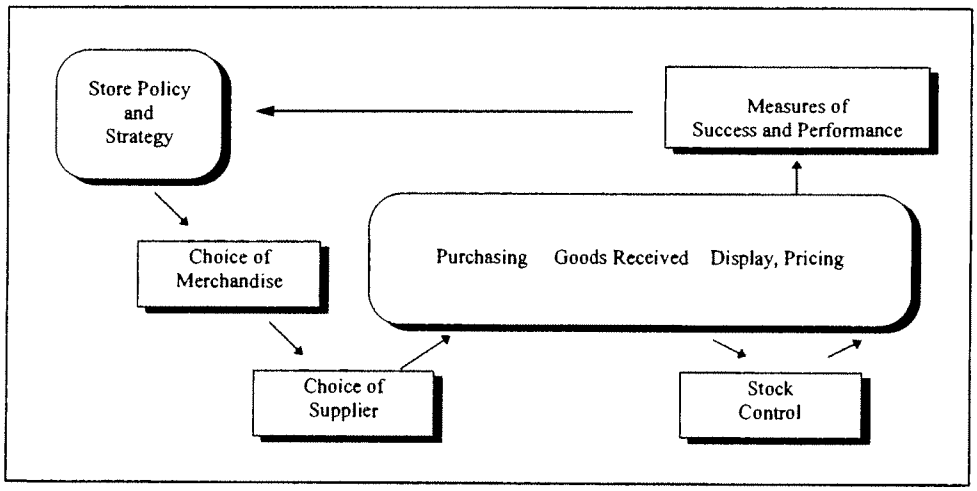


Figure 2. Merchandising operations flow (Howe, 1992, modified)

Merchandising management involves decisions on goods to be stocked, choice of suppliers, purchasing procedures, in-store merchandise handling, stock control and display and pricing of goods (Howe 1992).

Traditionally, distribution channels in fashion goods merchandising consist of independent companies. Manufacturer, wholesaler and retailer are customers and suppliers to each other and there is no overall control of channel performance. Each firm tries to maximize its profits, at the expense of the system as a whole. Today, vertical marketing systems (VMS) are replacing these conventional channels of distribution (Kotler, Armstrong, 1997). The aim is to have full control of the whole distribution channel and the producer, wholesaler and retailer operate under a unified system. VMS can be a organized in different ways: Contractual VMS, Corporate VMS or Administrated VMS (Pelton, Sturtton, Lumpin, 1997). This research discusses various types of VMS as well as traditional channels. The main focus with the model and case studies is, however, multishop retailer chains who source and sell own retailer labels.

Sourcing of seasonal fashion items can be carried out in several ways. Large multi shop retail chains as well as department stores and hypermarkets carry both supplier labels and their own labels in their product range. Sourcing strategies for these product ranges are different. Sourcing from supplier's collections is actually conventional buying and the retailer has a very small role in deciding what the

products are like. In private label sourcing the retailer has an active role in designing the product range. This research concentrates on the profitability of retailer label goods and does not make comparisons between retailer labels and supplier labels.

This research does not concentrate on the technical problems regarding control of quality, deliveries and transportation, although they also play a vital role in merchandising success. Neither does this study analyze ways of creating and selecting fashion. The focus is on different types of merchandising strategies and their impact on retail performance. The performance measures in this research are limited to financial measures without considering a wider range of measures like customer values, shareholder values, etc.

This research does not aim at calculating absolute values for performance measures, for example, by defining what level of stockturn a successful retailer should have. Instead, the measures are used in comparing different sourcing strategies. Neither is this a study of forecasting techniques although forecasting accuracy is of vital importance. Instead, the objective is to explain how forecasting accuracy as a critical success factor in product sourcing affects retail performance. Retail success, especially in the fashion products segment, depends largely on the range of products offered to the consumer. Making the right choice of merchandise also depends on the buyer's skills for sensing fashion trends. This research does not analyze ways of predicting fashion trends. The aim is to define strategies and policies for reducing the overall uncertainty when making purchase decisions. Advertising, promotion, attractive store displays and well selected store location create door traffic which obviously has an impact on retail performance, but as these variables are not directly connected to sourcing strategies, they are not considered in this study.

In general, a variety of measures are available for measuring retail success. Certain measures are selected for this study, primarily, on the basis of earlier research. Their suitability as measures is analyzed and commented within this study but no in-depth analysis regarding their viability is carried out, as the main focus of this research is on sourcing strategies rather than on measuring and calculation methodology.

The choice of fashion article sector for the study was made because this sector uses various types of merchandising strategies, it operates globally, and it daily wrestles with the choice of low purchase price with long lead time vs. higher purchase price with speedier stockturn. This selection is often done on the basis of intuition rather than a well planned strategy backed by reliable measures of retail performance. Due to global competition, faster product development, increasingly flexible production systems and a great number and variety of competing products, inaccuracy in forecasting is increasing (Fisher, Hammond, Obermeyer, Raman, 1994). There is a growing need to face this demand uncertainty and new tools and controlling measures must be created.

5. Research Methodology

According to Neilimo and Näsi (1980) the main research paradigms used in business and management sciences are:

1. Conceptual analysis research paradigm
2. Nomotetic research paradigm
3. Conclusive methodology research paradigm
4. Functions analysis research paradigm

Olkkonen (1994) further supports the suggestions by Kasanen, Laukka and Siitonen that a fifth research paradigm is useful in business and management sciences, namely:

5. Constructive research paradigm

A positivistic approach is usually chosen in physics, mathematics and the other natural sciences. The opposite is a hermeneutic approach which is used in the behavioral sciences when trying to gain an understanding of complex organizational processes. According to Olkkonen (1994), the business and industrial engineering sciences are located somewhere in-between these two. Both approaches are used, sometimes in the same research. A hypothesis can be developed by means of a hermeneutic approach and then tested by positivistic means (Olkkonen 1994). A positivistic approach is more natural with conceptual analysis, while functions analysis and constructive research use a hermeneutic approach.

Olkkonen (1994) defines the different research paradigms as follows:

Conceptual analysis

The objective of the conceptual analysis research paradigm is to produce a conceptual system for classifying or typifying information. On the basis of previously developed conceptual systems a renewed conceptual system is developed and tested, and, after the evidence of the new system is verified, the utilization of the renewed system can be recommended. This paradigm can be applied, for example, when developing new databases or planning systems.

Nomotetic research

The objective of the nomotetic research paradigm is to, on the basis of a positivistic approach, explain the causal and correlative relations of the research subjects. As with the natural sciences, the aim is to define the laws governing the impacts of selected variables. Mathematical models are used in defining the research problem.

The data is mathematically processed and the reliability of results is tested statistically.

Conclusive methodology research paradigm

The aim is to develop mathematical or computer models to be used in corporate decision making. The model can be used for simulating the options and their impacts. The research is usually based on earlier research and the model is designed by use of logic.

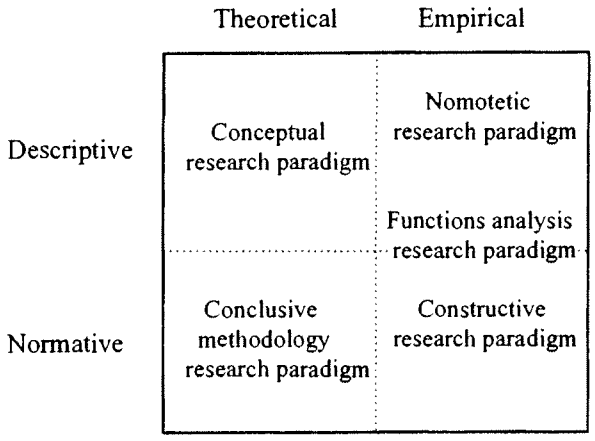
Functions analysis and constructive research

As defined by Olkkonen (1994), functions analysis aims at understanding the research problem on the basis of a hermeneutic approach, and it is widely used in research work focusing on a company's internal processes involving human participation. In the hermeneutic approach the researcher discusses various sides of the problem, and once the context has been defined and clarified, a solution to the original problem will also be found (Haaparanta, Niiniluoto, 1993).

The objective of the constructive research paradigm is to develop a mathematical system for finding solutions to specific management problems. The approach is innovative, creative and heuristic.

The main difference between functions analysis and constructive research is that functions analysis aims at understanding the phenomena and developing a theory on the basis of the phenomena, while constructive research starts out with a specific problem and aims at, on a normative basis, finding methods for solving the problem.

Kasanen, Laukka and Siitonen (1991) position the different research paradigms as follows:



Olkkonen (1994) suggests that the difference between a research paradigm and a research method is not very clear, but the research method can be interpreted as the scientific way of collecting and processing the data used in connection with the research paradigm. A number of different research methods are used in conjunction with different paradigms. For example, statistical methods are commonly used with the nomotetic paradigm. Qualitative methods are typical with functions analysis, although statistical methods may be applied to the processing of qualitative information. System analysis may also be used.

When selecting the research method it was obvious that a theoretical approach based on statistical analysis of a large number of samples was not possible. Firstly, the decision-making in product sourcing process is very complex. There are a number of factors that have an effect on how successful the selected strategy is. Secondly, product sourcing strategies are usually regarded quite confidential and it would have been difficult to collect reliable information from a large number of companies. For these reasons conceptual analysis, nomotetic research and conclusive methodology research paradigms were rejected. Functions analysis seemed to be most suitable for studying and solving the research problem of this study. On the other hand, the constructive research paradigm could also be considered as there is a great deal of creativity, innovation and heuristics associated with the problem context.

Based on company interviews and the researcher's own experience, it is obvious that a detailed study of a few selected case companies would be more beneficial. The objectives of this research are quite practical, aiming at giving fashion retailers guidelines for selecting proper ways of merchandising and helping them to understand how to measure success and performance.

Functions analysis was selected as the research method for this study. According to Olkkonen (1991), one research paradigm alone can seldom be followed. Rather a mixture of different paradigms are usually applied in the business and management sciences. Although functions analysis is the primary selected research paradigm for this study, the constructive research approach is also applied. The empirical part of the study concentrates on in-depth analysis of three case studies leading to a functional model for the merchandising process and mathematical equations for controlling success factors. As stated earlier, this research focuses on problems which have not been studied extensively earlier. Therefore a exploratory research approach is needed.

The functions analysis approach has its limitations. Although the analysis is done empirically and one tries to select cases which are as typical and representative as possible, the researcher is forced to come to conclusions on the basis of his intuition and understanding rather than on external readings and test results. Due to the limited number of cases, generalization of the results may be a problem. Another limitation is how to verify the results. They may have to be subjected to further research. In cases where the results of the study are normative recommendations for analysis and planning techniques, sufficient verification may be the fact that, in comparison to earlier methods, the new recommendations are useful on a practical level and in this way they contribute scientifically.

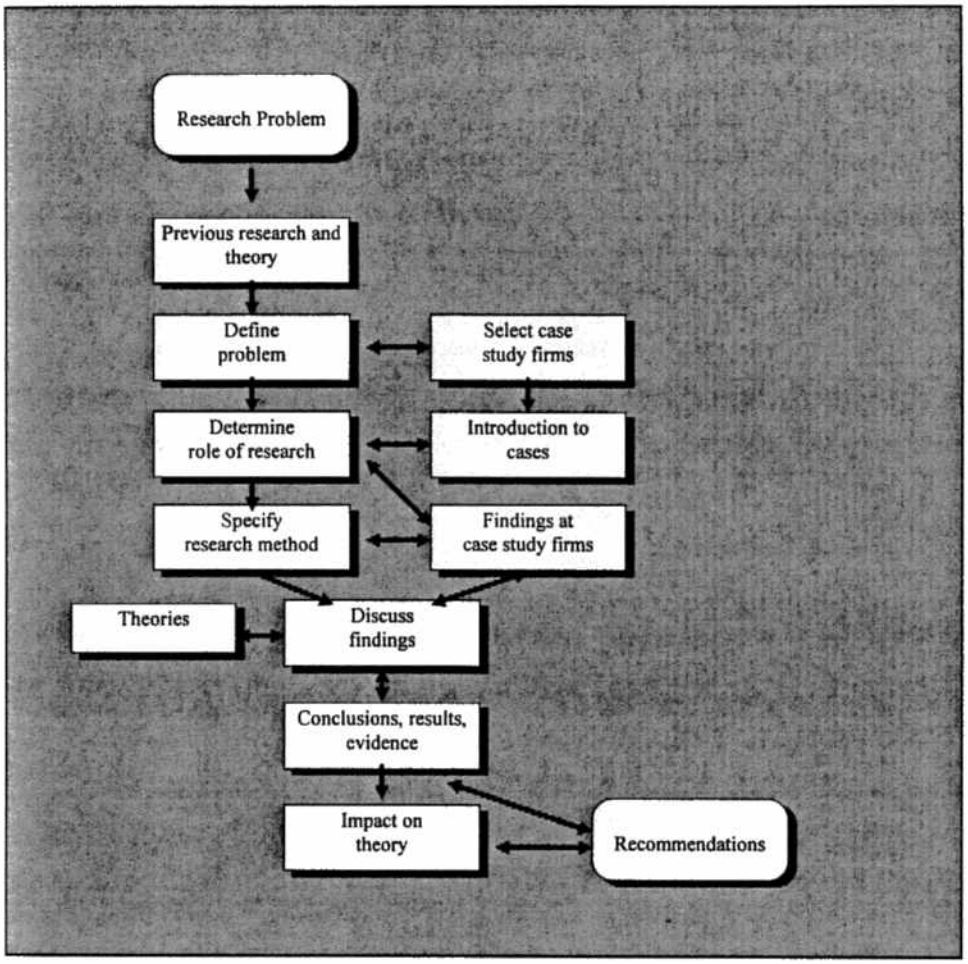


Figure 3. Structure of functions analysis research paradigm (Olkkonen 1994)

Lee (1989) states that for a single case study to be scientifically reliable, it must adequately address and handle four methodological problems: (1) making controlled observations, (2) making controlled deductions, (3) allowing for replicability, and (4) allowing for generalization. In order to avoid these problems several case studies were carried out during this research. Prominent companies with global product sourcing and a large variety of apparel product groups were selected. The research was done very in-depth. The following precautions were made in this research in order to eliminate the problems identified by Lee:

1. The same format of questionnaire was used during interviews and all case study firms were interviewed by the same person. In order to ensure controlled observations the results of the interviews were documented using the same format.

2. In order to make controlled deductions, all the cases were analyzed on the basis of same model and using same parameters developed by the theoretical part of this study.

3. As the same model could be used for all the case studies, one can assume that the sourcing process in all apparel retail companies is relatively similar and the results can be applied to garment retailers in general. Also, the results of earlier international research are in line with the findings of this study.

4. The case study firms represent volume retailers with different types of product concepts and sourcing operations and therefore the results can be regarded as general for the industry.

6. Study Structure

The functions analysis approach to the study consists of three parts:

1. Theoretical Study
2. Empirical Research
3. Model for Selecting Successful Merchandising Strategies

First, earlier Finnish and international research is discussed. A theoretical background for describing the merchandising process and ways of measuring success and performance is built on earlier research and literature analyzed in the next chapters. Various ways of measuring success in garment retailing are analyzed in order to outline the model to be used in empirical case studies. The results of the case studies are analyzed and as result the final model with recommendations is presented.

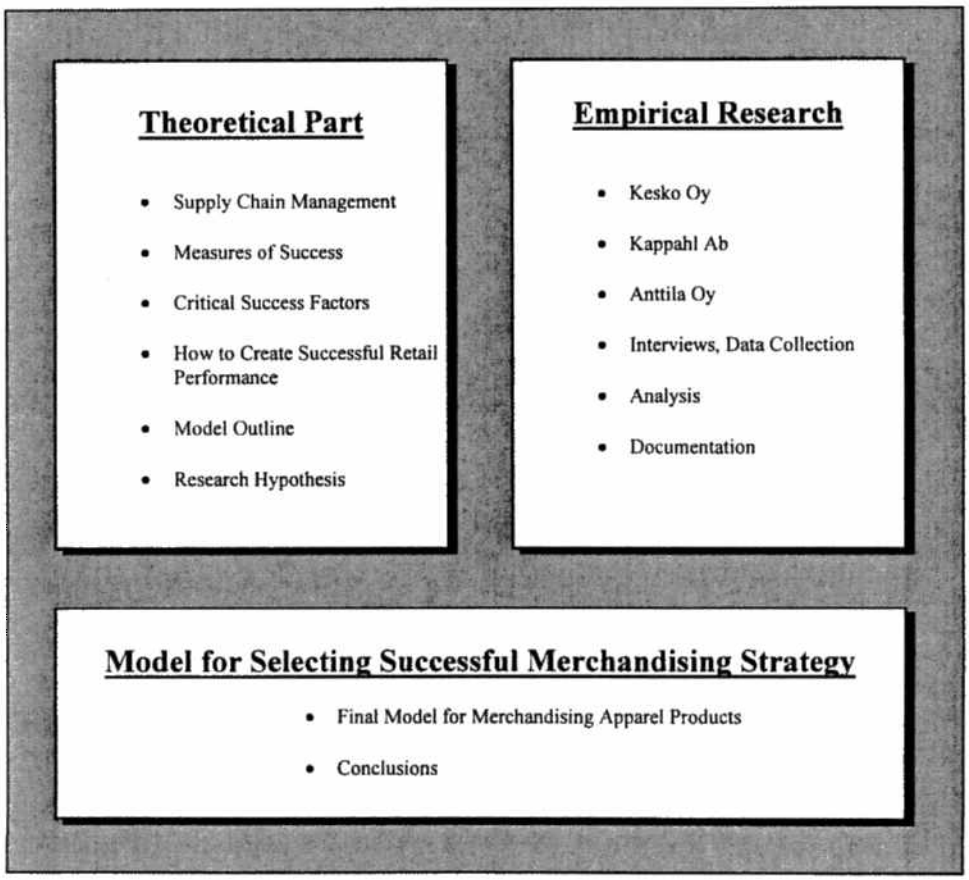


Figure 4. Structure of the study

SECTION II - EARLIER RESEARCH

1. Research in Finland

Merchandising strategies and their impact on retail performance have been researched in Finland on a very limited scale. There are studies about design, competitive behavior and company performance in the clothing industry (Antti Ainamo, Irma Tikkanen, Eivor Hulden), but their focus is not on the whole value chain.

Hannu Pirnes

Hannu Pirnes has studied product sourcing and merchandising as part of his research "Managing Efficiency and Effectiveness from a Time-Based Action Perspective" (1996). The focus of his study is on the simultaneous management of efficiency and effectiveness from a time-based action perspective. The study produces models for managing efficiency and effectiveness at the retailing and manufacturing level as well as positioning delay and friction factors in the value-added chain. Pirnes underlines technological knowledge and sourcing capabilities as well as a narrow assortment and speedy steering process as dimensions of efficiency in variable costs. The factors affecting the efficiency in capital costs are inventory turnover, optimal cost structure, marketing efficiency and organizational functionality. Time is the essential factor affecting the efficiency of value-added chain, i.e. the quicker the process the lower the working capital needed for manufacturing and retailing. He concludes that in low margin industries, such as manufacturing and retailing fashion products, it may be possible to regain competitiveness against low cost overseas imports by recognizing the combination of efficiency and effectiveness and using it in reorganizing company strategy. On an individual company level this means that the value chain one belongs to should be critically analyzed and vertical cooperation between various links in the chain should be increased, emphasizing the following:

1. Marketing perspectives

   Some marketing oriented factors such as differentiated products, brand names and promotional activities do not always lead to good retail performance, and their effect seems to diminish as the distance between consumer and manufacturer/retailer grows. The effectiveness of advertising is related to how well a producer/retailer can respond to consumer's product preferences. In the area of effectiveness, the power of marketing increases simultaneously with the improvement of the various dimensions of effectiveness, due to the decline in market friction. The positive impact of advertising on effectiveness relates not only to sales volume but also to the speed of the process. The faster the product flow, the better the potential for meeting with consumers' wishes. Advertising may help consumers to make their product choices faster and visit the advertised stores more frequently.

2. Organizational perspectives

When individuals have personal responsibility for the success of the company they become better motivated and develop more efficient ways of working. Lean management emphasizes individual decision making and underlines speed and efficiency. In a flat but still hierarchical organization the delay between consumer feedback, management decision making and implementation could be more effectively minimized than in an organization where individuals can make conflicting decisions.

3. Production perspectives

Increasing the speed on production activities on the basis of market pull effect requires production steering to be close to consumers. As it is difficult to utilize comprehensive consumer response information efficiently in production scheduling, test marketing techniques with sample based information should be adequate. In order to cut down production lead times and to increase efficiency, fabric and product dyeing techniques should be utilized at manufacturing. Manufacturing can be organized through subcontractor networks, but adequate and competitive technology, especially for design and transfer of information must be available. Production scheduling decisions involving consumer response have to take place as close to the consumer as possible, in order to avoid time delays and the effects of market friction factors.

Outi Uusitalo

Outi Uusitalo's research "Retail Dis/satisfaction: Framing the Domain of Consumer Dis/Satisfaction in a Dynamic Shopping Context" discusses the various aspects of consumer satisfaction and argues that satisfaction or dissatisfaction is an outcome of a comparison between expected and perceived product performance. The expectations and perceptions of performance levels affect customer satisfaction directly as well as indirectly via disconfirmation. As satisfaction is a result of comparison, it is a concept expressing a certain degree of relativity and therefore not stable in different circumstances. Several attempts have been made to classify the comparison standards in order to make sense of the disconfirmation model, for example to normative standards, optimal performance standards or most likely performance standards. Uusitalo questions the viability of attempts to divide the concept of customer expectations into smaller and smaller parts, because different standards represent different kinds of expectations and it is difficult to know which kind of expectations the performance of a product is compared with.

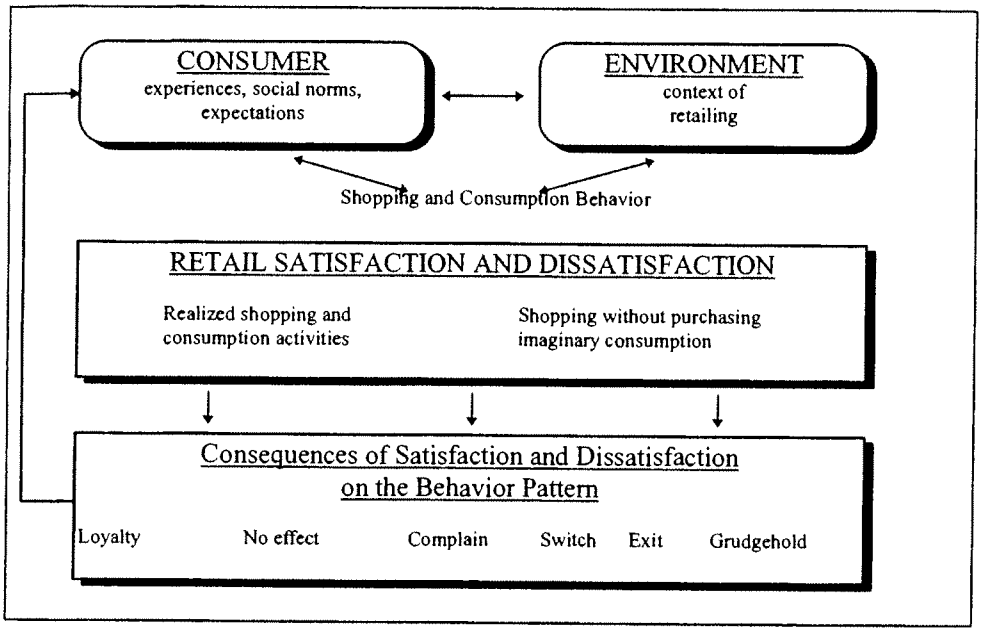


Figure 5. The framework of retail satisfaction (Uusitalo, 1993)

Shopping and consumption behavior is an ongoing and repetitive process. Some of the episodes may also reflect imaginary behavior, i.e. shopping without purchasing is a form of daydreaming. Possible reactions by consumers may range from loyalty to grudge-holding and the moments of satisfaction and dissatisfaction cannot be told apart from behaviors which occur either during or after the shopping events. The structure of retailing is of considerable significance: store types, retailing techniques, product ranges, price levels and location strategies. The importance of retail structure to consumers has to do with the whole consumption and shopping pattern rather than with specific mental structures (attitudes), argues Uusitalo. Among several propositions, Uusitalo lists the following:

1. Retail satisfaction is an ongoing process where evaluations are directed towards the continuously changing shopping environments and conditions.
2. Consumers may be at the same time satisfied with certain objects in the retail environment and dissatisfied with others.
3. Retail satisfaction is relative and proportional to reference points based on experience and social norms.

2. International Research

There are a number of international studies which approach the research problem of this research from different angles. North Carolina State University has been very productive in this field. Its researchers, Hunter, King and Nuttle, have published a number of studies and research papers specifically comparing Quick Response to other sourcing strategies. Several studies concentrate on inventory models. Supply channel partnerships and manufacturer / retailer relationships have also been researched. The following research is referred to below as they are considered relevant and contributory to the problems and areas of this study:

Katy S. Azoury, Bruce L. Miller

In their research they compare Bayesian and Non-Bayesian inventory models for optimizing ordering levels with decision problems under uncertainty. As pointed out by the researchers, many earlier studies have come to a conclusion that "Although before time t(n) the decision maker is uncertain as to what the world will be like at time t(n), he is less uncertain at times closer to t(n) than he was at times farther away. The decision maker acquires additional information - he learns about future states of the world - as time goes by." Therefore, when faced with uncertainty, it is desirable to consider, with decision models, how additional information during the progress of the process helps the decision maker.

M. Fisher, A. Raman

Fisher and Raman have studied how to reduce the cost of demand uncertainty through accurate response to early sales. Their case study firm is Sport Obermeyer, a ski wear manufacturer which faced problems in sourcing as a big proportion of production decisions must be made without prior orders. By implementing Quick Response the company was able to reduce stockout and mark-down costs by reducing lead time sufficiently to allow some production to be programmed after initial orders had been obtained. A test was made to determine the improvement of forecast accuracy when the forecast is made on the basis of 20 % of seasonal orders. The impact was dramatic, and a strategy for reducing the cost of too much or too little inventory could be implemented by committing to a modest amount of initial inventory and then producing an additional amount on the basis of improved forecasts.

The model developed by Fisher and Raman was based on the following key features:

- in order to improve the accuracy of production decisions, they should be conditioned to some extent on early sales
- dealing with seasonal collections means that estimation of demand density parameters cannot be based on demand history
- due to limited production capacity during the peak sales season a significant portion of production must be committed prior to receiving any orders

- due to the economical scale of production there is a limit under which production of apparel becomes uneconomical and minimum lot sizes must be respected.

The evaluation of impact of this kind of approach on stockout and mark-down costs was carried out at Obermeyer for the 92/93 season. During the test sourcing decisions were made on the basis of the Response Model and without it and the results of each were compared from style to style. The comparisons concluded that the total cost reductions achievable were between 2.8 % and 3.8 %. As these were direct cost savings the potential for improving profits was between 60 % and 127 %. The overall measure for the value of Quick Response compared to the situation where production commitments had to be made before observing any demand was 8.5 % on sales.

	Response Model		Decisions without Model
	Suggested	Actual	
Total production	124,805	121,432	172,896
Overproduction	22,036	25,094	83,445
Underproduction	792	7,493	14,380
Overproduction cost as % of sales	1.3 %	1.7 %	6.8 %
Underproduction cost as % of sales	0.2 %	1.6 %	3.6 %
Total cost as % of sales	1.5 %	3.3 %	10.4 %

Table 2. Impact of QR model at Obermeyer. Results for Obermeyer's 1992/1993 season

The case study firm OberMeyer is a manufacturer who sells its collections to various retailers. This case in comparison to the cases of this research has a different focus. A manufacturer selling products to retailers with his label receives orders from the retailer. The higher the proportion that can be produced on the basis of these orders, the lower the decision uncertainty. In case of a retailer, which is the research angle of this study, no customer orders can be used as basis for production commitments. Instead, the Point of Sale information from current season can be used. However, the decision making problems are the same as in case of Fisher and Raman, and the main findings of their research can be applied to this study as well.

M. Wall, M. Sommers, A. Wilcock

Nine major chain retailers and thirty-one apparel manufacturers located across Canada were interviewed in-depth in order to determine their approaches and heuristics regarding, among other things, product sourcing. The companies interviewed, including manufacturers, source at least part of their products form outside sources. Six themes were identified to be central and essential when carrying out evaluation of suppliers:

1. Product assessment, i.e. uniqueness of offering, fashion content, quality of materials and finishing.
2. Product cost determinants, such as direct cost of product, shipping, brokerage, customs and duty charges and foreign exchange charges.
3. Sourcing costs, i.e. buying office, personnel, travel, warehousing, opportunity costs of funds tied up, defective goods, carrying costs, spillage, order filling errors like short-shipping and variances from specifications, communication costs
4. Product ordering parameters, like minimum order size, lead times, re-order lead times, order cancellation dates, quota availability
5. Merchandising assessment as mark-down or mark-up potential
6. Buyer-source relationship, i.e. accessibility to source, ease and timing of communication, quality of interactions, language, frustrations at cultural differences

Sourcing is seen as a particularly complex function by the researchers. The companies use a variety of approaches from pure buying to private label-based contractual relationships with manufacturers. A common characteristic for all of these is the uncertainty under which the buyer has to make his sourcing decisions.

A. Iyer, M. Bergen

By using formal inventory models that separate the effects of Quick Response on each participant in the channel, Iyer and Bergen have studied how a manufacturer-retailer channel impacts choices of production and marketing variables under Quick Response. Within the fashion industry lead times are long, and retailers have to place orders with manufacturers regarding individual items long before demand is actually realized. Problems resulting from this are:

1. Too little inventory resulting in stockouts and low service levels
2. Too much inventory resulting in mark-downs and joboffs

Iyer and Bergen conclude, as also pointed out by several other studies, that when implementing QR, retailer service level improves from 80 % to 95 %. Some case study firms, such as Saks Fifth Avenue stores, report improvement up to 97 %.

Iyer and Bergen confirm the benefits of QR to retailers but argue that the whole supply chain, and especially the manufacturer, may not always benefit from QR. This is associated to increased production costs due to shorter production runs, and without any compensation in prices.

N. A. Hunter, R. E. King, H. L. W. Nuttle

Hunter, King and Nuttle have carried out and published several studies about Quick Response in the apparel industry. This team of North Carolina State University has compared traditional seasonal up-front buying to QR techniques which are based on in-season purchases done according to POS information. According to them

stockouts and mark-downs are a major problem for the apparel retailer and cause him to lose money. However, things can be improved considerably by implementing QR techniques.

Apparel goods can be divided into basic goods (25 %), seasonal goods that are replaced two to three times annually (45 %) and fashion goods with four or more seasons per year (30 %). Especially with seasonal goods and fashion goods stockouts and mark-downs are high if all buying is done up-front based on the buyer's plan. Mark-downs can, however, never be totally eliminated since a number of consumers always look for bargains and will not buy at first price.

In apparel retailing Stock Keeping Unit (SKU) is a term referring to one product at a style, color and size level, i.e. the basic item or unit in stock management as well as in sales. According to a consumer behavior model the consumers arrive at the store according to Poisson process. The consumer may have a specific item in mind or she might be browsing. Both cases may lead to a sale of one or more SKUs.

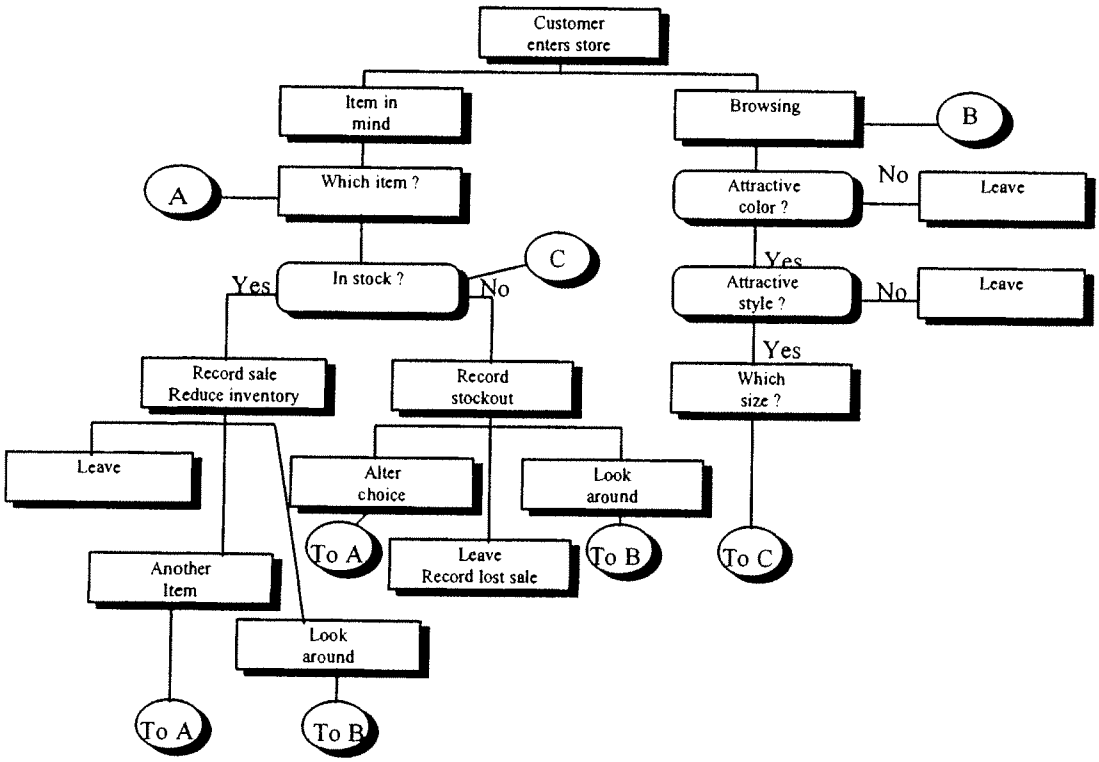


Figure 6. Consumer behavior model by Nuttle, King, Hunter

According to the consumer behavior model, when having a specific item in mind and finding it in stock, the consumer will buy it, thus reducing the stock level by one. After that she will leave, look for another specific item or start browsing. In each case, when on purpose or after browsing, the consumer starts to look for a specific item and cannot find it in stock, a lost sale is recorded.

The researchers developed a computer model for analyzing the above consumer behavior. The initial supply, a demand re-estimation procedure, reorder possibility together with reorder lead time and mark-downs are specified as input to the model. The model works with specified probabilities for various alternatives and relevant cost data is input to the model in order to evaluate the effectiveness of one buyer strategy vs. another.

Input variables for the model	
Season length	Branching probabilities
Reorder lead time	Price elasticity
Assortment	Actual consumer demand
Number of styles	Actual mix
Number of colors	Customer volume
Number of sizes	Customer arrival pattern
Buyer's plan	Re-estimation technique
Expected seasonal sales pattern	Reorder method
Expected sales volume	Cost and revenues
Expected mix	Wholesale price
Initial supply	Job-off price
Mark-down schedule	Inventory costs

Table 3. Input variables used by Hunter, King, Nuttle Model

The computer model can be used for comparing different scenarios. The output of the model covers several measures for retail performance, for example:

- percentage of sell through
- percentage jobbed off
- percentage of lost sales
- inventory turns
- gross margin
- gross margin return on inventory
- service level

When comparing the traditional way of buying where the buyer places an order for 60% of the planned volume up-front to QR buying with 35 % up-front buying, the QR

retailing yields a far better gross margin return on investment (GMROI), inventory turns and service level. The portion of lost sales and joboff sales is significantly lower.

In another study paper (An Apparel Supply System for QR Retailing) produced by the same team, pre-season, transition and selling season buying and production are studied by also taking fabric ordering into account. Both production and fabric orders are done weekly on the basis of POS information during transition and selling season production. The results of the study are in line with the one presented earlier. In this study emphasis was also placed on defining the limitations of QR. Among the findings of the study was that the value of reordering during the season decreases if the season length is shortened. Longer lead times allow for less reordering times for fabrics and goods thus decreasing the possibility of correcting earlier purchases. The study concludes that QR procedures become of limited value when the average volume (SKU) is less than 25 and / or the selling season is shorter than 10 weeks. The overall advantages of QR according to stochastic simulations are listed by the researchers as follows:

- weekly inventory level is lower throughout the whole season in QR buying compared to traditional buying even with one replenishment order
- service level stays at the optimum level with QR longer towards the end of the season
- stock-outs per customer occur more seldom with QR than with traditional buying.

SECTION III - THEORETICAL STUDY

1. Supply Chain Management

1.1. General

The objective of Supply Chain Management (SCM) is to make supply meet demand (Fisher, Raman, 1996). SCM is the collection of actions required to coordinate and manage all activities necessary to bring a product to market, including procuring raw materials, producing goods, transporting and distributing the goods and managing the selling process (Abend, 1998). Global competition, faster product development, flexible product sourcing systems and a great variety of products have contributed to the increase of uncertainty in the market. No doubt it has been the consumer who has enjoyed the benefits of this development, while manufacturers and retailers are having problems in predicting future demand. Sales forecasting has become more difficult and inaccurate resulting in growing stocks and at the same time stockouts. The proportion of mark-downs in retailing has increased tremendously.

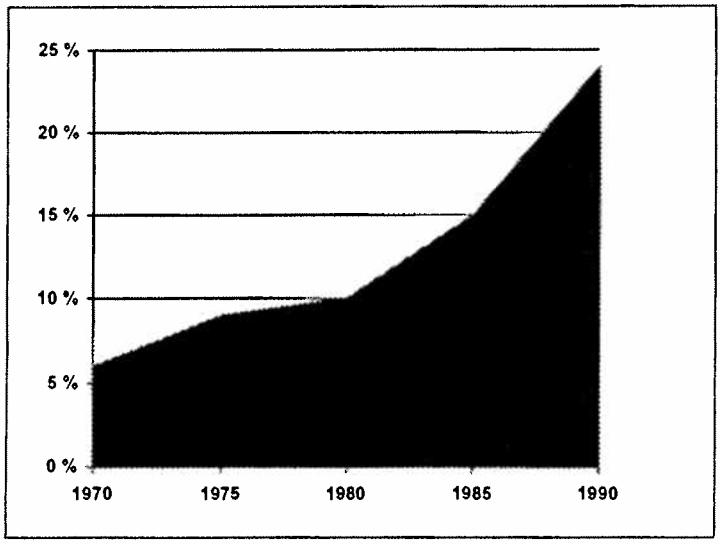


Figure 7. Department store mark-downs as percentage of sales in the USA according to National Retail Federation (Fisher, Hammond, Obermeyer, Raman, 1994)

Quick Response programs, Just-In-Time inventory systems, Efficient Consumer Response and other similar philosophies have been developed and applied in order to cope with the uncertainty of the market. However, a clear majority of apparel buying is done up-front and based on forecasts. If the forecasts are wrong, the supply chain

will be partly filled with products that do not meet the demand. According to Fisher, Hammond, Obermeyer and Raman, the cost of forecasting errors can be greatly reduced by implementing accurate response methods together with improved supply systems. The basic idea with the Accurate Response approach is to determine what can and cannot be accurately forecasted decisions regarding the most unpredictable items should be postponed until market information is available.

Forecasting errors have two kinds of undesirable effect, i.e. missed sales opportunities through stockouts and mark-downs through high inventory level. Both of these errors have a negative impact on sales and profits. The SCM system should be designed in such a way that both of these are considered. Those products for which demand is easier to predict should be distinguished from the unpredictable ones, and different forecasting and sourcing techniques should be applied. Products with predictable demand can now be sourced cost effectively well in advance of season and allowing for long lead time, while sourcing of products with unpredictable demand should be based on market information and short lead time. One particular company may have only basic products where demand is easy to forecast, while another company may operate with products of the very latest fashion with short life cycles. The market uncertainty for these companies is quite different and different kinds of forecasting methods should likewise be applied.

Forecast error is one of the main determinants of the need for safety stock, as stockouts caused by the forecasting error may occur. Forecasting accuracy tends to vary according to the length of the lead time and forecast error seems to increase more than proportionately the further ahead we have to forecast (Christopher, 1997).

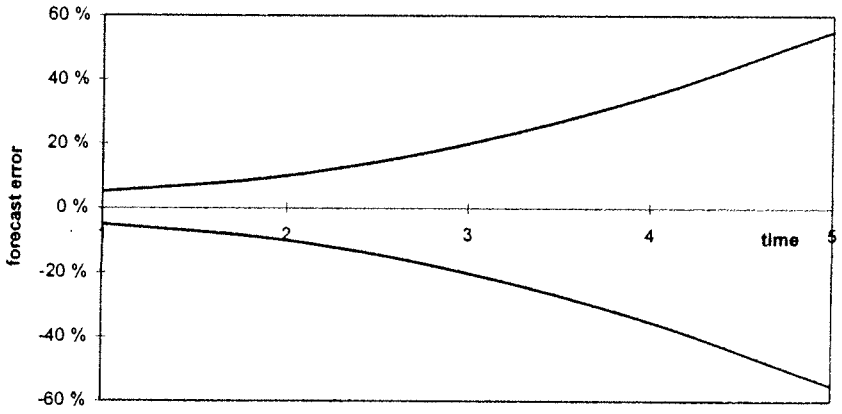


Figure 8. Forecast error and lead time (Christopher, 1997)

Mismatching of supply and demand is costly to all members in the supply chain and in the end to the consumer, as the mismatch costs are naturally costed into the prices. Fisher, Hammond, Obermeyer and Raman argue that by using accurate response the companies could actually lower prices instead of making the consumers pay for their inaccurate forecasts. The reason why this is not widely done is twofold. First, the dramatic increase in demand uncertainty is a recent phenomena and most retailers still plan their production and sourcing as if forecasts were reliable. Secondly, it is difficult to run multiple demand scenarios and incorporate them into the planning process simultaneously.

According to Jeff Stiely, Manager of Kurt Salmon Associates' Performance Enhancement Group, SCM is an alliance that is focused on a new type of relationship in the supply chain: the blurring of the organizational lines. The aim is to move beyond the exchange of some information, to the sharing of all information between different players in the supply chain. As part of the advance planning process, joint product development is needed. Today, fabric manufacturers design their own collections, garment manufacturers select some of these fabrics for designing their collections and finally the retailers make the decisions regarding which of these styles will be displayed in the stores. All these three members in the supply chain have made their own forecasts on what the consumer wants, and at the end we might have three different forecasts (Abend, 1997 and 1998).

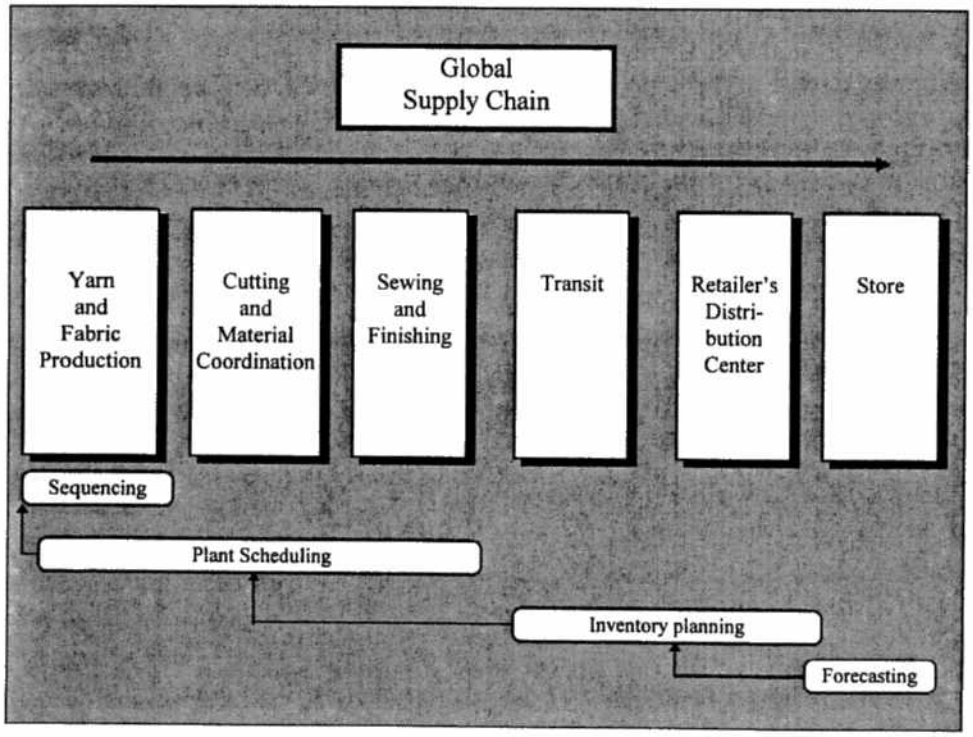


Figure 9. Apparel supply chain (Abend, 1998, modified)

According to Abend, SCM has the potential to drive efficiencies and profits higher than the sewn products industry has ever seen. SCM is specifically about cooperation, the sharing of designs, forecasts and POS information, which are all areas that have traditionally been kept confidential. Inventory planning, plant scheduling and sequencing of production are all based on demand forecasts and therefore forecasting accuracy is of utmost importance to the whole supply chain.

Quick Response (QR) is a merchandising strategy used by apparel manufacturers and retailers and their raw material manufacturers for shortening the pipeline from raw material to checkout counter at the retail store (Knill, 1997). The objective is to respond rapidly to consumer demands and at the same time to cut down inventories throughout the chain. Three types of information technology are usually required:

- Bar codes on all products sold in the retail outlets
- Use of bar code scanners at POS in retail outlets
- Electronic transmission of replacement data from the retailer to the manufacturer

Implementation of QR requires that vendors and customers form partnerships which are based on mutual trust and through which marketing information will be shared. Information processing and transfer throughout the whole pipeline is emphasized and usually requires EDI links between the partners. These technologies keep track of each Stock Keeping Unit sold, and transfer this information to suppliers for automatic replenishment of stock.

The philosophy behind Efficient Consumer Response is similar to QR, except that it goes further in joint sharing of supply chain functions in order to maximize consumer satisfaction (Knill, 1997). Also, with ECR, the principle for planning and operating is that, on real-time basis, actual sales information is made available for the supplier who in turn can plan his production and deliveries accordingly. This information is further transferred to the raw material supplier of the garment supplier. In this way all the members of the supply chain can plan their production according to real demand. QR and ECR originate from the United States where the garment industry wanted to find ways for competing with offshore buying. Kurt Salmon Associates carried out a study of lead times within the industry and concluded that the total time in the US apparel supply chain from raw material to consumer purchase was 66 weeks, of which 11 weeks was production time and 40 weeks warehousing and transit time. As result of the report various projects in the US apparel industry were launched and POS information is actually transmitted back to the garment and fabric manufacturer in several applications.

Lamey points out that the main difference between ECR and QR in the area of reducing inventories at the store is that the main emphasis of QR is to ensure that the

breadth of merchandise is large enough to maximize customer satisfaction, whereas with ECR the goal is to reduce inventories to a minimum level without sacrificing consumer service (Lamey, 1996). The three key features of ECR are customer focus, partnership development and integration of activities.

1. The customer has the central role in manufacturing and retailing. Production and supply are managed and controlled on the basis of customer needs.

2. Partnerships are formed between suppliers and retailers in order to cooperate in various areas of the supply chain and share the benefits of reduced inventories. On a practical level manufacturers and retailers may have conflicting goals, since manufacturers are interested in supplying the whole range of their products and retailers are interested in receiving only those that there is demand for. The objective of ECR is to find ways for cooperation in order to mutually benefit from the savings. Once problems of partnerships can be solved, it is possible to combine other activities as well, including promotion.

3. The whole supply chain is integrated comprising raw material suppliers, manufacturers, retailers and service providers. This integral approach replaces the tendency of managing each area separately, which means that each member in the supply chain is not aiming at maximizing his profits at the cost of other members in the chain.

Implementation of these key features require large-scale organizational and structural changes, according to Lamey. ECR Europe is an organization formed in 1994 with 18 major sponsoring firms from various European countries. The objective of the organization is to encourage European retailers in implementing ECR. ECR Europe has produced a model which identifies 14 key areas for ECR. These areas are listed under three main topics: category management, product replenishment and enabling technologies.

Category management is defined by the American ECR Best Practice Operating Committee as 'a distributor / supplier process of managing categories as strategic business units, producing enhanced business results by focusing on delivering consumer value' (Lamey, 1996). Category management, instead of focusing on individual products or brands, looks at a cluster of substitutable products. The clusters are formed on the basis of the function of products, in other words consumers would use the products for the same purpose. According to Lamey, the category manager, within the context of the category, seeks to:

- achieve the right mix of products (efficient assortment)
- reduce the number of failed product launches
- ensure that promotions are in line with category plans and achieve maximum pay back
- implement the latest information technology and logistic methods in all activities.

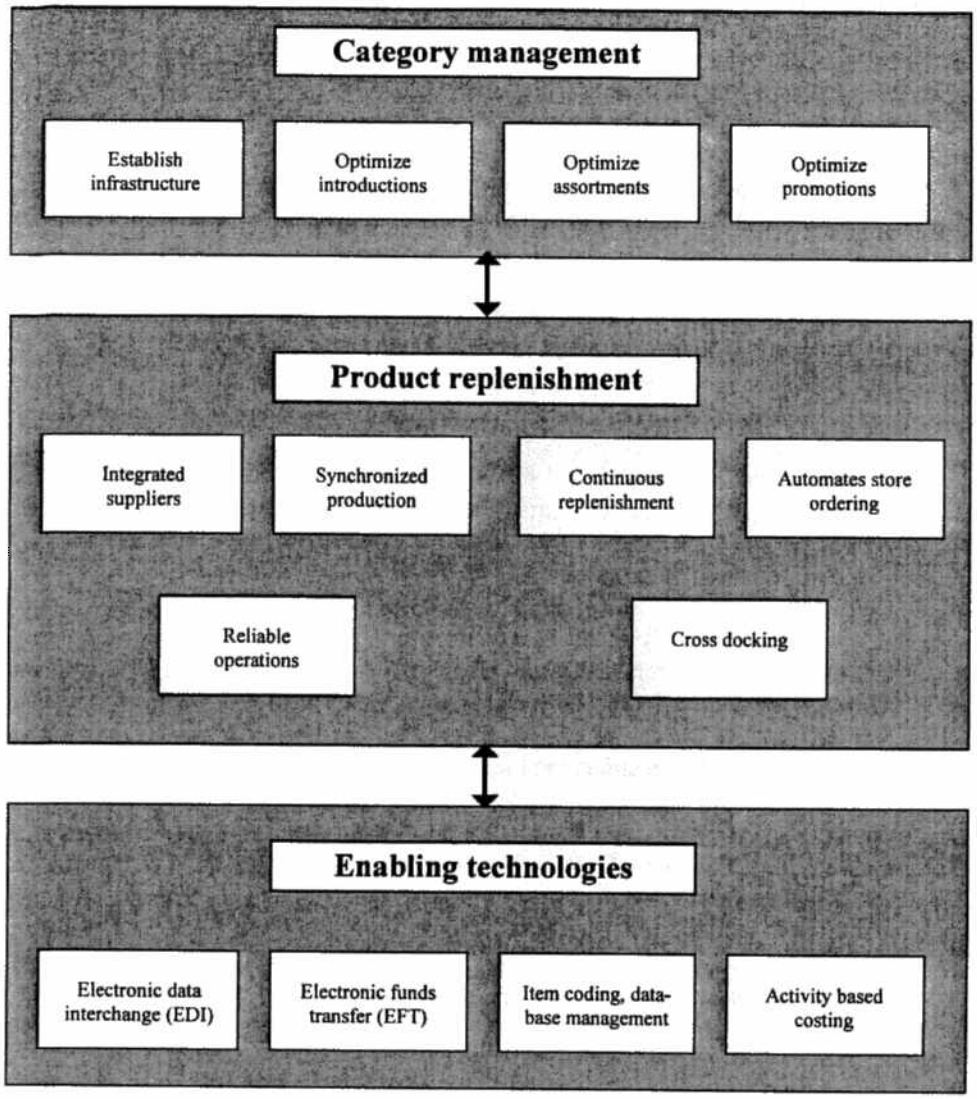


Figure 10. ECR focus areas as defined by ECR Europe (Lamey, 1996)

What the customer wants is the central element of ECR. Firstly, the store's trading area must be defined. The retailer needs to know who the customers in the trading area are, and what their main interests and characteristics are. This can be studied by in-store surveys, and by using customer database information. The customers' real needs must be defined. Also the competitive situation must be analyzed in order to benchmark against competitors the service, variety, price, quality and convenience. All this data must then be integrated and interpreted both at a qualitative and a quantitative level.

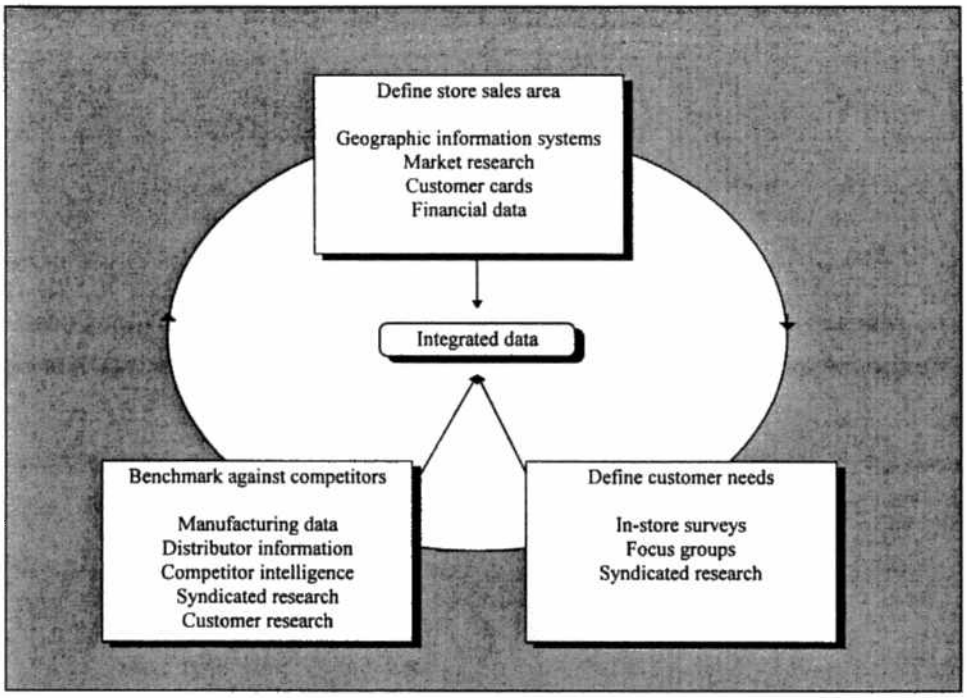


Figure 11. Developing an understanding of a customer (Lamey, 1996)

Vendor Managed Inventory strategy means, according to some definitions, that some of the season's goods are delivered at the start of the season and replenishment orders are usually made weekly on the basis of re-estimation or re-order algorithms (King, Hunter, 1995 and 1997). POS information is not shared with the supplier who plans his production on the basis of forecasts which are usually produced in advance. Therefore shipments may come up short resulting in stockouts or there might not be any orders for part of the vendor's inventory. In some basic apparel articles, such as hosiery, VMI may work well. The supplier is actually managing the customer's inventory on his behalf and refills the shelves according to demand. Due to very low fashion content there is no danger of producing the wrong items.

In the new competitive environment, it seems evident that successful marketing strategies are based upon an amalgam of three critical elements: the creation of a consumer franchise whereby end-users are attracted to the product/service because they perceive a superior offer; a strong customer franchise where intermediaries want to do business with the principal because of a tangible economic benefit and, third, an

underpinning supply chain effectiveness that delivers superior service at less cost (Christopher, 1997).

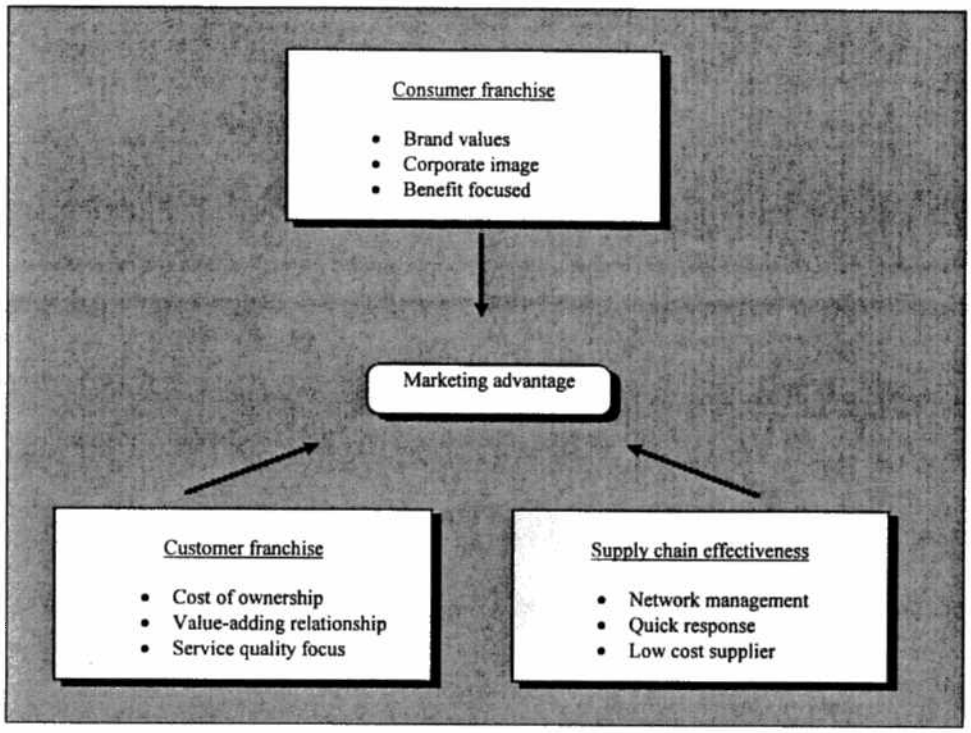


Figure 12. The sources of marketing advantage (Christopher, 1997)

By consumer franchise Christopher means that the retailer needs to build a "contract" with the end-user in order to gain consumer loyalty. Brand value is still a critical element in many purchase decisions although brand loyalty may no longer be as strong as it used to be. It also seems that consumer loyalty is often based on hard dimensions rather than soft ones. Value for money, convenience, reliability, safety and functionality are the drivers of product choice (Christopher, 1997). The growing penetration of retailers' own label products in major European markets is further evidence of this. The focus of marketing effort is more and more on delivering solutions which can be translated into hard, tangible benefits for the consumer. Obviously this means that product tailoring and customization will increase, argues Christopher.

By customer franchise Christopher also means that the supplier and especially the original product manufacturer should make the retailer an integral part of the marketing strategy, especially in brand marketing. Single-sourcing seems to be

replacing the former practice of spreading purchases over several suppliers. This, together with increasing market concentration, means that the buying power of one retailer is growing, resulting in a search for cost reductions and cost-effective sourcing.

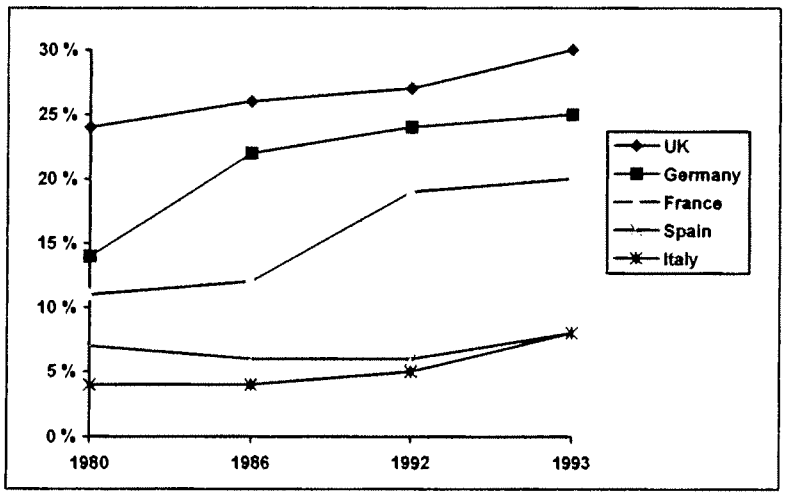


Figure 13. Retailer label market share according to Boston Consulting Group (Christopher, 1997)

Christopher points out further that in the new marketplace individual companies no longer compete with other companies but it is one supply chain against another supply chain. When organizations work independently of their up-stream supplier and down-stream customers, cost and inefficiencies tend to build up at the interfaces. Due to the growing time-based competition, supply chain integration as a source for competitive advantage is gaining momentum. This is especially true with volatile markets where responsiveness becomes critical, as can be seen with companies like Benetton, who through highly coordinated logistics and an integrated supply chain structure driven by the real time POS information as a planning base, have been able to respond rapidly to fashion changes in the market (Christopher, 1997).

1.2. Managing the Supply Chain

Supply chain management requires a new kind of thinking throughout the whole chain. Buyers and sellers should no longer sit at opposite sides of the table. A wider

and business development-focused relationship, where the supplier takes a holistic view of the customer's needs, is required. The stronger the relationship with a partner, the greater the barrier for a competitor to enter. For example, Marks & Spencer has exceptionally close links with suppliers. Both the supplier and Marks & Spencer have invested a considerable amount of time in product and process development, logistic system linkage and continuous improvement programs, and as result a supplier has little to fear from competitors as long as he is able to meet Marks & Spencer's stringent requirements (Christopher, 1997). In a conventional buyer seller relationship the interface is very fragile and easily broken by competitors, whereas in a relationship-based approach there are several connecting points between the vendor and the customer. Managing the supply chain becomes a mutual interest and the key focus is on customer management.

The idea behind customer management is that the supplier actively seeks to better understand the customer's business and the needs of his customers and then develops total business solutions in partnership with the customer (Christopher, 1997). In retailing there is a growing trend towards Category Management which means that the retailer seeks ways for improving the profitability of a particular group of products.

Michael Porter was one of the developers of the term 'value chain'. The term is usually understood to cover all the functions in a firm which create value for customers. The strategic importance of this concept is that it forces the firm to analyze every link in their value chain in terms of how cost effectively it creates value for the customer. Wherever cost effectiveness does not hold, the function could be out-sourced or if possible, eliminated totally. In case of out-sourcing, the firm to produce the out-sourced function becomes a part of the extended value chain.

The objective of supply chain management is to achieve the most cost-effective way of satisfying the needs of the end customer through buyer supplier process integration. The integration can be achieved only through sharing market information. In this way a seamless process can be created and implementation of JIT, ECR, QR and replenishment according to POS information becomes possible. At the same time as the process integration develops, companies are concentrating their purchasing. Retailers are interested in finding supplier partners rather than looking for cheap deals. This is the only way to carry out continuous quality and delivery improvement which is necessary in order to achieve the quality goals set forth by the value chain. According to Christopher, supply partnerships are demanding and all the partners in the chain must be willing to commit themselves to such things as:

- Early involvement of suppliers in the new product development process
- A joint program of continuous product and process improvement facilitated by transparency of costs in both directions
- Agreement of performance targets and measurement criteria
- Commitment to the open flow of information facilitated by the use of Electronic Data Interchange

Cost transparency means the members in the chain must be willing to share product cost information and jointly look for ways to reduce costs. Traditionally, and still is correct, the buyer tries to buy the products for as low a price a possible. Usually, it has been the supplier who has been forced to reduce his margin. In the new approach savings are achieved jointly. For example, a supplier can perhaps increase capacity utilization through improved planning and scheduling. Costing systems should also be analyzed and made fair and correct. This can be done by implementing activity based costing (ABC) which can help the supplier and customer to understand the real and total accumulation of costs through the supply chain.

Information related to demand, stocks and supply schedules should be shared openly between the vendor and customer. This requires mutual understanding and trust and can usually be done by selected partners only. The earlier the information is shared the better the competitive advantage within the chain.

Vertical integration is not the same as supply chain management. In vertical integration there is same ownership throughout or at least through part of the supply chain while a SCM chain consists of a network of independent companies who have voluntarily come together for cooperation. However, the supply chain under SCM operates as single entity and has same goal. SCM is also about logistics. But, while logistics management is primarily concerned with optimizing material flow within an organization, SCM looks at cooperation within a network of companies, suppliers and customers. According to Martin Christopher, the following issues are fundamental to why businesses are looking at SCM (Christopher, 1993):

- The increasing competition has created a customer service explosion which means that in order to stay competitive a company must enhance value-in-use by making the product worth more in the eyes of the customer because service has added value to the core product.
- Time compression is taking place in supply chains when product life cycles are becoming shorter, retailers require just in time deliveries and consumers have a growing choice of products and retail outlets to choose from.
- There is a clear trend towards globalization. Retailers are merging in order to grow bigger. Global sourcing is the standard practice for material. Offshore manufacturing and worldwide selling is increasing.
- Organizational integration is needed in order to manage the whole supply chain efficiently and effectively.

On the other hand there are several examples showing that vertical integration can also be successful. Zara is a Spanish multi shop chain, originally a garment manufacturer who expanded to retailing. Today, with more than 250 stores the company is rapidly expanding through Southern and Central Europe. Only own label goods which are partly manufactured by their own factory are sold. All the stores are directly owned by the company. Zara is an example of a Corporate Vertical Marketing System (VMS) which means that one firm owns and operates organizations at several levels of the supply chain. There are forward integrated and backward integrated VMSs. Zara, Benetton and InWear are examples of forward integrated

VMSs. As suppliers they have also established their own retail outlets. Retailers with their own manufacturing units are examples of backward integrated VMSs. Corporate VMSs are set up in order to gain total control over the whole supply chain. Decision making is not subject to approval by the retail level (Marketing in Europe 1997).

An administrated Vertical Marketing System is similar to conventional channels in that the participating firms are independently owned and operated, but the system has a highly effective inter-organizational management. Usually it is the dominant firm, the administrator, within the system that manages the chain. An administrated VMS is usually created in order to compete against more integrated systems. The administrator of a VMS will usually combine the use of expert market power with reward power. Both suppliers and retailers benefit from administrated VMS. Suppliers can benefit from the ability to develop their sales and profit potential without having to continuously compete in the changing market environment. Retailers benefit from clearly specified inventory investment requirements, timely availability of merchandise and preferential treatment from critical suppliers (Pelton, Strutton, Lumpkin, 1997).

Contractual VMSs consist of independent firms operating at different channel levels that integrate their distribution agendas on a contractual basis (Pelton, Strutton, Lumpkin, 1997). Formal contracts are signed between the partners allowing for greater economic and market impact for each member compared to operating independently. There are two types of VMS, i.e. Retailer-sponsored Cooperative Organizations (RCO) and Wholesaler-sponsored Volunteer Organizations (WVO). An RCO is established by independent retailer companies who collectively support a single wholesaling organization that performs various type of services for the members, such as sourcing, shipping, warehousing, promotion and information management. Kesko, one of the case study firms of this research operates on this basis. WVOs are organized around a wholesaler which remains in private ownership and provides similar services to its independent member companies, especially in the area of product sourcing. Depending on the agreement between the parties, the members agree to carry out a larger or smaller portion of their buying through the wholesaler. Buying associations are examples of this kind of vertical marketing system. Both WVOs and RCOs are taking on a great deal of power usually administrated by manufacturers, and offer their members strategic power otherwise unobtainable for small retailers.

Franchising is also one form of Contractual VMS which, according to Kotler and Armstrong, can be classified into three categories: Manufacturer-sponsored retailer franchise systems, Manufacturer sponsored wholesaler franchise systems and Service firm-sponsored retailer franchise systems (Kotler, Armstrong, 19979). Franchising is no doubt the most widely spread form of Contractual VMS.

Decisions for setting up VMSs depend on whether it is more economical to buy the services of the supply chain or to perform them by yourself. The main reason for seeking control of the distribution channel is to ensure an acceptable level of profits. This however, is possible only if sufficient volumes can be obtained in order to be competitive against large competitors, or through a high level of product and service specialization a sufficient amount of value can be added to products. Pelton, Strutton

and Lumpkin summarize the benefits of vertical integration as reduction of transaction costs and securing supply and/or demand. Costs from VMS are created by reduction of flexibility, high capital investment, loss of access to wider consumer research, wider managerial requirements and imbalanced throughput.

Value Adding Partnership (VAP) offers an alternative to VMS. VAP involves a set of independent companies who by cooperating can add value to each other. The value adding chain contains companies that by offering services to each other will individually benefit out of this partnership. Buying alliances are one form of VAP. Several large retailer organizations can come together and join forces in designing and sourcing collections. In order to improve the quality of product supply, retailers are looking for supply partners, i.e. manufacturers who are willing to cooperate on a long term basis in designing and supplying goods to the retailer.

A horizontal marketing system means that two or more companies at one level join together to take up a new marketing opportunity. The companies can be competitors or noncompetitors. Joining forces can be done in order to gain more marketing power, more sourcing power or just more strategic strength for a limited period of time or on a permanent basis.

Most companies use only one channel for marketing their products. But there are several companies that have chosen to use several distribution systems, for example retailing outlets, mail order sales, etc. One of the case study companies of this research, Anttila, with their retailing and mail-order distribution systems, is an example of this kind of hybrid marketing system.

1.3. Customer Service and Loyalty

A strengthening relationship with the customer is seen as most valued asset of a business as long term relationships are the basis for enhanced profitability. The primary objective of any customer service strategy is to reduce the customer's costs of ownership (Christopher, 1993). The services must provide real value to the customer, in other words the consumer must feel that he finds the SKUs he is looking for at acceptable price.

Customer service is a wide concept including products and services. When improving customer service it is important for the company to realize how customers themselves define service. Customer service can be measured with product availability at the SKU level, inventory covers etc., and the so-called optimal level of service can be determined by balancing the total cost of services, i.e. inventory, warehousing, transporting, sourcing, etc. against the cost of stockout. As a result the ideal level of service is below 100 %. Another approach is to focus on total quality and to meet with the promised service of 100 %. The service promise is an agreement within the supply chain and what is promised to different customers can vary.

According to a market study conducted by Droege & Comp. in Germany, customer-oriented companies and industry service leaders are also the most successful ones in

the market (Lennox-Kerr, 1995). Profitability correlates well with customer orientation. Three key factors, i.e. customer benefit, employee satisfaction and cash flow, combined with innovative long term strategic orientation are the keys to market leadership. According to the findings of the study, the main reasons for losing customers in apparel retailing are: (a) deficits in product range and value for money (55 %), (b) product availability at the point of sale (30 %) and (c) general customer service (25 %). Droege & Comp. concludes that retailing profits can be improved by optimizing the customer-benefit chain, i.e.:

- Profit and growth are dependent on customer bonding and satisfaction.
- Customers are satisfied when their expectations of benefit are fulfilled.
- Benefit fulfillment requires excellent productivity and quality.
- Productivity and quality are positively affected by employee bonding and satisfaction.
- Employees are more satisfied and more productive if the internal service quality is in order.

Customer bonding and loyalty schemes are central issues in today's retailing. The main reasons for losing customers according to Droege & Co. survey were deficits in product range and unavailability of products, in other words the key areas and targets of SCM systems. Continuous product development and real time merchandising should replace long lead times and seasonal planning as ways for improving customer satisfaction. This in turn reduced mark-downs from 13 % to 7 % and lost sales due to stockouts from 18 % to 6 % for the 114 companies surveyed by Droege & Co.

Martin Christopher defines the customer value to be a ratio between perceptions of benefits and total cost of ownership (Christopher, 1997):

$$Customer\ value = \frac{Perceptions\ of\ benefits}{Total\ cost\ of\ ownership}$$

Naturally the perceptions of benefits must exceed the total costs of ownership. Christopher uses the term 'ownership' instead of 'price', since to a customer, such as a retailer, there will be other costs beside the price, such as inventory carrying costs, maintenance costs, running costs, disposal costs, etc. In business to business marketing the total cost of ownership is critical since the buyer must look at the total life-cycle cost of the product. From a retailer point of view, as a buyer of garments, a retailer must analyze how he can get the best customer value from purchases. There are two ways, either to increase the perceptions of benefits or to reduce the total cost of ownership. Higher customer value can be created through superior logistics performance, which means shorter lead times, on-time deliveries, quicker stockturns and higher sell-through percentage.

It is possible to calculate the cost of attracting new customers. The best return on investment comes from those customers who stay with the supplier for longest, purchase most frequently and spend on average most per purchase (Rayner, 1996). It has also been suggested that it costs up to five times as much to win a new customer as it does to retain an existing one (Christopher, 1997). As it is generally recognized that there is a link between market share and profitability, there is equally strong evidence to show that it is the quality of that market share that counts. The profitability is bound to be higher if we have loyal customers who buy frequently.

1.4. Merchandising Models

The final objectives with merchandising is to provide the customer with merchandise that fits his or her needs. A merchandise system between vendor and retailer is built up of information flow and merchandise flow.

Two key persons are instrumental for the retailer / vendor merchandising system: the buyer and the customer. The objective of the buyer is to supply the customer the products that he or she is looking for at the time she or he wants. In order to do this the buyer develops plans for the season regarding sales and distribution. These are combined with a merchandising plan which also includes promotion and price. Initial orders are transmitted to vendors up-front of the season.

Each retailer uses different types of vendors, i.e. manufacturers, importers and wholesalers. The flow of information is organized in different ways depending on the type of cooperation. Retailer / vendor systems with QR and ECR applications require EDI links inbetween the companies in order to transmit POS and other data continuously. On the retailer side, computerized control of daily sales and stocks is needed. Those retailers who apply customer loyalty schemes have a chance to create a customer database and collect various kinds of POS data for future planning. In any case computerized cash register systems are used practically by every retailer today and sales information can be produced daily. Based on this kind of information technology stocks in the store and retailer's warehouse can be controlled and replenishment orders for replacing the sold SKUs can be produced.

Control of the distribution system is either shared between the vendor and retailer or one of them is in charge of transporting, warehousing and distributing. Usually, multi shop retailers need their own distribution centers. They carry out off-shore buying in which case transporting is also organized by the retailer. For domestic or near-by sourcing it is possible to rely on the vendor's distribution system. The basic question is which parts of the distribution chain should be kept by the retailer. This decision is usually made on the basis of value added analyses (McGoldrick, Davies, 1995).

The current trend in the industry is to shorten the pipeline from manufacturing to the consumer. Shorter lead times mean that purchase decisions can be made closer to the season and the buyer is likely to have a better idea of what will sell during the season. Forecasting errors, as discussed earlier, will be smaller and stock turns higher. Application of QR and ECR methodology makes it possible to increase the portion of

replenishment orders during the season in such a way that they are directly based on point of sale information transferred directly to the vendor.

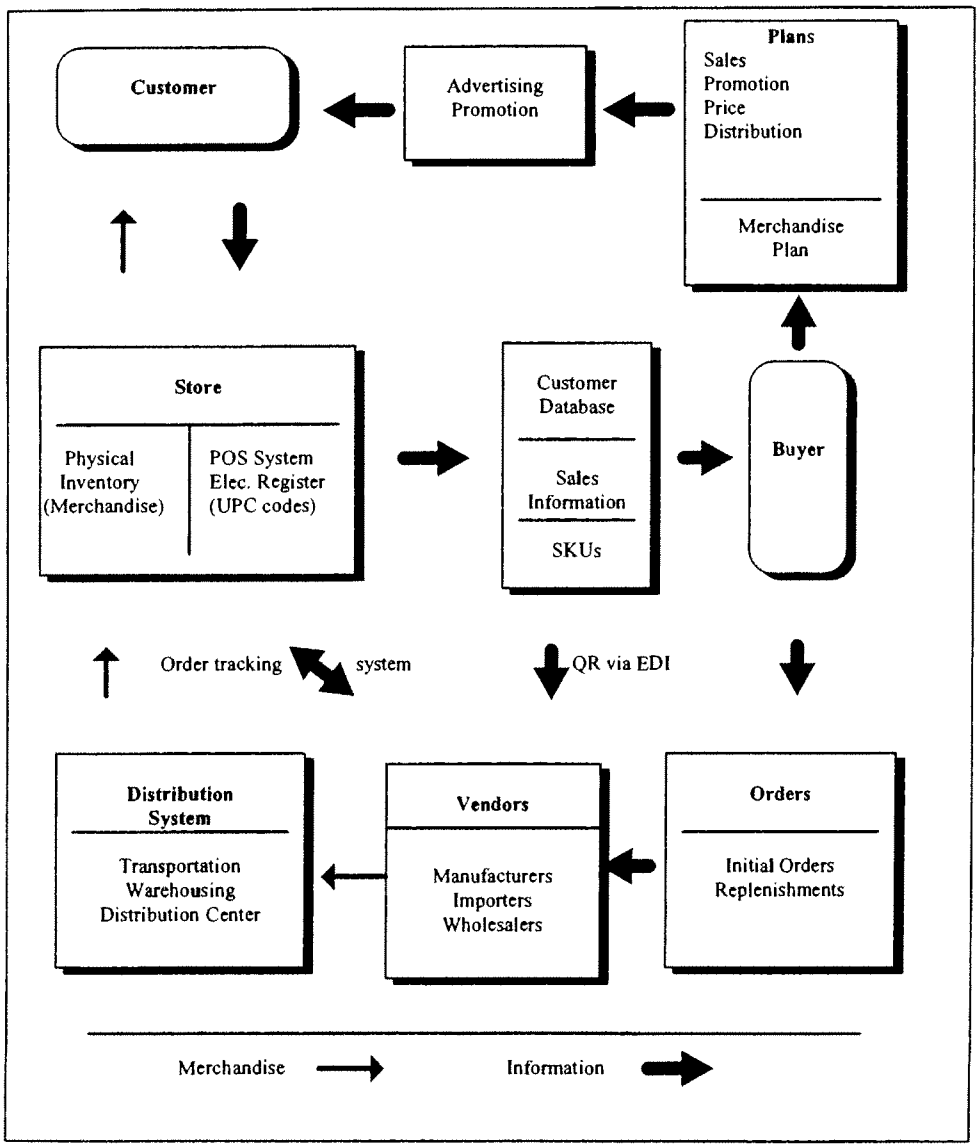


Figure 14. Flow of information and merchandise in a retailer / vendor system (Hasty, Reardon, 1997)

1.5. Inventory Management

It is no longer enough to be able to buy the products at the lowest prices. The retailers must get their goods to the right place at the right time and with acceptable operational costs. Good logistics and inventory management is needed in order to achieve this. Logistics cost is also a competitive element as can be seen between the two American giant supermarket chains Wall-Mart and K-Mart. As result of Wall-Mart's ability to give the customer exactly what they want at the lowest cost level, the non-product operating costs are only 18 % compared to K-Mart's 24 % (Dvorak, van Paasschen, 1996).

The logistical systems of different steps in the value chain need to be integrated. Efficient management of logistics requires coordination and cooperation across several organizations. Improved and more effective inventory management helps all the members in the delivery channel. The store is a high cost environment in comparison to the distribution center. Retailers should, instead of pulling the inventory into the store, have an efficient replenishment system that within a day or in a matter of hours can replace the sold items at store. This might require different types of handling of merchandise and inventory management.

Cost elements	Type of product		
	Fast-to-the-market	Delivery intervals	Low cost
Manufacturing costs	Trade off some cost for speed and flexibility	Live with longer lead times in order to drive lower purchase cost	Seek lowest purchase cost and offload as much work as possible to supplier
Transporting from manufacturer to distribution center (DC)	Use frequently high cost transportation (air freight)	Balance speed and cost by using low cost transportation to small number or regional DCs	Maximize use of low cost transportation by establishing many local DCs close to stores
DC cost	Look for speed	Balance speed and cost in handling delivery intervals	Operate DC's to minimize work done in stores
Transportation from DC to store	Small, fast and costly store deliveries	More cost effective small store deliveries	Most cost effective full truckload delivery to stores
Store operation	Full service	Full service	Self service

Figure 15. Logistic cost elements for different types of products (Dvorak, van Paasschen, 1996)

In fashion retailing one of the most critical elements that affect the inventory is forecasting. As only some of the goods can be supplied during the season and on the basis of POS information, up-front buying has to be based on forecasts. Forecasting techniques have a direct effect on stock turns. Different types of goods should also be handled differently. 'Fast-to-the-market' products must pass through the supply pipeline as quickly as possible and some cost must be sacrificed, while low cost products must be handled most cost effectively. 'Delivery interval' products are shipped to the store in several waves. The sold items are replaced by the same ones or slightly different styles in order to give the store a new appearance.

The main reason for long lead times are the several non-value-added activities throughout the supply pipeline. These are the kind of activities that could be reduced or eliminated totally without reducing the total value added to the product. For example, when the throughput time for order processing is reduced by reducing the transfer time required from the salesman's file to the company computer by using a portable order registering computer, this reduction is not seen as reduction of value added by the customer. The same would refer to reduction of inventory in the warehouse. This would not affect the value-added either, providing that this does not create stockout situations at stores. In lead-time reduction projects, the whole pipeline must be analyzed in terms of whether each activity really creates customer value, and such activities in the process where this does not happen should be eliminated.

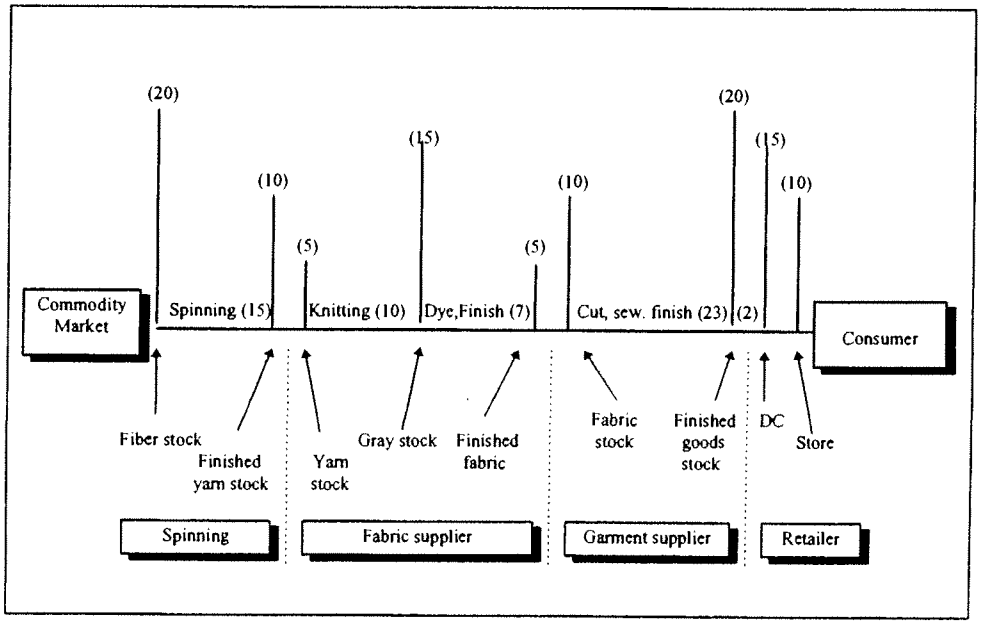


Figure 16. Lenght of the supply chain in a knitwear garment supply pipeline (Christopher,1997)

One way of analyzing the inventories and the supply pipeline is to draw the whole pipeline in such a way that the process time and inventory time are separated, as in Figure 16. Actual process time is on the horizontal axis giving us the total length of activities that add value to the product. Inventory time can be indicated by the vertical axis giving us the total time when no activities are produced on the product. The sum of process time and inventory time is the total lead time. The various inventory times could now be reduced without having to make changes to the process itself. According Figure 16, the process lead time is 57 days, inventory time is 110 days and the total lead time is 167 days.

Evidence exists that there is a positive relationship between retail profits and rapid turnover of merchandise (Dickinson, 1985). One of the main objectives of inventory management is to find a balance between turnover of stock and stockouts. 100 % service level in retail is difficult to achieve. According to studies, 10 - 25 % of basic items are out of stock at one time in discount department stores (Dickinson, 1985). According to other studies discussed by Dickinson, it is common to have service levels of 70 - 90 % when the level of service is calculated as:

$$Service\ level = \frac{Sales}{Sales + estimated\ lost\ sales} \times 100\%$$

In fashion retailing the relationship is not so straightforward. Customers do not always look for a particular product when they go shopping. Determining lost sales volume due to stockout is therefore more difficult.

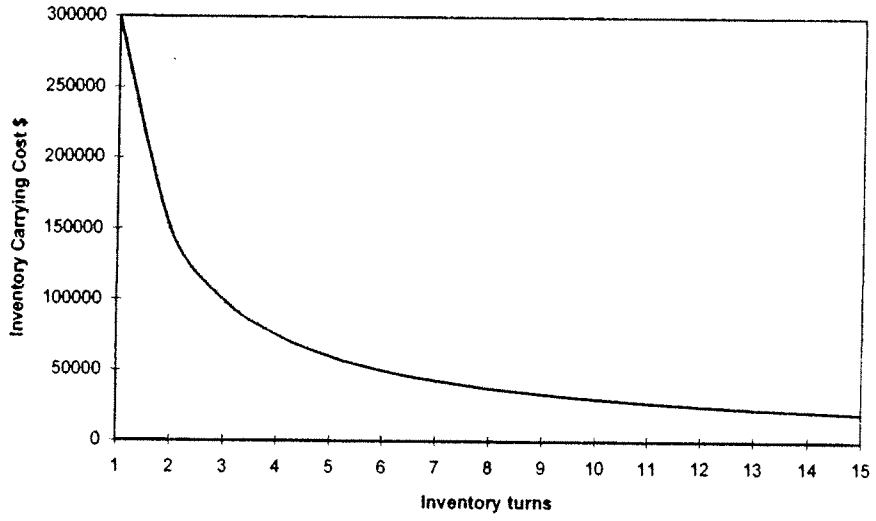


Figure 17. Relationship between inventory turns and inventory carrying costs (Lambert, Quinn, 1981)

There are also practical limits to improving profitability by accelerating inventory turnover. If inventory turns are pushed too far the logistic system may collapse resulting in additional costs and lost sales. In an example presented by Douglas, Lambert and Quinn, a company has inventory carrying costs of $ 300,000 per year if stock turns only occur once a year. The relationship of annual inventory carrying costs and stock turnover is presented in Figure 17. As the graph shows there is a big impact on inventory carrying costs when stock turnover is improved from two to four, but the impact is very little when going from eight to 15.

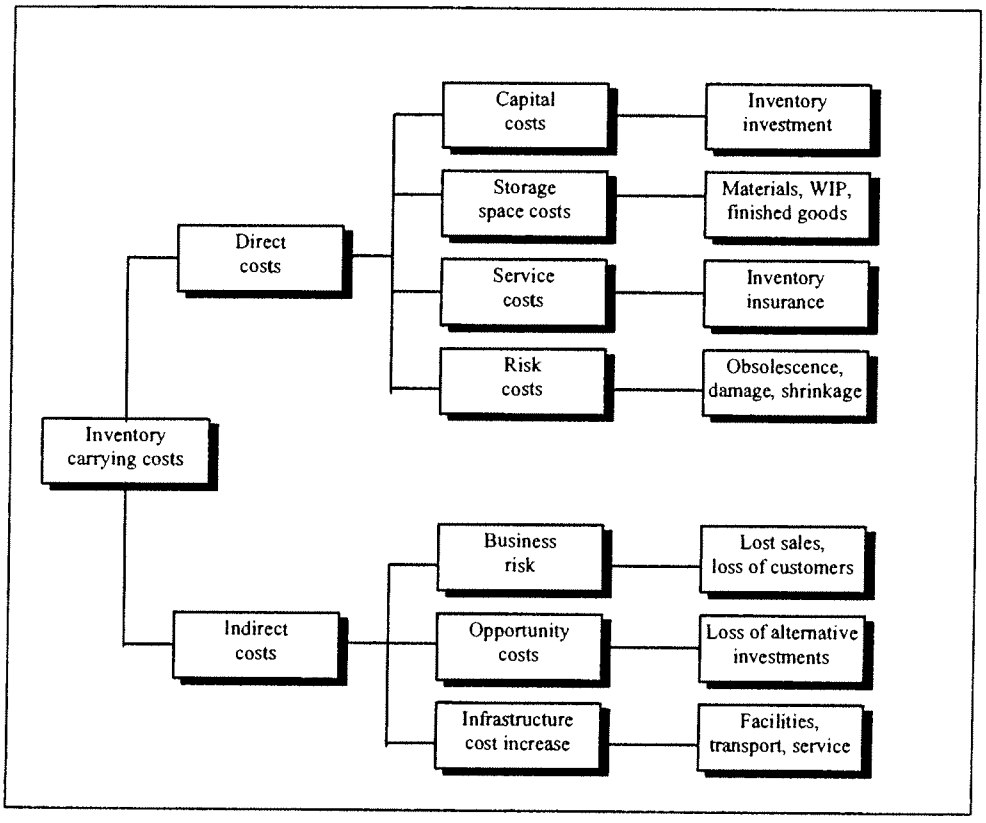


Figure 18. Inventory carrying costs (Gattorna, Walters, 1996)

Inventory carrying costs can be divided into two main categories, direct costs and indirect costs. In Gattorna and Walters' model, where they look at the whole supply chain, they divide the direct inventory carrying costs into four main categories. The first main category is capital costs, which are the interest costs from financing the inventory. The level of inventory depends on service policy and supply chain management. The second category is the facilities costs from storing the raw materials, work in progress, and finished goods in various stages of the pipeline. Storage space may be owned or leased or the activity of stock keeping may be done by

an outside company on a service basis. Nevertheless, there will be costs that must be covered. Inventory insurance is a service cost which is volume related and can be regarded as a penalty on the business if the inventory level is excessive. Risk costs vary according to the type of business. In sensitive businesses such as fashion retailing, obsolescence may not only result in mark-downs but may render the whole product worthless. Damage to merchandise reduces its value. Shrinkage is the result of loss or perhaps theft.

The indirect costs are divided into three categories. Business risk concerns two issues: lost sales through stockouts and as result loss of customers. Carrying a high level of inventory ties down a lot of capital which could be invested elsewhere. Increase of infrastructure costs is caused by excess inventory. More space, more transportation equipment, more handling is needed.

Conventionally inventories are categorized into six types, each type indicating their reason for existing in the supply chain (Gattorna, Walters, 1996):

Cycle stock is the inventory resulting from the replenishment process. In businesses with constant demand the inventory is updated with delivery at set intervals in order to replace the sold items. In businesses with seasonal and varying demand replenishment can be done if up-front buying is not 100 %.

In-transit inventories are goods that are being transported from one location to another. In offshore buying this kind of inventory may be substantial as transporting by sea from the Far East to Europe may take up to 8 weeks.

Safety stock is usually referred to the level of inventory held above the cycle stock in order to allow some delay in replenishment and still not run out of stock.

Speculative stock is caused by opportunities to gain advantageous discounts through buying special offer lots or large quantities. Also, production economies of scale may require certain order minimums or, because of limited production capacity, orders must be placed ahead before actual demand. In garment retailing, from the retailers point of view, all stock held by the retailer is the result of speculation on consumer demand and fashion trends.

Seasonal stock is a form of speculative stock, which involves the accumulation of inventory prior to a season. All goods bought through up-front buying are purchased on the basis of forecasts for the particular season.

Dead/obsolete stock is inventory for which no demand existed during a certain period of time. With seasonal businesses, goods from the previous season are usually categorized as this kind of stock. Their value is usually written down in the company books as sales will be done for clearly discounted prices.

Availability of inventory is a component in customer service. According to Gattorna and Walters, sales correlate with customer service level, which is defined by the availability of products in comparison to demand. The margin is the difference between sales and the total costs. The following variables have an effect on sales revenues and on the cost of availability.:

Cost of lost sales decreases as a function of product availability or customer service level, being theoretically 0 once 100 % service level is achieved.

Cost of availability increases as a function of customer service level. These costs increase disproportionately and rapidly if the final 5 % or 10 % of the 100 % service level is achieved.

The total cost of availability and lost sales is at minimum at a manageable level of operations and increases rapidly when the service level is radically lowered or increased.

Sales revenue is different at different levels of availability or service. Gattorna and Walters argue that sales response is also a disproportional function of availability or service level. In order to analyze the margin created when operating at different levels of availability/service, cases should be studied individually.

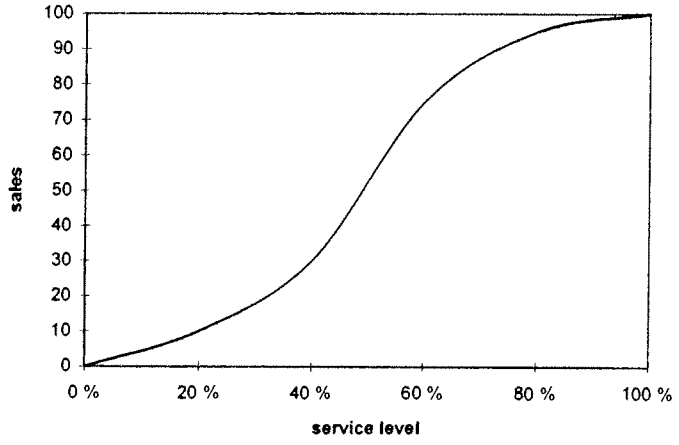


Figure 19. The benefit of service (Christopher, 1993)

In the seasonal fashion product business it is difficult to define what the customer response to service level changes is, because there are so many variables that affect customer behavior. According to Christopher, there is a limit after which service improvement does not have a big effect on a customer's purchasing behavior, and the customer service response curve is S-shaped. It is possible to affect the curve of cost

of services, for example by implementing QR and ECR policies and in this way improve the service level without creating additional inventory costs.

1.6. Cost Trade-Offs, Cash-Flow and Financial Impacts

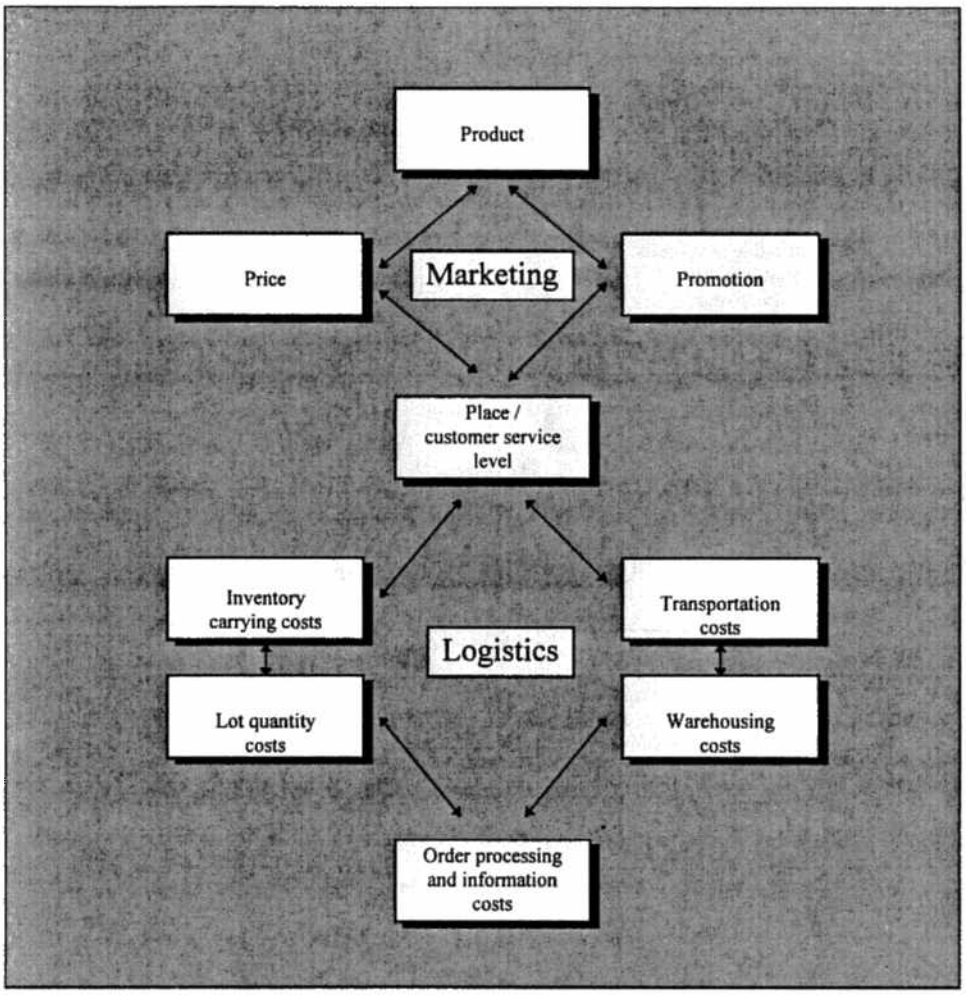


Figure 20. Cost trade-offs required in marketing and logistics (Lambert, Stock, 1993 modified)

The objective of marketing is to present products and services to the customer and allocate various resources to the marketing mix to maximize the long-run profitability of the firm. The objective of logistics is to present products and services to the customer by minimizing total costs of logistics which are transportation costs + warehousing costs + order processing and information costs + lot quantity costs + inventory carrying costs (Lambert, Stock, 1993). In order to achieve the best possible

cost level at the company, trade-offs are required, and the management must make decisions on a strategic level regarding the overall objectives.

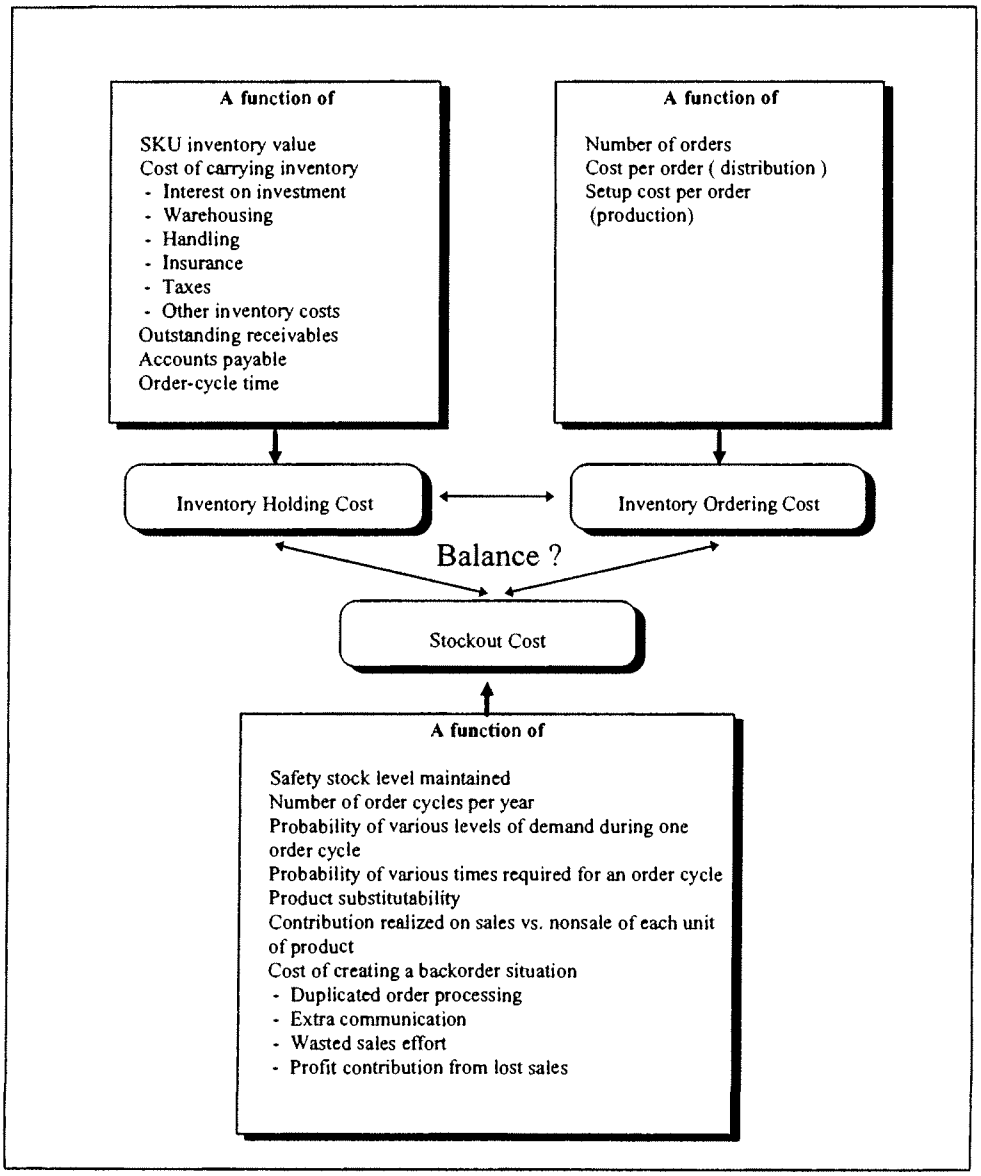


Figure 21. Trade-offs typically found in managing and controlling inventory levels (Stern, El-Ansary, 1992)

Merchandise planning and control start with decisions regarding the variety and assortment of merchandise. A department store traditionally carries a large variety of products, whereas a high profile fashion chain can limit its ranges to a very narrow segment of consumers. One part of merchandise planning is to decide about stock

levels. High stockturn means limited investment in inventory, reduced warehouse space, and reduced interests, insurance and other inventory costs, in other words higher return on invested capital. Managing and controlling inventory is a balancing game between inventory holding costs, inventory ordering costs and stockout costs.

Decisions regarding supply chain management have an impact on the cash-flow and financial performance of the company. Such logistic variables that influence sales revenue are for example mark-down and discount policies, the use of which depends on current inventory levels. Sales revenue increases, but margins per product will decrease, and additional sales are needed in order to cover for the lost total margin. In order to have full control over such an action, all costs involved must be well known and followed-up. Costs of goods sold consist of sourcing and purchasing costs, selling and administration costs and facility utilization costs. These are cost items that supply chain management deals with daily. Interest expenses depend on inventory carrying costs and also on facility investment or leasing decisions.

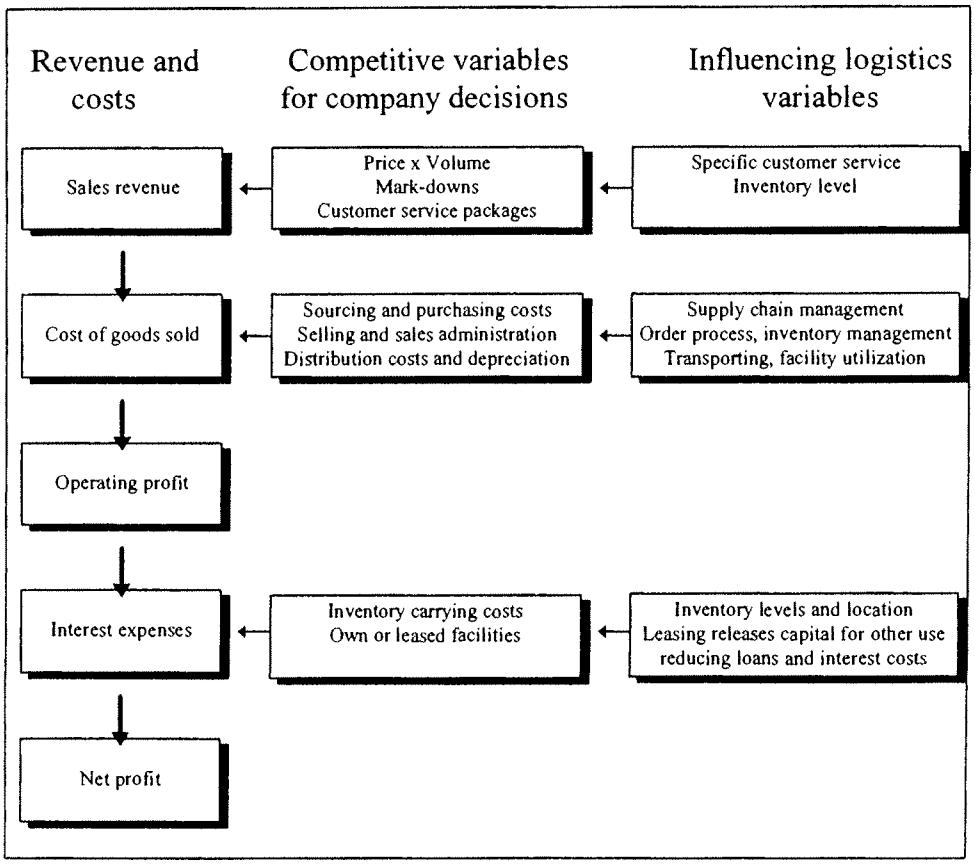


Figure 22. The influence of logistics on the profit and loss account (Gattorna, Walters, 1996, modified)

1.7. The Future Store

Uncertainty in the market over the past ten years has brought structural changes in garment retailing. The markets have become more concentrated as multi-shop chains, department stores and hypermarkets have increased their share of the market. The share of independent garment retailers in the EU is expected to change from 48 % in 1988 to 37 % in 2000. The state of concentration varies from country to country. The highest concentration is in the UK and the lowest in Italy.

Bernardi and Larsson (1993) predict that the development of consumption will be two-fold in the near future. On the one hand the demand with respect to quality and style will be more diversified, and on the other hand price consciousness will increase and the demand for basic and competitively priced items will increase. The multi-chain companies will increase their market share and the large groups will expand internationally. Some of the department stores will be closed and turned into sales galleries. Mail order continues to be strong and many catalogue companies are expanding internationally to the new markets in Eastern Europe. Teleshopping and videopurchasing is not expected to expand until the new generation of customers who have grown up with computers enter the market. This generation is starting to be here now. In his article, Michael Krantz in Time Magazine (August 3, 1998) predicts that there will be 61 million on-line shoppers on the Internet by the year 2002, while in 1997 the number was 10 million. According to this estimate, the main articles bought in 1998 are travel tickets (US$ 2,091 million), PC hardware (US$ 1,816 million) and groceries (US$ 270 million), while clothing articles amount to only US$ 71 million. Although conventional shopping habits in garment buying are likely to continue, there is a growing market in Internet shopping as well which should not be overlooked when companies are revising their information technologies. This is especially so for retailers with well known own brands. Mass customization is another trend with pioneers already in the market. The product is designed according to the customer's wishes in the store and delivered to his home later (Scheller, 1997, Walker, 1995).

Lead times in supply chains are expected to become shorter. On the other hand, consumers want to do their shopping as quickly as possible (Field, 1997). The retailer's problem in the future is how to speed the consumers through the store as fast as possible but still keep them there as long as possible. This, according to Bernardi and Larsson (1993), means that the 'cage and circus concept' will remain in the future as well, i.e. the fun things are located in the corners of the shop while the discount items with no service are placed in the easily accessible center.

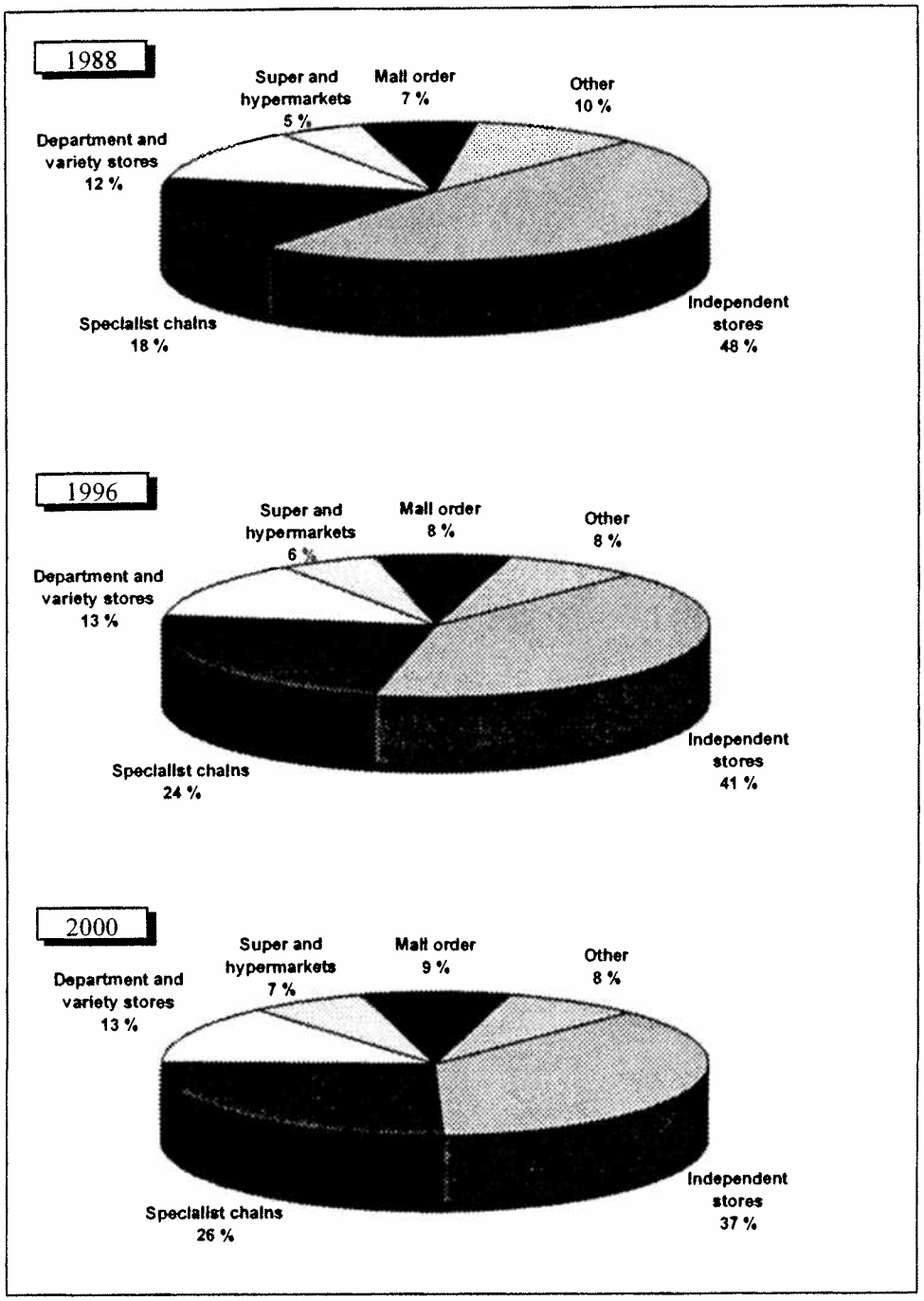


Figure 23. The changing structure of EU clothing retailing (OETH, 1998)

OETH (1995) estimates that shops without stocks can be a reality in the future. By using information technology in data transfer between suppliers and retailers it will be possible to present only samples in the store and provide hand-held terminals to customers to scan selected items. These items would then be delivered home directly from the supplier. Retailers would actually become advice, sample and fitting centers and they could concentrate on improving customer service (Economist, 1995).

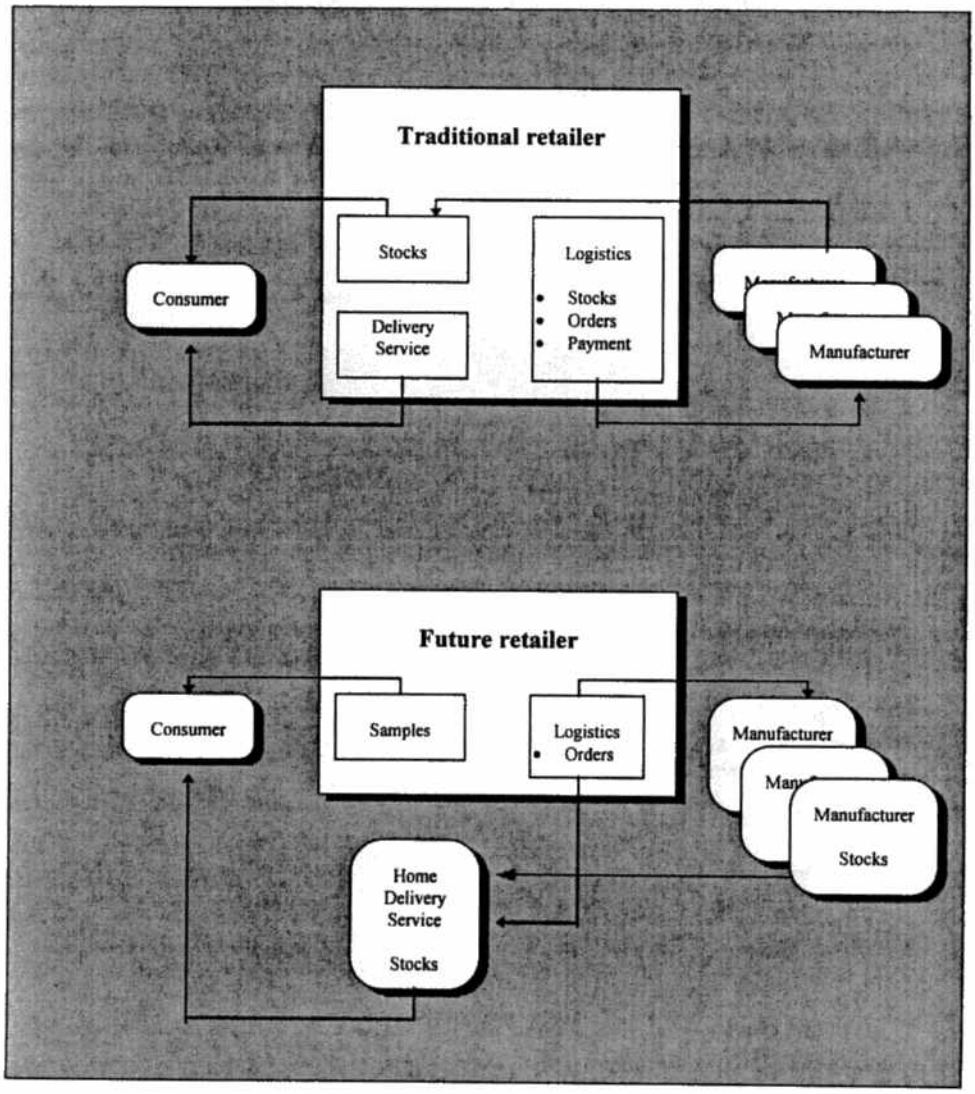


Figure 24. Future shop without stock (OETH, 1995)

2. Measuring Success and Critical Success Factors

2.1. Performance Measures

Assessment of marketing channel performance is multidimensional and generally a subjective matter, and it is difficult to develop rules that apply across the board in all situations. Stern and El-Ansary (1992) divides the focus of marketing channel performance analysis as follows:

1. Macro or societal perspective asks how from a cost - benefit point of view distribution succeeds in delivering the service outputs desired by the segment.
2. Micro or managerial perspective asks which channel members are the most profitable and creates the highest end-user satisfaction.

Performance should be analyzed on a several dimensions, such as effectiveness, equity and efficiency.

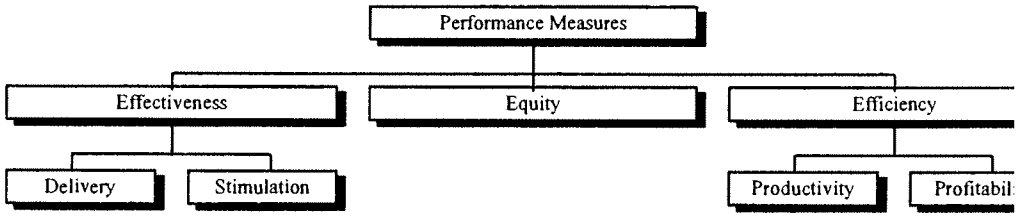


Figure 25. Performance measures in marketing channels (Stern, El-Ansary, 1992)

Effectiveness is a measure of how cost-effectively the channel delivers the service outputs required by the end users. On a short-term goal-oriented level it measures how well delivery meets the demand of the end-users. On a long-term goal-oriented level it measures how well channel members stimulate latent demand to reach optimal levels of demand for the service outputs. Equity measures the extent of equality to which marketing channels serve all members of the country, for example in problem-

ridden markets and geographically isolated consumers. Efficiency measures, from a macro perspective, how cost effectively society's resources are used in order to accomplish specific outcomes. The physical efficiency is measured by productivity. The financial efficiency is measured by return on investment, liquidity, leverage and profits. Stern and El-Ansary call this a 3E perspective (Stern, El-Ansary, 1992)

From a managerial point of view the analysis of distribution channel performance focuses on the financial performance of wholesalers and retailers, the overall performance of the channel members and the comparative performance of different channels. There is, however, no single measure that would illustrate the financial performance of a retailer. Due to the multidimensional character of a retailer firm, the following areas must be taken into consideration:

1. Profitability measured by return on investment
2. The ability of the firm to meet its financial obligations (liquidity)
3. The capital structure of the firm (leverage ratio)
4. Development of sales and profits
5. Growth potential of sales and profits

The main objective of the supply chain can also be defined as competitive customer service. In order to evaluate service performance, there must be pre-determined standards. In the end the customer expectations should be fulfilled 100 % in order to have maximum service performance. In order to set standards, it is necessary to define the key customer service elements. Christopher (1993) defines the customer service elements as follows:

- **Order cycle time** is the time that elapses from customer order to delivery
- **Stock availability**, i.e. to what percentage of demand SKUs are available from stock
- **Order-size constraints**, i.e. do we have the flexibility to cope with just-in-time deliveries for smaller and smaller quantities?
- **Ordering convenience** means how easy the customer feels it is to do business with our organization
- **Frequency of delivery** is one of the key areas since customers request response to their demand for more frequent and just-in-time deliveries
- **Delivery reliability** in a wider scope reflects delivery performance, stock availability and order processing performance
- **Documentation quality** indicates how error-free invoicing, shipping documents and other customer communications are
- **Claims procedure** tells how quickly and successfully a company can deal with claims and what the procedures for service recovery are

- **Order completeness** indicates what proportion of orders are delivered complete
- **Technical support** after sales (important in certain businesses)
- **Order status information** means whether customers can be informed about the status of their orders at any given time, including advance warnings about delivery problems.

Christopher suggests further that two of the above elements are more crucial in winning and keeping customers: delivery reliability and order completeness, and they could be combined and called On-time Order Fill, which can be calculated as follows:

$$On-time\ order\ fill = \frac{Orders\ delivered\ complete\ on\ the\ date\ specified\ by\ customer}{All\ orders\ delivered}$$

Christopher (1997) suggests use of the term 'the perfect order' for orders which are delivered on time, complete and error- and damage-free. On the basis of this term a customer service index can be defined. By using these three critical service elements, the customer service index can be calculated as follows:

Customer Service Index =

$$\frac{\text{Orders delivered on time}}{\text{Total orders received}} \times 100 \times \frac{\text{Orders delivered complete}}{\text{Total orders received}} \times 100 \times \frac{\text{Clean invoices}}{\text{Total invoices}} \times 100$$

Figure 26. Customer service index (Christopher, 1997)

2.2. Strategic Profit Model

With the help of balance sheet and profit and loss account information the Strategic Profit Model (SPM) can be used for calculating the return on net worth (RONW) and thus evaluate the performance of the main areas of financial and asset management.

According to Stern and El-Ansary (1992) gross margin and operating expenses are the key elements in deriving the net profit margin. They argue that when managing margins one should focus on gross margin planning rather than on pricing when seeking ways to enhance gross margin. The ratio of net sales to total assets measures the effectiveness of capital management in the company, i.e. the total capital invested in inventories and fixed assets that is generating the sales revenue.

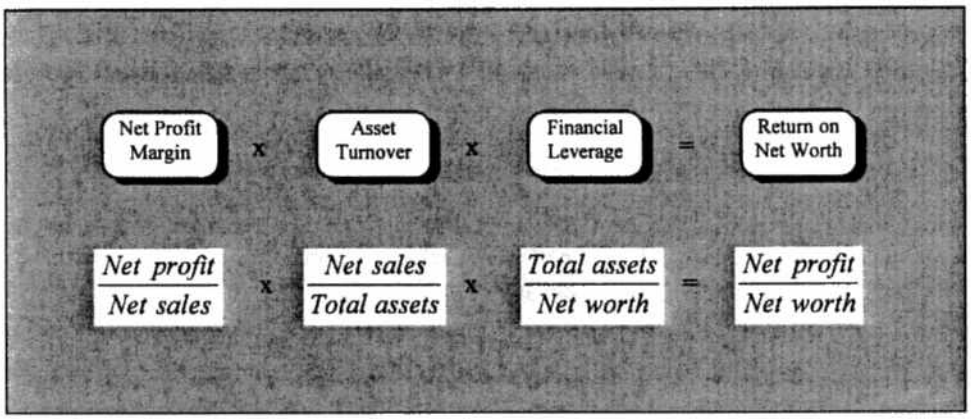


Figure 27. The Strategic Profit Model (Berman, Evans, 1995)

The financial leverage is the ratio of total assets to net worth or equity and it indicates how well the company manages borrowed funds both in the short and long term. The lower the ratio, the more the firm is being financially supported by owners' equity instead of borrowed capital.

By using the SPM a company may come to the conclusion that its poor return on net worth could depend on poor assets turnover or too low financial leverage. The ways of improving the return on net worth are to increase net profit margin, improving assets turnover or financial leverage. Berman and Evans (1995) give an example of RONW for two American garment retailers: Gap with 23.73 RONW and The Limited, Inc. with 20.08 RONW according to 1992 annual data. The return of net worth represents the value of owners' investment in the business. Net worth can also be referred to as owners' equity, and in fact, being the difference between the value of assets and the liabilities, it is the value of the owner's capital in a small retail firm. As can be seen in the model provided by Hasty and Reardon (1997), all aspects of

company operations and financial management have an impact on the return on net worth, or return on equity.

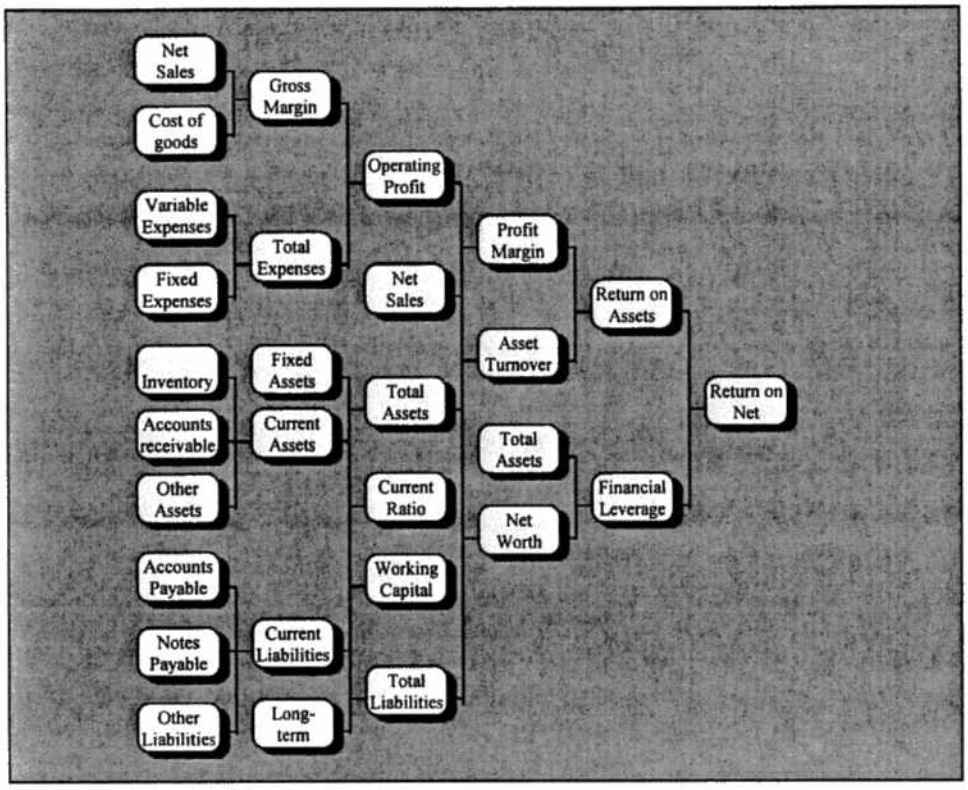


Figure 28. Background to the Strategic Profit Model (Hasty, Reardon, 1997)

2.3. Direct Product Profitability

Direct product profitability (DPP) is a method for analyzing the profit contribution of individual products by allocating to the product all costs involved in moving the product from the point of manufacturing to the point of sales (Gattorna, Walters 1996). By using DPP the retailer aims at determining the profitability of each category or unit of merchandise by computing the adjusted per unit gross margin by

considering direct product costs of warehousing, transportation, handling and selling (Berman, Evans, 1995). Berman and Evans, however, point out that there are major problems with DPP due to the complexity and difficulty of allocating costs accurately.

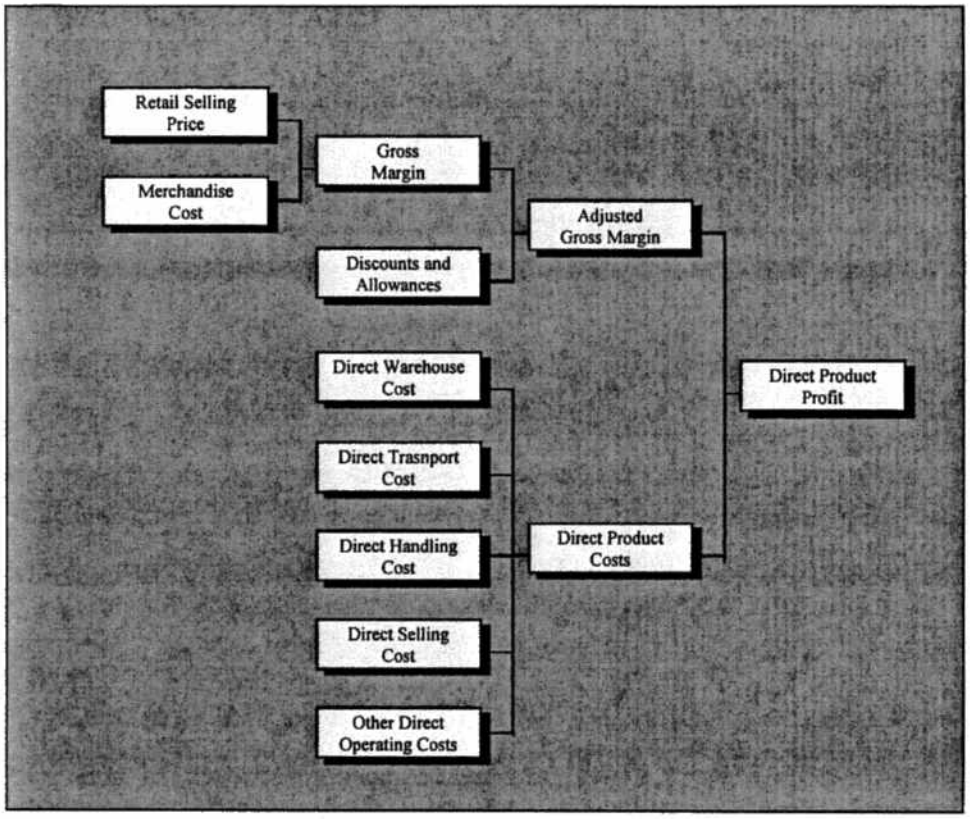


Figure 29. Direct Product Profit (Berman, Evans, 1995)

One of the main concerns of retailers is minimizing the cost of sourcing products and ensuring the financial return on space allocated to the product. This means that if the rate of sale of a product related to the space utilized is attractive, higher costs and lower DPP may be accepted because the cash value of the product makes a contribution larger than compared to other products. This may be the case with branded products where margins are higher and also with support and complementary sales situations. Since sales/space is much easier to calculate than DPP, many retailing companies use that as a measure of product profitability rather than trying to calculate DPP.

In the DPP model, payment discounts, merchandising allowances and forward-buy profits are considered when adjusting gross margin. Direct product costs consist of warehouse costs (labor, space and inventory), transportation costs (freight, insurance, forwarding, customs clearance, re-pressing) and store costs (stocking labor, checkout labor, space and inventory). McGoldrick (1990) suggests the use of workstudy techniques for allocating labor costs at receiving, sorting, moving, price-marking, shelf-loading and at check-out. The space cost can be allocated by calculating the square or cubic meters occupied and the rate of stock turn of the item.

One way of improving direct product profitability is to focus on direct product costs. By requesting the products to be delivered store-ready, extra handling costs like repressing, sorting and picking at the warehouse, etc. can be eliminated. DPP can also be improved by reducing the product range for those items or categories that yield low profits. Gattorna and Walters (1996) suggest use of a Space and Product performance matrix as presented in the figure below for analyzing the range of products in order to choose those with high DPP.

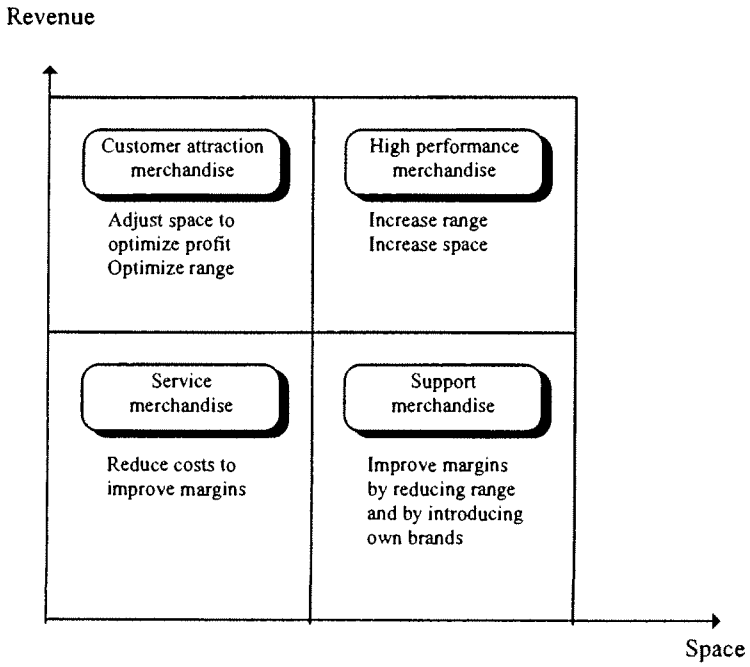


Figure 30. Space and product performance (Gattorna, Walters, 1996)

One method of allocating overhead costs to products is Activity Based Costing (ABC) which relates the overhead costs to various activities supporting the process. ABC does not divide costs into variable and fixed costs as in traditional accounting, but

focuses on variability of costs in the long term and assumes that all costs are variable and can be connected to individual products. According to ABC, costs can be controlled by managing the workload, eliminating non-value-added activities and streamlining the management process (Gattorna, Walters, 1996), i.e. by efficient use of resources. The activity of the business is the central element of ABC. An activity describes how resources (time, labor and capital) are used in achieving its objectives. Activities generate costs, and by selecting how an activity is performed one can influence the costs related to the activity.

The costs of individual activities must first be identified and then related to a particular activity cost pool. The activities are cost drivers which contribute to the overhead costs. For example distribution contains drivers such as receiving, unloading, storing, order processing, inspecting, delivering, etc. Secondly cost drivers must be analyzed and rates for attributing the overhead costs to individual products should be determined.

A management philosophy using ABC is called activity based management. Within activity based management the company activities and their costs are analyzed in order to identify opportunities for performance improvement. It is difficult to allocate different costs of distribution to various products, and in this area ABC can be successfully used. Activity based costing can also be extended to consider customer expectations within the context of the product/service to be offered. The steps in such a case according to Gattorna and Walters (1996) are as follows:

1. Evaluation of customer expectations
2. Identifying critical success factors
3. Identifying and developing activity analysis
4. Exploring product offer profitability
5. Exploring the real value of expansion of business
6. Developing an integrated activity accounting system

Customer expectations are analyzed in terms of customers' service expectations, the form and type of competitors' service, and customers' product use behavior patterns. On the basis of customer research the critical success factors which are instrumental in creating customer satisfaction are defined. Then activities which support, for example, the distribution process are identified, i.e. order cycle times, delivery frequency, delivery reliability, inventory availability and order processing procedures.

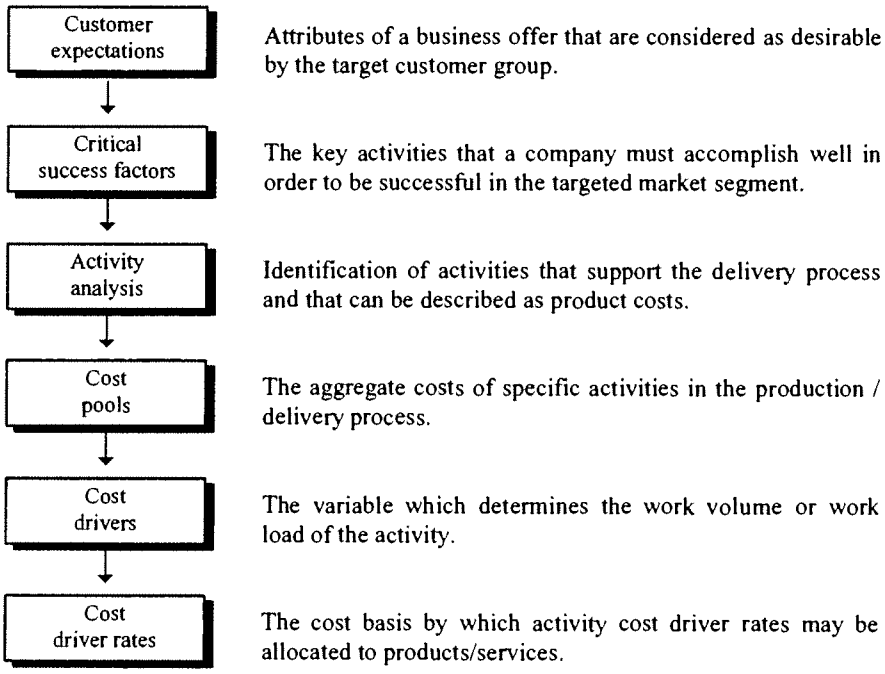


Figure 31. The customer-market-oriented activity based management process (Gattorna, Walters, 1996)

2.4. Pricing Approaches

There are three basic approaches to pricing: (1) demand-oriented pricing, (2) cost-oriented pricing, and (3) competition-oriented pricing. In demand-oriented pricing the retail profits are maximized at the price that results in the sale of the number of items at which the marginal cost of selling the item is equal to the marginal revenue received from the item (Arnold, Capella, Smith, 1986). Marginal analysis of revenue and costs is needed in order to apply this approach, which in practical terms is very difficult to carry out. Demand-oriented pricing can be used in a less theoretical form by estimating the highest price that customers are willing to pay for the product and what the sales volume will then be.

Cost-oriented pricing, also known as mark-up pricing is the most widely used retail pricing method (Berman, Evans, 1995). The price is determined by adding a fixed percentage or a flat rate amount on top of the cost of the product. In this way the difference between the merchandise cost and the retail price is the retailer's mark-up. The competition-oriented pricing means that the retailer sets the prices of the goods according to competitors' prices, the same, higher or lower depending on his competitive strategy, and disregards the costs or margins (Baker, 1992).

In retail pricing of goods Berman and Evans (1995) suggest that five steps should be used in the pricing procedure:

1. Determine the floor price
2. Determine the ceiling price
3. Determine the mark-up price
4. Adjust the price to fit the store image
5. Adjust the price for the store's consumers and policies

The floor price would normally be the cost of an item to the retailer. Lower prices could be used only in clearances or in special offers which are used for getting the consumers to enter the store. The ceiling price is the price charged for the same item by a direct competitor. Charging a higher price for the same item as a competitor might be difficult to justify and the ceiling price is normally the highest possible price for the item.

The mark-up price should now ideally be between the floor and ceiling prices. In the pricing process the mark-up percentage should be based on the profit target of the retailer. In this case the mark-up percentage to be used in the pricing process would, according to Berman and Evans (1995), be calculated as follows:

$$Mark-up\ percentage = \frac{Planned\ retail\ operating\ expenses + Planned\ profit}{Planned\ net\ sales} 100\%$$

For products already priced or for the whole retail operation a mark-up factor can be calculated as follows:

$$Mark-up\ factor = \frac{Retail\ price - Merchandise\ cost}{Merchandise\ cost}$$

Arnold, Capella and Smith (1986) argue that price reductions must also be accounted for when determining the initial mark-up percentage. If this is not done the price reduction during the season would mean a direct loss to the company and the retailer would never achieve his profit target. This way of thinking means that there is the 'initial mark-up percentage' that is used when setting the prices. This level of mark-up will, however, not be achieved on average throughout the whole season, since price reductions take place. Therefore another term, 'mark-up percentage maintained', can be used for the average mark-up. Likewise we can talk about the 'original retail price' or 'first price' which is the price set by using the initial mark-up percentage or mark-up factor at the beginning of the season. The initial mark-up percentage would be calculated as follows:

$$Initial\ mark-up\ percentage = \frac{Expenses + profit + reductions}{Sales + reductions}$$

Adjustments of the original retail price are used in order to adapt the prices to different situations during the season. The following types of adjustments are used:

Additional mark-up is a price increase made on top of the initial mark-up. This may be used in case of high demand and low availability of the product, when the retailer wants to meet the competitors' price level or when the article is made more attractive to the customer (Hasty, Reardon, 1997).

Mark-up cancellation is a price reduction of additional mark-up.

Mark-down is a reduction of the original retail price of the article. Mark-downs are used in sale events, when the retailer wants to meet the competitors' price level or in clearances.

Mark-down cancellation is a price increase when the price has already been marked down.

Regarding prices and reductions, King and Hunter (1997) use the following terms to describe how successful the retailer was with the season's merchandise:

Sell-through is the proportion of the season's merchandise that sells at the first price, i.e. the original retail price.

Joboff is the percentage of units remaining at the very end of the season which could not be sold at all and must be disposed of.

2.5. Strategic Resource Model

In order to evaluate the utilization of key resources at retail level, three inter-related measures of performance can be used: gross margin return on inventory (GMROI), gross margin return on space (GMROS) and gross margin return on labor (GMROL).

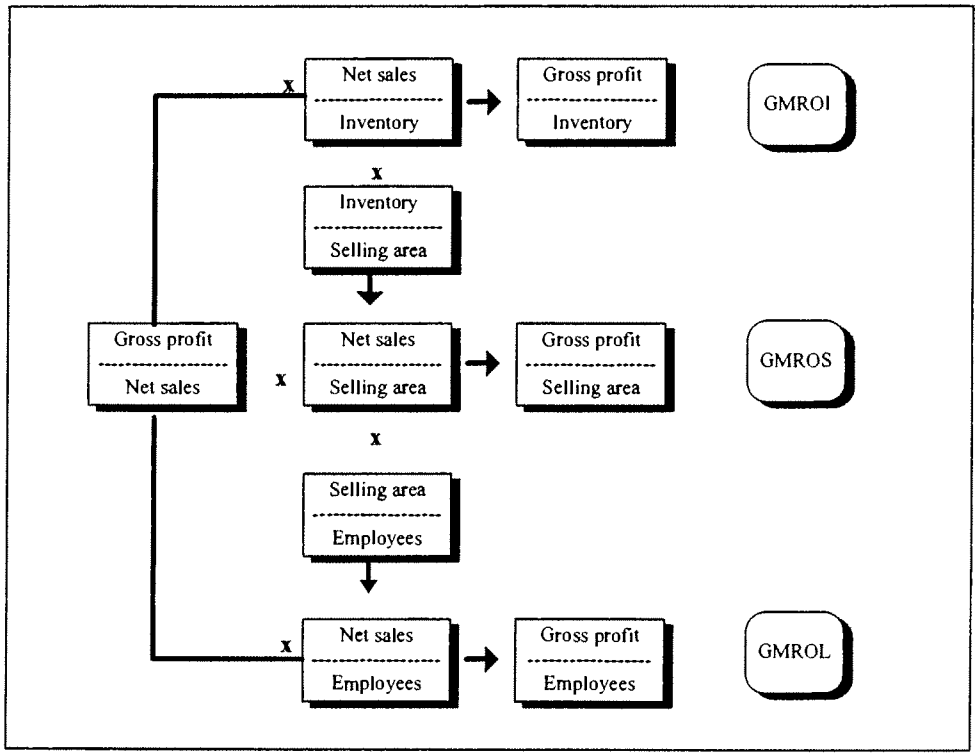


Figure 32. Strategic resource model (Stern, El-Ansary, 1992)

GMROI combines margin management and inventory management and it measures how well the merchandising inventories generate gross profit. It can be calculated for the whole store, category of products or separately for stock keeping units (SKU). Calculation is relatively easy and most retail companies have the necessary data routinely available:

$$GMROI = \frac{\text{Gross Margin}}{\text{Average inventory investment at actual cost}}$$

McGoldrick (1992) points out that there are limitations to GMROI as it does not accommodate the full complexity of retail cost structures. For example it does not consider the cost of financing consumer credit or the benefits of supplier credit terms. Further the profitability per square meter or the costs per square meter are not taken into account. Arnold, Capella and Smith (1986) say that GMROI does not clearly indicate the relationship between gross margin and turnover and they suggest using the retail price in calculations and call this measure GMROI-R:

$$GMROI\text{-}R = \frac{\text{Gross Margin}}{\text{Average inventory investment at retail price}}$$

GMROI-R, however, is not a measure of return on inventory investment, as GMROI is, since the actual cost of inventory investment is not used. But, in general it will yield the same interpretation as GMROI, as pointed out by Arnold, Capella and Smith (1986) by an example of analyzing the profitability of three brands by a ladies' wear retailer.

1 000 $	unit	Brand A	Brand B	Brand C
Sales	$	1 000	1 200	1 500
Gross margin	$	400	480	600
Average inventory investment at actual cost	$	120	180	300
Average inventory investment at retail price	$	200	300	500
Gross margin	%	40 %	40 %	40 %
Stockturn		5.0	4.0	3.0
GMROI	%	367 %	267 %	200 %
GMROI-R	%	200 %	160 %	120 %

Table 4. Examples of GMROI and GMROI-R (Arnold, Capella, Smith, 1986)

The example in table 4 shows that despite the fact that the sales and gross margin generated in money terms by brand A is lower than with brands B and C, it yields the best GMROI and GMROI-R due to the fact that it has a better stockturn.

GMROS is a tool for assessing how efficiently the shelf or floor space is used, as it indicates the gross profit per area. GMROL is normally calculated per full-time

equivalent employee. Gross margin per employee should be optimized as Stern and El-Ansary (1992) point out, not maximized since all the fixed costs do not have to increase in line with sales increase.

2.6. Key Ratios

Ratio analysis is based on a relationship of two or more financial variables, and ratio analysis is used for evaluating the financial performance and condition of a company. Both McGoldrick (1990) and Arnold, Capella and Smith (1986) classify the ratios into four basic types, i.e. profitability ratios, liquidity ratios, leverage ratios and activity ratios. Of these ratios the following are useful when analyzing retail performance:

Profitability ratios measure the ability of the company to create profits from achieved sales and from invested amounts:

$$\text{Gross profit margin} = \frac{\text{Sales - Cost of goods sold}}{\text{Sales}}$$

Indicates the total margin available to cover operating expenses and yield a profit.

$$\text{Operating profit margin} = \frac{\text{Profits before taxes and before interest}}{\text{Sales}}$$

Indicates the firm's profitability from current operations without interest charges.

$$\text{Net profit margin (return on sales)} = \frac{\text{Profit after taxes}}{\text{Sales}}$$

Indicates after-tax profits in proportion to sales.

Activity ratios measure the company's ability to generate profits from its assets:

$$\text{Inventory turnover (Stockturn)} = \frac{\text{Sales}}{\text{Inventory}}$$

Indicates the scale of inventory compared to sales.

$$\text{Fixed assets turnover} = \frac{\text{Sales}}{\text{Fixed assets}}$$

Indicates sales productivity and utilization of plant and equipment.

$$\text{Total assets turnover} = \frac{\text{Sales}}{\text{Total assets}}$$

Indicates sales productivity and utilization of firm's total assets.

Retail performance ratios listed by King and Hunter (1997) describe the success of sourcing, especially regarding how well the product range offered by the store meets the demand:

$$\text{Customer service level} = \frac{\text{No. of customers who find their first choice SKU}}{\text{Total number of customer visits}}$$

Indicates the percentage of times a customer finds his or her first-choice stock keeping unit when shopping.

$$\text{Lost sales} = \frac{\text{Number of customers who find no SKU preference}}{\text{Total number of customer visits}}$$

Indicates the percentage of times a customer finds none of his SKU preferences, i.e. their first choice, second choice, etc.

$$\text{Sell through} = \frac{\text{Total non-mark-down sales in pieces}}{\text{Total sales in pieces}}$$

Indicates the proportion of the season's merchandise that sells at the first price.

$$\text{Joboff} = \frac{\text{Total number of liquidated products}}{\text{Total sales in pieces}}$$

Indicates the proportion of SKUs remaining at the very end of the season and which must be disposed of

Actually King and Hunter call the first ratio on their list just 'service level', but in order to avoid confusion, in this research it has been renamed 'customer service level' since service level in general has another interpretation:

$$\text{Service level} = \frac{\text{Number of different SKUs available at store}}{\text{Total number of different SKUs in collection}}$$

Indicates what portion of the original assortment is available throughout the season.

The ratios can be used for comparison to similar retailer firms or to previous ratios of one's own company. Arnold, Capella and Smith (1986) suggest that when comparing current ratios to previous ones, one should look for trends. Trough trend changes, trend analysis will indicate potential problems before they get out of control.

2.7. Inventory Planning and Control

The starting point for merchandise planning is decisions about merchandise variety and assortment. The rate of stockturn indicates how many times the stock on hand is turned over a period of one year. It is a ratio which is widely used by the retail industry for planning and controlling inventories. In the retailing of seasonal products, like apparel, the inventory level varies throughout the season. If stockturn is calculated according to the value or volume of stock at one particular time, the stockturn ratio will give a wrong picture of stock turnover. Berman and Evans (1995) point out that the average inventory level for the entire period covered in the analysis must be calculated, in order not to give a mistaken view. A retailer can increase its stock turnover in different ways, for example by reducing the assortment, eliminating

slow-selling items, maintaining a minimal inventory for slow-sellers, buying efficiently, applying quick response inventory planning and by using reliable suppliers (Berman, Evans, 1995).

High stock turnover may not always be economical. Buying in small repeated quantities may increase the purchase price. Some of the customer sales may also be lost due to a narrow assortment. There are several ways planning the inventory level. It can be done on a judgment basis, i.e. quantities to be bought and inventory levels are based on experience and intuition. Or it can be done with mathematically calculated safety stocks or percentage variations.

In order to use replenishment buying during the season, all the budgeted quantities cannot be bought up-front of season. A part must be left open. This so called open-to-buy (OTB) figure states what part of the season's budgeted merchandise has been left open to be bought during the season.

Open to buy is calculated as follows:

OTB = Planned purchases - merchandise on order - merchandise received

Stock turnover can be calculated both in volume and in value:

$$\text{Annual rate of stockturn (in units)} = \frac{\text{Number of units sold in a year}}{\text{Average inventory on hand (units)}}$$

$$\text{Annual rate of stockturn (in retail price)} = \frac{\text{Annual net sales}}{\text{Average inventory on hand (retail price)}}$$

$$\text{Annual rate of stockturn (at cost)} = \frac{\text{Cost of goods sold during the year}}{\text{Average inventory on hand (at cost)}}$$

The overall merchandise control requires a balanced relationship between inventory and net sales. When buying seasonal products a smaller or bigger part of buying is left to be done during the season. In QR concepts, it may be that the majority of purchases are made during the season and a high OTB portion is intentional.

Budgeting and forecasting for a season's sales is difficult in apparel retailing. This may lead to an overbought situation, i.e. when too much merchandise was bought compared to demand. An overbought situation may also refer to some items only while for other items selling well there is a need to buy more than planned. But it is evident that the higher the OTB proportion the better chance the retailer has to make accurate forecasts about demand, since lead time from the moment of buying to receiving goods becomes shorter.

3. How to Create Successful Retail Performance

3.1. Forecasting

Forecasting standard items like groceries is relatively easy and straightforward. But in the fashion sector forecasting is much more difficult. Fashion is subject to rapid changes. Lead times from the purchase decision to having the goods in store are long. McGoldrick (1990) further points out that it is difficult to judge how well fashion, i.e. the look and color, is interpreted in the style of a specific garment. Risk can, however, be reduced by minimizing initial orders and negotiating rapid replenishment cycles with manufacturers, although this will increase the risk of stockouts. McGoldrick (1990) points out that forecasting in the fashion sector must be broken down to SKU level when specifying the quantities required:

1. **Classification** of the type of goods, such as trousers, shirts, jackets, etc. Various information sources indicating trends and competition may be used for adjusting the forecast.

2. **Style** relating to skirt length, trouser width, looseness and tightness of patterns, etc. These design aspects cannot be forecasted on the basis of past trends.

3. **Price** zones within which the items will be positioned. Most stores carry items for several price zones, although customers usually have an image of the store as for being on high, medium or low price level.

4. **Sizes** can generally be determined from past records. There might, however, be styles that are unsuitable for large customers.

5. **Color** is very much a design and fashion trend factor and needs to be decided on the basis of fashion forecasts available from various sources. Concept shops selling combinations have a further problems of ensuring that the colors of various items to be combined fit together.

If the above elements can be accurately estimated, the forecast would be fairly accurate. But in the fashion environment, on a practical level, there is no way of estimating consumer tastes accurately eight to nine months in advance of the season. Fashion trends, i.e. what is expected to be fashionable during the next season, are relatively easy to predict. Yarn, dyestuff and fabric manufacturers all come out with their trend colors for the coming season. There are design studios, like Promostyl of Paris, who on a professional basis make trend catalogues regarding style, fit, materials and colors for the coming season. Any firm in the fashion business can easily get hold of such prognoses, and by combining a few of them the general expectations of the

industry for the next season can be clarified. But this does not always go together with customers' preferences. Some forecasted colors will not sell at all and styles of such colors have to be marked down or perhaps even jobbed off at the end of the season, while some styles, materials or colors become very popular, resulting in out of stock situations very early in the season.

Since forecasting is not effort-free it is important to try to predict the likely forecasting error. Standard error of estimate (S.E.) is a term used for such error and it is used when determining how much extra safety stock is needed in order to cope with larger than estimated customer demand (Stern, El-Ansary, 1992).

McGoldrick (1992) points out that, out of the several statistical forecasting techniques based either upon time-series projections from past sales or upon known correlation between sales and various independent variables, the following three could be useful:

1. **Moving averages** means that the forecast is based upon the average over the last few weeks. As new weekly sales figures are available, they replace the oldest sales figures in the calculation.

2. **Exponential smoothing** is a technique whereby each new forecast is a function of the last forecast, adjusted according to the accuracy of that forecast. An alpha factor is used for defining the extent to which the forecast is adjusted:

$$F(t) = F(t-1) + \alpha\left[S(t-1) - F(t-1)\right]$$

where F = forecasted sales for the time period
t = time period of constant duration
S = most recent actual sales
α = alpha factor

By setting the alpha factor at 1, the effect is to set the forecast equal to the most recent sales figure. A low alpha factor, like 0.2, causes the forecast to be less responsive to short term change.

3. **Regression** means that instead of basing the forecast on past sales, it will, by using correlation analysis, be based on the relationship of sales and other factors. For example sales of children's heavy duty winter coveralls could be found to correlate with the average temperature of the area and of course fashion trends. So stores geographically located in areas where annual average temperature is above a certain level would sell very few of such items.

Dvorak and van Paasschen (1996) point out that there are three fundamental logistic objectives that a firm needs to achieve when optimizing logistics: to create an integrated logistic system, to look for an end-to-end optimization throughout the

whole supply chain, and to establish reliable forecasting. In a multi-shop chain organization one way of balancing sales and forecasts is to fully utilize the firm's distribution center which can deliver replenishment items to each store according to daily sales. In this way local variance in sales can be balanced.

Stern and El-Ansary (1992) say that customer demand patterns can be classified as: (1) regular and highly predictable, (2) irregular but mathematically consistent, and (3) irregular and unpredictable, and it is the latter that requires the greatest degree of sophistication in designing an inventory control system. Dvorak and van Paasschen (1996) suggest that forecasting techniques can be used even in the unpredictable fashion trade, for example by using catalogue sales to gauge demand, testing the spring collection in warmer climates before the season starts or by using test sales methods and showing the goods in advance to selected consumers for their opinion. But in fashion retailing forecasting has its limitations and the company must build its systems so that, for example, slow selling items can be quickly cleared away from the store and the space allocated to better selling goods. The whole logistics system must be analyzed and applied to the fact that accurate forecasting is not possible, for example, by adopting the following practices:

- Preferably five to six ranges of clothing should be crated each year in order to break seasonal buying and deliveries to the store into several waves.
- Styles, fabrics and pricing must be based on extensive market research.
- Designs that pass the market tests must be rushed to the store as quickly as possible.
- Special arrangements with suppliers, like supply partnerships, are formed.
- Designing and material sourcing is done jointly with the supply partners.
- Part of the supply partners' production capacity is reserved for five to six months period in terms of monthly quantities per product type while the exact styles will be defined much later.
- Use air-freight for all items selling well in order to have them in the store as quickly as possible for reducing the number of stock-outs.
- Keep stock in a single warehouse or distribution center which can replenish individual stores more quickly.

Dvorak and van Paasschen (1996) argue that by using the above methods the higher product sourcing costs will be clearly covered by increased sales and lower mark-downs. They say that in high-fashion retailing, at every opportunity, speed - even if transporting becomes more expensive - is the main means of maximizing sales and profits. Logistics should, however, be adjusted to the firm's strategy which in terms of delivery logistics can be determined as: (1) Fast to the market, (2) Waves of fresh assortment, and (3) Low cost.

	Fast to the market	Waves of fresh assortments	Low costs
Manufacturer costs	Trade off some cost for speed and flexibility	Live with longer lead times in order to drive down purchase costs	Achieve the lowest purchase cost and off-load as much work as possible to manufacturer
Transportation from manufacturer to DC	Frequently use highest cost transportation mode to gain speed	Balance speed and cost using low cost transport mode to small number of regional DCs	Maximize use of lowest cost transportation modes by establishing many local DCs close to the stores
Distribution center cost	Look for speed	Balance speed and cost in handling new product waves	Operate DCs to minimize work done in stores
Transportation from distribution center to store	Small, fast and expensive store deliveries	More cost effective small store deliveries	Most cost effective full truckload delivery to the stores
Store operation	Full service	Full service	Self service

Figure 33. Three examples of delivery strategies (Dvorak, van Paasschen, 1996)

According to Fisher and Raman (1996) and Bradford and Sugrue (1990), the unpredictability of demand together with a complex supply chain makes forecasting very difficult in the apparel industry and trade. In their research they have come to the conclusion that through Quick Response fashion retailers can really reduce stockout and mark-down costs as lead times are sufficiently reduced. The methodology to be applied is the following:

- Forecast accuracy for a season can be dramatically improved once 20 % of initial demand is taken into account in revising the forecast
- The correlation between the total and the first period demand is around 0.8 to 0.9 for most products
- The forecast can be further improved by taking the second period demand into account.

With this type of approach Fisher and Raman came to a conclusion that the increase of profits is manifold compared to a system where production commitments had to be made before observing any demand.

3.2. Order Quantities and Stockouts

As discussed earlier, the trade-offs in managing and controlling inventory levels are:

- Inventory holding costs
- Inventory ordering costs
- Stockout costs

With a purchasing and inventory control system a retailer aims at efficiently planning how much to reorder, when to reorder and how to control stockouts and find a balance between the above trade-offs at the lowest possible cost (Stern, El-Ansary, 1992). In garment retailing the customer (consumer) demand is stochastic and cannot be accurately forecasted. Therefore each forecast will have some error in it, and it is the management's responsibility to maintain a desired level of service at an acceptable cost of stockouts. The main cost of stockout is lost sales due to the fact that the consumers did not find the items they were looking for, and in case of continuous stockouts, the store might start loosing customers.

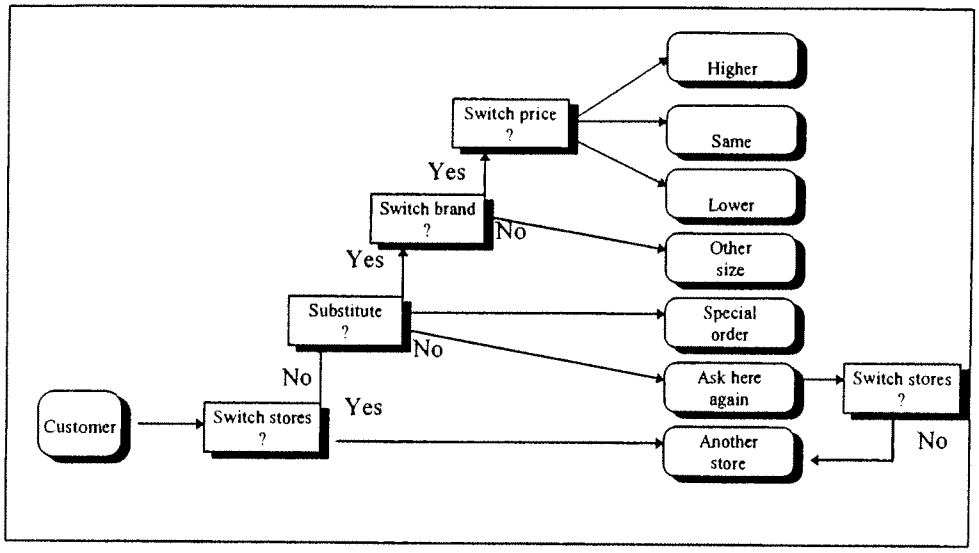


Figure 34. Consumer reaction to repeated stockouts (Lambert, Stock, 1993)

Stockouts measure product availability and they should be recorded by product and by customer in order to find reasons for stockouts. When stockouts occur, customer goodwill may be maintained by trying to substitute the originally sought-after product with something else, or try to get the consumer to wait for the next replenishment shipment. Product substitution means that the original product is replaced by another size or color or by an entirely different product that has the same function as the one desired by the customer. It is easier for the customer to find and accept a substitute if the retailer carries a wide range of products. According to Lambert and Stock (1993), successfully organized substitutions have a distinct impact on the customer service level. Two product substitutions would increase the customer service level from 70 % to 97 % with no change in inventory, whereas a firm that can maintain 97 % customer service level without substitutions needs about a 28 % higher level of inventory.

Traditionally, economic order quantity (EOQ) is a function of the cost of ordering and the cost of holding inventory:

$$EOQ = \sqrt{\frac{2DS}{IC}}$$

where

EOQ = Economic order quantity (units)
D = Annual demand (units)
S = Costs to place an order (money)
I = Annual cost of carrying inventory (%)
C = Unit price of one item

Order processing costs are reduced when quantity per order is increased since fewer orders are needed to purchase the same total annual quantity. Inventory holding costs increase when the order quantity increases since more products are kept in inventory for longer time. However, with seasonal goods EOQ should be determined on the basis of forecasts in order to establish an optimum balance between ordering cost, stock-holding costs and stockout costs. The first two cost categories are fairly easy to determine and calculate, while stockout costs are more difficult and depend on the consumers' decision in such cases. According to research, a stockout situation very often leads to 'buy nothing' decision and this means lost sales. McGoldrick (1992) refers to a study by Nielsen regarding customer reactions to out-of-stock situations, whereby it was found that only 26 % of consumers in the non-food sector bought a substitute and 74 % did not buy anything. Out of these 74 %, 33% bought the items later but 31 % went elsewhere. In the fashion industry and retailing there is a further problem. The long lead time forces the retailer to buy a large proportion of their merchandise up-front and without special arrangements with the suppliers it is impossible to plan the purchases on the basis of EOQ.

According to Pooler and Pooler (1997), the inventory holding costs consist of the following:

- Interest on investment
- Space charges
- Handling costs
- Supplies
- Insurance
- Taxes
- Obsolescence
- Depreciation
- Deterioration
- Use of money elsewhere

3.3. Lead Times and Time-Based Competition

The 'cash-to-cash' cycle can be used as a measure for the total cash that is locked up in the pipeline from buying materials to receiving payments from customers (Christopher, 1997). In garment retailing the cash-to-cash pipeline can be quite long, especially for companies that still operate with seasonal up-front buying. Every day that the cash stays in the pipe-line is a cost to the company, firstly a cost of funding and secondly an opportunity cost. The cash could be used in a more productive way.

The logistic pipeline consists of manufacturing process time, in-stock time and in-transit time. The length of both the logistic and cashflow pipelines depends on the method and place of sourcing garments. Transportation time from nearby sources is shorter. European suppliers usually accept payment on 30 to 60 days credit while from the Far East buying is done on a Letter of Credit basis. Transport time from nearby sources is hours or days, while from the Far East it can be up to eight weeks. According to Christopher (1997), reducing of the length of the pipeline will bring many benefits, for example:

- Release of capital
- A continuing benefit through the reduced cost of financing a shorter pipeline
- Shorter response time improves customer service levels
- Less vulnerability to market-place volatility
- More flexibility in meeting precise customer requirements like options, pack sizes, colors, etc.

Besides having direct financial impacts, a shorter pipeline contributes to the overall success of retailing. Forecasting accuracy will be improved since forecasts can be produced closer to the season, and forecasting errors can further be corrected through replenishment buying.

Christopher (1997) lists three main dimensions of time-based competition:

Time to market, i.e. how long it takes the business to recognize a market opportunity, to translate this into a product or service, and to bring it to the market.

Time to serve, i.e. how long it takes to capture a customer's order and to deliver or install the product to the customer's satisfaction.

Time to react, i.e. how long it takes to adjust the output of the business in response to volatile demand. How quickly the tap can be turned on and off.

In garment retailing, product life-cycles have been reduced from the original half a year (1 season) to a few months. Retailers prefer to turn the stock around quickly and likewise reorganize the display and merchandise in the store, in order to draw in the same customers several times during the season. Due to the shorter life cycle there is less time to make a profit with one particular product and timing becomes critical. The goods must be on sale when planned in order to avoid an outdated inventory.

Together with short lead times reliability of deliveries is emphasized. The lower the stock levels are kept the more vulnerable a retailer is in terms of delayed deliveries. Delayed deliveries cause stockouts and lost sales.

The garment retailing market is very volatile. Significant upward and downward changes in demand occur continuously and unpredictably. Accurate forecasting is difficult. But the longer the lead time is the further ahead forecasting must be done. As discussed earlier, forecasting error seems to increase more than proportionately with the lead-time, and forecasting error is the main reason for keeping safety stocks. In line with increase of global sourcing the lead times have become longer. A typical trade off in sourcing is whether to go for a cheaper purchase price by producing in the Far East and having a long lead time or to order the products from nearby suppliers with higher production costs but short lead times.

Significant benefits can be achieved through reduction of lead times. The need for operating capital will be lower and the retailer can improve his cash-flow. It will be possible to react more quickly to changes in demand, and forecasting accuracy will be improved. Christopher (1997) uses the term 'strategic lead time management' for a management concept which targets at understanding and managing lead-times. Strategies for lead time reduction should focus on the following points:

- In the manufacturing process as well as when selling coordinated collections, each component may have different lead times and the total lead time is determined by the component which has the longest lead time.
- Critical path analysis should be applied in order to locate the slowest-moving component.
- Graphic mapping of the whole pipeline from one end to another in time-based form helps in analyzing lead times. Horizontal time can be used for time spent in process either in manufacturing or in-transit, and vertical time can be used for illustrating time like inventory time when nothing is happening, as presented earlier in figure 17.

- A pipeline can be divided into value-adding time and non-value-adding time. Non-value-adding time is caused by activities that, from the customer's point of view, do not add value to the product, for example order processing time, in-transit time, in-stock time, etc. The pipeline should be analyzed step by step, classifying the activities that actually create customer value and not only costs, as presented in Figure 35.
- Implementation of the floor-ready merchandise (FRM) concept reduces in-stock time as products are delivered completely ready for the store, including acceptable pressing quality, price tags, UPC bar code tickets, appropriate retail hangers for hanging goods, etc.

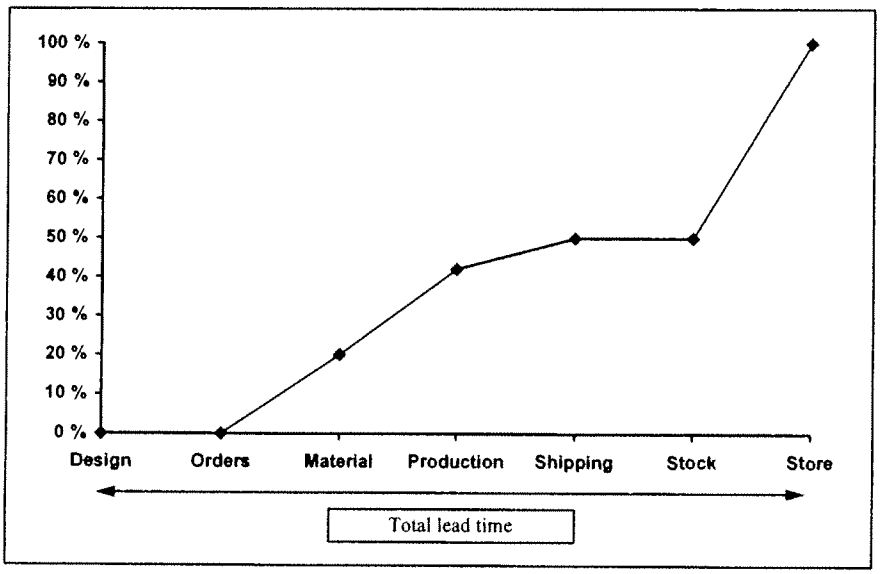


Figure 35. Value added throughout the garment sourcing pipeline (EA-Projects Oy.Ltd)

From the consumer point of view, designing and order processing do not as such add value to the product as the product starts to materialize only after purchasing raw materials. Neither does keeping the product in stock add value to the product, but once the product is successfully displayed at store the retailer is able to add his margins on top of the purchase price and the full value added has been gained, providing that deliveries were on time and demand was correctly forecasted. Otherwise the value will be reduced through mark-downs.

The Textile/Clothing Technology Corporation $(TC)^2$, a research institute based in North Carolina, has produced complete process step maps for various kinds of garments. The process diagram for men's cotton slacks presents various steps from

the cotton field to consumer, concluding that in traditional processes the total waiting time can be between 30 to 90 days, in-transit time when the products are produced locally can be around 30 days, etc. Although these lead times do not present financial requirements to the retailer, they nevertheless slow down the whole process and increase forecasting errors.

3.4. Up-Front and Replenishment Buying

The traditional supply chain consists of individual companies with only minimal up-stream and down-stream transparency of market-related information. This situation creates uncertainty and each member must secure himself with buffer inventories. As a result the chain carries far more inventory than necessary, creating cash-flow problems for its members and making the whole chain slow in responding to market changes. Further, the numerous inventories and minimal exchange of information create so-called 'Forrester Effect' which is named after the MIT professor who discovered it (Christopher, 1997). Small changes in end-user demand will result in amplified demand the further upstream the signal travels. The cause of this tidal wave is that independent inventories act as buffers and distort and amplify the requirements causing even higher inventories. In order to avoid this management techniques such as ECR and QR have been developed. The aim is to reduce inventories and exchange as much information as possible. This makes the supply chain lean, cuts down inventories and increases reaction speed.

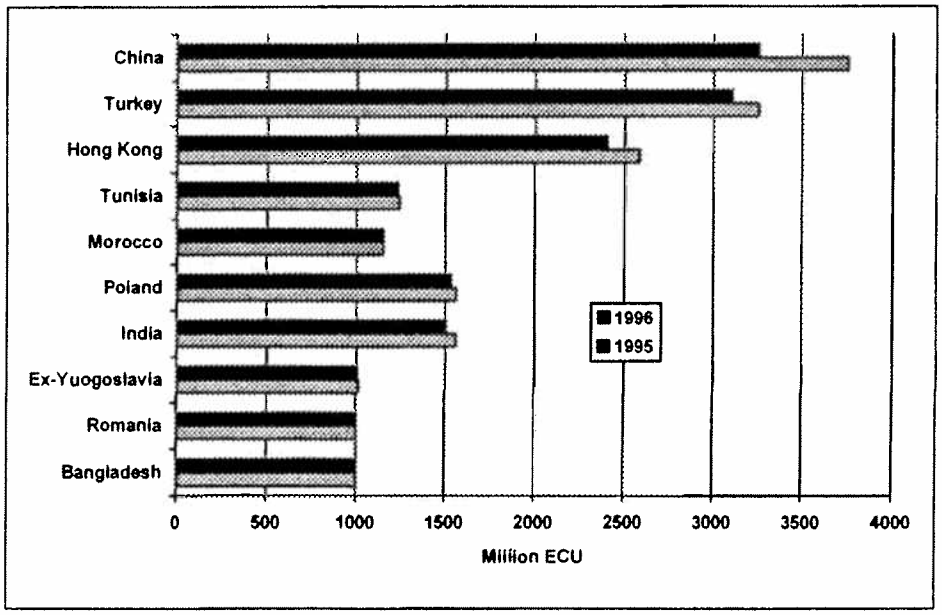


Figure 36. Non-EU suppliers of apparel products to the European Union (Euratex 97/4)

The market for apparel products is price-oriented. The majority of consumers look for competitive prices rather than up-market designs and quality. Therefore, the purchase price of merchandise is very important to the retailer. Low-cost sources for apparel products are far away. The main sources outside Europe for European retailers are the Far East and North Africa, while American retailers buy from the Far East and Central and South America. Although the lead times are long the low prices seem to justify volume buying from these areas (Anson, 1997, Aspinall, 1998, Barbee, 1998).

In order to combine the advantages of low purchase prices and short lead times, many companies buy part of their seasonal merchandise up-front and the rest during the season through replenishment buying. The following separate inventory levels are normally used in planning and forecasting reorders:

- **Order level** is the inventory level for satisfying expected demand between reorders.
- **Lead time level** is the level of inventory needed to cope with the demand as long as it takes to receive the reordered lot.
- **Safety level** or buffer inventory is the amount of goods needed for coping with expected variation in demand or in re-supply lead time.

Up-front buying is based on the seasonal forecast. In order to leave room for in-season replenishment part of the forecast is left open. This open-to-buy (OTB) level depends on the strategy of the company, and can be very small if replenishment is not done systematically. Companies using ECR or QR methods have higher OTB levels. In the following ways OTB makes it possible for the retailer to plan and control purchasing (Risch, 1992):

- Regulates the balance between inventory and sales, thus limiting an overbought or underbought situation
- Prevent loss of sales due to an out-of-stock position
- Maintains purchases within the financial limitations of the periodic merchandise budget
- Reduces mark-downs, increases sales and thus enhances both turnover and gross margin

- Allows the retailer to hold back purchase dollars so as to reorder fast selling items and replenish staple stock, take advantage of special price merchandise offered by the vendor and sample new vendor lines or items

- Planning errors, such as inaccurate sales forecast, buying errors, such as failure to recognize fashion trends, promotional errors and timing errors can be corrected to a certain extent

Davies (1996) points out that the retailer, ideally, would like to hold no stock at all and turn the store into a cross-docking operation. The wish to reduce stocks demands shorter lead times throughout the whole pipeline, and the process of efficient replenishment is driven by the need to predict the consumer demand and off-take more accurately. This, however, must be done in a planned way since the consumer off-take is heavily influenced by the pattern of in-store merchandising, pricing and promotion.

King and Maddalena (1998) tested the impact of reordering on gross margin in the United States. The case study involved Dillard's - a retailer who normally sources its entire children's line up-front, and The Warren Featherbone Co. a children's wear producer. The companies agreed to test replenishment buying in order to see what results could be achieved, i.e.:

- What are the financial and service benefits of in-season replenishment?
- How many replenishment orders should be made and when?
- What stock should be replenished in each store in the chain?
- What is the impact of forecasting error on the replenishment strategy?

Prior to actual reordering, the case was tested by Sourcing Simulator, a software program specifically designed for testing different garment sourcing strategies. The program is developed by North Carolina State University jointly with the North Carolina-based garment and textile industry research and training institute called $[TC]^2$. The objective of the pre-season analysis was, by examining several options with the Sourcing Simulator software, to define the parameters of the replenishment program at various levels of forecasting error. The scale of forecast error in the test was from - 50 % to + 50 %. The results achieved by King and Maddalena were as follows:

- Compared to 100 % up-front buying , i.e. 100 % of the plan delivered prior to the season with no replenishment, a sourcing strategy with 50 % up-front delivery and 50 % bought and delivered during the season in one delivery improves the gross margin between 4 % and 13 % depending on the reorder week. According to the results one reorder can be made flexibly over a lengthy period of time during the season and still receive significant results.

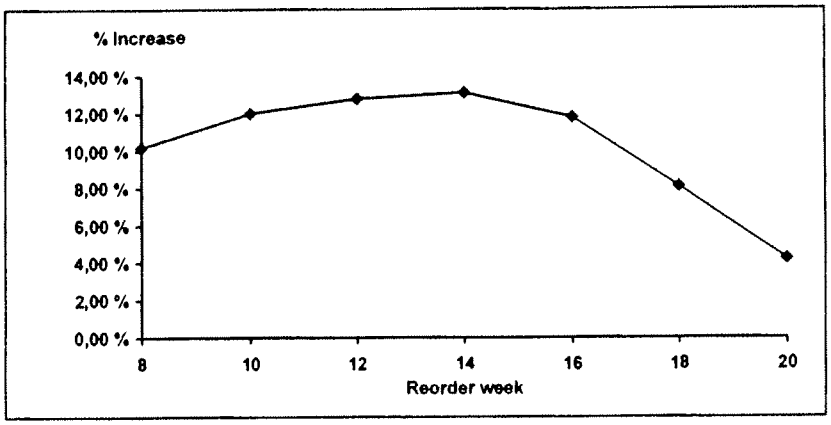


Figure 37. Improvement in gross margin for different reorder weeks when comparing 100 % up-front buying to one reorder of 50 % (King, Maddalena, 1998)

- The proportion of up-front buying and replenishment buying was tested regarding the average revenue per garment at different initial stock levels bought up-front. The purpose of initial stock is to cover demand until replenishment is received. Over-committing initial inventory can lead to overstocking and under-committing to stockouts and lost sales. As shown by Figure 38, the best zone is between 30 % and 50 %

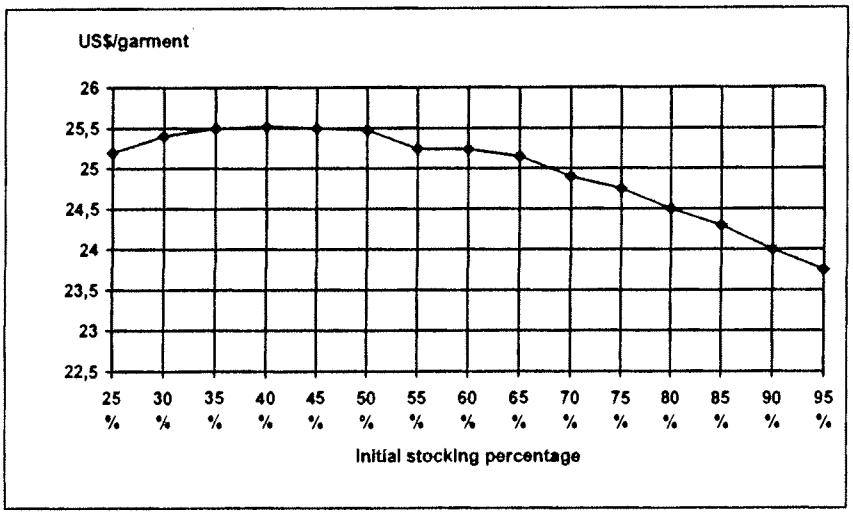


Figure 38. Revenue per garment for different initial stock levels (King, Maddalena, 1998)

- The improvement of gross margin achieved through one 50 % reorder possibility at various levels of forecast error was tested, both when the demand was underestimated and overestimated. In Figure 40 a forecast error of -30 % means that demand is 30 % less than the forecast. If the forecast was perfect there is very little that can be corrected through reorder. Over-forecasting is more difficult to correct than under-forecasting, because the gross margin will be affected by mark-downs and liquidation costs of the extra merchandise.

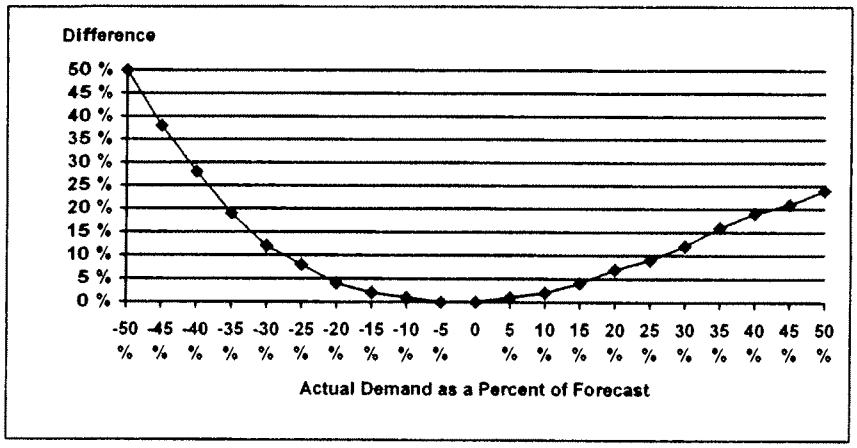


Figure 39. Improvement in gross margin through reorder possibility at various levels of forecast error (King, Maddalena, 1998).

- The impact of more than one reorder on gross margin was also tested. The results show that most of the improvement of gross margin is achieved by one reorder, further reorders contribute to the improvement as well as shown by Figure 41. However, King and Maddalena point out that more frequent reorders have a much bigger impact on stockturns and GMROI.

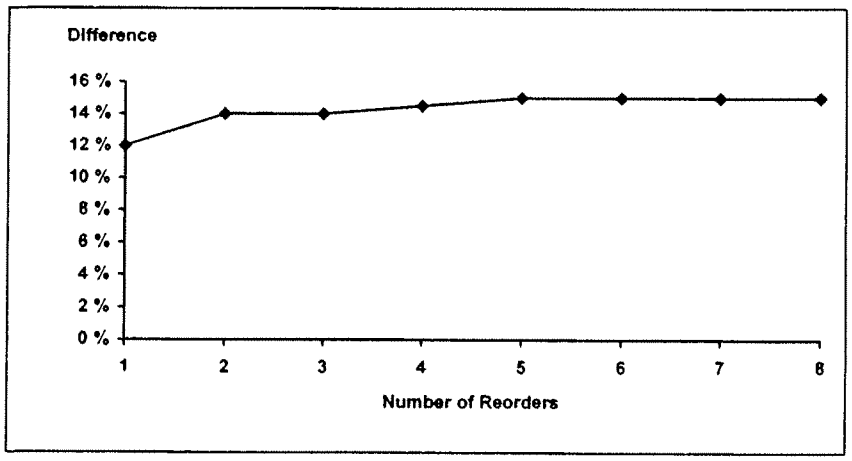


Figure 40. Impact of more than one reorder on gross margin (King, Maddalena, 1998).

According to the tests and analysis by King and Maddalena, the possibility of replenishment buying is fundamental in correcting forecast errors and, in the end, gross margin. A combination of partial up-front buying, certain OTB level and use of POS data for replenishment buying seem to be the critical success factors in planning and executing purchases of seasonal goods like apparel. Forecast errors will always occur and, the errors increase as lead times increase. The time from ordering to receiving goods should be as short as possible in order to minimize the forecasting error, and therefore the overall lead time is a third critical success factor.

3.5. Information Technology

Implementation of ECR and QR is not possible without information technology in a multi-store environment. POS data must be collected in real time and made available for decision making immediately. A competitive logistic strategy simply cannot function without computers. Information must be processed and exchanged between different parts of the organization within one company. Retailers and suppliers must also exchange information, usually through EDI links.

Marks and Spencer, a British multi-shop apparel retailer, has been using an information system for the replenishment process for a number of years already (Christopher, 1993). Daily POS information makes it possible for the Central Planning to decide replenishment needs. The suppliers of Marks and Spencer produce according to a production plan provided by Marks and Spencer. This plan is naturally based on forecast, but all the merchandise is not received by Marks and Spencer stores in one shipment. Instead POS information is transmitted to suppliers who collect individual store requirements together, and these bar-coded shipments are delivered by

a logistic service company just in time to the stores. In this way stocks are kept at a minimum and, by consolidating shipments, transport costs are also competitive, as presented in Figure 41.

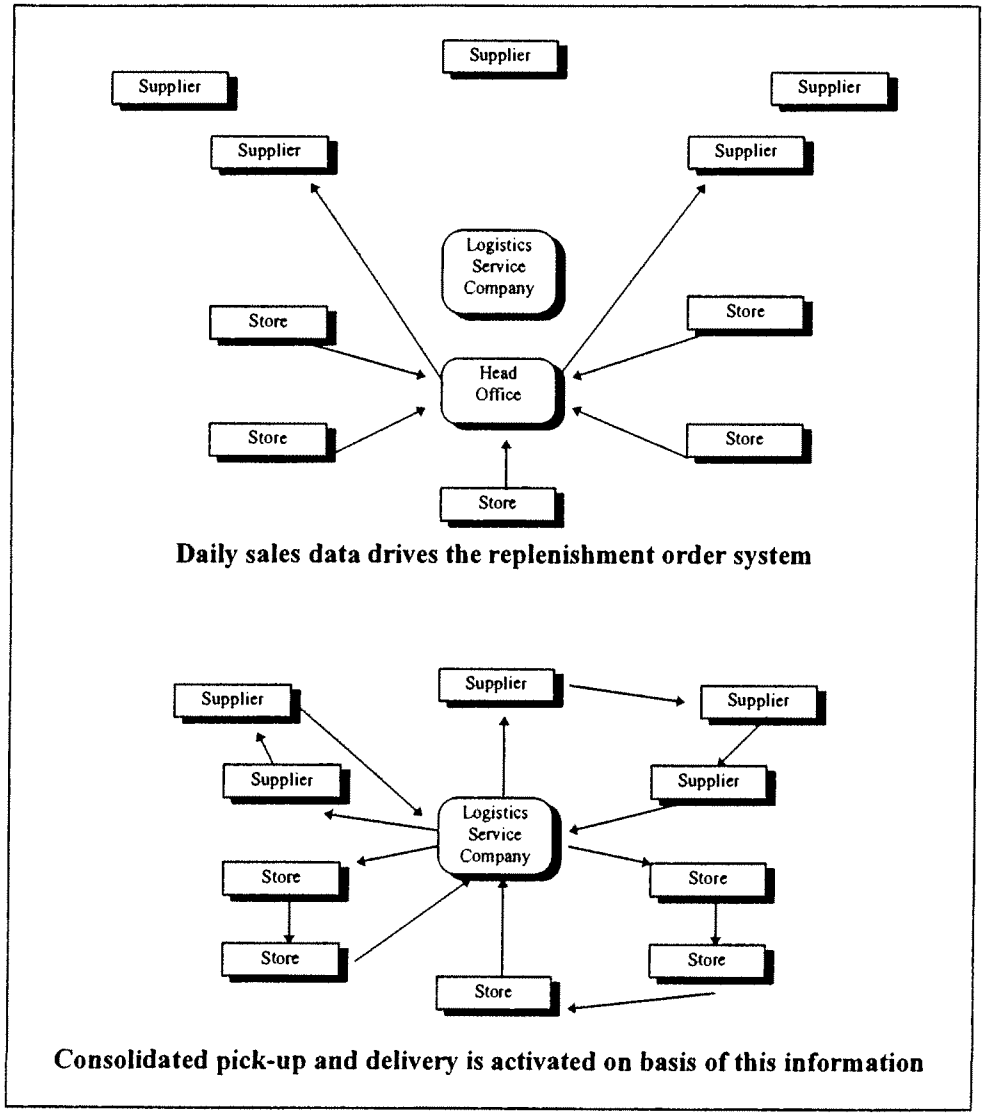


Figure 41. POS information is transmitted from stores to suppliers and the logistics service company at Marks and Spencer (Christopher 1993)

Today's information systems are integrated and with open architecture which enables various systems to exchange and use the same information. Logistic systems are also vehicles for integrating planning, control and other functions throughout the whole

supply chain. Lamey (1996) points out that despite high usage levels, EDI is primarily still used to automate invoicing and order processing and real data is rarely exchanged between different companies. The main reason for this is lack of standards, for example regarding product coding. Unique product codes (UPC) should be attached to products and used by both suppliers and retailers. Another problem is the high error rate with UPC, which can be 15 to 20 % (Lamey, 1996). However, Lamey is convinced that EDI forms an important part of ECR and QR which help retailers to reduce lead times, increase service levels and reduce inventories.

A number of studies and industry-wide initiatives in the US apparel industry have lead to increasing supply chain collaboration, mainly by utilizing the POS information collected at the electronic check-out throughout the whole supply chain (Christopher, 1997). Kurt Salmon Associates, an American consulting firm specializing in apparel industry and retail consulting, argues that QR is the only way to reduce the long lead times and improve the overall competitiveness of the industry. Information technology is an essential part of QR when expanding it throughout the whole supply chain.

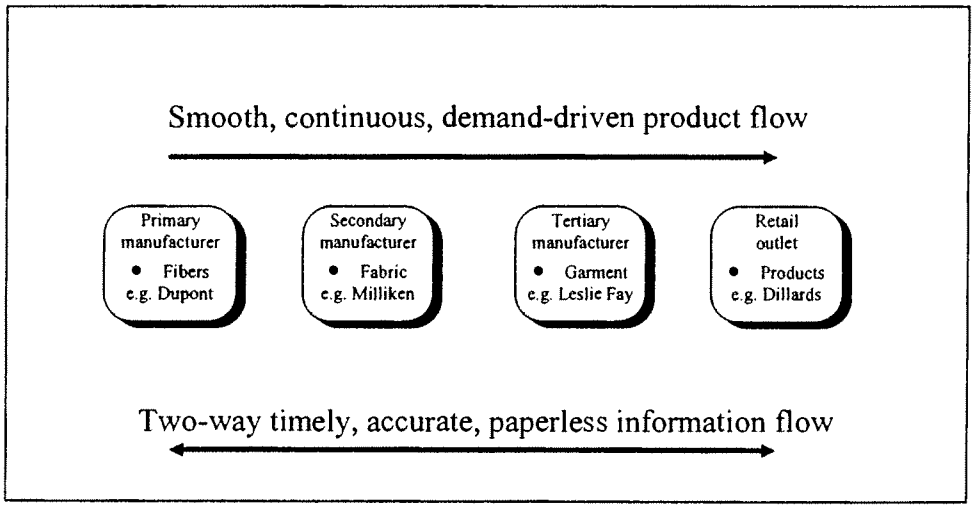


Figure 42. Quick response in the US apparel industry according to Kurt Salmon Associates (Christopher, 1997)

Most retailers base their sourcing strategy on the assumption that low purchase price gives best profits, no matter how long the lead time is. This may not be the best choice in terms of overall profitability since with long lead times forecasting error grows. As sourcing is a complex procedure it is difficult to verify different alternatives, at least without basic information and the possibility of using computers. For comparing offshore and local sourcing, North Carolina State University and the

research institute $[TC]^2$ suggest that the following information and measures should be used in the analysis:

Information

- Number of SKUs, wholesale costs, other procurement costs, inventory carrying costs, etc.
- The buyer's pre-season forecast of demand, i.e. total volume, SKU mix and seasonality pattern
- Means of merchandising (retail price, mark-down schedule, etc.)
- Sourcing means (type of vendor, initial delivery quantity, number of in-season replenishment orders, lead time until receipt, vendor reliability, etc.)

Measures

- Inventory turns
- Percentage of offering sold
- In stock percentage
- Customer service level
- Lost sales percentage
- Gross margin
- GMROI

3.6. Financial Considerations

The relationship of net profit to sales (profit margin) indicates the management's ability to recover the cost of merchandise and the operational costs and it describes the cost/price effectiveness of the operation. Gross margin and operating expenses are the key elements that affect profit margins. Stern and El-Ansary (1992) argue that one should look beyond price and think more directly about gross margin planning and that there are several ways to increase gross margin, for example:

- More effective purchasing, especially via consolidation of suppliers
- Mark-down control
- Shrinkage reduction, especially via proper measurement
- Merchandise mix, emphasis on higher margin items via display procedures, product adjacencies and suggestion selling
- Price adjustments, especially via increases on non-price-sensitive items

The logistic pipeline from weaving material to actual sale of the ready-made product to the consumer is very long. Depending on which sourcing concept is used

(definitions below by EA-Projects), the retailer ends up financing a shorter or longer part of this logistic pipeline:

- **Cut and manufacturing (CM)** means that the retailer, when buying directly from the source, must buy all the materials including all accessories and have them shipped to the manufacturer for production. The retailer buys only manufacturing services from the supplier. This also means that the buyer must finance the purchasing of all materials on behalf of the supplier in good time, ahead of product delivery.

- **Cut, manufacturing and trimmings (CMT)** is a similar sourcing concept as CM but in this case the retailer buys only the fabric and maybe some other main materials and ships them to the supplier. The manufacturer buys the rest of the accessories and charges the buyer a price including these accessories as well as the manufacturing costs.

- **Full price sub-contracting** means that the buyer specifies the design of the product as well as all materials, but the supplier buys the materials and charges the buyer the cost of materials and manufacturing, i.e. the price of a complete garment - hence the term 'full price'.

- **Private label** as a sourcing concept means that to a large extent product design, including selection of materials, is done by the supplier, but the products are supplied under the retailer's label.

- **Supplier label** means that the retailer buys from the supplier's collection and sells the products under supplier's label.

CM and CMT sourcing concepts are often the only possibility with very low cost supplier countries that, in terms of quality, have no acceptable material production of their own. These concepts are usually used in sourcing from Russia and many countries of the former Soviet block, from several African countries and from the least developed countries in Asia, such as Laos, Cambodia and Mayanmar. Full price sub-contracting and even private label sourcing is used more in sourcing from China, Hong Kong, Taiwan, Portugal, Greece and Turkey.

Terms of payment is another factor that has an impact on a retailer's cash flow. The following methods of payment are used in international sourcing (Madura, 1995):

- **Prepayment** means that the goods are paid for before shipment and the buyer must completely rely on the supplier to ship the goods as ordered. Since the buyer has the full risk, this method is used only under special circumstances, for example with nearby European suppliers or in case the buyer otherwise has control over the supplier (owner, joint venture, etc.).

- **Letter of Credit** is a widely used instrument in the international sourcing of garments, since it is fairly risk free, both to the supplier and the buyer. The buyer's bank agrees to pay the seller's bank upon presentation of the shipping documents in compliance with the terms stipulated therein. The seller usually requests the Letter of Credit when accepting the order, which is several months before delivery. As the buyer's bank guarantees the payment, the seller must either have an equal amount of cash in the account or provide other type of guarantee to the bank.

- **Draft** is a form of documentary collection, often referred to as documents against payment, whereby the bank releases the shipping documents to the buyer after the buyer has paid the draft. This can take place once the goods have arrived and are ready for customs clearance.

- **Consignment** is a seldom used method of payment in garment sourcing. In consignment business the retailer pays the supplier only after the goods have been sold out of the store and has the right to return all unsold items.

- **Open account** is a transaction in which the supplier ships the goods and expects the buyer to remit payment according to the terms agreed upon between the parties. The payment may have to be made at the date of delivery or the buyer may be given credit for a limited period of time. There may often be a cash discount for quick payment. For example, if paid within 14 days from shipment, the discount is 4 %, the discount within 30 days is 2 % and net amount is expected to be paid within 60 days. According to the example, the buyer gets a credit for a certain period and with quick turnaround of stock he might be able to sell most of the merchandise before paying the supplier.

Letter of Credit is a commonly used instrument when buying from the Far East or from other remote regions. Prepayment is used only in special circumstances as stated above. The open account method of payment including credit for a limited time period is widely used in sourcing within Western Europe, and sometimes after several years of reliable business it may be accepted by Asian suppliers as well.

The effect of the sourcing concept and the method of payment selected by the retailer is two-fold. There will be costs, such as interests and bank charges which load operating costs and decrease profits. The financing of material and product purchases requires operating capital. Purchase prices are low with CM and CMT but materials must be financed for a long period of time. Prices from a European supplier on private label basis will be higher but the open account method of payment including a credit period lowers the financial burden. With European suppliers it is also possible to reduce lead time or even set up QR sourcing.

Interests and service charges are often neglected in sourcing although they may be proportionally quite meaningful. All costs involved in executing and financing sourcing should be analyzed and considered.

4. Model Outline

4.1. General

Product sourcing and merchandising strategies are fundamentally important in creating retailing success with apparel products. The attractiveness and fashionability of collections and individual products that are offered to consumers play a vital role in achieving sales targets. The main objective of forecasting is to predict in advance what the fashion of the coming season will be like and what the consumers are likely to want. This study does not focus on fashion forecasting or forecasting techniques, although forecasts and the impact of lead time on forecast error are central to the analysis of this study.

Managing the product sourcing process is complicated, and in many cases the buyers and sourcing managers lack the tools for planning and controlling this vital operation. This study focuses on identifying the critical parts of the product sourcing process, how they should be planned and managed, how retailing success should be measured and what the critical success factors are.

Apparel products can be divided into basic products such as socks, underwear, etc. and fashion products such as outerwear clothing. The selling of fashion apparel is seasonal, consisting of two seasons, autumn/winter and spring/summer, with new styles, designs and colors for each season. Traditionally the retailers bought their merchandise twice a year and received all the products for each season more or less simultaneously. Increasing competition and requirements for faster cash flow have changed this pattern and now the retailers split the deliveries into several delivery intervals during the season even though they may still buy for the whole season at the same time. Nevertheless, when sourcing products from far away low cost sources, orders have to be issued a long time ahead of the season.

The most critical part of the sourcing process is **forecasting accuracy**. If the buyer makes a perfect forecast for the season and buys accordingly, the store will carry all the goods and just the goods the customers are looking for. No stockouts will happen, and there will be no need for mark-downs or product liquidations and the optimum gross margin will be achieved. This, of course, is not possible. No one can predict a long time in advance what kind of styles and colors the consumers are going to be interested in. But, there are ways of improving forecasting accuracy. Different types of mathematical methods can be used, but they are of little help in apparel retailing since coming fashion cannot be forecasted on the basis of past trends. Panel of experts can be used and is widely used for forecasting. In pre-season meetings the merchandising management jointly outlines forecasts for the coming season. Forecasts can be revised on the basis of incoming orders as discussed earlier. But a critical factor regarding forecasting accuracy is the sourcing process **lead time.** The longer the lead time is the higher the forecast error is likely to be. Replenishment buying reduces the overall lead time since part of the seasonal merchandise can be bought later. Another critical success factor is to what extent purchasing is divided into **up-front buying** and **replenishment buying.** If the buyer leaves part of his

budget open and bases purchasing of this OTB-part on POS information he is actually not guessing any more but buying for the direct consumer need. Quick Response and Efficient Consumer Response are special techniques developed for this type of sourcing. Point of sale information is transmitted directly to suppliers who can utilize it in their own planning. According to the agreed system the retailer can now order products at very short notice and expects fast deliveries. When POS is collected early in the season it can be used for improving forecasts and for ordering products according to actual demand. Short lead times and replenishment buying have a positive effect on **cash flow** as well. Figure 43 presents an outline of information and material flow up-front and replenishment buying indicating the various process lead times.

The most common way of measuring retail productivity is gross margin. Product costing prior to the season will show that products with the lowest purchase price are most profitable. This, however, is an illusion. The lowest purchase prices are available from either far away sources like China, Laos, Cambodia, etc., or from badly organized countries like Russia, Romania, etc. Common to all these sources is that orders must be issued well in advance and manufacturing and transporting times are long. As result of the long lead time, forecast error increases and quantities bought are either too small or too large, or totally wrong merchandise may be bought. Therefore other measures should be used for analyzing the profitability of sourcing.

As discussed earlier, the strategic resource model outlines three measures for evaluating the utilization of key resources at retail level. i.e. **GMROI, GMROS, GMROL** and **GMROI-R.** GMROI combines margin management and inventory management and it measures how well the inventories generate gross profit. GMROS takes the occupied space into account and indicates the gross profit per selling area. GMROL is the gross margin per full time employee. GMROI-R emphasizes the relationship between gross margin and turnover. **Activity ratios** and especially **stockturn** (inventory turnover) measures the success of purchasing and retail management. Quick stockturn indicates that inventories are kept at a low level which has a positive impact on cash flow.

Special **retail performance ratios** measure how successfully the merchandise bought meets with demand. **Customer service level** indicates the percentage of customer visits to the store when the customer finds his or her first-choice stock keeping unit. Service level, when calculated like this, is an excellent way of measuring sourcing success, but only in theory, as practical use of this measure would require in-store customer interviews. **Service level** indicates what proportion of the full SKU range is available at the store. **Lost sales** measures the percent of times a customer finds none of his SKUs, i.e. first choice, second choice, etc., and leaves the store without buying anything. Practical use of this measure encounters same difficulties as service level. **Sell-through** indicates the proportion of the season's merchandise that sells at first price. This figure is easy to calculate and it tells how well in line with demand the purchases were. **Mark-down ratio** indicates the proportion of all goods sold at reduced price including those that are finally jobbed off. **Joboff** or liquidation percentage is the proportion of SKUs remaining at the very end of the selling season and which must be disposed of at any price.

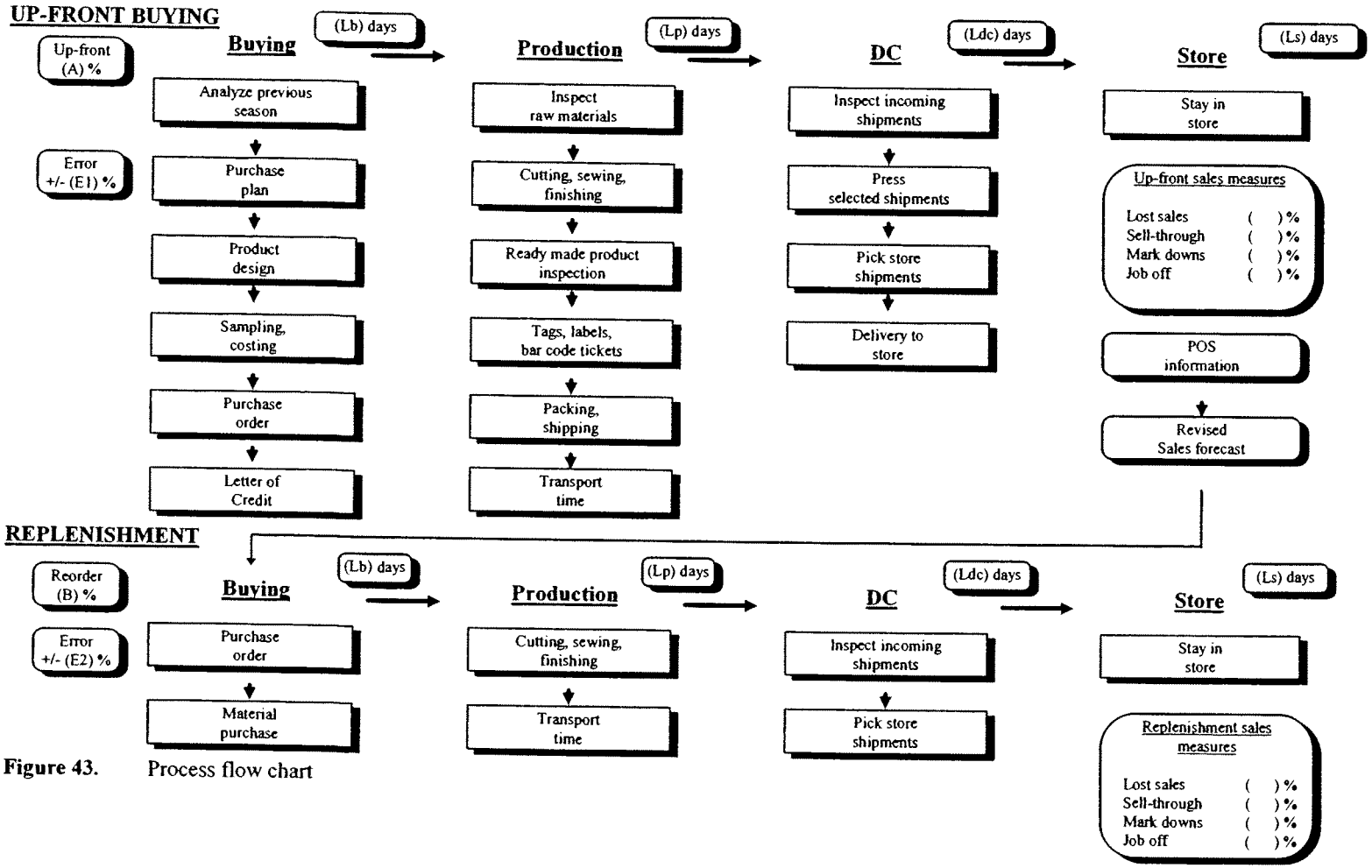


Figure 43. Process flow chart

In this study and for the purpose of the model of this study, measures of success are divided into two categories:

- Theoretical measures which can be used when calculating performance on a theoretical level, for example, in creating models. These measures are usually good indicators of success but on a practical level they are difficult to calculate, often requiring in-store customer interviews, which can not be organized on a continuous basis. As these measures indicate the potential for sales and earnings that now, due to poor planning, is lost, they are called potentiality measures in this study.

- Practical measures which are easy to calculate from the normal accounting information or production and delivery control data available to every retailer. These measures can be used for controlling retailing performance on a continuous basis.

As the theoretical part of this study shows, the meaning of some of the terms varies according to different researchers. In order to avoid misunderstanding, the main terms and determinants used in the context of this study are defined as follows:

Forecast error

The demand forecast in garment retailing follows a distribution which is defined by its mean and error deviation. The mean is the buyer's plan and the deviation is the forecast error (Fisher, Hammond, Obermeyer, Raman, 1994). When a buyer makes a purchase plan for the season he tries to forecast the demand as accurately as possible. When purchasing seasonal fashion products it is unlikely that, due to a countless number of determinants, a perfect plan with no forecast error could be made. Instead, the demand regarding certain SKUs will be higher than the plan, and regarding other SKUs lower than the plan. According to Hunter and King (1996), the forecast error is a combination of volume error and assortment error. Assortment error consists of three attributes: color, style and size, which together make up the mix of stock keeping units (SKUs). Suppose that, in a certain style and color, the sizes available are Small, Medium, Large and Extra-Large. The forecast distribution of sizes is 10%, 35%, 40% and 15%, respectively. If the actual demand percentages turn out to be 10 %, 30%, 30 % and 30%, the size error is:

0% + 5% + 10% + 15% = 30 %

It is possible that the total level of demand forecast is accurate while the assortment is not. But The SKU mix error represents the total error associated with forecasting style, color and size distribution, and it is the total error that matters instead of the distribution of error across each individual style, color or size (King, Pinnow, 1998). As shown by the above example, the forecast error on SKU level can be positive or negative. The positive error results in unsold goods that are later sold at mark-down prices. The negative error causes stockouts and lost sales which do not appear in the profit and loss account, but rather represents the lost sales potential. In the model and

equations of this study E is used as a symbol for the total forecast error. It can be either positive or negative. E is given a positive value in connection with computing inventory and mark-down sales volumes. E is negative when the lost sales potential and its impact on profits is calculated.

There are a number of determinants that affect forecast accuracy, for example, fashion trends, competitor behavior, shop displays, promotion activities, delivery performance, buyer's personal skills, weather, and so on. The demand forecast for seasonal fashion products can not be based on history as the product range is renewed for each season.

Critical factors regarding forecasting accuracy seem to be the process lead time and the use of POS information for in-season replenishment buying. The objective of this research is not to study forecasting techniques as such or ways for controlling all the determinants that affect demand. The focus is on how to minimize the forecast error by selecting sourcing strategies that reduce the lead time and make it possible to use POS information during in-season buying.

SKU

Stock Keeping Unit (SKU) is a term referring to one product on a style, color and size level, i.e. the basic item in stock management as well as in sales. Synonyms used by the industry are item and unit.

SKU range

SKU range means the assortment of different SKUs bought for a season. Symbol R is used in the equations for the number of different SKUs in the assortment when calculations are carried out with quantities. When the equations are in value, the impact of SKU range on the inventory value is calculated with the ratio of SKU assortment over the total number of products sold, for which symbol t is used.

Service level

Service level indicates what proportion of the full SKU range bought for the season is available at store. A service level of 90 % means that 90 % of all the different SKUs bought for the season are available throughout the whole season. It also means that at the end of the season 90 % of SKU range is left over and will have to be cleared through mark-down sales.

This measure is somewhat theoretical as the actual demand is difficult to define. Further, many firms do not carry the whole seasonal range from the beginning of the season to the end. Instead, deliveries take place during the season as well. Nevertheless, service level is a useful measure and it is used in this study in order to outline the importance of customer service and the effect that it has on lost sales.

Mark-up factor

In the context of this study mark-up factor is defined as the ratio between retail price and product purchase price. The retail price can be calculated by multiplying the purchase price by the mark-up factor.

4.2. Critical Success Factors

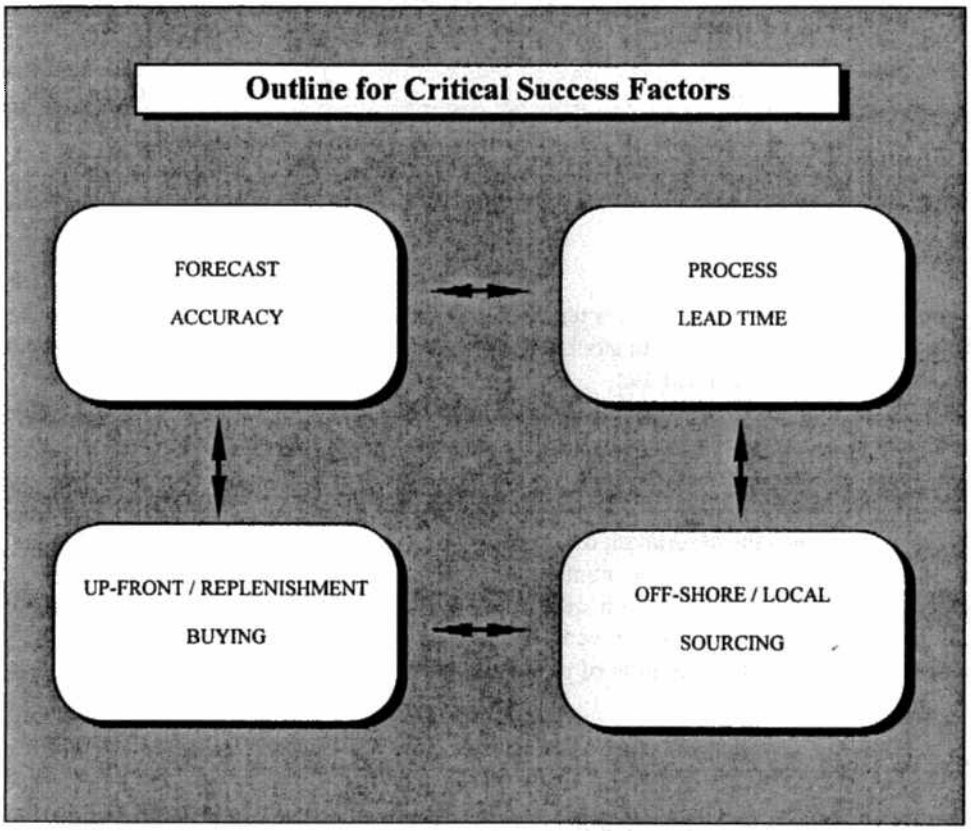


Figure 44. Outline for critical success factors in apparel retailing specifically concerning sourcing and merchandising

The success of apparel retailing depends on four critical success factors, which in the process of sourcing management affect each other. The majority of product purchasing is done on a forecast basis. The accuracy of the forecast is fundamental and the management should organize the sourcing operations in such a way that forecasting error can be minimized. Process lead time has an effect on forecasting

accuracy. The further ahead one must forecast the higher the error. On the other hand, with short lead time forecasting error can be corrected by repeating forecasts on the basis of POS information. By reducing up-front buying it is possible to reduce the the impact of forecasting error and the total lead time. By utilizing POS information replenishment buying can be done according to actual demand. Purchase prices are distinctly lower when sourcing off-shore, but lead times are long. Use of QR and ECR are possible due to short delivery times when sourcing locally or within Europe.

4.3. Success Measures

Potentiality measures are difficult to calculate, and their use requires complicated arrangements, such as in-store customer interviews. They are, however, useful on a theoretical level when planning sourcing and merchandising strategy. Information for such measures must be obtained by market study or from already published studies. Practical measures can easily be calculated from the information daily or monthly available to the company management. They should be used continuously when verifying retailing performance.

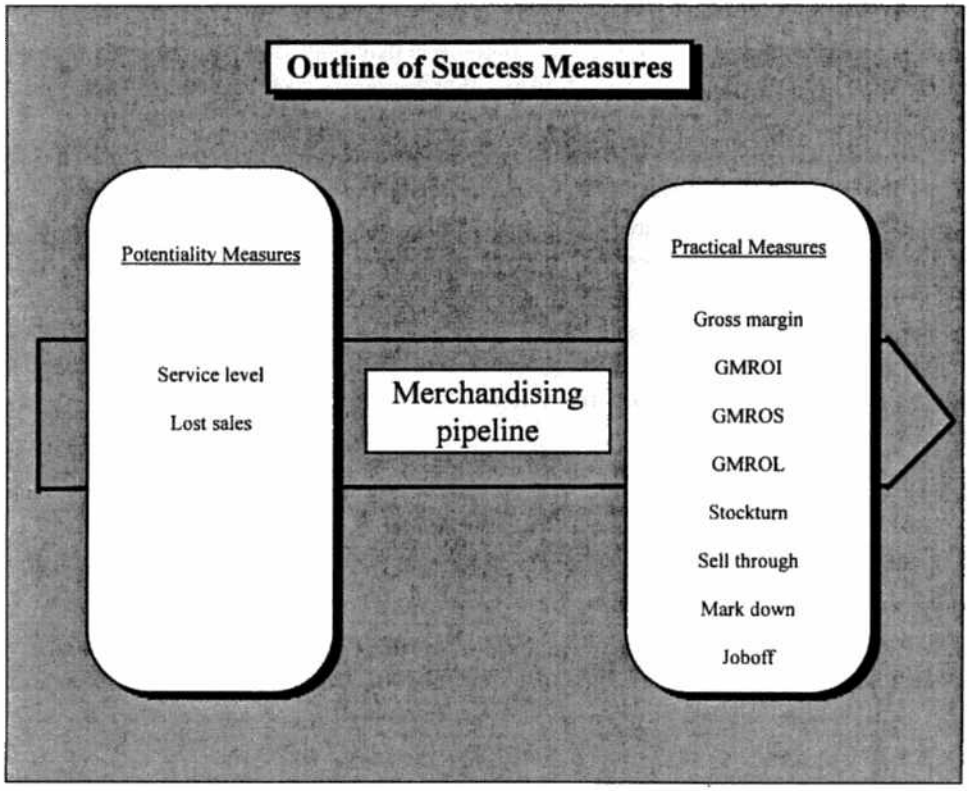


Figure 45. Outline of success measures suitable for measuring retail success in connection with sourcing strategies

The overall process lead time can be broken down into several sub lead times. In the process itself, the time needed for preparation and buying procedures, production functions and distribution center functions add to the total lead time, which can be defined as follows:

- L_f = *Lead time from forecasting to receiving goods*
- L_{lc} = *Lead time from opening Letter of Credit to receiving*
- L_o = *Lead time from issuing of order to receiving goods*
- L_{dc} = *Lead time from receiving at distribution center to delivery to store*
- L_b = *Lead time for buying process*
- L_p = *Lead time for production process*
- L_s = *Lead time from receiving at store to sale to customer*
- L_{md} = *Lead time from receiving at store to selling at mark-down sale*
- L_t = *The total process lead time*

L_f is important when analyzing the forecast error, and as discussed earlier forecast error is likely to grow when L_f grows. In most cases, when buying offshore, $L_{lc} = L_o$ as the supplier will consider the order seriously only after receiving the Letter of Credit. $L_{lc} + L_{dc} + L_s$ is the total time that has an impact on capital costs and cashflow.

L_{dc} is the lead time required for the goods to pass through the distribution center. Offshore deliveries may be unreliable, and a safety margin in delivery times is often accounted for. This increases DC inventory as goods might have to be stored for lengthy periods of time before they are delivered to the stores. $L_t = L_f + L_{dc} + L_s$ is the total process lead time from making the sales forecast to selling the goods to the consumer. The total process lead time can be very long in up-front offshore buying while replenishment buying takes place on a much shorter throughput time.

4.3.1. Stockturn

The annual rate of stockturn in units (T_u) is the number of goods sold during the year divided by the average inventory:

$$T_u = \frac{S_u}{I} \qquad (01)$$

where S_u is the number of goods sold and I is the average unit stock

In order to maximize stockturn, lead times in DC and the store should be made as short as possible. This is achievable by making the length of the selling season short,

which usually means that instead of the two traditional seasons, spring-summer and autumn-winter, one must have several seasons. Goods for each season must be purchased separately. In cases where all goods are bought simultaneously for several seasons, and a new type of merchandise is shipped to the stores monthly, the stockturn will still be slow since the goods are stored in the DC.

In order to maintain a targeted service level throughout the selling season more goods must be purchased than the sales forecast. In order to avoid stockouts and lost sales the minimum stock at the end of the selling season is the full range of SKUs, i.e. the original assortment. For example, if during the season there are on average 100 different styles, three colors in each style and ten sizes available at the store, the full range of products is 3000 SKUs. The product range available at a store changes during the selling season as some styles are available earlier and some later during the season. Also, there is usually more than just one piece of each SKU in the store. This means that the total number of different SKUs over the whole season is not the same as what is available at any one moment.

Besides the number of SKUs available in the store, the unsold stock is further increased by forecast error. Forecast error varies by product and assortment, and therefore an average forecast error must be used in the calculations. The forecast error can be positive or negative in comparison to the demand. For example, an error of +30 % would mean that 30 % of total SKUs bought could not be sold, while and error of -30 % means that the demand was 30 % higher than the number of SKUs available. In cases of negative forecast error, stockouts will occur, causing lost sales. Positive error means that too many SKUs were purchased in comparison to demand and all the products could not be sold at the original price. It is also possible to overbuy or underbuy for the season. In case of overbuying, the mean is shifted on purpose and the positive forecast error is high but lost sales through stockouts are likely to be low.

The purpose of this study is not to calculate absolute values for the measures, for example what stockturn should be in a well organized retail store, but to analyze which variables have an impact on these measures, and what kind of impact. Also, comparisons will be made between different sourcing strategies. In order to achieve these targets a universal way of comparing had to be found, and the equations in the following chapters are based on assumptions which are general and can be used in different situations.

When buying up-front, and providing that all goods for the season are received simultaneously ahead of the season and sold evenly throughout the season, the average in-store inventory can be calculated as follows:

$$I_n = \frac{B_{un} + (B_{un} - S_{un})}{2} = \frac{B_{u_n} + I_{END}}{2} \qquad (02)$$

where I_n is the average in-store unit stock during the selling season, B_{u_n} is the number of units bought for the season, S_{u_n} is the number of units actually sold during the season and I_{END} is the end of the season inventory.

The end of the season inventory at the targeted service level is the service level portion of SKU assortment plus the quantities over-bought due to the positive forecast error. For example, if the targeted service level is 90 %, then 90 % of different SKUs in the assortment must be available to the very end of the season, which means that, in order to avoid stockouts, this quantity of goods is left over. In case of +30% forecast error, 30 % of goods bought for the season are not sold. At the same time, there will be stockouts with other SKUs. An error of -30% would mean that there is a stockout for 30 % of other SKUs resulting in lost sales. This, however, does not affect the inventory level and therefore, when calculating inventories, only the positive forecast error is considered. The end of the season inventory is

$$I_{END} = sR_n + E_n S_{u_n} \qquad (03)$$

when

s = service level
R_n = number of different SKUs in the assortment
E = forecast error percentage
n = the number of seasons per year

With the targeted service level and expected forecast error the minimum quantity bought for the season is

$$B_{u_n} = sR_n + E_n S_{u_n} + S_{u_n} \qquad (04)$$

According to equations 02, 03 and 04, the average in-store inventory during the season is

$$I_n = \frac{B_{u_n} + I_{END}}{2} = \frac{2(sR_n + E_n S_{u_n} + S_{u_n}) - S_{u_n}}{2} \qquad (05)$$

or when calculated with values instead of units, the inventory in retail price is

$$I_n = \frac{2(stS_v + E_n S_{v_n} + S_{v_n}) - S_{v_n}}{2} \qquad (06)$$

where

$$t = \frac{R_n}{S_u} \qquad (07)$$

S_v = net sales value

In the above equation t indicates what percentage the number of different SKUs in the assortment is of the total number of SKUs sold. When the total seasonal sales value is multiplied by t the result is the sales value of the assortment.

The garment retail year consists of the following selling periods:

- prime selling season is the period when goods are sold at original mark-up price
- clearance is the period when goods are on sale at mark-down price

Some retailers choose to have on-going special offers instead of having only a special clearance sale. At the end, however, the effect on GM is the same, although these firms do not accumulate stock for clearance during the previous selling seasons and their stockturn is faster. In order to focus on the essential and to avoid confusing complexity, it is assumed in analysis of this research that special clearance periods are organized.

Merchandise stored in the distribution center is part of the company inventory, as well as goods in transit. Transit time from DC to store is usually short, a few hours or a couple of days at maximum. Transit time from an offshore factory to DC can be six to eight weeks. Goods in such transit would be considered as part of company's inventory only if they are paid for in advance, which is not normal. Therefore the average DC and in-transit inventory in retail dollars is:

$$I_{dc} = \frac{L_{dc}}{365} S_v \qquad (08)$$

Many retailers have more than two selling seasons per year, and clearance with mark-down prices is usually organized twice a year. Products not sold during the previous seasons are stored until clearance is organized. Goods left over after the mark-down period will be liquidated at joboff price or disposed of and minimum sales revenue is

gained. The impact on average inventory level with l number of clearance periods per year is that the inventory on average at retail price is increased by:

$$I_{cl} = \frac{\sum_{i=1}^{n} E_i S_{v_i}}{2l} \tag{09}$$

Based of the above equations, the stockturn for the whole year at retail price can now be calculated as follows:

$$T_v = \frac{S_v}{\frac{\sum_{i=1}^{n} I_i}{n} + \frac{L_{dc}}{365} S_v + \frac{\sum_{i=1}^{n} E_i S_{v_i}}{2l}} \tag{10}$$

For example, a company having 20 stores with 1,000 different SKUs available in each store, on average selling 1.0 million units or 20.0 million dollars per year with a targeted service level of 90 % and a one month DC lead time would have the following stock turns at various levels of forecast error and with two or more seasons per year:

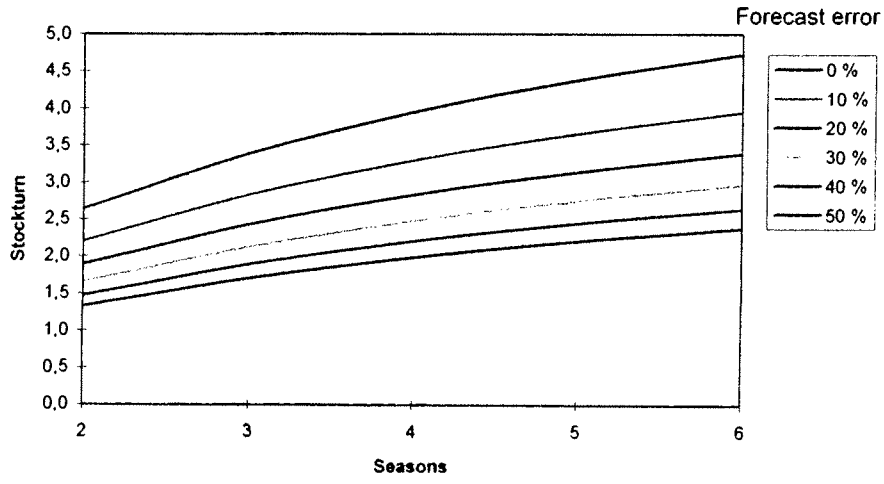


Figure 46. Stockturn as a function of number of seasons at various forecast error levels

As the example in Figure 46 shows, the increase of seasons per year improves stockturn considerably, and the higher the forecast error the slower the inventory turnover. Stockturn has a direct impact on company cash flow. The higher the stockturn the less money tied down in inventories and the lower the capital costs as well. The following variables seem to affect the rate of stockturn:

1. Number of seasons per year has a strong impact on the rate of stockturn.
2. Increase of forecast error clearly slows down stockturn, but with more than two seasons per year forecast error has less impact on the rate of stock turnover.
3. Service level and the number of SKUs have less impact on stockturn.

Increasing the number of seasons per year means improved stock turnover. The number of seasons per year can be decided independently of whether up-front buying or replenishment buying is used. Offshore buying means long lead time and use of several seasons with separate buying processes increases ordering costs.

4.3.2. Gross Margin

Gross margin is the total margin available to cover operating expenses and yield a profit:

$$GM = \frac{S_v - C_v}{S_v} \tag{11}$$

where GM is the gross margin percentage, S_v is the net sales value and C_v is the cost of goods sold, i.e. the amount paid for the merchandise including freight charges, less all terms of payment discounts

GMROI measures how well the merchandising inventories generate gross profit. It is calculated as the ratio of GM and average inventory.

$$GMROI = \frac{S_v - C_v}{I_{vc}} \tag{12}$$

where I_{vc} is the average value of the inventory at actual cost.

As pointed out by Arnold, Capella and Smith, GMROI does not clearly indicate the relationship between gross margin and turnover. They suggest that this relationship can be developed by changing the average inventory from the cost to the retail basis (Arnold, Capella, Smith, 1986), which can be calculated as follows:

$$GMROI - R = \frac{S_v - C_v}{I_{vr}} \tag{13}$$

where I_{vr} is the average value of the inventory in retail dollars

GMROI-R will in general yield the same interpretation as GMROI when considering multiple purchase alternatives but it is not a measure of return on inventory investment as GMROI is, since the retail value of the inventory is used in the equation (Arnold, Capella, Smith, 1986). One of the objectives of this research is to define the critical success factors by analyzing various variables that affect retail performance with a specific focus on sourcing strategies. When choosing between up-front and replenishment buying or offshore and local sourcing, the merchandise strategy trade-offs must be analyzed in terms of gross margin and inventory turnover, as with low gross margin and high stockturn the same GM dollars can be earned as with high gross margin and low stockturn. In order to fully consider the relationship of gross margin and stockturn, GMROI-R instead of GMROI is selected to be one of the measures for the tentative model.

The retail price is calculated by adding mark-up to the purchase price. Usually this is done by multiplying the purchase price by a mark-up factor. This mark-up factor may vary between different product groups and individual styles. On average the mark-up factor in Scandinavia is between 2.0 and 2.4. When the goods are sold at clearance, the mark-down percentage may vary between 30% and 70 %. Providing that the forecast error is the only cause of mark-down sales, the net sales value and GM can be calculated as follows:

$$S_v = mC_v - EmC_v d \tag{14}$$

and

$$GM = \frac{(mC_v - EmC_v d) - C_v}{(mC_v - EmC_v d)} = \frac{m - Emd - 1}{m - Emd} \tag{15}$$

where

m = mark-up factor
E = forecast error
d = average mark-down percentage

Forecast error causes the average GM percentage to drop due to mark-downs. If mark-up factor is 2.2, the theoretical gross margin is 54.5 %. If prices are marked down by 40 % on the average during the clearance period, the GM percentage would drop to 48.3 % when forecast error is 30 %. With 50 % forecast error and 60 % average mark-down percentage, GM percentage would drop to 35.1 % as showen by Figure 47.

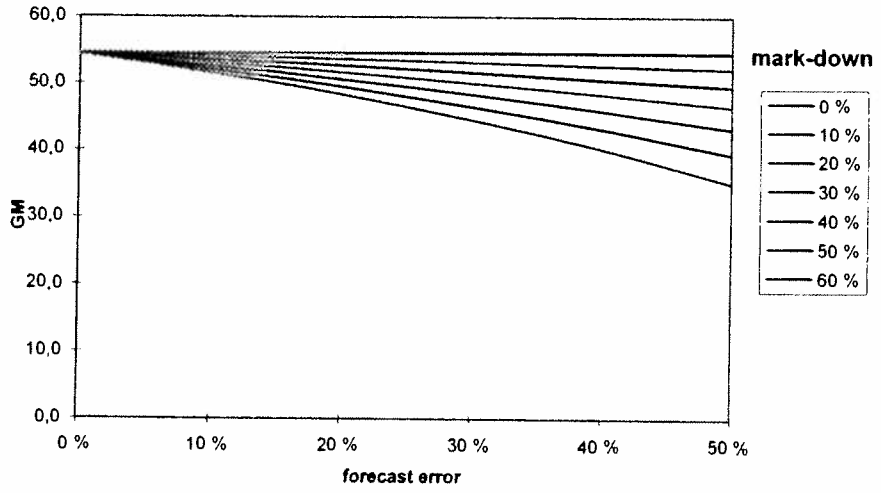


Figure 47. GM as a function of forecast error at different mark-downs

4.3.3. Lost Sales

Negative forecast error causes stockouts and lost sales. With lower forecast error more goods could be sold. Such increase in sales would increase net profits as more GM dollars could be generated with the same amount of operating expenses and other costs. Lost sales (B) can be calculated as follows:

$$B = \frac{E(100\% - z)(mC_v - EmC_v d)}{mC_v - EmC_v d} = E(100\% - z) \qquad (16)$$

where

z = proportion of consumers who in case of stockout find and buy a substitute

The concept of lost sales is complex. As discussed earlier, lost sales is normally associated with stockouts when the customer does not find her preference in style, color or size. What about price? The consumer might find just what she wants but feels the price is too high and goes somewhere else to look for a better bargain. This obviously is lost sales too, and might have been avoided if the products were sourced offshore. The portion of consumers selecting a substitute is difficult to define. Yet it has a vital impact on lost sales. Badly chosen suppliers may perform poorly with deliveries again causing stockouts and lost sales. Whether the retailer should increase his safety stock in order to avoid this, is another trade-off. Due to the complexity of lost sales, conclusions that are justified only on lost sales value are avoided in the analyses of this research, although lost sales is obviously a central factor in retail success.

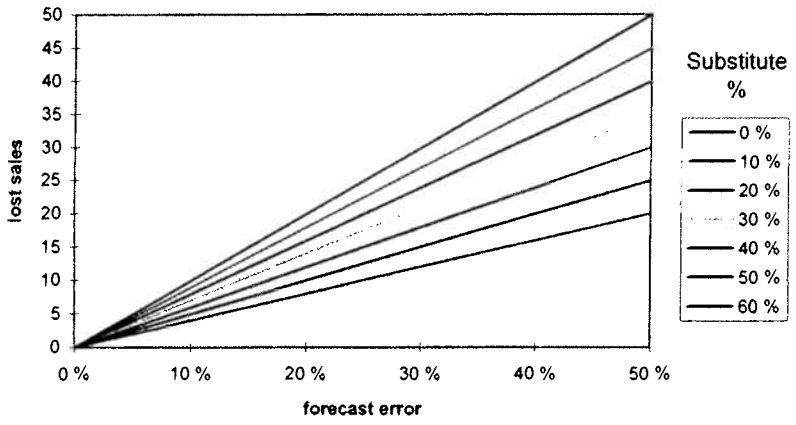


Figure 48. Proportion of sales lost as a function of forecast error and the percentage of consumers buying a substituting product

Lost sales caused by negative forecast error has a major impact on gross margin and net profits. Of course, this cannot be seen in the profit and loss statement. Negative forecast error should be understood as potential for improving profits providing that forecast accuracy can be increased. In fact, the effect of positive forecast error on gross margin is not as dramatic as with the negative one, since overbought products can be sold at discount prices. Therefore it may be advantageous to overbuy rather than underbuy for the season.

4.3.4. GMROI-R

Based on the above the equation GMROI-R is calculated as follows:

$$GMROI - R = \frac{S_v - E_l S_v d - C_v}{\left(\frac{\sum_{i=1}^{n} I_i}{n} + \frac{L_{dc}}{365} S_v + \frac{\sum_{i=1}^{n} E_l S_{v_i}}{2l} \right)} \tag{17}$$

$$= \frac{\left(S_v - E_l S_v d - C_v\right)}{\left(\frac{\sum_{i=1}^{n} 2(stS_v + E_l S_{v_i} + S_{v_i}) - S_{v_i}}{2n} + \frac{L_{dc}}{365} S_v + \frac{\sum_{i=1}^{n} E_l S_{v_i}}{2l} \right)}$$

where

m = mark-up factor
d = average mark-down percentage
s = service level
t_n = no. of SKUs available in store in proportion to total units sold

$$t_n = \frac{R_n}{S_u}$$

R_n = no. of SKUs in assortment
S_{v_i} = sales value during a season
L_{dc} = distribution center lead time
l = number of clearances per year

Figure 49 is an example of GMROI-R for a company buying up-front of a season, with 2.2 mark-up factor, 50 % average mark-down percentage, 90 % service level, 0.4% proportion of SKU assortment of total sales, and 30 days lead time in the distribution center. The level of GMROI-R depends very much on the number of seasons and on the forecast error. For example, GMROI-R with the traditional two seasons per year and 40 % forecast error is 0.5, while with six seasons and 10 % error it is 2.3.

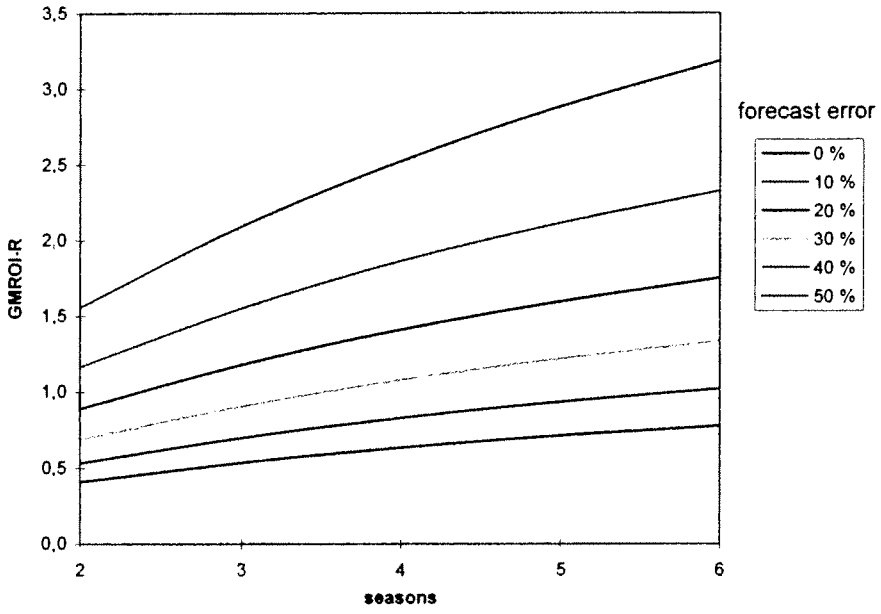


Figure 49. GMROI-R at different forecast errors and with various numbers of seasons

4.4. Tentative Model

In apparel merchandising and product sourcing there are three types of strategic decisions to be made:

1. How many selling seasons with separate product sourcing should the company have?
2. What is the ratio between up-front buying and replenishment buying?
3. What is the ratio between off-shore and local sourcing?

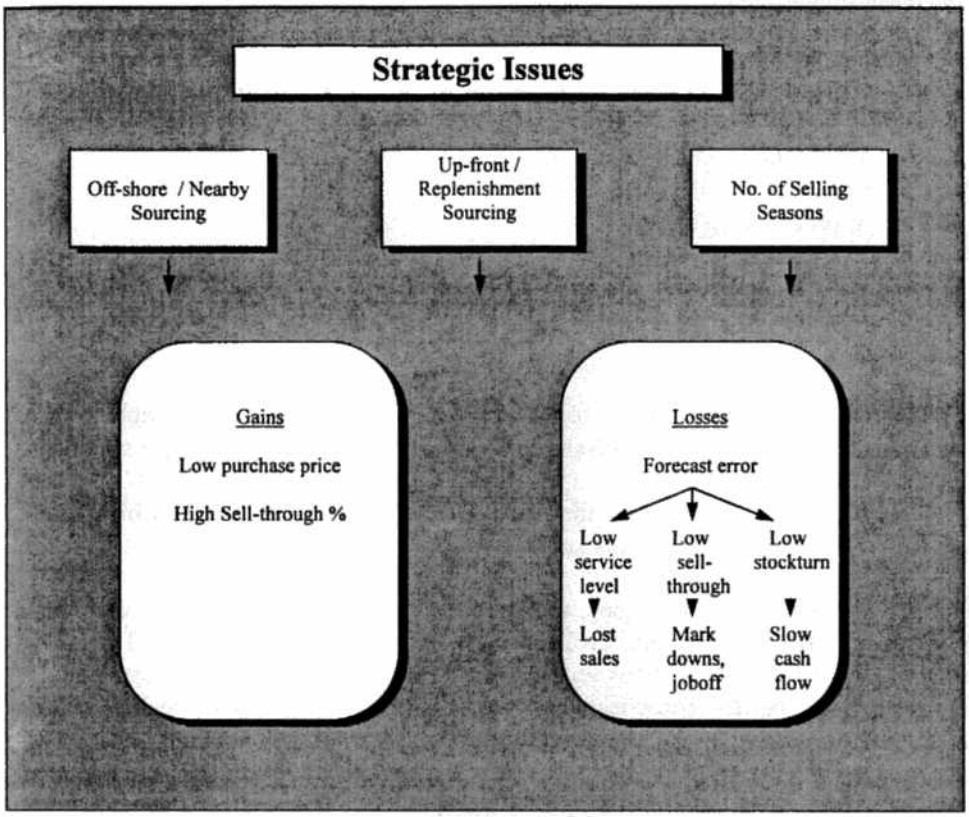


Figure 50. Strategic issues regarding product sourcing

The trade-offs regarding the above strategic alternatives are:

- The rate of stock turnover is increased by having more than two selling seasons per year, but this increases ordering costs and reduced quantities per order may mean higher purchase prices.
- Purchase prices are very competitive when sourcing off-shore but lead times are long and ordering costs high. Higher forecast error results in lower sell-through percentage. Buying from nearby sources means higher prices but shorter lead times making it possible to use QR and ECR techniques.
- Up-front buying is the only economical way to buy from off-shore where purchase prices are low but lead times long. Replenishment buying means shorter lead times and lower forecast error especially when using POS information. This, however, is technically demanding and requires special arrangements like QR with suppliers, which again is costly and increases purchase prices.

There are also several variables in apparel merchandising effecting retail performance, some of which depend on the sourcing strategy selected by the company and some are the result of management decisions. Some of the variables are:

1. Average mark-up factor that is used in converting purchase prices to retail prices
2. Average mark-down percentage used during clearance
3. Service level maintained throughout the season
4. Number of SKUs in the assortment
5. Various process lead times
6. Number of selling seasons
7. Purchase price, especially regarding off-shore and local sourcing
8. Forecast error

The main measures for retail performance used in the following paragraphs of this study are **Stockturn, GM, Lost Sales** and **GMROI-R**. By using the case study data various sourcing strategies and operational variables and their impact on retail performance will be tested with the equations presented in Figure 51, which forms part of the tentative model for this study.

The retail performance and success with seasonal fashion products depends on a large number of variables which are difficult to predict, forecast and control. This study focuses on the impact of various sourcing strategies. In order to develop a model that is practical and not too complicated but which still corresponds with reality, certain approximations have to be made. For example, mark-up factor and mark-down percentage can vary from product to product although in this study they are regarded to be constant. Inventory levels may vary throughout the selling season depending on shipping schedules and the so-called seasonality pattern which means that peak sales may occur at the beginning of the season with a slow-down towards the end. In this study it is assumed that all goods are received at the beginning of the selling season with linear sales during the season. These variables would have an impact on absolute performance measures, but as this study concentrates on comparing different sourcing strategies the relative results are still valid.

As already discussed, several variables are ignored, for example the impact of order quantity on purchase price, product quality problems, delivery performance risks with Quick Response strategy, the impact of fashionability level on forecast accuracy, the effect of weather on demand, etc. Some of these variables would be impossible to evaluate mathematically, and some are irrelevant regarding the comparisons between different sourcing strategies. During the research the selection of which variables shall be ignored was carefully made in order to ensure that the validity of the study results will not be compromised.

$$T_v = \frac{S_v}{\frac{\sum_{i=1}^{n} I_i}{n} + \frac{L_{dc}}{365} S_v + \frac{\sum_{i=1}^{n} E_i S_{v_i}}{2l}} \quad (10)$$

$$GM = \frac{m - Emd - 1}{m - Emd} \quad (15)$$

$$B = \frac{E(100\% - z)(mC_v - EmC_v d)}{mC_v - EmC_v d} \quad (16)$$

$$GMROI - R = \frac{S_v - ES_v d - C_v}{\left(\frac{\sum_{i=1}^{n} I_i}{n} + \frac{L_{dc}}{365} S_v + \frac{\sum_{i=1}^{n} E_i S_{v_i}}{2l} \right)} \quad (17)$$

where

T_v = Stockturn
S_v = Sales value
I_n = Selling season's average inventory
L_{dc} = Distribution center lead time
E_n = Season's forecast error
m = Mark-up factor
d = Average mark-down percentage
C_v = Cost of goods sold
B = Lost sales
l = Number of clearances per year

Figure 51. Tentative model for analyzing apparel retail performance

5. Research Hypotheses

The focus of this study is on merchandising strategies and their impact on retail performance. The strategic product area is seasonal products with a fashion content. Apparel retailing was chosen to be the test product area. The objective is to define the critical success factors in apparel retailing with special regard to product sourcing and merchandising, and what measures should be used for analyzing retail performance and success. The hypotheses presented hereby shall be verified in the empirical part of the study in order to validate the model outline. The hypotheses are divided into four groups: (1) Critical success factors, (2) Sourcing and merchandising policies, (3) Sourcing strategies and (4) Performance measures.

5.1. Critical Success Factors

Hypothesis 1

> Retail performance depends on the accuracy of the demand forecast used in connection with product buying plan. Reduction of forecast error improves the rate of stockturn, gross margin and gross margin return on inventory.

Hypothesis 2

> The first buying plan is done seven to eight months prior to selling season. The information used as basis for the season's demand forecast increases in quality and quantity towards the start of the selling season, and therefore a long lead time reduces forecast accuracy and retail performance.

Hypothesis 3

> Up-front buying with deliveries prior to the selling season is less profitable compared to mixing up-front and in-season replenishment deliveries especially, when POS information is used for improving forecast accuracy.

Hypothesis 4

> Offshore sourcing is more profitable than local sourcing because of lower purchase prices.

5.2. Sourcing and Merchandising Policies

Hypothesis 5

Traditionally there are two selling seasons per year: spring and autumn. Retail performance can be improved by increasing the number of selling seasons per year, providing that sourcing decisions and product deliveries are made separately for each season.

Hypothesis 6

The target for purchase volume may be set higher or lower than the expected demand, resulting in over-buying or under-buying. The deviation of forecast error shifts accordingly. Over-bought products will be cleared through clearance. Under-buying causes stockouts and lost sales. In order to avoid stockouts and lost sales, over-buying is more profitable than buying according to forecasted demand volume.

Hypothesis 7

High service level, i.e. the proportion of different SKUs in the seasonal assortment available in store throughout the season is profitable, especially if the percentage of consumers expected to buy substituting products in case of stockout is low.

5.3. Sourcing Strategies

Hypothesis 8

Quick Response and Vendor Managed Inventory strategies yield better retail performance than up-front buying from low cost offshore sources when the purchase price difference is reasonable.

5.4. Success Measures

Hypothesis 9

GMROI-R indicates the relationship between gross margin and inventory value at retail price and measures the utilization of key resources at retail level better than Gross Margin.

Hypothesis 10

Sell-through percentage, mark-down ratio and joboff percentage measure how successfully the demand was forecasted.

Hypothesis 11

Customer service level, service level and lost sales indicate the success of sourcing but they are theoretical measures and can be used only in planning and selecting sourcing strategies.

SECTION IV - CASE STUDIES

1. General

Three retailing companies were selected for the case study part. Each company has a different business structure and in this way various approaches to sourcing strategies could be covered. Kesko Oy's Vaatehuone chain is a voluntary chain of independently owned specialty stores while Kesko is a wholesaler sourcing products on behalf of the retailers. Anttila Oy is a chain of department stores selling various types of clothing products, and Anttila has a large mail order business as well. Both channels can be used for marketing the total stock of goods. KappAhl AB is a retailing chain with all the stores directly owned and controlled by the central organization. All these firms are major retailers in Scandinavia and, because of the volume of their business, the results of the interviews represent the industry well. However, no conclusions that would be statistically representative can be presented.

The management of each company was interviewed during two in-depth sessions regarding sourcing and marketing strategies. The main objective of these interviews was to first of all find out what sourcing and marketing strategies each firm has, and also what the various variables are that have an impact on retailing performance. The objective was not to analyze each firm as such or make any comparisons between these companies regarding which one has been more successful, but rather to define realistic levels for various variables to be tested by the model. Each company operates differently in sourcing and merchandising and the variables are also different. Through interviews it was possible to define realistic ranges within which the different factors vary. In order to ensure the validity of the case studies a method suggested by Yin (1984) included three phases: design, single-case data collection and analysis and cross-case analysis (Yin, 1984).

2. Kesko Oyj - Vaatehuone

2.1. General

Vaatehuone is a voluntary chain of specialty stores which sells garments for men and ladies. Kesko Oy is the largest general wholesaler in Finland controlling among other things several garment retailing chains. Control is not based on ownership but supply chain management.

Altogether there are 62 stores in the Vaatehuone chain. The turnover in 1997 was FIM 394 million. All the stores are independently owned, usually by the storekeeper and his family, and Kesko has no direct financial interest in the stores. The member stores are located in different parts of Finland while Kesko's central organization is in Helsinki.

2.2. Marketing Concepts

Three types of product concepts are sold by the Vaatehuone chain, i.e. basic labels, own labels and supplier labels. Traditionally, stores in the Vaatehuone chain have had a very wide price scale. Basic labels are "unknown" labels which are used for competitively priced goods. Products are usually designed by Kesko Clothing Department. The basic segment has been used widely in advertising and promotion, creating an image of a low-priced chain. The largest marketing concept in terms of sales is own label products. These collections are designed by Kesko Clothing Department to suit price and quality conscientious consumers. Supplier labels are also sold by Vaatehuone stores. These labels are well known domestic or international labels.

The individual stores in the Vaatehuone chain do not have equal product ranges. Each retailer buys some of his merchandise directly form domestic and international suppliers and only about 50 % of sales volume consists of products which are sourced and supplied centrally by Kesko Clothing department. There are two category managers who are responsible for Kesko's collections. They create the collections together with two free-lance designers and 13 product managers who are responsible for sourcing. However, it is the retailer in the chain who finally decides what styles and in which quantity he is going to buy. Kesko Clothing Department organizes sourcing only based on these orders.

The overall marketing concept actually works in such a way that the stores are customers to Kesko Clothing Department. The degree of coordination is low, at least when compared to chains with central ownership.

2.3. Sourcing Concepts

Kesko Clothing Department takes care of central sourcing and buying for the Vaatehuone chain. Each retailer within the chain creates his own budgets and targets for buying for each season. Theoretically Kesko Clothing Department is just another supplier and the retailer members make their purchase decisions independently. Each retailer selects his merchandise from the outside suppliers as well as from Kesko's collections. This flexibility makes it possible for each store to select its product ranges according to its customers. But, as a result the profile from one Vaatehuone store to another, at least regarding product ranges, varies, and it is difficult to carry out joint promotion and advertising.

The retailers meet several times during each season in order to place their orders. At these meetings the retailers give their orders to Kesko which in turn issues production orders to the suppliers. Usually Kesko buys somewhat more on top of the retailer orders in order to have some stock for example for new members joining the chain during the season. The following sourcing concepts are used at present:

1. CMT is not used at all at the moment since Kesko has no organization for handling and managing materials.

2. Full price sub-contracting is the most common way of sourcing products. Products are made according to Kesko's specifications and delivered under Kesko's labels.

3. Private label buying is done to some extent. Kesko's buyers select the products from the manufacturer's ranges, but the products are delivered under Kesko's labels.

A large number of products are sourced from Hong Kong, China, Taiwan, Vietnam, Thailand, Laos, India, Bangladesh and other countries in the Far East. In Europe Kesko buys goods from Portugal, Italy, Turkey, United Kingdom, France, Denmark and East European countries. Part of the product range is bought from domestic manufacturers as well. For the Vaatehuone chain the distribution is different as the majority is sourced from Europe. Kesko prefers to buy directly from the source and avoids importers and agents. In the Far East, however, trading firms are used to some extent. On behalf of Kesko they take care of quality and production control against a commission.

The retailers place their orders in 2 to 3 stages during the season:

Autumn season:

January	-	basic outerwear products in large quantity
February	-	more fashionable products
March	-	Christmas novelty

Spring season:

June	-	basic products in large quantity
September	-	more fashionable products

Purchases are made once per season for each group of products. Retailers don't have any open-to-buy portion when buying from Kesko. In their own purchase planning the retailers may reserve some capacity for in-season domestic deliveries.

The retailers in the chain price their goods independently. However, as most of them use the same mark-up, the price differences from one store to another are small. Sales and mark-downs are decided by the members independently as well. In case of campaign products with joint advertising, prices are set equally.

Due to the structure of the Vaatehuone chain, centralized computer systems have not been used for creating and utilizing POS information. The retailers have their own computer system and Kesko as a central organization has another one without any direct communication. At the moment the Vaatehuone chain is starting with its own system which will link retailers and Kesko together. POS information regarding sales of Kesko's collections will be available daily.

2.4. Business Control

Kesko has a service department which can assist the independent retailers in various ways, for example with store decorations, selecting product ranges, management and control systems, and financing. In fact each retailer has the same computerized management information system for controlling stocks and sales. Kesko's central computer systems will shortly have a link to the retailers' systems and control information can be processed automatically.

2.5. Sourcing and Merchandising Variables

The majority of products bought for the Vaatehuone chain originates from Europe, because of better quality and shorter lead times. The distribution is as follows:

Offshore	30 %
Europe including Finland	70 %

Kesko supplies the retailers mainly with products which are sourced on a full price sub-contracting basis. The retailers do buy smaller proportions directly from suppliers and may use suppliers labels as well. The distribution between various sourcing concepts for products delivered by Kesko is as follows:

CMT	0 %
Full price sub-contracting	80 %
Private label	20 %
Supplier label	0 %

The concept of selling seasons is being changed and Kesko will have five seasons in the future. From a sourcing point of view these seasons are not entirely separate as several seasons may be bought simultaneously. The seasons will be:

Autumn 1
Autumn 2
Christmas
Spring 1
Spring 2

At present all products delivered through Kesko are bought up-front. The retailers carry out some replenishment buying directly from other suppliers.

	Up-front	Replenishment
Products through Kesko	100 %	0 %
Retailers buy directly	90 %	10 %

The forecast for the buying plan is based on the previous season's actual sales statistics and market research regarding the retailer's image. Such research is carried out by Kesko once a year for every Vaatehuone retailer. Some of the retailers use POS information during the season for improving their forecast. At first buying plan stage there is very little information that the forecast can be based on. More information is received from various sources during the planning process when getting closer to the start of the selling season. If the end of the selling season equals to 100% of information regarding the seasonal sales, then, the accumulation of forecast information is estimated, proportionally, to be as follows:

Phase of process	% of forecast information
First buying plan	5 %
Firm orders	40 %
Start of selling season	40 %
1/4 through selling season	70 %
1/2 through selling season	80 %
3/4 through selling season	90 %
End of selling season	100 %

The forecast error is estimated to vary from one product group to another. Due to longer lead time in ordering, basic products with low fashion content tend to have higher forecast error than fashionable products. Kesko management estimates that their forecasting error for Vaatehuone retailers is the following:

	Forecast error
Up-front buying	±20 %
Replenishment buying	±10 %

Various terms of payment are used. All offshore buying is done on a Letter of Credit basis while purchases from European suppliers is done on a CAD or credit basis.

Some Italian and domestic suppliers use terms such as 14 days less 2 % or 14 days less 4 %. Distribution of terms of payments is estimated as follows:

	Offshore	Other
Letter or Credit	100 %	0 %
CAD		50 %
Credit 30 or >30 days		50 %

A safety margin up to one month is used, especially when buying offshore, in order to avoid delays in deliveries to the retailers. Delays do, however, occur, but purchases are hardly ever canceled due to late deliveries.

		Offshore	Other
Performance:	Deliveries on time	85 %	85 %
	2 weeks late	10 %	10 %
	4 or more weeks late	5 %	5 %
Cancellations:	Orders canceled due to late deliveries	0.2 %	0.2 %

The inventory carried for Vaatehuone chain in the distribution center and at retailers vary during the season. The average stockturn is:

Average annual stockturn	2.5

Lead times for various parts of the sourcing and merchandising process from the retailer's point of view vary considerably from case to case. More basic items may be bought on a very long lead time while more fashionable products are bought closer to the selling season. Figure 52 illustrates the overall lead times.

	Lead times
Purchase plan / start of selling season	7 months
Issue firm order / start of selling season	4-7 months
Letter of Credit / start of selling season	3-6 months
Stay in DC	2-3 weeks
Stay in store	2-4 months

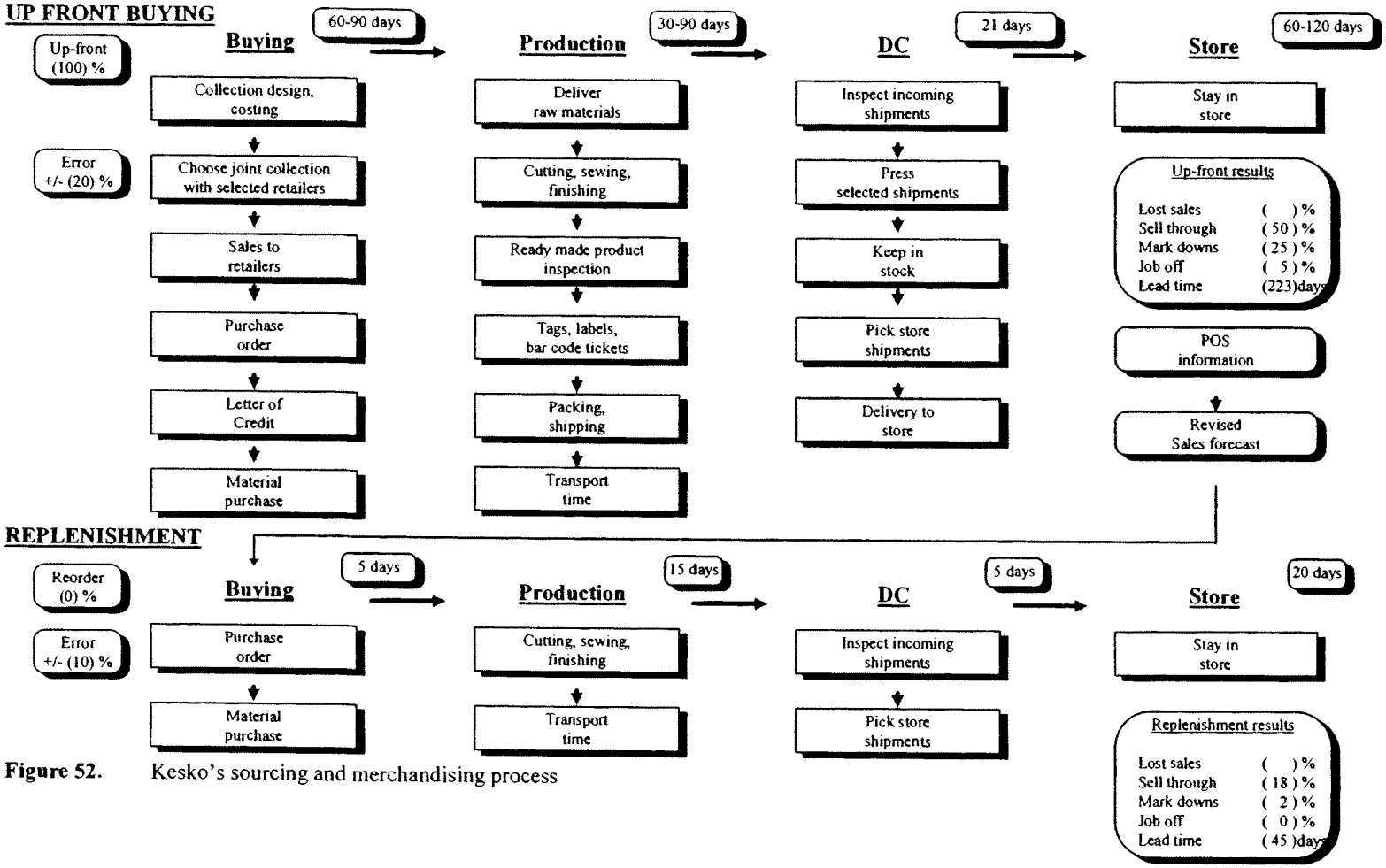


Figure 52. Kesko's sourcing and merchandising process

Of all products sold by the Vaatehuone chain, 50 % are sold at the original price and the rest at various mark-down prices. A very small proportion of goods are jobbed off at the end of the season. According to the Kesko's management the ideal distribution of full price and mark-down sales for each season would be that 70 % of merchandise is sold at the original price:

	Current	Ideal
Sell-through	50.0 %	70.0 %
Mark-down sales	49.4 %	30.0 %
Joboff	0.6 %	0.0 %

Different mark-downs are used during clearance as follows:

Proportion of goods sold at mark-down prices	Mark-down percentage
37.5 %	25 %
25.0 %	50 %
25.0 %	63 %
12.5 %	>63 %

Due to forecast error some SKUs are over-bought and prices for the excess stock are marked down and sold during clearance. Vaatehuone also buys products specifically for clearance as follows:

	Mark-down sales volume
Bought originally for the season	80 %
Bought specifically for clearance	20 %

Purchase prices from European suppliers are estimated to be on average 40 % higher compared to offshore sources. Mark-up percentage in pricing varies from product to product. Retail prices at Vaatehuone chain are more elastic today than before, but it is important to stay within certain price categories, for example FIM 460 - 499. Prices cannot be increased during a season. If a product was originally bought from offshore and priced with normal mark-up, a replenishment order from a nearby source must be sold at the same retail price even though the purchase price may be 40 % higher.

Kesko Oy uses different measures for retail performance at Vaatehuone chain, and rates the importance of various measures as follows (1 = not important, 4 = very important):

Measure	Calculated as	Rating 1	2	3	4	used x
Gross margin	Sales - Cost of sales / Sales				x	x
GMROI	Gross margin / Average inventory			x		x
GMROS	Gross margin / Selling area			x		
GMROL	Gross margin / No. of employees				x	
Stockturn	Sales / Inventory				x	x
Sell through	Total non mark-down sales in pieces / Total sales in pieces			x		
Mark-down	Total mark-down sales in pieces / Total sales in pieces			x		
Jobbed off	Total no. of liquidated products / Total sales in pieces	x				x
Service level	No. of customers that find their first choice SKU / Total no. of customer visits			x		
Lost sales	No. of customers who find no SKU preference / Total no. of customer visits			x		

Table 5. Rating of performance measures by Kesko's merchandisers

Forecast accuracy, process lead time and use of POS information for buying were regarded as the main critical success factors by Kesko management. In the following rating, 1 = not important, 4 = important.

	Rating
Forecast accuracy	3.5
Process lead time	3.5
Replenishment buying	3.0
Use of POS information for buying	3.5

The so called t % used in the analysis of this research, i.e. the number of different SKUs (assortment) in proportion to the total number of SKUs sold during the year is:

$$t = 5\ \%$$

3. Anttila Oy

3.1. General

Anttila Oy carries out general retailing through a chain of department stores and also has one of the largest mail order businesses in Finland. Altogether there are 29 department stores in Finland. The mail order business covers Finland, Estonia and presently also Latvia. The department stores, as well as mail order, sells various kinds of goods, not only clothing products. However, garments are a major part of the business. In fact Anttila is ranked as the second largest apparel retailer in Finland (Market 4/98). Anttila is currently owned by Kesko Oy. The retailing business, as well as mail, order operate independently from Kesko. In sourcing and purchasing areas some cooperation with Kesko is done, and all financing is through Kesko Oy.

3.2. Marketing Concepts

Anttila operates in the low to low-medium price range and has a reputation for offering apparel products for very competitive prices. The main means of competition is price. A quality image is created by advertising and promotion. Products are sold under own labels, but supplier labels are also available. The proportion of own label products varies depending on product group. For example, in men's knitwear 50 % of total garments sold are with own label. In men's outerwear garments own label products are 80-90 % of total sales.

There are several labels in the men's wear segment. The consumer target group for the AMC label is modern men. Harrison is more classic and Ralph Martins is for modern city men. In ladies' wear Twice is a label for the modern lady and Elisabeth Shanon is more classic. The objective of Anttila is to increase sales of own label goods and through advertising create real labels out of them.

3.3. Supply Chain Management

The apparel sector is divided into four segments, i.e. ladies' wear, children's wear, men's wear and footwear. There are four sales managers, one responsible for each segment. Each sales manager coordinates purchases and selling. Seasonal buying is based on budgets which are calculated by product group. The collection manager is responsible for product sourcing of certain type of garments. The product manager looks after deliveries and controls the movement of products from the central warehouse to department stores. Anttila employs its own garment and pattern designers.

About 50 % of apparel goods are bought domestically. International sourcing is done primarily from the Far East. Lots of goods are also sourced from European countries such as Portugal, Italy, Greece, etc. All own-label goods are bought on a full price sub-contracting or private label basis. CMT buying is not done. Anttila cooperates with the Swedish company Åhlens in international sourcing. However, this cooperation covers sourcing services only and Anttila designs and selects its product ranges independently. Åhlens Far East Ltd takes care of production and quality control for Anttila in Hong Kong, China, Taiwan and Macao. Control services are bought in other areas as well. Some of the goods are bought through local agents.

Anttila has a central warehouse and distribution center. All flat-pack goods are first received by the distribution center both for department stores and mail order. All goods which are delivered hanging are received by the forwarding agent who takes care of distributing them further to department stores. Only about 60 % of goods are received store-ready, and in many cases tags and bar code tickets have to be attached to the products at the warehouse.

Purchase decisions for goods to be made for the spring season in the Far East are done in April-June. For domestic and European production purchases are done in August-October. Products for mail order sales must, however, be decided earlier. About 80% of goods are bought up-front. The open-to-buy percentage varies between product groups. In some product groups, like underwear, buying is done on a Vendor Managed Inventory basis. POS information is available on a daily and weekly basis and it is used for replenishment buying. Lead times are not followed systematically. A large number of products are the same for department stores and mail order, and items selling well by mail order can be taken from the department store side. Likewise, those products that do not sell well by mail order can be marked down and sold in the department stores.

3.4. Sourcing and Merchandising Variables

A large proportion of Anttila's garments are sourced domestically, either from domestic manufacturers or through importers. In men's products majority of garments are actually from domestic sources:

	Ladies' wear	Men's wear	Children's wear
Offshore and Europe	67.7 %	48.3 %	55.9 %
Domestic	23.3 %	51.7 %	44.1 %

The distribution between various sourcing concepts for products bought by Anttila is as follows:

CMT	0 %
Full price sub-contracting	40 %
Private label	40 %
Supplier label	20 %

Anttila Oy has six selling season during the year:

Autumn 1
Autumn 2
Christmas
Spring 1
Spring 2
Summer

Only 10 % is bought through replenishment orders during the seasons. It was felt by Anttila Oy purchase management that the main obstacle for increasing the share of replenishment buying is lack of reliable Quick Response suppliers.

	Up-front	Replenishment
All seasons on the average	90 %	10 %

The forecast for the buying plan is based on the previous season's actual sales statistics. Retail performance is analyzed by collection and by supplier. POS information is used for adjusting sales forecasts during the season, but as there are very few QR suppliers this information cannot be fully utilized. Some information regarding the coming selling season is available from the above-mentioned sources

when the first buying plan is produced. More information is received from various sources during the planning process. If the end of the selling season is equal to 100 % of information regarding the seasonal sales, then, the accumulation of information for forecast is estimated, proportionally, to be as follows:

Phase of process	% of forecast information
First buying plan	30 %
First contacts with suppliers	50 %
Revised buying plan	60 %
Firm orders	70 %
Start of selling season	80 %
1/4 through selling season	90 %
1/2 through selling season	95 %
3/4 through selling season	99 %
End of selling season	100 %

The forecast error is estimated to vary from one product group to another. Also, from season to season the over-buy or under-buy situation changes. Some seasons are well over-bought resulting in high inventories. On average, Anttila Oy purchase management estimates the forecast error as follows:

	Forecast error
Up-front buying	± 20 %
Replenishment buying	± 5 %

Various terms of payment are used. Most offshore buying is done on a Letter of Credit basis while purchases from European suppliers are made primarily on credit basis, even with 14 days less 4.5 %. The distribution of terms of payments is estimated as follows:

	Offshore	Europe
Letter or Credit	90 - 100 %	
Credit 30 or >30 days		90 - 100 %

Anttila's suppliers have a good delivery performance. Delays do, however, occur, but purchases are hardly ever canceled due to late deliveries.

		All sources
Performance:	Deliveries early	15 %
	Deliveries on time	67 %
	1 week late	15 %
	2 or more weeks late	3 %
Cancellations:	Orders canceled due to late deliveries	0.2 %

The total inventory includes goods in department stores, in the distribution center and in the mail order warehouse. The average stockturn per product group is:

	Ladies	Men	Children
Average annual stockturn	1.9	2.4	2.5

The number of different SKUs (assortment) available at one department store in proportion to total SKUs sold during the year (t %) is:

t = 7 %

Domestic suppliers deliver the goods directly to the department stores. Imported goods are first received at the DC and delivered further to the stores prior to and during the selling season. Figure 53 illustrates the overall lead times.

	Lead times
Purchase plan / start of selling season	8 months
Issue firm order / start of selling season	3-7 months
Letter of Credit / start of selling season	3-7 months
Stay in DC	1 week
Stay in store	5 months

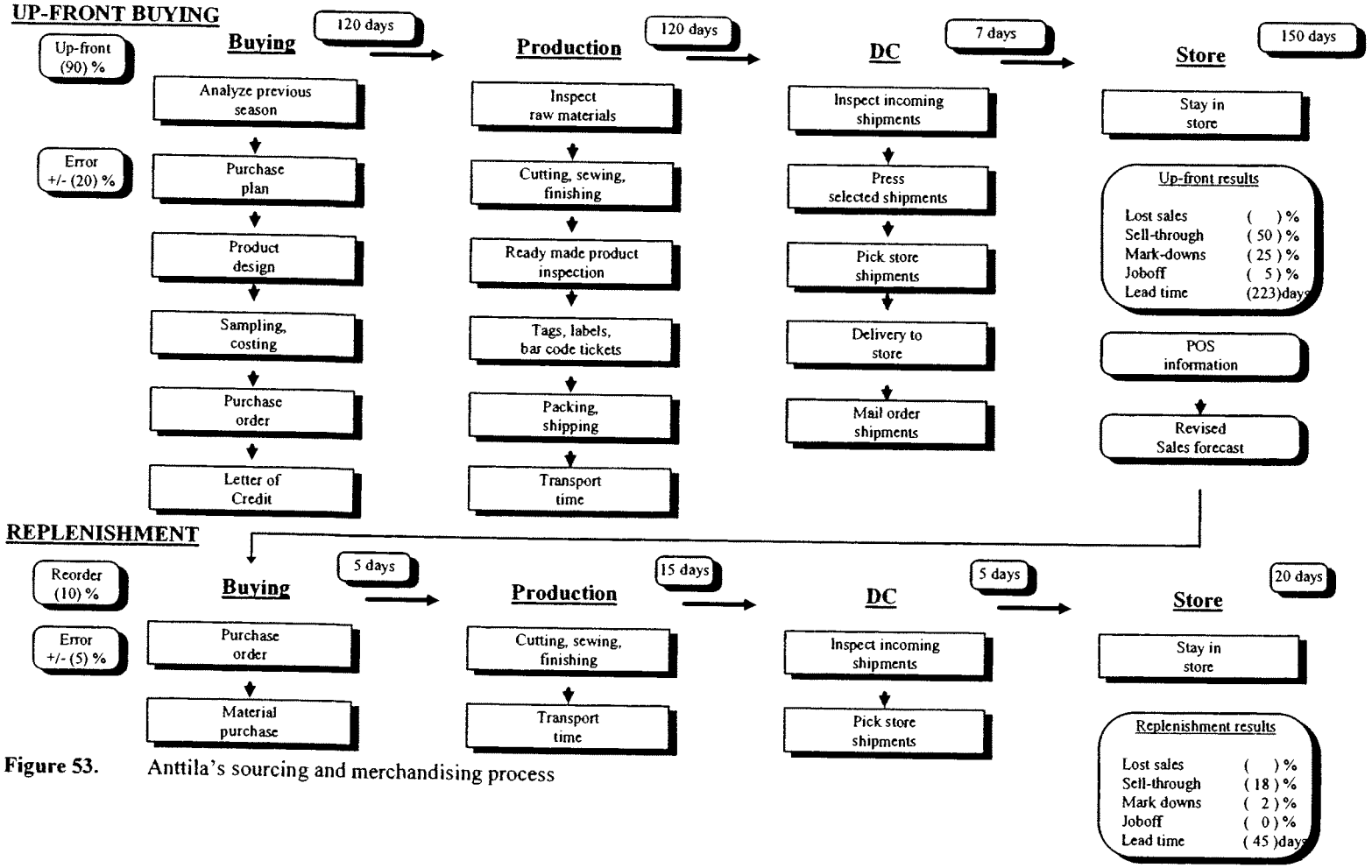


Figure 53. Anttila's sourcing and merchandising process

Of all products sold by Anttila 69.5 % is currently sold at original prices and the rest is marked down during the clearance period. Joboff percentage is very small. Besides the two clearances per year, Anttila continuously has special price offers. These offers are presented in small catalogues sent to consumers.

	Current
Sell-through	69.5 %
Mark-down sales	28.5 %
Joboff	2.0 %

Different mark-downs are used during clearance as follows:

Proportion of goods sold at mark-down prices	Mark-down percentage
30 %	30 %
45 %	50 %
25 %	70 %

Due to forecast error SKUs are over-bought and these goods end up to be marked down sold during the sale period. Anttila also buys products specifically for special offers and clearance as follows:

	Mark-down sales volume
Bought originally for the season	90 %
Bought specifically for clearance	10 %

Purchase prices from European suppliers are estimated to be on the average 30 % higher compared to offshore sources. Mark-up percentage in pricing varies from product to product. Pricing is regarded very sensitive. Prices cannot be increased during a season. If a product was originally bought from offshore and priced with normal mark-up, a replenishment order from a nearby source must be sold at the same retail price even though purchase price may be 30 % higher.

Anttila Oy uses different measures for retail performance, and the management rates the importance of various measures as follows (1 = not important, 4 = very important):

Measure	Calculated as	Rating 1	2	3	4	used x
Gross margin	Sales - Cost of sales / Sales				x	x
GMROI	Gross margin / Average inventory				x	x
GMROS	Gross margin / Selling area			x		x
GMROL	Gross margin / No. of employees		x			
Stockturn	Sales / Inventory				x	x
Sell through	Total non mark-down sales in pieces / Total sales in pieces				x	
Mark-down	Total mark-down sales in pieces / Total sales in pieces				x	
Jobbed off	Total no. of liquidated products / Total sales in pieces				x	
Service level	No. of customers that find their first choice SKU / Total no. of customer visits				x	
Lost sales	No. of customers who find no SKU preference / Total no. of customer visits				x	

Table 6. Rating of performance measures by Anttila Oy's purchase management

Forecast accuracy, process lead time, replenishment buying and use of POS information for buying were regarded as equally important critical success factors. In the rating below, 1 means not important and 4 means important.

	rating
Forecast accuracy	4
Process lead time	4
Replenishment buying	4
Use of POS information for buying	4

4. KappAhl AB

4.1. General

KappAhl AB is a Swedish multi shop chain specializing in ladies', men's and children's wear. The firm is a wholly owned subsidiary of Kooperative Detaljhandelsgruppen AB, which in turn belongs to KF, the Swedish Cooperative Union. In October 1997 KappAhl took over a Danish ladies' wear retailer MacCoy A/S, which had 46 stores in Denmark. With 101 KappAhl stores in Sweden, 22 in Norway and 19 in Finland, KappAhl Group has 189 stores in total.

At the end of 1997 operations were organized into five operational companies. The parent company is responsible for sourcing products for the whole group as well as for sales in Sweden. There are separate sales companies in Norway, Finland and Denmark which are responsible for sales in each respective area. KappAhl Far East Limited operates out of Hong Kong and takes care of sourcing, quality control and delivery control on a practical level. The present Business Areas are Ladies' wear, Men's wear, Children's wear and Body Zone underwear. The management of the company has established the vision "The best service company in the business" as objective for the overall strategic development.

4.2. Marketing Concepts

All products at KappAhl's stores are sold under own labels. Each Business Area Manager has a team consisting of buyers, assistants, designers and an economic planner. The planner supports the buyers with financial analysis and detailed plans of the whole process of merchandising. Most product designs sold by KappAhl originate from the company's own design team which utilizes computer-aided systems for designing garments and patterns. Only 10-20 % of designs are originally produced by suppliers or in cooperation with supplies. But, these products are also sold under KappAhl's labels.

The company emphasizes KappAhl as a store brand by underlining the values behind the trade mark and by focusing on consumer awareness and a value-for-money image. The aim is to expand further in the Scandinavian market. In 1997 KappAhl was rated the 42nd in the list of the strongest trademarks in Sweden.

Men's Wear

KappAhl is the market leader in men's fashion in Sweden and this position has been consolidated during 1997 (KappAhl Annual Report, 1997). Men's wear products are

sold under labels No.1 and Request. The consumer target group is a well dressed, grown-up man who enjoys wearing casual or semi-classic garments. The company is in the process of increasing the quality level of men's wear products with the target of improving the value for money ratio in order to attract even more male customers.

Ladies' Wear

Ladies' wear is the largest business area of the company. Sales of ladies' wear has developed well since 1996 and this positive trend is expected to continue. The target group is a well-dressed mature woman. A new collection, XLNT, was launched in 1997. This collection aims at ladies with a fuller figure. Ladies' garments are sold under labels No.1, Sinclair and now XLNT. No. 1 is a more dressed label while Sinclair is more casual. Motherline is a collection of maternity wear.

Body Zone

Body Zone is a label which carries underwear, socks, stockings and night wear for all KappAhl's consumer target groups. XLNT underwear collection was launched in 1997 catering for the full figure lady. The Body Zone product group is growing and plays an important role in creating store traffic.

Children's Wear

Children's wear collection has established and stabilized its position in the children's wear market in Scandinavia as a quality and value-for-money range. The degree of coordination between various collections has been increased. The first test store selling only children's wear was opened in Örebro, Sweden in 1997.

Market Shares

Sales grew by 7 % in Sweden from 1996 to 1997 while the overall increase of the fashion market was 3 % (Statistics Sweden). The turnover of KappAhl in 1997 in Sweden was SEK 1,670 million which represents a market share of 7.6 %. The corresponding share in 1996 was 6.8 %. The increase in market share is primarily due to the success of the Ladies' Wear Business Area.

In Norway the growth of sales achieved in 1997 was 22 %. This growth comes mainly from the Ladies' Wear and Body Zone Business Areas. The XLNT collection was also well received in Norway. The fashion market had an overall growth of 5 % and the market share of KappAhl was 1.8 % at the end of 1997.

KappAhl has been successful in the Finnish market for years and the KappAhl brand image is very strong in the market. A growth of 13 % was achieved in 1997 while the general growth of the sector was only 4 %.

In order to expand and cement the market position in Scandinavia, KappAhl took over a Danish chain called MacCoy A/S. The fashion market in Denmark is still very fragmented, consisting of numerous independent small retailers. MacCoy is the market leader in ladies' wear with 46 stores. However, the market share in Denmark is still only 2.3 %. The objective is to run MacCoy as a separate chain while distribution and certain parts of the range will be coordinated with KappAhl.

Collections

KappAhl has concept shops which offer a full range of garments under various brands. Each label has its own consumer target group. The collections under each label are put together of combinations forming a concept of basic products and seasonal fashion products. Design of a new collection starts from analysis of sales from the previous collection. Design, as well as sourcing and sales, are planned for a quarter year period. The basic product lines run continuously, while the design of fashion products is more seasonally oriented.

4.3. Supply Chain Management

The business Area Manager has the overall responsibility for designing, buying and supplying goods to the stores. There is a separate matrix organization for purchase development. This organization provides technical assistance regarding product construction, manufacturing, quality and delivery controls and coordination of sourcing office work. KappAhl has local sourcing offices in Hong Kong, Shanghai, Beijing, Dhaka and Delhi. These offices help in placing production orders to factories and they carry out quality and delivery inspections.

At the moment 50 % of products are sourced from Europe and another 50 % from Asia. The main supplying countries in Europe are England, Portugal, Lithuania, Estonia, Greece and Turkey. China, Bangladesh, Korea and Hong Kong are the main countries of origin in Asia.

KappAhl has reduced the number of suppliers drastically. Before, there were altogether 600 suppliers. Today there are about 200 active suppliers in 30 different countries. Another reduction has taken place with intermediaries in the supply chain. Only about 15 % of the total merchandise is sourced through agents today.

The following sourcing concepts are used:

1. CMT manufacturing has been tried out in Lithuania. Within this concept all main raw materials as well as product specifications are supplied by

KappAhl. Only manufacturing capacity together with some trimmings are bought from the supplier.

2. Full price sub-contracting is the most common sourcing concept used by KappAhl. The manufacturer is provided with product specifications and occasionally information from where to buy the materials. The supplier buys all raw materials, produces the products and sells the products for full price including materials and manufacturing costs.

3. A small proportion (10-20 %) of designs is produced by the suppliers. This is done especially in the fashionable ladies' wear area with products of short life cycle. KappAhl selects these products from suppliers' collections. Alterations are made if necessary, and the goods are delivered with KappAhl's labels.

The type of concept used depends on what kind of service each supplier is capable of offering. Sourcing on a CMT basis is new to KappAhl. Only 1-2 % of total buying is done on this basis. This is, however, the area that the company management wants to develop in the future. About 70 % of all products are bought on a sub-contracting basis. The remaining part is bought from suppliers' collections. Both CMT and buying from suppliers' collections are expected to increase in the future. There are several suppliers with whom KappAhl cooperates with, for example, in selecting fabrics. The suppliers are expected to use KappAhl's basic patterns and measurement charts. The objective is to increase cooperation with selected suppliers. A special Partnership Development Program has been set up by KappAhl. Altogether seven supplier companies have been selected for this program and cooperation started with two of them half a year ago. The Partnership Development Program is one of the ways KappAhl aims at improving supply chain management.

A rolling 12-month budgeting system is used by the company. Based on these plans, sales forecasts and purchase plans are done quarterly throughout the year. However, buying is still largely done seasonally and very up-front. Compared to the budgets, the Open-to-buy figure within the season is only 20 %. A higher stock to sales ratio is kept with basic lines of products which are sourced from the Far East. The overall lead time for these products is also longer. A small proportion of fashionable ladies' wear is bought on a very short delivery time and buying for these products takes place late in the season. KappAhl has suppliers in United Kingdom who are capable of supplying products in this way. The average lead time from issue of the production order to goods on the shop floor is 165 days at present.

KappAhl has been applying an overall management methodology called Balanced Scorecard. This is a strategic planning system which, according to the selected visionary target "The best service company in the market", analyses various focus areas in the company and sets overall development targets both for hard figures and soft management values. The targets are kept the same for all areas in the company while critical success factors and measures are defined separately for each department. Customer satisfaction is one of the central areas of concern at KappAhl. This is measured by a questionnaire handed out to customers at the time of purchase. Besides finding out the overall impression of the customers, this information, whenever

possible, is used for re-targeting the purchases for the remaining part of the season. Customer satisfaction index is used as measure and the follow-up is done regularly.

In order to improve internal efficiency and to lower mark-downs, two critical success factors have been selected, i.e. punctuality of deliveries and the lead time. KappAhl is able to follow sales at the style and color level through Point of Sale information collected daily through the computer system. KappAhl's objective is to expand the present computer network in order to cover the sourcing offices and suppliers as well. Besides the POS information, information regarding sourcing, work in progress and delivery status will also be covered. The improved management control system is seen as an essential tool for reaching the overall goals.

All products are received by the Distribution Center in Gothenburg and delivered from there further to various shops. Products are inspected at production sites and the goods from European suppliers are received hanging and shop-ready, including all hangers, hang tags, bar code labels, etc. From the Far East, goods are usually delivered flat packed, and most outerwear garments must be pressed and finished in Sweden prior to delivery to the stores. In order to increase delivery flexibility at the Distribution Center, unified price tags for all markets will be introduced. Commitment to environmental issues is part of the management philosophy of KappAhl. These policies effect supply chain management in various ways. Use of plastic and paper as packing material in deliveries to the Distribution Center has been minimized. Only those manufacturers are used which are willing to comply with KappAhl's directives regarding fabric dyeing and finishing chemicals, working conditions in factories, and avoidance of child labor. These requirements and conditions are specified by KappAhl's Code of Conduct which is an integral part of the frame agreements with suppliers.

During 1998 KappAhl has kept on streamlining its supply chain organization and management systems. The focus is on employee and customer satisfaction. A "Co-worker satisfaction index" was established on the basis of an attitude study carried out throughout the whole organization. The index is presented month by month on the basis of data collected from representative parts of the organization.

4.4. Business Control

Business Control guides and coordinates the company functions towards various financial goals set up for the group as a whole and for individual sections separately. There are local controllers in each country. Their work is coordinated with the Central Business Control in Sweden. A central tool in this work is KappAhl's Scorecard management system. Business Control not only keeps up the system, but also develops it further by advising and suggesting more precise measures for critical success factors. Business Control also assists the organization in using the system as internal management tool.

4.5. Sourcing and Merchandising Variables

About half of the products bought by KappAhl originate from Europe. The rest is bought offshore. Hardly anything is sourced domestically. The distribution is as follows:

Offshore	50 %
Europe	50 %
Sweden	0 %

Full price sub-contracting is the main way of sourcing products. All products bought by KappAhl are delivered under KappAhl's own labels. The distribution between various sourcing concepts is as follows:

CMT	5 %
Full price sub-contracting	85 %
Private label	10 %
Supplier label	0 %

Purchase budgets are produced on quarter year basis. This budget period is further divided into months and weeks and a buyer's plan is produced for each week. Buying is a continuous process where selling seasons overlap each other. For the purpose of this study one can state that KappAhl has four distinct selling seasons and two clearance periods per year.

KappAhl carries out replenishment buying continuously. In bulk products most goods are bought up-front of season. In the most fashionable product groups replenishment buying is used more.

	Up-front	Replenishment
Bulk products	90 %	10 %
Basic products	50 %	50 %
Fashion products	10 %	90 %

The forecast for the buying plan is based on the previous and current season's sales statistics. POS information is used for the planning of replenishment orders to a certain extent. KappAhl would like to increase active use of POS information but it has been difficult to find suppliers capable of operating on a QR basis. KappAhl has

actively reduced over all lead times in order to be able to use the previous season's sales statistics in purchase planning. In this way a fair amount of information regarding coming season is available when the first buying plan is produced. More information is received from various sources during the planning process. If the end of the selling season is equal to 100 % of information regarding the seasonal sales, then, proportionally the accumulation of forecast information is estimated to be as follows:

Phase of process	% of forecast information
First buying plan	50 %
Revised buying plan	55 %
First contact with suppliers	60 %
Firm orders	65 %
Start of selling season	70 %
1/4 through selling season	75 %
1/2 through selling season	90 %
3/4 through selling season	95 %
End of selling season	100 %

KappAhl has no follow-up information regarding forecast error and, in order to avoid stockouts caused by negative forecast error, seasons are over-bought. Based on mark-down volumes the forecast errors were estimated to be as follows:

	Forecast error
Up-front buying	±30 – 50 %
Replenishment buying	±10 – 30 %

The objective is to buy on a CAD and credit basis. A Letter of Credit is used only if required by local laws or if requested by new suppliers. KappAhl negotiates prices on net terms and no cash discounts are used. Distribution of terms of payments is estimated as follows:

	Offshore	Europe
Letter or Credit	15 %	0 %
CAD	85 %	0 %
Credit 30 or >30 days		100 %

Delivery times are agreed on a weekly basis. A deviation of +/- one week is accepted. Of all deliveries 60 % are received on time both from offshore and European sources.

		Offshore	Europe
Performance:	Delivered on time	60 %	60 %
Cancellations:	Orders canceled due to late deliveries	10 %	10 %

The average annual turnover of stock including goods in the distribution center and in the stores is:

Average annual stockturn	3.6

Lead times vary from one product line to another. Basic items are bought on a longer lead time while fashionable items are expected to be delivered quickly. On average the lead times are as follows:

	lead times
Purchase plan / start of selling season	7 months
Issue firm order / receiving at DC	5 months
Stay in DC	2 weeks
Stay in store	3 months

The number of different SKUs (assortment) available at one department store in proportion to total SKUs sold during the year (t %) is:

$$t = 7\ \%$$

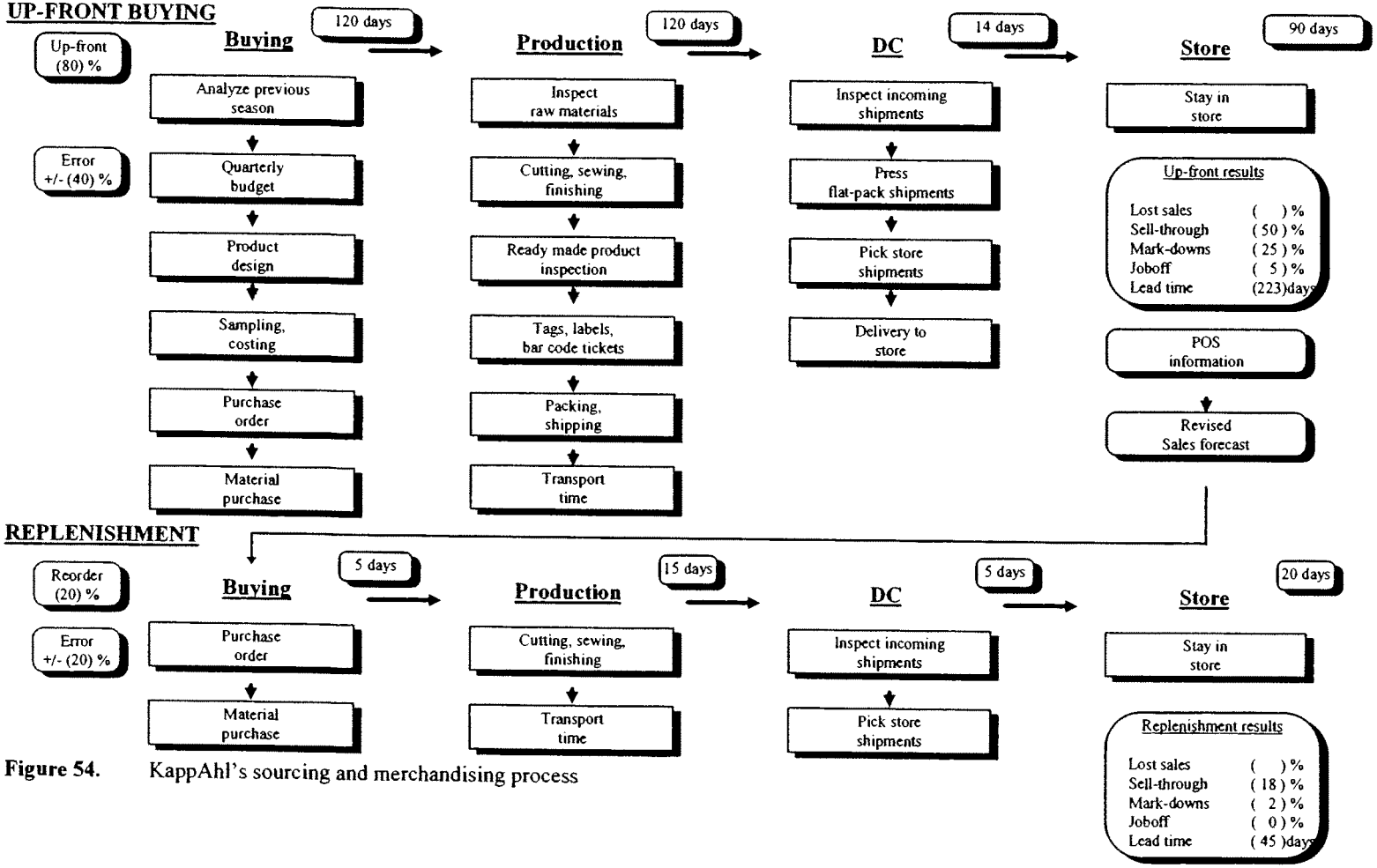


Figure 54. KappAhl's sourcing and merchandising process

KappAhl has a fairly high sell-through percentage as 69 % of total volume is sold at original price. Goods sold at mark-down prices are 29.5 % of total sales. Joboff sales is small, only 1.5 %. KappAhl does not buy any products for clearance. There are two major clearances per year, and small sale offers are done during the season as well. The objective is to keep mark-down sales volume below 20 %.

	Current	Ideal
Sell-through	69.0 %	80.0 %
Mark-down sales	29.5 %	20.0 %
Joboff	1.5 %	0.0 %

Different mark-downs are used during the discount sales period as follows:

Proportion of goods sold at mark-down prices	Mark-down percentage
29.5 %	50 %

Purchase prices (landed prices in Sweden) from European suppliers are estimated to be on average 50 % higher compared to offshore sources. Mark-up percentage in pricing varies from product to product. Prices are regarded as very sensitive, and prices cannot be increased during a season.

Different types of performance measures are systematically used by KappAhl. Service level and lost sales are currently not known but KappAhl management feels that these measurements are important and the information would be valuable when planning the product assortments for buying plans.

KappAhl management rates the importance of various measures as follows (1 = not important, 4 = very important):

Measure	Calculated as	Rating 1	2	3	4	used x
Gross margin	Sales - Cost of sales / Sales			x		x
GMROI	Gross margin / Average inventory			x		
GMROS	Gross margin / Selling area				x	x
GMROL	Gross margin / No. of employees			x		
Stockturn	Sales / Inventory				x	x
Sell through	Total non-mark-down sales in pieces / Total sales in pieces		x			
Mark-down	Total mark-down sales in pieces / Total sales in pieces				x	x
Jobbed off	Total no. of liquidated products / Total sales in pieces	x				
Service level	No. of customers that find their first choice SKU / Total no. of customer visits				x	
Lost sales	No. of customers who find no SKU preference / Total no. of customer visits				x	

Table 7. Rating of performance measures by KappAhl's merchandisers

Replenishment buying during the season and the use of POS information for buying are regarded as the main critical success factors by KappAhl management. In the following rating, 1 means not important and 4 means important.

	Rating
Forecast accuracy	3.0
Process lead time	3.0
Replenishment buying	4.0
Use of POS information for buying	4.0

SECTION V - FINDINGS

1. Analysis of Case Studies

1.1. General

The case study firms have both similarities and differences regarding the sourcing and merchandising process. All carry out sourcing both offshore and in Europe. However, offshore sourcing varies between 30 % and 50 % only, making Europe the main source for their apparel products. All the firms have several selling seasons per year with at least partly separate buying processes. Vaatehuone's five seasons and Anttila's six seasons are traditional multi-season concepts. KappAhl breaks down the quarterly budgeting system into monthly purchases with weekly delivery schedules, and converts the seasonal collections to rolling collections with continuously new deliveries.

All the firms have two main clearances per year. In addition, KappAhl has a small scale offering of mark-down priced goods continuously. Anttila has special consumer catalogue mark-down offers throughout the year as well. Vaatehuone and Anttila regard clearances as actual seasons, even buying products specifically for discount sales while KappAhl tries to minimize the mark-down sales volume. There are three reasons why products end up in mark-down sales: (1) due to forecast error some goods could not be sold at original price during the selling season, (2) the season is over-bought on purpose in order eliminate the negative forecast error which causes stockouts and lost sales, and (3) products are bought specifically for the clearance period. The proportion of goods specifically bought for sale varies from 0 % to 20 %.

Buying up-front of the selling season is the main way or sourcing products. Replenishment buying during the season varies between 10 % and 50 %, with the exception of KappAhl's fashion products. Lead times are long. The period between making a buying plan and the start of a selling season varies between seven to eight months. Firm purchase orders are issued six to seven months before receiving of goods when sourcing offshore, while the lead time is three to five months when sourcing from Europe. The case study firms estimated that the amount and quality of information available for forecasting when making the first buying plan for a season is very low. More information regarding expected demand is received gradually towards the start of the season from sources like fabric suppliers, fashion fares, etc., increasing the accuracy of the forecast. When the sales season is a quarter of the way through the firms say that the final demand can be very accurately forecasted. According to estimates by the case study firms, the forecast error in up-front buying varies between ±20 % and ±40 % and in replenishment buying between ±5 % and ±20 %.

After receiving the goods the processing time in the DC varies between one and three weeks, and the goods stay in stores for three to five months. This makes the rate of

total stockturn low (2.3 to 3.6). New products are received continuously during the season. Therefore the in-store inventory is not very large. In proportion to the total number of SKUs sold per year the in-store inventory of different SKUs (assortment) varies between 5 % and 7 %. Despite several selling seasons the stockturn rate stays low due to forecast errors and overbuying. Low stockturn rate complicates the cash flow situation as a large amount of capital is tied down in inventories. Offshore buying may create a further financial burden if, as in the case of Kesko and Anttila, nearly all offshore buying is on a Letter of Credit basis.

All the case study firms aim at keeping the service level high throughout the selling season. The service level is usually calculated as percentage of SKUs available at store in comparison to the total assortment of SKUs bought for the season. The number of SKUs has an impact on the inventory. A large product range and high service level means that the in-store inventory is also large. Rolling collections, however, reduce the inventory as all the different styles are not displayed in the store simultaneously.

Slightly more than half of all goods are sold at original price making the sell-through percentage vary between 50 % and 69 %, while 29.5 % to 44.4 % of goods are sold at mark-down price. The joboff percentage is very low, varying between 0.6% to 1.5 %. The average mark down percentage for all goods sold at clearance varies between 47.6 % and 50 %.

Price elasticity was estimated to be quite high, as the image of all the case study firms is to sell at competitive prices. The relative purchase price difference between offshore and European sources was estimated to be between 30 % to 50 %. If the original goods were sourced offshore and replenishment orders during the season are placed with European suppliers, the case study firms feel that the prices must stay at the same level and margins have to be reduced. On the other hand, it is very seldom that exactly the same product is bought through replenishment. More likely there will be similar products with the same color and appearance and therefore pricing can be done more freely.

None of the case study firms had studied the distribution of their total store traffic to consumers just browsing and to consumers looking for a specific product. Therefore, customer service level, if calculated as the proportion of customers finding their preference and buying it in comparison to total customer visits could not be estimated. Like wise, lost sales when calculated as the proportion of customers not finding their first choice or any replacing product and who leave without buying anything could neither be estimated. The case study firms felt, however, that these would be important retail performance measures as they indicate how well the range of products bought on the basis of forecast meets with the preferences of targeted consumers.

In the following paragraphs the analyses are carried out with values that are within the distribution of the case study company variables, and in this way the test results are practical and realistic. As there are only three case study firms, no statistical conclusions regarding the variables can be made. Neither is the purpose to analyze how successfully the case study companies carry out their sourcing and merchandising. The purpose is to test the model and the selected measures in order to

compare different ways of apparel sourcing and to define which are the critical success factors in terms of garment retailing.

Variable	Case study firms
Offshore sourcing	30 - 50 %
European sourcing	50 - 70 %
Up-front buying	80 - 90 %
Replenishment buying during selling season	10 - 20 %
Number of selling seasons per year	4 - 6
Stockturns	2.3 - 3.6
Portion of in-store different SKUs to sales (t)	5 - 7%
Forecast error - up-front buying	20 - 40 %
Forecast error - replenishment buying	5 - 20 %
Lead time first buying plan/start of season	7 - 8 months
Turnaround time in DC	1 - 3 weeks
Turnaround time in store	3 - 5 months
Sell-through volume of total sales volume	50 - 69 %
Mark-down sales volume of total sales	30 - 44 %
Joboff volume	0.6 - 1.5 %
Average mark-down	47 - 50 %
Proportion of goods bought for clearance	0 - 20 %
Prices from nearby sources / offshore	130 - 150 %

Table 8. Distribution of sourcing variables at case study firms

The tentative model is used for analysis in the following chapters. In order to ensure the validity of the analysis the values for different variables are selected to be the averages of the case study data, as presented in the table above. When testing the critical success factors some variables stay constant, unless their own impact is being tested. The constant test values are listed in Table 9. As discussed earlier approximations had to be made due to the large number of variables. Some are ignored and some are kept constant. This study compares different sourcing and merchandising strategies and measures the impact of different variables on retail performance. Therefore, in order to have test results which are comparable, and to determine the relations of different critical success factors, these selections were made. For example, when the impact of forecast error is measured by stockturn and GM, the input values are the same in order to validate the results.

Variable	Constant value used in analysis
Service level	90 %
Ratio of different assortment SKUs to sales (t)	6 %
DC lead time	1.0 month
Number of clearances per year	2
Mark-up factor	2.2
Forecast error - up-front buying	26 %
Forecast error - replenishment buying	12 %
Local/offshore price difference	130 %
Average mark-down percentage	49 %
Product substitute percentage	40 %

Table 9. Variables that are kept constant when comparing sourcing strategies. However, these variables also vary when their impact is tested.

1.2. Critical Success Factors

1.2.1. Forecast Accuracy

According to the definition of forecast error on page 93, the error can be positive or negative and the error varies from product to product. A positive total error means that more products were bought in comparison to demand. Such products will be sold during clearance at mark-down prices affecting GM and GMROI. Negative error causes stockouts and lost sales as demand is higher than what was purchased. GM dollars lost will affect the profitability of the company.

Forecasting accuracy depends largely on the overall lead time between producing a buying plan and actually receiving the goods at store level. The case study firms estimate the accumulation of forecasting information quite differently, which indicates different ways of operating. Nevertheless, in up-front buying firm orders are given to manufacturers five to six months before the start of the selling season, and 40 % to 60% of information is available at this stage. According to the case study firms, very little information accumulates during the several months from issuing firm orders to the start of the season. This seems to indicate that relatively little can be achieved by cutting down the lead time from ordering to the start of the season. Once the season starts there is a rapid increase of information and the outcome of demand can be fairly accurately forecasted. This indicates that replenishment orders during the selling

season when using POS information will improve forecasting accuracy much more than reduction of overall lead time.

Months	Kesko-Vaatehuone	%	Anttila	%	KappAhl	%
- 8			First buying plan	30 %		
- 7	First buying plan	5 %			First buying plan	50 %
- 6	Firm orders	40 %	Revised plan	60 %	Revised plan	55 %
- 5			Firm orders	70 %	Firm order	65 %
- 4						
- 3						
- 2						
- 1						
0	Start of season	40 %	Start of season	80 %	Start of season	70 %
1	1/4 through season	70 %	1/4 through season	90 %	1/4 through season	75 %
2	1/2 through season	80 %	1/2 through season	95 %	3/4 through season	95 %
3	3/4 through season	90 %			Season ends	100 %
4	Season ends	100 %	3/4 through season	99 %		
5			Season ends	100 %		

Table 10. Accumulation of forecasting information for a season when the sales results at the end of the season represent 100 % knowledge

Forecast error has an impact on stockturn. As shown in Figure 55, stockturn would be 4.4 with a perfect forecast. According to the earlier definition of forecast error, the error may be positive regarding some SKUs and negative regarding other SKUs, and some SKUs are underbought while other are bought over within the error distribution. SKUs under-bought will cause lost sales but there is no impact on stockturn. In cases of 30 % error, over-buying would be 30 % of the whole volume, and the unsold inventory at the end of the selling season equals 30 % of total sales. With 30 % forecast error, stockturn would come down to 2.8.

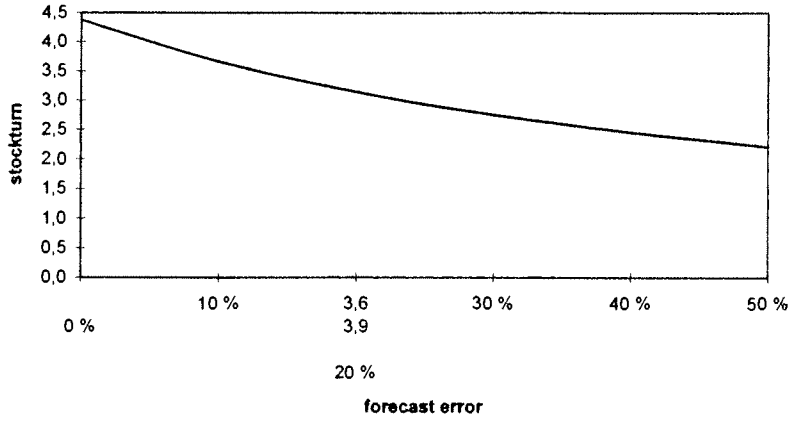


Figure 55. The impact of forecast error on stockturn

Gross margin percentage will go down when forecast error increases. This is due to the fact that more goods will be sold at reduced prices. It has to be remembered though that forecast error is not the only reason why goods are sold at mark-down prices as goods are also specifically bought for the clearance period. But, nevertheless, the impact on GM is significant when average mark-down percentage is around 49 % as with the case study companies.

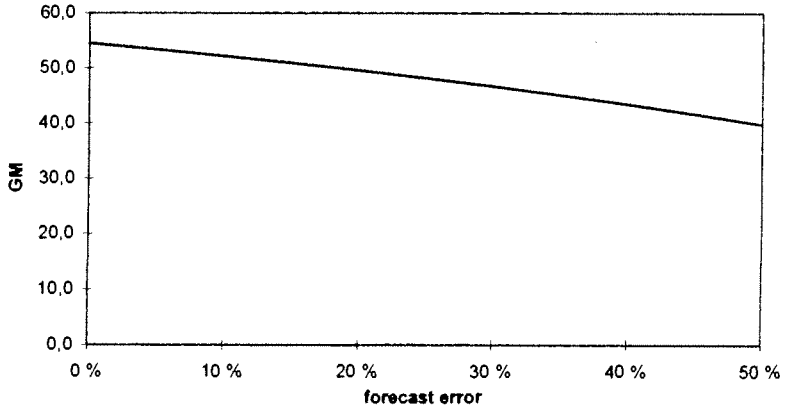


Figure 56. The impact of forecast error on Gross Margin percentage when average mark-down is 49 %

Unreliable deliveries is a problem that may have economical consequences. Delayed shipments can cause stockouts if the stores run out of certain types of products. Where the products were planned for a campaign sales with advertising support, lost sales is quite clear. One way to solve this is to plan shipment earlier than needed or to keep safety stock at the DC. Both of these actions would, however, slow down stockturns and decrease productivity when measured by GMROI-R.

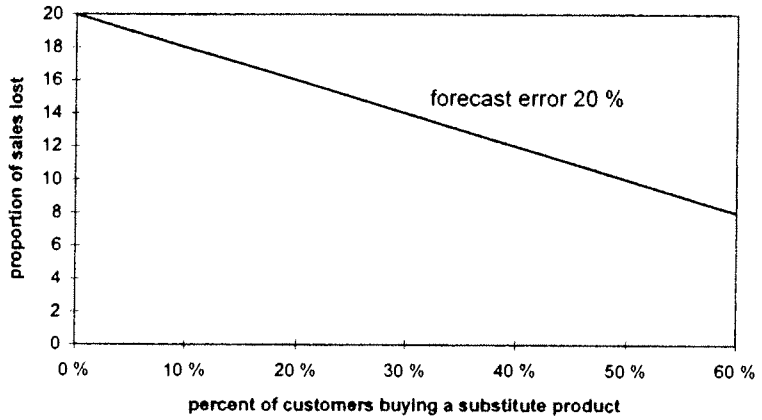


Figure 57. Proportion of sales lost due to forecast error when forecast error is ±20%

Potential annual sales value is reduced by both positive and negative forecast error. Prices are marked down for items not selling at first price during the normal season. Negative error causes stockouts and lost sales. With 49 % average mark-down and ±20% average forecast error, 12 % of sales would be lost when 40 % of customers buy an alternative product.

In fact, lost sales according to the model is a function of forecast error and the substitute rate only, and the other variables have no effect on the proportional lost sales value.

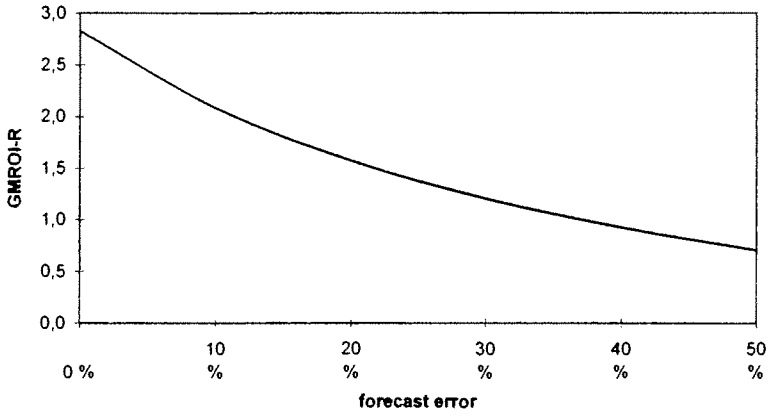


Figure 58. Impact of forecast error on GMROI-R

Forecast error has a direct impact on GMROI-R. Gross margin dollar earnings are reduced since, as a result of the forecast error, not all the goods are sold during the normal selling season. They will be discounted and sold at mark-down prices. Inventories grow as result of forecast error. Figure 58 shows the development of GMROI-R with a 2.2 mark-up factor, 49 % mark-down percentage and five seasons per year. GMROI-R drops from 2.8 to 1.6 when the forecast error increases from 0 % to 20%.

Based on the case study analysis, forecast error slows down stockturn and reduces gross margin and earnings in the company. Gross margin return on inventory is also lower with higher forecast error levels. The results are summarized in Table 11.

	Forecast error					
	0	10%	20%	30%	40%	50%
Stockturn	4.4	3.7	3.1	2.8	2.4	2.2
GM %	54.2	52.2	49.6	46.7	43.5	39.8
GMROI-R	2.8	2.1	1.6	1.2	0.9	0.7

Table 11. Implication of forecast error measured by stockturn, GM % and GMROI-R

According to previous studies the distribution of forecast errors in apparel retailing follows a deviation with the buyer's estimate being the mean of the demand distribution (Fisher, Hammond, Obermeyer, Raman, 1994). If the mean is moved on purpose, the distribution of errors shifts the to positive or negative side of the mean. For example, if more products are bought than needed, negative error is less likely and stockouts and lost sales will be reduced. Positive forecast error may also be intentional. This is done because goods are needed for clearance anyway. Over-buying shifts the mean of forecast error distribution for example from 0 % to + 10%, and the probability of negative error can be reduced to a certain extent. In this study the positive and negative deviation as a percentage of total sales is considered. However, there is no evidence that the deviation is symmetric over the whole assortment of SKUs.

Two of the case study firms seem to buy on the average more products than the actual demand, as they estimated the forecast error to be 20 % but mark-down sales was estimated at 30.5 % to 50 % of the total volume. Although they buy products separately for the clearance sale, the difference is not fully covered by this extra purchase.

If the forecast error is 20 % and the season is overbought by, for example, 15 % , then with the deviation of forecast error, there should be less stockouts and lost sales, but also more products would be left unsold. If the average mark-down is 50 %, then very little gross margin dollars if any are earned during clearance. When combining the effects of stockouts and mark-down sales, one can conclude that over-buying the season slightly is more profitable than under-buying or buying according to the forecast.

1.2.2. Lead Times

Theoretically long lead time increases forecast error. The case study companies estimated to have a relative amount of 30 % to 50 % of forecast information on hand when making the first buying plan. Kesko - Vaatehuone's estimate is only 5 % which is due to the fact that the first buying plan is done centrally by Kesko and the retailers get involved only at firm order stage. The proportion of information available at firm order stage was estimated to be between 40 % and 70 %. Firm orders are issued five to six months before starting of the selling season. It is unlikely that the forecast accuracy would be much improved if, for example orders are issued three to four months before the season, as according to estimate very little information is accumulated between order issuing and the start of the season. During the season the information accumulates rapidly, and the use of POS information for replenishment ordering would definitely improve overall forecast accuracy.

Use of a Letter of Credit as a payment instrument in offshore buying is costly and increases the financial burden of the company at least from the banker's point of view. In order to reduce financial obligations, a far better result will be achieved by changing to CAD terms of payment instead of trying to reduce lead time.

Distribution center lead time effects the level of inventory and stockturn. The overall stockturn increases from 3.9 to 5.2 when DC lead time is reduced from four weeks to one week. By ordering goods store-ready it is possible to reduce the DC time.

	Distribution center lead time		
E = 20 %, n = 5	4 weeks	2 weeks	1 week
Rate of stockturn	3.1	3.6	3.9

Table 12. Overall stockturn at various DC turnaround times when forecast error is 20 % and there are five selling seasons per year

1.2.3. Up-Front and Replenishment Buying

Increase of replenishment buying improves stockturns, as inventory values are reduced. Forecast accuracy is far better especially when POS information is used as a basis for forecasting. The impact of replenishment buying on stockturn can be analyzed by using the equation presented earlier.

Forecasting errors were estimated by the case study firms to be from ±20% to ±40% for up-front buying and from ±5% to 20% for replenishment buying. By using the forecast error of ±26% for up-front orders and ±12% for replenishment orders the impact of various volumes of replenishment buying and the number of replenishments per season on stockturn is presented in Figure 59. The number of replenishments has a dramatic impact on stockturn.

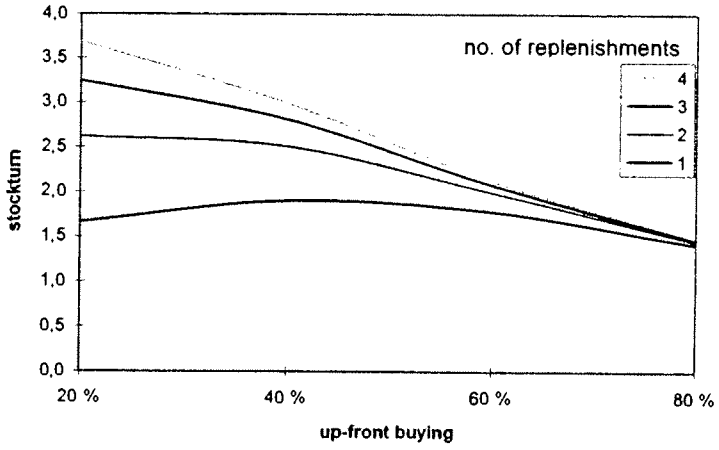


Figure 59. Stockturn as a function of up-front buying and the number of replenishments

GMROI-R, i.e. gross margin return on inventory at retail cost, increases when the volume of replenishment buying and the number of replenishments during a season is increased. By increasing replenishment buying the forecast accuracy is improved. With several replenishments per season the inventories are reduced and GMROI-R is improved accordingly.

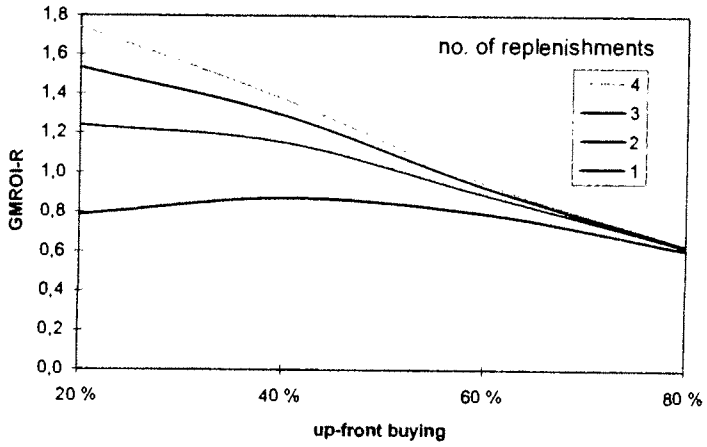


Figure 60. GMROI-R as a function of up-front buying and number of replenishments

Both stockturn and GMROI-R increase when the number of replenishment orders increases as in both cases inventories are reduced. The impact of replenishment buying was tested with three replenishments during the season. Both stockturn and GMROI-R increase when the proportion of replenishment buying is increased.

	Proportion of replenishment buying			
	20%	40%	60%	80%
Stockturn	1.5	2.1	2.8	3.2
GMROI-R	0.6	0.9	1.3	1.5

Table 13. The impact of replenishment buying on stockturn and GMROI-R with three replenishments per season

1.2.4. Offshore or Local Sourcing

The estimates for the price difference between offshore and European sources vary between 30 % and 50 %, when calculating as landed price. Figure 61 illustrates GM percentage at various offshore / local price differences and offshore / local sourcing ratios, when the average mark-up is 2.2, offshore forecast error is 26 %, nearby forecast error is 12 % and average mark-down percentage is 49 %.

In the graph in Figure 61 the price comparison is done in such a way that 100 % represents the offshore price level. For example, when the price difference is 130 %, the price from a local source is 30 % higher compared to offshore prices. In reality prices vary and the price difference varies between different sources and suppliers. The representatives of the case study firms indicated the average price difference which is the basis for the approximation used in the test illustrated by Figure 61.

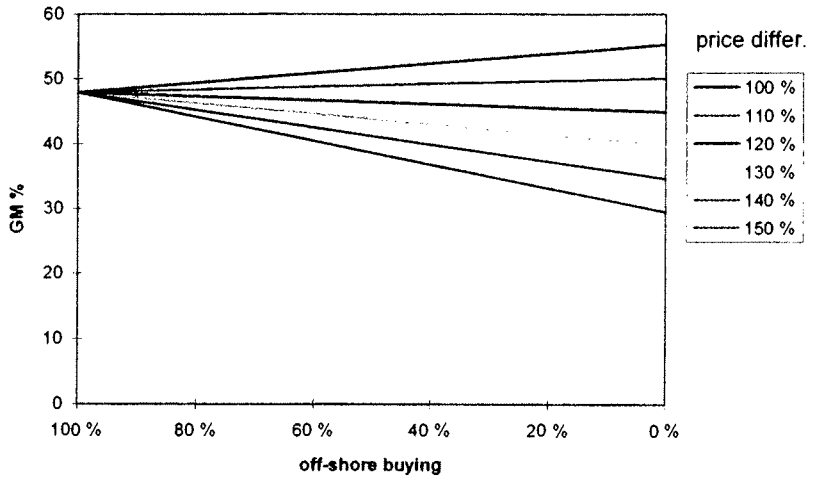


Figure 61. GM at various purchase price difference and different offshore/local buying ratios in relation to 100 % offshore sourcing

As Table 14 shows, sourcing from offshore becomes more profitable if local prices are more than 14 % higher when goods sourced locally are delivered in one shipment.

		Proportion of offshore sourcing					
		100 %	80 %	60 %	40 %	20 %	0 %
Price diff.	100 %	48	49	51	52	54	55
	110 %	48	48	49	49	50	50
	120 %	48	47	47	46	45	45
	130 %	48	46	44	43	41	40
	140 %	48	45	42	40	37	35
	150 %	48	44	40	37	33	29
Break-even	114 %	48	48	48	48	48	48

Table 14. GM break-even point with local sourcing delivered in one shipment

The ratio of offshore / local sourcing has an impact on lost sales as well since the forecast error is estimated to be lower with local sourcing. Figure 62 illustrates the impact of offshore / local sourcing on lost sales percentage, calculated with 40 % of consumers buying a substitute product.

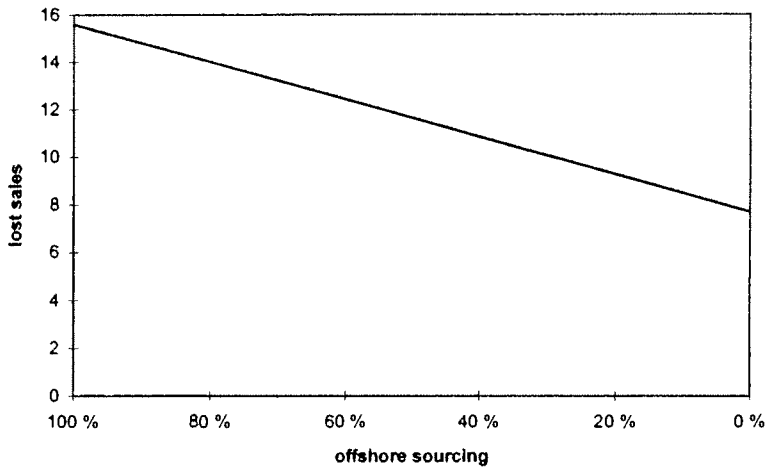


Figure 62. Proportion of lost sales as function of offshore/local sourcing with 40 % customers buying a substitute

The effect of different variables was tested with the model presented in Figure 62 and Table 15 and the following observations were made (see detailed analysis in Enclosure):

1. Products with higher mark-up require a higher price difference in order to break even. For example, if mark-up is 2.4, offshore sourcing is more profitable if local prices are at least 16 % higher.

2. If the forecasting error variance between offshore and local sourcing grows, a higher price difference will be needed for offshore sourcing to be profitable. The extreme forecast error variance estimated by the case study firms, i.e. ±40% for offshore and ±5% for local sources would mean that local sourcing is more profitable as long as the price difference is less than 25 %.

The case study firms estimated that offshore prices are 30% to 50 % lower on average. This means that offshore sourcing is more profitable than local sourcing as long as all the goods sourced locally are delivered in one shipment. The situation changes if more than one replenishment shipment is used. As shown in Figures 59 and 60, both GMROI-R and stockturn increased considerably when the number of replenishments increased.

	Case study firms		Test	
	original value	break-even price differ.	test value	break-even price differ.
Mark-up factor	2.2	14 %	2.4	16 %
Forecast error - offshore	26 %	14 %	40 %	25 %
- local	12 %		5 %	

Table 15. Price difference required for GM to break even with various values of mark-up and forecast error

Due to lead times and other practical reasons, buying from offshore is usually done up-front of the season and with local buying it is possible to use replenishment orders. When the purchase price difference between offshore and local sources are considered and the local buying is done in several replenishments the results are as follows:

1. GMROI-R is clearly improved when the number of replenishments increase, providing that offshore buying is less than 60 %. With a higher proportion of offshore buying the impact on GMROI-R is marginal.

2. The bigger the price difference between offshore and local sources the more profitable offshore sourcing is.

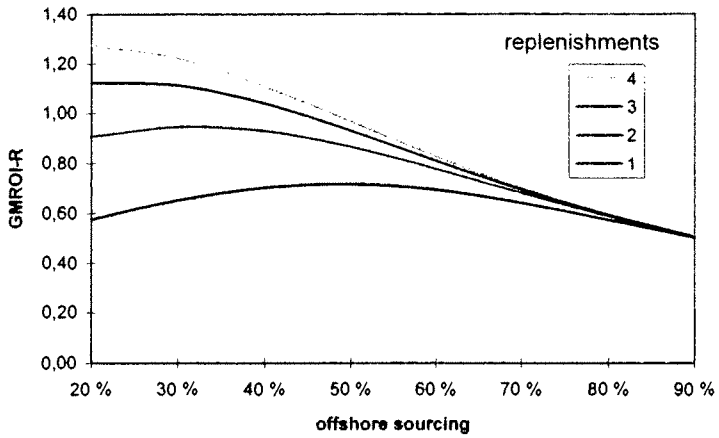


Figure 63. GMROI-R at different replenishments and various ratios of offshore/local buying when the price difference is 40 %

Providing that up-front buying is used in offshore sourcing, local sourcing is done with three replenishments during the season and that the purchase price difference between offshore and local sources is 40 %, the results can be summarized as presented in Table 16. The values in the table point out that GM grows rapidly when the proportion of offshore sourcing grows. At the same time lost sales increases in line with the increase of offshore sourcing, which means that the potential GM is reduced. GMROI-R, which accounts for both gross margin and inventory at retail price, would decrease when the share of offshore sourcing increases, i.e. less gross margin could be generated with the retail value of inventory needed at each level of offshore sourcing.

	Proportion of offshore sourcing			
	20%	40%	60%	80%
GM %	37	40	42	45
Lost sales %	9	11	12	14
GMROI-R	1.1	1.0	0.8	0.6

Table 16. Retail performance at different offshore / local sourcing ratios, providing that offshore buying is done up-front, local buying involves three replenishments during the season, and that the price difference between local/offshore sources is 140 %

1.3. Sourcing Variables Affecting Retail Performance

1.3.1. Number of Selling Seasons

Increasing the number of selling seasons from the traditional two improves stockturns and GMROI-R automatically as the average inventory is reduced. Furthermore, with several selling seasons forecast errors do not have as drastic consequences as with two seasons since smaller quantities are bought at one time and, if needed, assortments can be adjusted for the following seasons.

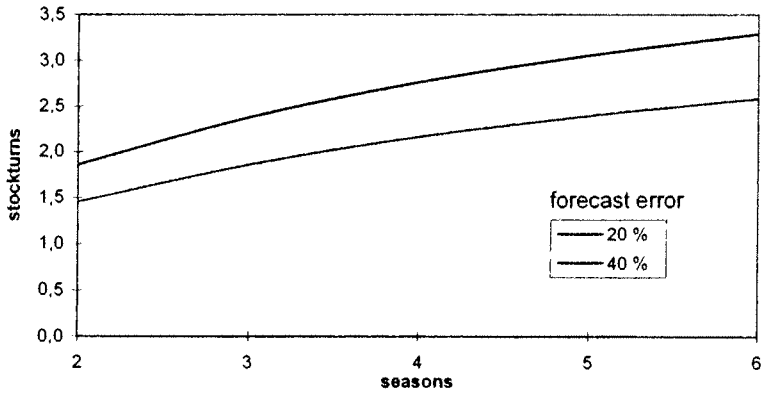


Figure 64. Stockturns as a function of the number of seasons within the forecast error variance estimated by case study firms

The case study firms' estimate for forecast error varies between 20 % and 40 % for up-front buying. By increasing the number of seasons from two to six, stockturns would be improved accordingly. The number of selling seasons has a similar impact on GMROI-R. For example, with a forecast error of 20 %, GMROI-R would increase from 0.9 to 1.7.

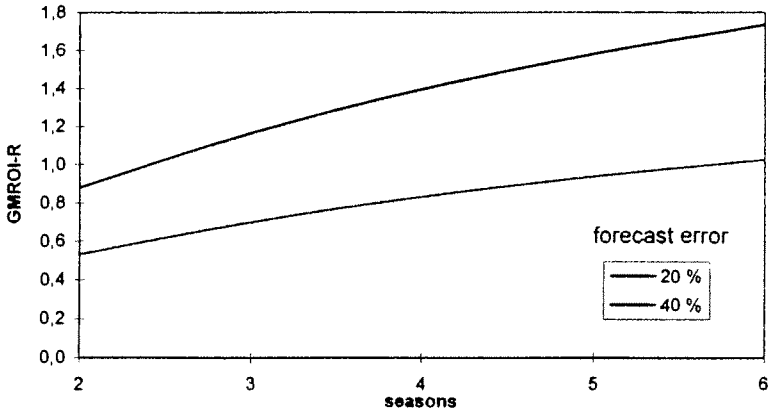


Figure 65. The impact of the number of seasons on GMROI-R within the case study data variance for forecast error

Higher number of selling seasons per year affects stockturn and GMROI-R as the average inventory is reduced.

	Forecast error	Seasons 2	3	4	5	6
Stockturns	20 %	1.9	2.4	2.8	3.1	3.3
	40 %	1.5	1.9	2.2	2.4	2.6
GMROI-R	20 %	0.9	1.2	1.4	1.6	1.7
	40 %	0.5	0.7	0.8	0.9	1.0

Table 17. The impact of the number of selling seasons on stockturns and GMROI-R within the forecast error variance.

1.3.2. Service Level

There are two ways of maintaining a high service level. The season may be over-bought in order to have the full range of assortment SKUs available to the very end of the season. Or, replenishment ordering based on POS information can be organized during the season by utilizing QR and ECR techniques. Retailers usually plan for 90% service level, since 100 % is difficult and costly to achieve (Iyer, Bergen, 1997).

According to the equation presented in the tentative model, the inventory is a function of service level, the number of SKUs available in store on average, the number of seasons per year, DC lead time and the forecast error. The level of inventory in turn defines the rate of stockturn. The impact of these variables on stockturn was tested when forecast error is 20 % and there are five selling seasons per year, with the following results:

	Service level		
	90 %	70 %	50 %
Rate of stockturn	3.1	3.2	3.3

Table 18. Stockturn at different service levels when forecast error is 20 % and the number of selling seasons per year is five.

Service level has very little impact on stockturn. When service level drops, the number of SKUs available in store goes down and lowers inventory level. This has far more impact on GM and GMROI-R. The concept of service level is problematic even when it is defined to be the percentage of different SKUs (assortment) available in store in comparison to the number of different SKUs in the collection. None of the case study firms receive the whole season's merchandise simultaneously at the beginning of the season. Rather there are continuous deliveries, at least during the first half of the season. Some products may be sold out and substituted by something else. Styles where service level starts to be low are put aside to be sold during mark-down sales. Or the season is split into several display periods and the store is reset with combinations of new and old merchandise in order to make it look different to the consumer.

If service level is low, lost sales is high as customers do not find their preference in color or size, unless they buy a substituting product. The impact of service level on GM potential can be calculated as follows:

$$GM_{diff} = \frac{mC - C - (100\% - s)(100\% - z)(mC - C)}{mC - C} 100\% \qquad (18)$$

where

s = average service level of the selling season
z = proportion of consumers buying substitutes in case of stockouts
m= mark-up factor
C = cost of products sold

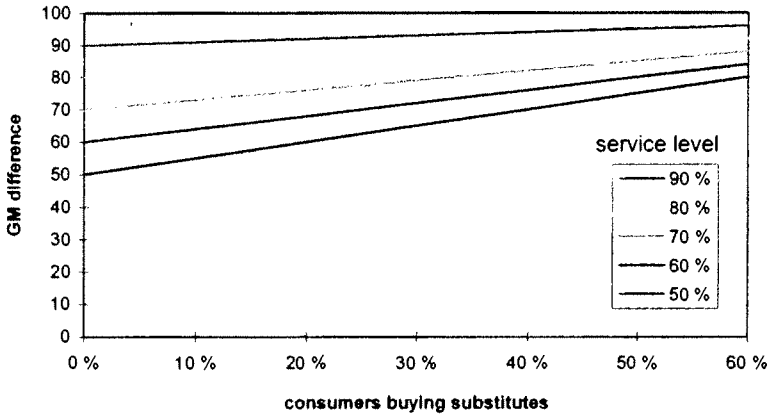


Figure 66. Proportional impact of service level on GM at various rates of consumer substitute buying

The GM potential lost due to service level is recovered partly by consumers' willingness to buy substitute products. If the substitute buying rate is 0 % then GM is reduced in line with the service level.

1.3.3. SKU Range

In order to maintain the targeted service level, the corresponding portion of styles, colors and sizes must be available in store throughout the season. As the assortment changes due to shipments received during the season, the calculations must be based on the number of different SKUs available on average rather than the total seasonal collection.

The number of different SKUs available in store in proportion to total sales seems to have a limited impact on stockturn. However, it can be concluded that the larger the range of SKUs in the assortment the slower the stockturn. On the other hand, the store must be furnished with enough variety to attract customers, otherwise some sales will be lost as the customers feel they find nothing to buy. What the optimum portion is cannot be calculated mathematically. Further study regarding the impact of the width of the collection on sales would be needed.

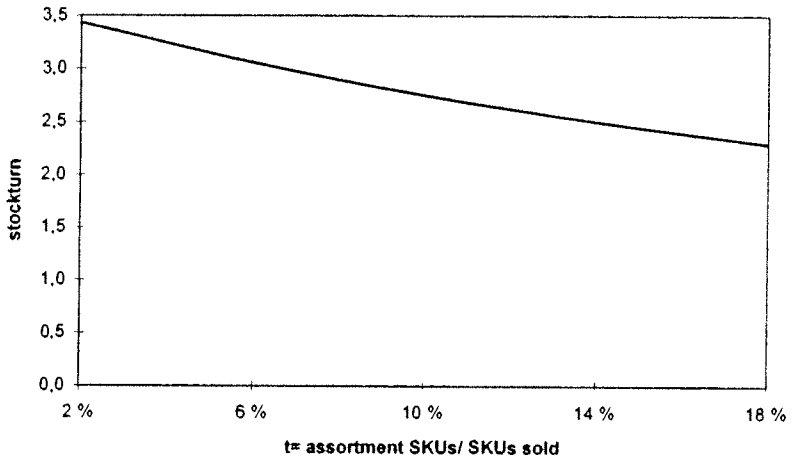


Figure 67. The ratio of the number of different SKUs in the assortment to total number of SKUs sold has a limited impact on stockturn, when realistic ratios vary between 4% and 10 %.

1.3.4. Inventory Capital Costs

The implications of the capital costs of the inventory should also be analyzed. Inventory capital costs are part of the total inventory carrying costs presented in Figure 18. The analysis of this study do not consider the total inventory carrying costs as they only partly depend on sourcing strategies and their impact might be misleading.

The case study firms use Letter of Credit, CAD and 14 to 30 days credit as terms of payment. Two of the firms use Letter of Credit as the main terms of payment for offshore purchases. CAD or credit is used for purchases within Europe. Some suppliers even give a cash discount if paid within certain period of time. This, however, is more difficult to consider, as when negotiating prices it is also possible to agree about net prices without discounts, and at the end arrive at the same price.

The financing costs with Letter of Credit consist of charges regarding opening and changing the L/C. From the bank's point of view L/C is a credit requiring a guarantee, but in case of financially sound customers guarantees are not separately requested and therefore no costs are involved. When buying on CAD or credit terms there are no special financing costs.

Capital costs of inventory are the interests for the capital tied down in inventories at the distribution center, stores and goods collected for clearance. L/C costs can be considered insignificant in proportion to total sales. Inventory capital costs behave like general inventory carrying costs as described in Figure 17. The retail value of the inventory is used in this study when calculating inventory turns. In order to evaluate capital costs the inventory value must be considered at cost level and the retail value is divided by a mark-up factor. The capital costs of inventory can be calculated as

$$F = i\left(\frac{I_v}{m}\right) \tag{19}$$

where

F = inventory capital costs
i = interest rate
m = mark-up factor

Based on equations 1 and 19 the ratio of inventory capital costs and sales value is

$$\frac{F}{S_v} = \frac{i\frac{I_v}{m}}{T_v I_v} = \frac{i}{mT_v} \tag{20}$$

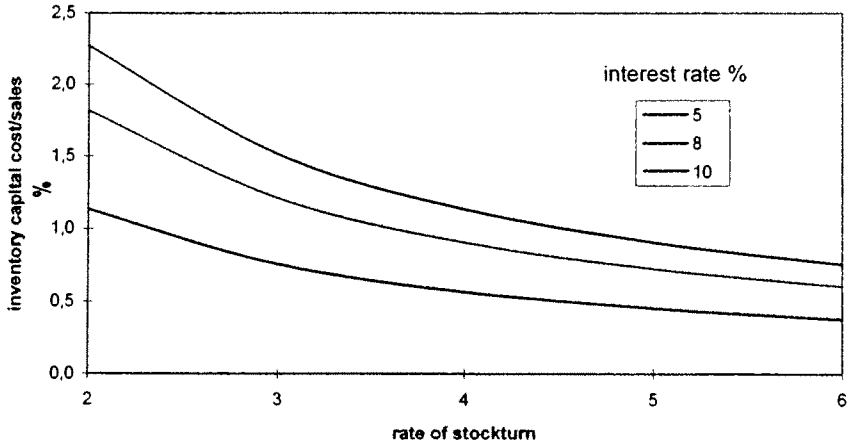


Figure 68. Percentage of inventory capital costs of total sales as a function of stockturn at different interest rates when mark-up is 2.2

By increasing stockturn rate the proportion of inventory capital costs will be reduced as described by Figure 68.

1.4. Sourcing Strategies

1.4.1. Traditional

Traditional sourcing strategy focuses on wholesale cost and goods are purchased from the least expensive supplier. Usually this means offshore sourcing with one delivery prior to the selling season. The volume and assortment of goods are based on the retail buyer's plan (King, Pinnow, 1998). The case study firms primarily use traditional sourcing strategy with limited replenishment buying. Due to long lead time forecasting is difficult and forecasting accuracy is the main success factor. The advantage of traditional sourcing strategy is the low purchase price. Disadvantages are lost sales and high mark-down volumes as discussed in the previous paragraph.

1.4.2. Quick Response

QR strategy is based on a mixture of up-front buying and replenishment during the selling season. A certain amount is sourced traditionally and delivered prior to the start of the selling season. In-season garment manufacturing based upon re-estimation of actual demand by using POS data takes care of the rest. QR strategy requires re-estimation and reorder systems that turn POS data into information that can be transmitted via electronic data interchange and used for manufacturing and delivering products that are currently in demand (King, Hunter, 1997).

None of the case study firms use a QR strategy. But, on the basis of case study data and by using the model of this research, it is possible to theoretically compare various sourcing strategies and to draw conclusions regarding their efficiency.

The initial supply for the season may, for eaxample, cover 25 % of the season, i.e. three weeks in case a season is 12 weeks long. The case study firms estimate that at this point the demand for the whole season can be well forecast. Replenishment shipments arrive thereafter weekly or bi-weekly. According to a survey carried out in the USA by Little and Heinje, forecast accuracy achieved by firms using QR is 95 %, sell-through is 95 % and DC lead time is eliminated by delivering goods floor-ready directly to the store (Little, Heinje, 1998).

Stockturn is calculated with equation 10 as follows :

$$T_v = \frac{S_v}{\frac{\sum_{i=1}^{n} I_i}{n} + \frac{L_{dc}}{365} S_v + \frac{\sum_{i=1}^{n} E_i S_{v_i}}{2l}} \qquad (10)$$

where, for a Quick Response strategy, the in-store inventory is calculated as

$$I_n = \frac{2(stS_v + E_n \frac{S_{v_n}}{w_s / w_d} + \frac{S_{v_n}}{w_s / w_d}) - \frac{S_{v_n}}{w_s / w_d}}{2} \qquad (21)$$

where

w_s = length of the season in weeks
w_d = length of replenishment period in weeks

1.4.3. Vendor Managed Inventory

VMI means that some goods are shipped in advance according to the buyer's plan. Replenishment orders are done for example weekly on the basis of POS information. The vendor ships the goods directly from stock and POS information is not shared. The goods are made in advance, for example on the basis of the buyer's plan. Forecast accuracy is as critical in VMI as in traditional sourcing. The case study firms use VMI strategy for basic items on a small scale.

Within VMI the retailer should achieve a performance as good as with QR, except that since goods are manufactured in advance according to the buyer's plan, forecast accuracy is not as high as with QR. According to tests and analysis by King and Hunter, the forecast accuracy with VMI is around 90 % as with QR 95 % can be achieved. Lost sales is 10.7 % in comparison to 5.10 % with QR (King, Hunter, 1997).

1.4.4. Comparisons

The data collected from the case study firms are used in this research as a guideline rather than as accurate values in order to avoid volume errors. However, different sourcing strategies can be tested and compared with these values by using the equations presented in this study. When the tests are run with the same values the results are comparable.

When comparing the strategies the following principles are accounted for:

1. Forecast error with QR is ±5%, with VMI ±10% and with Traditional sourcing ±20%
2. Forecast error causes lost sales and mark-down sales. With smaller forecast error more goods can be sold as stockouts and lost sales are reduced, and the number of units sold at mark-down price is also reduced.
3. Price elasticity is high. Any price increase would reduce sales volume. Therefore goods purchased from local sources must be sold at the same relative price as offshore products even though margins are lower.
4. A mark-up of 2.2 and average mark-down of 49 % are used in the comparisons below.
5. With QR and VMI sourcing is done locally with higher purchase prices in comparison to Traditional strategy with low offshore prices

When measured by stockturns and GMROI-R the comparisons are made assuming that with Traditional strategy all products are sourced offshore and bought up-front while with QR and VMI 25 % initial purchase is done offshore and the rest is replenished weekly during the selling season. Purchase prices are assumed to be 40 % higher with local sourcing. Stockturns with Quick Response and Vendor Managed Inventory strategy are superior compared to Traditional sourcing strategy. With QR and VMI the store is supplied with replenishments weekly after the initial shipment of 25%. With Traditional strategy all goods are received prior to the season. Local prices are assumed to be 40% higher than offshore prices when calculating GMROI-R.

	Sourcing strategy		
	QR	VMI	Traditional
Stockturns	11.4	10.0	3.1
GMROI-R	3.9	3.1	1.4

Table 19. Stockturns and GMROI-R with different sourcing strategies calculated with 40 % higher prices when sourcing locally

A company cannot survive on stockturns. GM dollars are needed. In order to compare the strategies in terms of GM dollars earned, the comparisons are made on the basis of purchase price difference. As discussed earlier, the forecast error is assumed to be 5 % for QR, 10 % for VMI and 20 % for Traditional sourcing. Firstly, smaller forecast error means less stockouts and lost sales. The forecast error difference between QR and Traditional is 15 % which means that with the same store traffic 15% more goods could be sold when operating with QR. Secondly, there is a difference in the number of products that stay unsold during the season and have to be marked down.

In order to consider the sales volume difference, gross margin dollars are now calculated as follows, when assuming that customers do not buy substituting products in cases of stockout.

$$GM_{\$} = S_u(100\% - E)P_F + S_u EdP_F - S_u \frac{P_F}{m} D_P \qquad (22)$$

and

$$S_u(QR) = S_u \frac{E_{trad}}{E_{QR}} \qquad (23)$$

and

$$S_u(VMI) = S_u \frac{E_{trad}}{E_{VMI}} \qquad (24)$$

where

S_u = Sales in units (for QR and for VMI strategy)
P_F = First unit price
D_p = Price difference between offshore and local sources

Due to higher sales volume and lower mark-downs, gross margin dollars earned with QR and VMI are clearly higher than with Traditional strategy if there is no difference is purchase prices. When purchase price difference grows this advantage is gradually lost since it is assumed that the high price elasticity does not allow use of same mark-up factor for offshore and local sourcing. Instead, the same sales price must be used. The break-even point when comparing GM dollar earnings is reached with a higher purchase price difference than with GM percentage, since with QR and VMI sales volumes are higher.

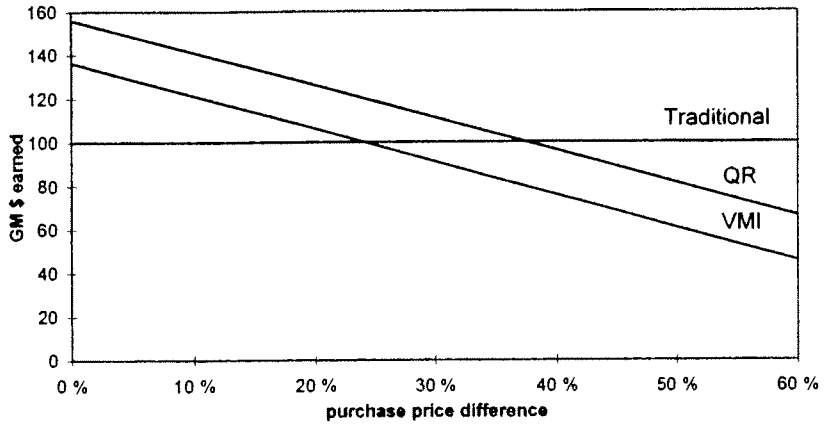


Figure 69. GM dollar break-even for QR and VMI compared to Traditional sourcing as a function of purchase price difference

If the product substitute percentage (z), i.e. customers buying a substituting product in cases of stockout is accounted for, the comparative advantage of QR and VMI regarding increased sales is somewhat narrowed. For example with 0 % of substitute buying as in Figure 69, the break-even point between QR and Traditional sourcing in terms of purchase price difference is 39.5 %. If substitute buying is assumed to be 20%, then the break even point would be at 37.5 % price difference and with 40 % of substitute buying the strategies would break even at 35.5 % price difference.

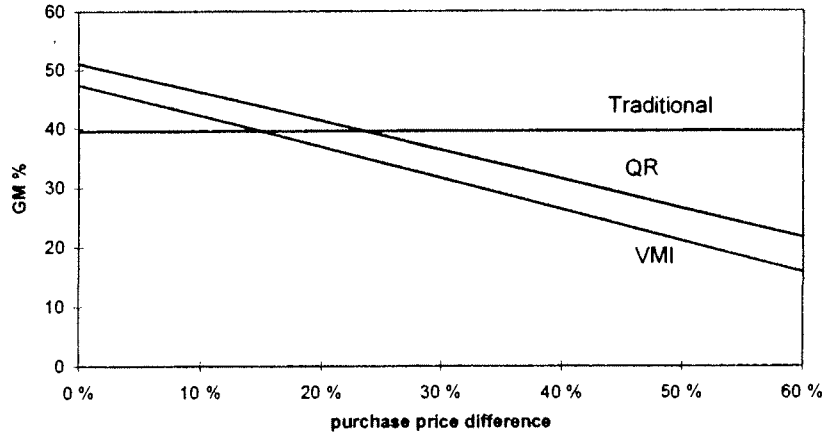


Figure 70. GM percentage break-even between different sourcing strategies

The purchase price difference does not affect stockturns, when it is measured, as throughout the whole study, as the ratio of sales and inventory at sales price.

Therefore, comparisons regarding purchase price difference are not measured by stockturn. The sourcing strategies when compared with GMROI-R show that the price difference must be quite a big one before the Traditional strategy is more profitable than QR or VMI.

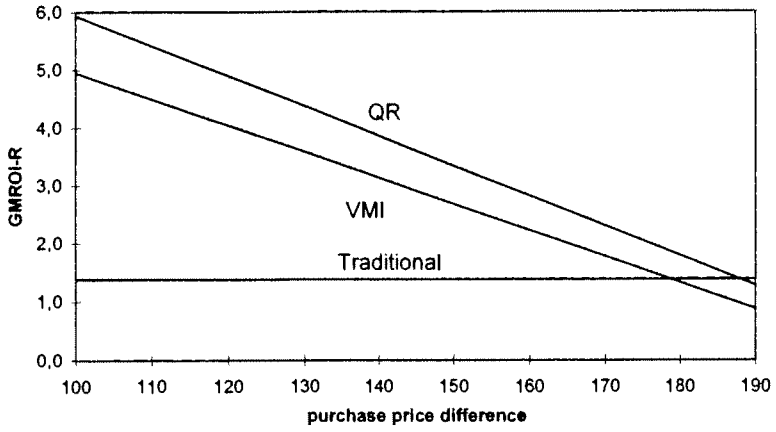


Figure 71. Comparisons of the three sourcing strategies in terms of GMROI-R

		Purchase price difference between offshore and local sources						
	E	0 %	10 %	20 %	30 %	40 %	50 %	60 %
GM $								
• QR	5 %	161	145	130	115	99	84	68
• VMI	10 %	139	124	108	93	77	62	47
• Traditional	20 %	100	100	100	100	100	100	100
GM %								
• QR	5 %	51	46	41	36	32	27	22
• VMI	10 %	47	42	37	32	26	21	16
• Traditional	20 %	40	40	40	40	40	40	40
GMROI-R								
• QR	5 %	5.9	5.4	4.9	4.4	3.9	3.3	2.8
• VMI	10 %	5.0	4.5	4.0	3.6	3.1	2.7	2.2
• Traditional	20 %	1.4	1.4	1.4	1.4	1.4	1.4	1.4

Table 20. Comparison of QR, VMI and Traditional sourcing strategies at various purchase price differences when forecast error with QR is 5 %, VMI 10% and Traditional sourcing 20 %

The impact of each sourcing strategy on retail performance can be analyzed by different measures. Stockturns and GMROI-R measure productivity in relation to inventory value. Gross margin percentage when calculated as in the above analysis measure the relative profitability. The most important measure, however, is the number of GM dollars earned by each sourcing strategy.

The results of the break-even analysis can be summarized as follows:

1. When using various measures, QR and Traditional sourcing strategies break even at the following purchase price differences, when z is the percentage of customers buying substituting products in case of stockout:

	Purchase price difference %
GM $ earnings (z = 0%)	39.5 %
GM $ earnings (z = 20%)	37.5 %
GM $ earnings (z = 40%)	35.5 %
GM %	23.0 %
GMROI-R	88.0 %

2. When using various measures, VMI and Traditional sourcing strategies break even at the following purchase price differences:

	Purchase price difference %
GM $ earnings (z = 0%)	25.5 %
GM $ earnings (z = 20%)	24.0 %
GM $ earnings (z = 40%)	23.0 %
GM %	15.0 %
GMROI-R	78.0 %

2. Testing the Hypotheses

The purpose of this chapter is to test the validity of the hypotheses and to present conclusions on the basis of findings from the case studies. The data collected from the case study firms were used as a guideline rather than as exact values. The equations of the model were developed on a theoretical basis and they can be universally used for analyzing sourcing strategies in retailing seasonal fashion products.

2.1. Critical Success Factors

Hypothesis 1

> *Retail performance depends on the accuracy of demand forecast used in connection with the product buying plan. Reduction of forecast error improves the rate of stockturn, gross margin and gross margin return on the inventory.*

The total error associated with forecasting style, color and size distribution was estimated by the case study firms to vary between ±20% and ±40% for up-front buying and between ±5% and ±20% for replenishment buying. The impact of forecast error variance on success measures was tested by the equations presented in the Model Outline chapter of Section III.

According to the findings, stockturn is a function of the total number of units sold, service level, the number of different SKUs in the range, DC lead time, the number of clearances per year and the number of seasons per year. Stockturn is calculated in this research by dividing the total sales by average inventory at retail prices. The inventory consists of in-store inventory, DC inventory and the inventory of unsold goods from previous seasons stored for the next clearance. Forecast error affects in-store inventory and clearance inventory. When they grow as a result of increased forecast error, stockturn is slowed down. Variation of the other variables has an impact on stockturn, but none of them, when given realistic values, reverses the trend.

No. of seasons	Forecast error					
	0 %	10 %	20 %	30 %	40 %	50 %
5	4.4	3.7	3.1	2.8	2.4	2.2

Table 21. Stockturn as a function of forecast error

Gross Margin percentage and Gross Margin dollars are both reduced through mark-down prices. The average mark-down used by the case study firms is 49 % during the clearance. The variable in the equation for calculating GM is the mark-up factor that does not affect the shape of the curves for GM or GMROI-R.

Mark down %	Forecast error					
	0 %	10 %	20 %	30 %	40 %	50 %
49 %	54,5	52,2	49,6	46,7	43,5	39,8

Table 22. GM as a function of forecast error

In the equation for calculating GMROI-R the variables are mark-up factor, average mark-down percentage, service level, ratio of SKUs in the range to total sales, number of sale periods and the percentage of consumer who buy substituting products in cases of stockouts. Variation of these variables change the shape of the curve but not the fact that when forecast error increases, GMROI-R decreases.

No. of seasons	Forecast error					
	0 %	10 %	20 %	30 %	40 %	50 %
5	2,8	2,1	1,6	1,2	0,9	0,7

Table 23. GMROI-R as a function of forecast error

Stockouts and lost sales caused by negative forecast error are considered as lost potential since their impact cannot be seen on the corporate profit and loss statement. None of the case study firms estimate lost sales, although they are quite aware of its impact on GM and GMROI-R. The percent of sales lost due to stockout depends on what proportion of customers select and buy a substituting product.

Customers buying a substitute	Forecast error					
	0 %	10 %	20 %	30 %	40 %	50 %
40 %	0 %	6 %	12 %	18 %	24 %	30 %

Table 24. Percent of sales lost due to stockouts caused by forecast error assuming that 40 % of customers buy a substituting product

All the measures used in the analysis support the conclusion that improving forecast accuracy increases the profitability of the company, even when considering the variation of variables used in the equations.

Hypothesis 2

> *The first buying plan is done seven to eight months prior to the selling season. The information used as basis for season's demand forecast increases in quality and quantity towards the start of the selling season, and therefore long lead time reduces forecast accuracy and retail performance.*

The accumulation of information for demand forecast between the first buying plan and the start of the season cannot be measured accurately. Instead, one has to rely on estimates and opinions from professional buyers. The forecast for the coming season is based on actual sales statistics from the previous season and on prognoses and forecasts regarding fashion trends for the coming seasons. During the case studies the buyers were asked about this and they confirmed that fairly little information regarding coming season's demand is available seven to eight months prior to the season when the first buying plan is done. Later, through fashion shows and other contacts, this information increases.

As presented in table 10, the estimate for relative availability of forecast information at first buying plan stage is 18 % on average, increasing to 58 % when firm orders are given to suppliers five to six months before the start of the selling season. After that the forecast information regarding seasonal demand increases only little, until a quarter of the selling season has passed. According to the buyer's estimate, 78 % of information in relation to the final outcome is available at this stage. The reason for the nonlinear accumulation of information seems to be that from the time of issuing firm orders to the start of the selling season very little happens in terms of contacts to fabric suppliers, fashion shows, etc., which are the main sources of information.

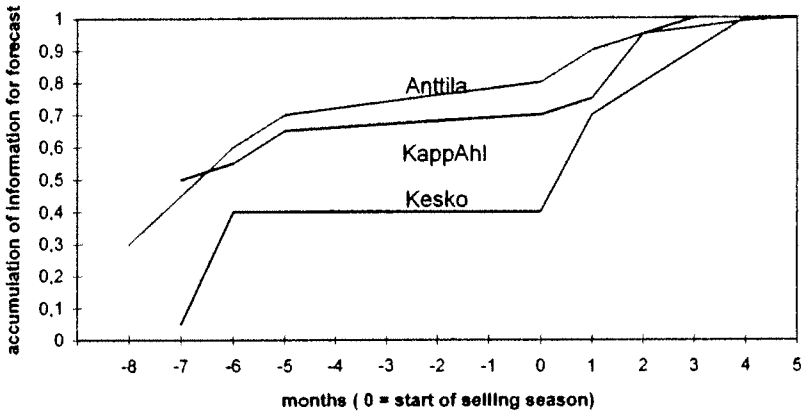


Figure 72. Accumulation of information for a season's demand forecast

The forecast accuracy can be assumed to develop in line with the increase of information. Forecasts based on information available seven to eight months prior to the season are less accurate than forecasts made later. The total process consists of buying, production and distribution center stages before the goods enter the stores. These sourcing and merchandising processes are described for each case study firm in Section IV. Buying and production lead times affect forecast error but do not directly affect inventory levels as the goods are not yet the property of the retailer. Distribution center lead time affects the level of inventory directly and has an impact on stockturn and GMROI-R. As presented in the analysis in table 12, the rate of stockturn increases from 3.1 to 3.9 if DC lead time is reduced from four weeks to one week.

Operating with long lead time requires planning purchases early and to be committed to orders at early stage. As result, forecast accuracy is low. The shorter the lead time the better the forecast accuracy. However, it seems that fairly little can be gained by reducing the lead time from the firm order stage to the start of the season. Instead, using the POS information when a quarter of the season has been sold would increase the forecast accuracy considerably.

Based on above arguments it can be concluded that long lead time reduces forecast accuracy. Reduction of lead time reduces forecast error which in turn, as argued with hypothesis 1, improves retail performance and company profitability.

Hypothesis 3

> *Up-front buying with deliveries prior to the selling season is less profitable compared to mixing up-front and in-season replenishment deliveries, especially when POS information is used for improving forecast accuracy.*

According to the estimates by the case study firms the forecast error for in-season replenishment buying is considerably lower compared to up-front purchasing. As already discussed with hypothesis 1, the reduction of forecast error improves company profitability.

All the three case study firms buy 80% to 90% of their volume up-front. Their reasons for this are both economic and practical. Buying up-front with a long lead time makes offshore sourcing possible. Offshore prices are much lower than the local ones. On the other hand there are very few local suppliers that reliably offer deliveries on such a short lead time that in-season replenishment buying is possible.

In-season replenishment buying means shorter production runs. The minimum order sizes requested by offshore suppliers vary between 2,000 and 6,000 pieces per style and color, depending on material consumption. Replenishment orders, if done weekly, may be less than 100 pieces per style and color. In order to cope with such small orders and with very short delivery times, special capabilities are required from the supplier. First of all, the manufacturer must have free capacity for replenishment orders. Secondly, the materials must be available at a very short notice. The third point is that the garment supplier must have an extremely flexible production system which usually means modular production instead of long production lines.

In order to minimize the risks of failing with deliveries, the in-season replenishment orders, when made systematically, are only possible under manufacturer / retailer partnership agreements which cover at least the following items:

1. Open-to-buy (OTB) capacity agreement, meaning that the retailer and the manufacturer agree how much capacity is left open for in-season replenishment orders.
2. Materials are either bought beforehand on a basis of mutual agreement or a weaving mill is included in the agreement for quick deliveries.
3. The principle delivery times for replenishment orders are agreed and they are conditional and subject to keeping within the OTB capacity agreement and the availability of materials as agreed in point 2.

Three replenishments per season	Up-front buying			
	20%	40%	60%	80%
Stockturn	3.2	2.8	2.1	1.5
GMROI-R	1.5	1.3	0.9	0.6

Table 25. Stockturn and GMROI-R as a function of up-front buying calculated with three replenishments per seasons

The conclusion is that as the forecast error is lower with replenishment buying than with up-front buying, productivity, when measured by stockturn and GMROI-R, increases as the proportion of replenishment buying grows.

Hypothesis 4

Offshore sourcing is more profitable than local sourcing because of lower purchase prices.

The landed price difference between offshore and local sources is estimated to vary between 30 % and 50 %. Despite the higher freight costs, custom duties and in many cases quota charges, the landed cost in Europe is still lower compared to European prices. This is the main and perhaps the only reason why apparel products are sourced from offshore in such a big volume.

The advantage that local sourcing has is shorter lead time and therefore higher forecast accuracy and the possibility of in-season replenishment orders. This means lower forecast error. The average estimate for forecast error in offshore sourcing was ±20% while in local sourcing the forecast error is estimated at ±12%.

The case study analysis showed that GM varied as a function of the price difference between offshore and local sources. If the price difference is less than 14 %, a higher gross margin percentage is achieved by increasing the proportion of local sourcing, when using Traditional sourcing strategy. With a price difference above this break-even point, a higher proportion of offshore sourcing results in a higher GM.

The impact of the offshore/local sourcing ratio on lost sales is that the higher the local sourcing the lower the sales lost. This is primarily due to the fact that forecast error is lower with local sourcing. When considering that local sourcing makes replenishment buying possible, the impact on GMROI-R was found to depend on the number of replenishments used in local sourcing. With a 40 % price difference and with four replenishment orders local sourcing is more profitable when measured by GMROI-R. If the number of replenishments declines, offshore sourcing becomes more profitable.

In Section I .4, "Limitations", one of the limitations of the research was that the focus of the study will be retailer-labeled goods, where the full scope of forecasting, including design and colors, is solely in the hands of the retailer. With supplier label collections the design is a given factor and the retailer only makes a 'purchase or no'-decision.

As discussed earlier, the information regarding fashion trends, colors and styles is obtained from different sources during the buying process. One source can be the supplier. Within private label buying, the garment manufacturer contributes to the design know-how by selecting materials and suggesting styles and products for the collection. Private label supplier partners can be found in Europe. Offshore manufacturers usually sell production capacity only and have nothing to offer in terms of design. The buyers interviewed at the case study firms could not estimate the scale of the impact of this on forecast accuracy, except that such firms form one of the main sources for this information.

The variables in the equation are mark-up factor, proportion of consumers buying substitute products, forecast error and average mark-down percentage. The outcome was tested by giving the variables different values within the variance of case study data. With a higher mark-up factor a slightly higher price difference is needed in order to break even. The lower the proportion of consumers selecting a substituting product in case of stockout, the higher the price difference required for offshore sourcing to be more profitable. And, if the forecast error difference between offshore and local sourcing grows, a higher price difference is again required for break-even.

Price difference: 40 % Replenishments: 3	Proportion sourced offshore			
	20 %	40 %	60 %	80 %
GM %	37	40	42	45
Lost sales %	9	11	12	14
GMROI-R	1.1	1.0	0.8	0.6

Table 26. GM, lost sales and GMROI-R as a function of the ratio of offshore / local sourcing with a 40 % price difference and three replenishments during the season

Offshore sourcing is more profitable when buying decisions are made traditionally on the basis of demand forecasts without in-season replenishments. This, however, is conditional and subject to having an adequate purchase price difference between offshore and local sources. The price difference of 30 % to 50 % as suggested by the case study firms would be adequate in most cases. However, local sourcing makes it possible to use in-season replenishments and due to lower forecast error and reduction of inventories, local sourcing is more profitable when measured by GMROI-R if at least three replenishments are done during the season.

The conclusion regarding the fourth hypothesis is that with traditional sourcing strategy hypothesis 4 can be supported and offshore sourcing is more profitable. But, by using replenishment ordering, local sourcing becomes more profitable providing that at least three replenishments are ordered during the season and the purchase price difference is reasonable. Besides the impact that the shorter lead time has on forecast accuracy, the local suppliers can provide additional information for forecasting seasonal demand and in this way they can contribute more to retail profitability in comparison to offshore suppliers.

2.2. Sourcing and merchandising policies

Hypothesis 5

> *Traditionally there are two selling seasons per year: spring and autumn. Retail performance can be improved by increasing the number of selling seasons per year, providing that sourcing decisions and product deliveries are made separately for each season.*

The in-store inventories are automatically reduced when selling seasons per year are increased. The retail performance measured by stockturn and GMROI-R will be higher since in the equations for calculating stockturns and GMROI-R the average inventory consists of in-store inventory, DC inventory and inventory for clearance. With several selling seasons the impact of forecast error is also reduced as smaller quantities are purchased at a time.

Regarding the number of selling seasons per year the conclusion is that under all circumstances retail performance is improved when the number of selling seasons is increased, providing that purchases and deliveries are done separately for each season.

Increasing the number of selling seasons also means smaller orders. For a small scale retail operation this could have a negative effect as unit prices would go up. But for a

multi-shop chain which is buying for 100 or 200 shops, this would hardly be a problem as the orders will still be big enough.

Hypothesis 6

> *The target for purchase volume may be set higher or lower than the expected demand resulting in over-buying or under-buying. Over-bought products will be cleared through clearance. Under-buying causes stockouts and lost sales. In order to avoid stockouts and lost sales, over-buying is more profitable than buying according to forecasted demand volume.*

Over-buying shifts the mean of the demand distribution above the buyer's estimate. The demand forecast in garment retailing follows a distribution which is defined by its mean and error deviation (Fisher, Hammond, Obermeyer, Raman, 1994). As a result, the volume of stockouts will be reduced. At the same time, of course, due to over-buying, more products are left over for clearance.

The case study firms mark down the prices by 49 % on average during the discount sale period. This means that very little if any gross margin is earned by selling normally priced goods at sale. But, on the other hand, if the forecast error is 20 % and the season is over-bought by, for example, 15 % , then with the deviation of forecast error, there are likely to be fewer stockouts and lost sales. When combining the effects of stockouts and mark-down sales, one can conclude that over-buying the season slightly is more profitable than under-buying or buying according to the forecast because stockouts and lost sales are reduced.

The findings from the case studies and analysis support hypothesis 6, as long as over-buying is modest. The conclusion is that over-buying the season slightly is more profitable than buying according to the demand forecast.

Hypothesis 7

> *High service level, i.e. the proportion of different SKUs in the seasonal assortment available in store throughout the season, is profitable, especially if the percentage of consumers expected to buy substituting products in case of stockouts is low.*

The service level has an impact on the level of in-store inventory as, in the equation used in the model, the in-store inventory is calculated partly by multiplying the number of different SKUs in the seasonal range by the service level. If the service level is reduced the in-store inventory is also reduced, but as found in the case study analysis, the impact on stockturn is very limited.

Low service level causes stockouts and lost sales. The impact of lost sales on GM as function of service level and the proportion of consumers buying substituting products was analyzed and it was found that the loss of GM increases when the service level and proportion of consumers buying substituting products goes down.

Portion of customers buying substitutes	Service level					
	100 %	90 %	80 %	70 %	60 %	50 %
0 %	100 %	90 %	80 %	70 %	60 %	50 %
20 %	100 %	92 %	84 %	76 %	68 %	60 %
50 %	100 %	95 %	90 %	85 %	80 %	75 %

Table 27. Proportion of GM lost as a function of service level and percentage of customers buying substitutes

The analysis support hypothesis 7 and the conclusion is that increasing the service level improves retail performance.

2.3. Sourcing Strategies

Hypothesis 8

> *Quick Response and Vendor Managed Inventory strategies yield better retail performance than up-front buying from low-cost offshore sources when purchase price difference is reasonable.*

As none of the case study firms uses QR or VMI strategies the effectiveness of these strategies had to be analyzed theoretically but still by using data from the case study firms in order to ensure the validity of the analysis. Traditional up-front buying was compared to QR and VMI strategies within which the selling season is started with small scale initial up-front supply followed by weekly replenishments.

According to research by King and Hunter, it is possible to achieve 95 % forecast accuracy with QR strategy and 90 % accuracy when using VMI strategy (King, Hunter, 1997). This affects inventories as the excess amount of goods purchased due to forecast error is smaller compared to traditional sourcing. In QR and VMI goods

are shipped store-ready directly to stores, eliminating DC inventory completely. The season is further broken down into weekly deliveries, lowering the in-store inventories.

When measured by stockturns and GMROI-R, QR and VMI are superior strategies in comparison to Traditional offshore sourcing, even when local prices are 40 % higher than offshore. This is due to much lower inventories carried by these strategies. Forecast error causes both lost sales and loss of GM dollars due to clearances. The strategies were compared by measuring their ability to produce GM dollars in relation to purchase price difference. GM percentage was also used as a measure. The forecast error difference between QR and Traditional sourcing is assumed to be 15 %, meaning that with the same store traffic 15 % more goods could be sold when operating with QR. At the same time the number of GM dollars lost through mark-downs would be lower.

It was found by break-even analysis using the average case study company variables that QR strategy is more profitable than Traditional offshore sourcing as long as purchase price difference is below 39.5 %. The case study companies estimated that on average the price difference is 40 %. A higher GM percentage is achieved by Traditional offshore strategy if the price difference is more than 23 %. When measuring by GMROI-R, the break-even point regarding price difference is at 88 %.

The corresponding break-even point regarding price differences between VMI and Traditional sourcing is 25.5 % when measured by GM dollar earnings, 15 % measured by GM % and 78 % when measured by GMROI-R.

In strategy comparisons the most important measure is the amount of GM dollar earnings. The conclusion is that according to this measure hypothesis 8 is supported by the analysis, on the condition that the purchase price difference between offshore and local sources does not exceed 39.5 % in case of QR and 25.5 % in case of VMI. However, as discussed earlier, use of such sourcing strategies is possible only if supplier partners who can reliably offer such services can be found.

2.4. Success Measures

Hypothesis 9

> *GMROI-R indicates the relationship between gross margin and inventory value at retail price and measures the utilization of key resources at a retail level better than Gross Margin.*

Gross margin is calculated as a ratio of gross margin dollars to turnover. The equation does not consider the impact of lead times, forecast errors, mark-down percentage or

lost sales which have an essential impact on retail performance, as the findings of this research show. It can be a misleading measure if used alone as a tool for guiding sourcing decisions as it does not predict what the final gross margin shall be. The cheapest price is not necessarily the key to profitable operation.

GMROI-R combines margin management and inventory management. It allows the retailer to evaluate the inventory according to the return on investment and not just by gross margin percentage (Stern, El-Ansary, 1992). It is calculated as a ratio of gross margin dollars to the average retail value of inventory, indicating the relationship between gross margin and stock turnover. The equation for calculating GMROI-R considers lead times, forecast errors, mark-down percentage, lost sales and even the number of seasons, i.e. all key areas that have an impact on retail performance. GMROI-R is a meaningful measure of performance for buyers measuring how well the major assets, i.e. merchandising inventories, under the buyer's control generate gross profit dollars (McGoldrick, 1992). McGoldrick points out though that GMROI does not accommodate the full complexity of retail cost structure. It especially does not take into account financial aspects, such as the cost of financing consumer credit or the costs connected to terms of payment regarding product purchases.

The costs of financing consumer credit are not connected to sourcing strategies and therefore, in the context of this study, these costs can be ignored. The case study firms buy on Letter of Credit, CAD and credit terms. As discussed earlier, the charges and costs in connection with L/C are insignificant in comparison to the total sales value. No financing costs exist with CAD and credit terms. Capital costs created by the inventory are not directly accounted for but as GMROI relates the gross margin dollars to the inventory value, the cost effect of the inventory is accounted for. Sourcing management costs, for example the cost of offshore sourcing office, is not considered by GMROI. This can, however, be overcome if the sourcing office is a separate company and the costs of sourcing services are included in the purchase price and not as a fixed cost to the retailer. Based on these arguments, it can be concluded that GMROI-R is a practical tool for analyzing retail performance when sourcing decisions are made. In conclusion, compared to Gross Margin, GMROI-R reflects the retail performance more thoroughly and considers a much wider range of variables affecting retail success, which supports hypothesis 9.

Hypothesis 10

> *Sell-through percentage, mark-down ratio and joboff percentage measure how successfully the demand was forecast.*

Sell-through percentage is the proportion of all goods sold at the original mark-up. According to the model, goods end up in mark-down sales as result of forecast error. With a very accurate demand forecast, goods purchased will be sold at the original price and sell-through percentage is high. The mark-down ratio is the proportion of all goods sold at marked down prices including those that could not be sold at all and

had to be jobbed off. Goods are purchased on the basis of the demand forecast. How well the demand and the products offered in the store match is reflected by sell-through percentage, mark-down ratio and joboff percentage.

This supports hypothesis 10 and it can be concluded that the accuracy of demand forecast is reflected by sell-through percentage, mark-down ratio and joboff percentage.

Hypothesis 11

> *Customer service level, service level and lost sales indicate the success of sourcing but they are theoretical measures and can be used only in the planning and selecting of sourcing strategies.*

Customer service level, when calculated as the percentage of times a customer finds his or her first-choice stock keeping unit when shopping, indicates the success of sourcing well. So does lost sales which is calculated as the percentage of customers not finding their first choice or not finding any substitute product either. But, these measures are complicated to calculate. First, a large number of customers entering the store may be browsing without having any intention to buy a particular product. Secondly, without asking the customer, there is no way to determine when sales actually was lost. The only way to determine these measures is to carry out in-store customer interviews.

Service level used in this research is calculated as percentage of SKUs in the seasonal range available throughout the whole season. Lost sales result from forecast error according to which a certain percentage of SKUs required by demand were not sourced and stockouts occur, creating lost sales. Also, in this case lost sales depends on the percentage of customers selecting a substituting product.

The model and equations used in this research support hypothesis 11. Service level and lost sales are an integral part of the model used for evaluation of retail performance. The conclusion is that they are needed for planning sourcing strategies and when making buying decisions, but their values can be determined only by specific market study.

3. Final Model

The purpose of this chapter is first to summarize the findings of the case study analysis and to discuss what modifications need to be made to the tentative model, and secondly to present the final model for analyzing sourcing strategies and measuring retail performance. The main contribution of this research is definition of the critical success factors and success measures, and a model for analyzing retail performance when comparing sourcing strategies for seasonal fashion products. The final model consists of a process flow chart, critical success factors and their relation to each other, success measures, and equations for calculating the main measures.

3.1. Critical Success Factors

The tentative model contains four critical success factors, i.e. forecast accuracy, process lead time, offshore / local sourcing mix and up-front / replenishment buying mix. The various analyses of this research confirm that these are the main critical success factors and they are closely related to each other.

3.1.1. Forecast Accuracy

The analysis of various variables within the case study data confirmed that forecast accuracy is one of the main critical success factors in apparel sourcing and merchandising. Purchase decisions are made five to six months prior to the selling season when buying up-front. The buyer's plan is based on the demand forecast. Forecast errors follow a deviation, with the buyer's estimate being the mean of the demand distribution. As a result of forecast error some SKUs bought cannot be sold at the original price and they have to be sold through clearance or jobbed off. At the same time, negative error causes stockouts and lost sales. Forecast error has a powerful impact on retail performance.

3.1.2. Process Lead Time

Lead time is the main reason for forecast error as buying decisions must be made well ahead of the selling season. An offshore and up-front buying strategy means a long lead time. Due to lead times, inventories in the distribution center and in the stores grow, reducing inventory turns and GMROI-R.

The case study firms estimated how information regarding the season's demand increases from the point of making the first buying plan to the start of the season. According to the buyers, the information increases relatively little from the issue of firm orders to the start of the selling season. But once the first quarter of the selling season is done the outcome of the whole season can be forecast quite accurately. This suggests that reducing the long lead time in traditional sourcing by a couple of months

does not improve the forecast accuracy significantly. Instead, if replenishment ordering can be used during the season, the forecast accuracy will be greatly improved.

3.1.3. Offshore / Local Sourcing Mix

Offshore sourcing means attractive purchase prices but long lead times and goods are usually delivered in one shipment prior to the selling season. With local sourcing it is possible to operate on a much shorter planning range, carry out in-season replenishment buying and even utilize such sourcing strategies as QR, VMI and ECR. It was found out that offshore sourcing is more profitable than QR and VMI only with a considerable purchase price difference. Retail performance and profitability depend largely on correct sourcing mix.

3.1.4. Up-Front / Replenishment Buying Mix

Due to the long lead time, buying up-front is usually the only way to carry out offshore sourcing. In-season replenishment buying requires very short delivery times and therefore local, or at least European suppliers are used. Use of POS information for replenishment buying improves forecast accuracy as forecast error is higher with up-front buying.

3.2. Success Measures

The outline for success measures suggests using service level and lost sales as theoretical measures and gross margin, GMROI, GMROS, GMROL, stockturn, sell-through percentage, mark-down percentage and joboff percentage as practical measures when analyzing retail performance. All these measures were tested in the case data analysis part of this research except GMROS and GMROL, which are useful measures for retail performance but do not directly reflect the success of sourcing decisions. Also, for reasons explained earlier, GMROI-R was selected instead of GMROI. Sell-through percentage, mark-down percentage and joboff percentage were combined into mark-down rate, which is the percentage of total sales volume sold at different mark-down prices. Further, the average mark-down percentage, which also includes joboff percentage, was used.

3.2.1. Potentiality Measures

The findings of the analysis are that service level, lost sales and product substitute percentage are useful measures for planning retail success but, as they indicate the potential that is lost due to planning errors, they will be called potentiality measures in the final model.

Service Level

The SKU range bought for a season is the number of different products counted on a style, color and size level. Service level is the percentage of different SKUs available throughout the selling season. The impact of service level is not straightforward as there are customers who buy an alternative product in case of stockout. Nevertheless, service level is a useful tool and it is included in the equations of the tentative model.

Lost Sales

Lost sales is the result of stockout. Stockouts occur when, due to forecast error, the inventory does not correspond to actual demand. Lost sales is a speculative measure as it cannot be computed from the company's profit and loss statement. But it is a necessary tool for analyzing the success potential between various sourcing concepts.

Product Substitute Percentage

Another speculative measure that had to be included in the analysis is the percentage of consumers who in case of stockout select a substituting product. In-store customer interviews are the only way to determine any value for the substitute percentage.

3.2.2. Practical Measures

Gross Margin

Gross margin percentage and gross margin dollars were both used in the analysis. GM is a simple and useful measure for retail performance. Its shortcomings are in the area of inventories and capital turnover which are not considered.

Stockturn

Rate of stockturn reflects the success of sourcing well as it ties together purchase volumes and inventories indicating how efficiently the total material flow is organized.

GMROI-R

Gross margin return on inventory at retail price, i.e. GM divided by average inventory value indicates the relationship between gross margin and inventory turnover, and in this way reflects the retail performance as result of successful sourcing well.

Mark-Down Rate

Mark-down rate is the percentage of all goods sold at mark-down or joboff prices. This measure is a practical tool for analyzing the results of the season and can be easily calculated. For planning purposes it is not used in this model as the share of mark-down sales is determined by forecast error.

3.3. Final Model

The final model consists of:

Process flow chart	Figure 73
Critical success factors	Figure 74
Success Measures	Figure 75
Equations for analysis	Figure 76

Table 28. Contents of the final model

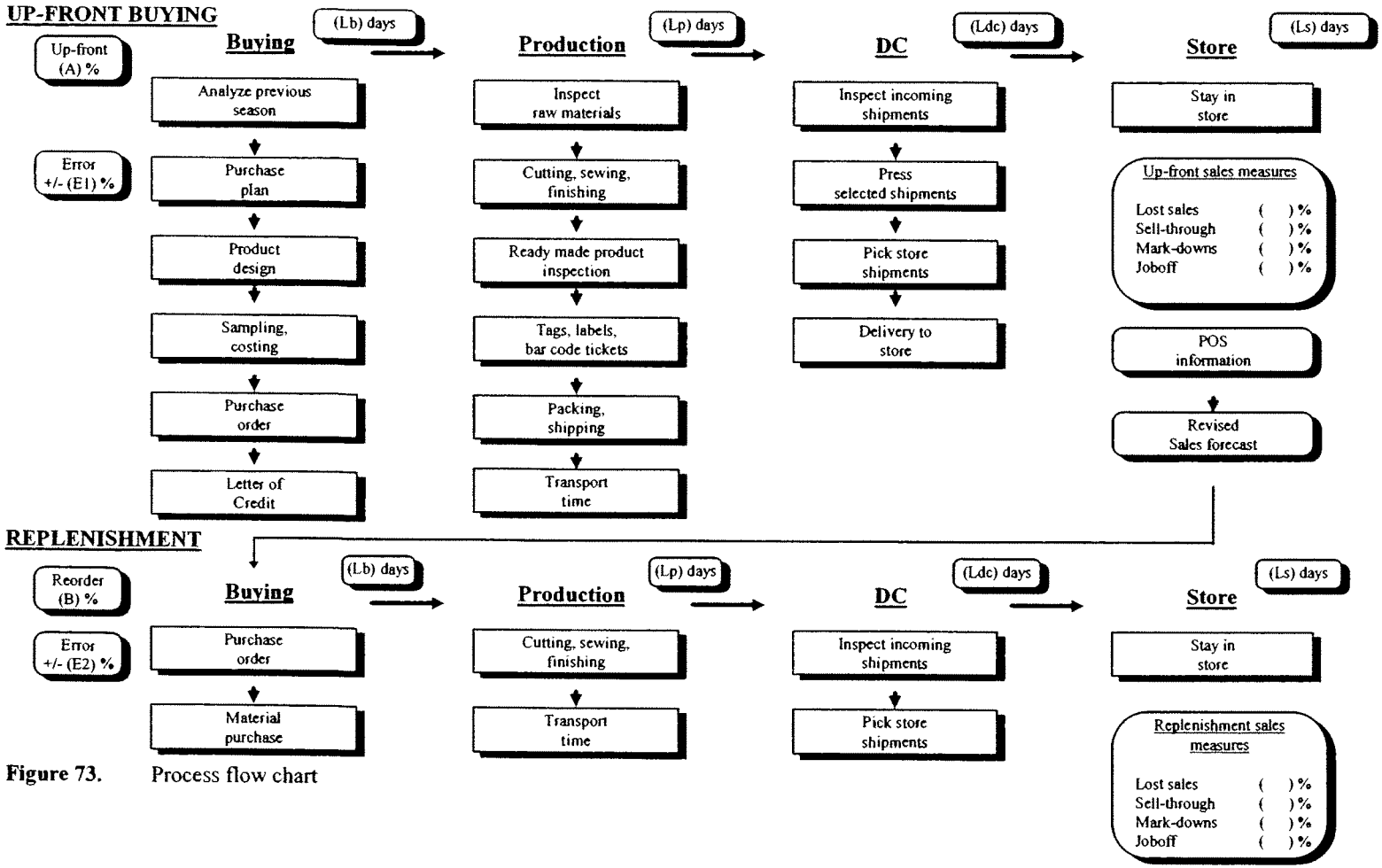


Figure 73. Process flow chart

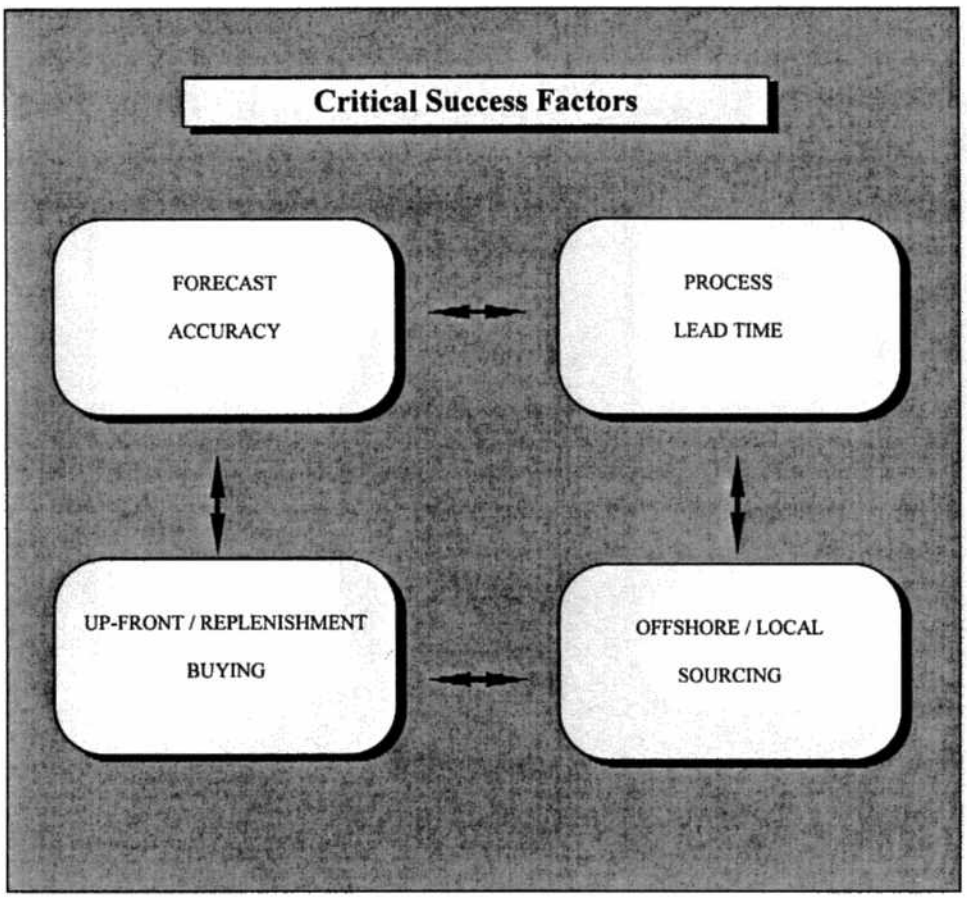


Figure 74. Critical success factors regarding the sourcing of seasonal fashion products

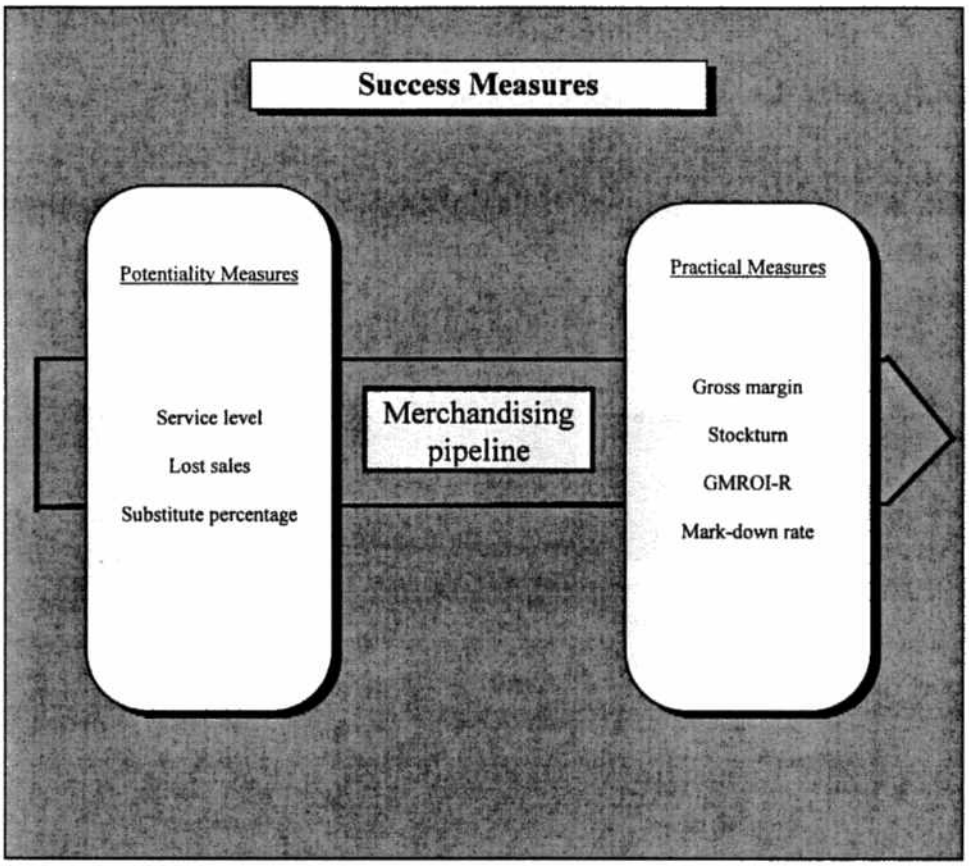


Figure 75. Success measures in connection with sourcing strategies

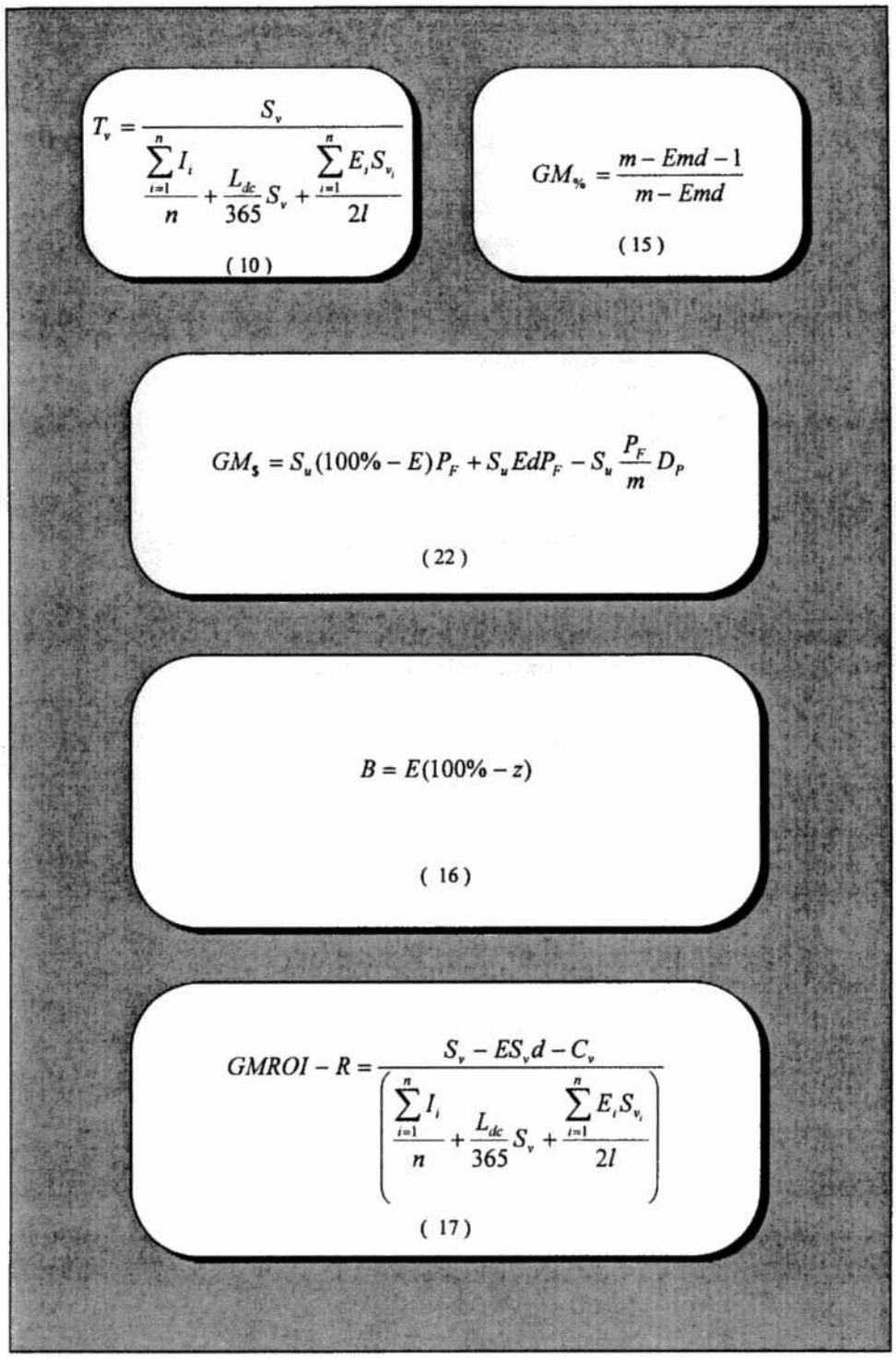


Figure 76. Equations for analysis

Symbols used in equations:

T_u = Stockturn in units
S_u = Sales in units
I_n = Selling season's average inventory
L_{dc} = Distribution center lead time
E_n = Season's forecast error
l = Number of bargain sale periods per year
m = Mark-up factor
d = Average mark-down percentage
S_v = Sales in value
B = Lost sales
C_v = Cost of goods sold
z = Proportion of customers buying substituting product
P_F = First unit price
D_P = Price difference between offshore and local sources

When comparing QR, VMI and Traditional sourcing strategies,

$$S_u(QR) = S_u \frac{E_{trad}}{E_{QR}}$$

and

$$S_u(VMI) = S_u \frac{E_{trad}}{E_{VMI}}$$

SECTION VI - CONCLUSIONS

1. Summary

This sections summarizes the findings of this research and draws conclusions from the findings. The objective of the research was to define the critical success factors and find out what measures should be used for measuring retail success with special reference to sourcing and merchandising seasonal fashion products. The contribution of this research is a model for verifying alternative sourcing strategies and policies. By using case study data the model was tested in order to find out the impact of various variables on retail performance.

1.1. Critical Success Factors

The critical success factors in connection with sourcing seasonal products with a fashion content are as follows:

- Forecast accuracy
- Process lead time
- Offshore / local sourcing mix
- Up-front / replenishment buying mix.

The accuracy of demand forecast is a fundamental success factor since a majority of merchandise is bought with a long lead time on the basis of the buyer's plan. The plan is made seven to eight months prior to the start of the selling season. The forecast error is a combination of volume error and assortment error. The total error rather than the distribution of forecast error over each individual style, color and size was considered in the analysis in this research. In earlier research it has been found that the apparel demand follows a distribution with positive and negative deviation from the buyer's plan. The error can be expressed for example as ±20%, meaning that on average 20 % more SKUs were bought than sold and at the same time on average there was a 20 % stockout. Goods overbought will be discounted and sold during the season or sold later through clearance. Sales at mark-down price lower gross margin and profitability. Negative forecast error causes stockouts and lost sales as the customers cannot find their preference in color, size or style.

Forecast accuracy depends on lead time. When making the first buying plan, very little information is available regarding the demand during the coming season. More information is obtained closer to the selling season, and 25 % through the sales period the final outcome of sales can already be quite accurately predicted. Reducing lead times improves forecast accuracy, especially if in-season POS data can be used for improving forecast accuracy in connection with replenishment buying. Distribution centers are used for collecting individual shipments together and sometimes for finishing products before they are sent to the stores. By buying the goods store-ready

with direct-to-store shipments DC lead time can be reduced or eliminated totally. Special mark-down sales are organized for example twice a year. Goods unsold due to forecast error are stored and they have to wait for the next clearance. Lead times increase inventories and slow down stockturns.

An offshore / local sourcing mix, where offshore sourcing with attractive prices but long lead times competes with local sourcing with quick deliveries but higher prices, is a strategic decision for the retailer. When analyzed by GM percentage, offshore strategy seems to be more profitable, simply because the cost of sales is lower. The margin at the end of the season is, however, reduced by mark-down sales, joboff costs and inventory carrying costs, which are not accounted for when using GM as a planning measure. GMROI-R considers the impact of the inventory and in this way is a better measure in this case. The findings of the analysis show that a certain purchase price difference must exist between the alternative sources before offshore buying is more profitable.

What up-front / replenishment buying mix can be used depends largely on the offshore / local sourcing mix. Offshore sourcing normally requires up-front buying due to long delivery time. Replenishment buying must be done from near-by sources as delivery times must be short. A major up-front buying share means slow stockturn and low profitability when measured by GMROI. Also forecast error will be higher causing lost sales and mark-down sales. Use of POS information for replenishment buying is possible if delivery times are short. This lowers forecast error and causes less stockouts and mark-down sales.

1.2. Measures of Success

The analyses in this study were carried out by using the following success measures:

- Service level
- Lost sales
- Product substitute percentage
- Gross margin
- Stockturn
- GMROI-R
- Mark-down rate

Service level, lost sales and product substitute percentage are called potentiality measures in this study, as they are used for measuring potential sales lost due to stockouts. These measures can only be used in planning as they cannot be defined directly from the books or accounts at the end of the season. The only way to benchmark these measures is to carry out customer interviews in stores.

Gross margin, stockturn, GMROI-R and mark-down rate are practical measures for analyzing different sourcing strategies at the planning stage and at the end of the season as well.

The range of different SKUs sold during one selling season consists of styles, colors and sizes. Service level indicates the percentage of the seasonal assortment that is available in store at SKU level. Service level varies from one style to another. Some sizes in one color may be sold out quickly while other styles, colors and sizes are left unsold. With up-front buying high service level is the result of high forecast accuracy. The more accurate the demand forecast, the higher the service level. By using in-season replenishment buying it is possible to correct forecast errors to a certain extent and buy those products that sell well.

Lost sales is caused by stockouts. With high forecast accuracy and high service level, lost sales can be minimized. The lost sales figure indicates what additional sales could potentially have been achieved if the inventory had corresponded with demand in a better way. Lost sales is another measure which is useful in planning but impossible to calculate afterwards due to complex consumer behavior. Firstly, no one knows, without asking, which customer is browsing and which one is looking for a particular product. Secondly, customers may select a substituting product when, for example, a size has run out. Nevertheless, lost sales helps to understand the potential achievable through a well selected sourcing strategy.

Gross margin percentage is perhaps the most commonly used measure in garment retailing and in business in general. But it is not a good tool in planning when, for example, sourcing decisions should be made. GM considers only selling price, purchase price and the effect of forecast error by estimating mark-downs but leaving out inventories. Other measures such as GMROI-R should be used together with GM.

The equation presented by this research for calculating stockturn includes the average inventory of the selling seasons, the inventory at the distribution center and the average inventory of unsold goods stored for clearance. The stock at the end of the season equals the number of different SKUs in the seasonal range multiplied by the service level plus the number of SKUs corresponding to the forecast error. The distribution center lead time is used for calculating the DC inventory. The average inventory of goods to be marked down is calculated as an average of goods accumulated for various selling seasons until a clearance sale is carried out. Stockturns is a measure of inventory management. The higher the stockturn the more efficiently the capital tied down in inventories is used.

Lost sales is a measure that indicates the sales potential achievable if no stockouts exist. Stockouts are caused by forecast error as products which are in demand were not bought. Forecast accuracy can be improved by reducing lead times and by using POS information as the basis for replenishment orders.

GM dollars are divided by the average annual at-cost inventory value in order to calculate GMROI, thus combining profitability and asset management. As GMROI does not indicate the relationship between gross margin and the retail value of inventory, GMROI-R was selected for this study. GMROI-R is calculated by dividing gross margin dollars by the retail value of the inventory.

Mark-down rate is the total percentage of goods sold at reduced prices including joboff. Mark-down rate depends directly on forecast error as goods not sold at the original price will be discounted.

1.3. Implications of Sourcing Variables

The number of selling seasons per year affects retail performance. With more than the traditional two seasons, purchases are divided over several seasons and, especially with up-front buying, inventories are reduced. Productivity, when measured by stockturns and GMROI-R, is improved when the number of selling seasons increases.

Service level, i.e. the proportion of original SKUs available throughout the selling season, affects lost sales percentage. The higher the service level, the lower lost sales caused by stockouts. High service level can be achieved if forecast accuracy is high or if the season is over-bought.

The number of SKUs in the original range of products obviously has an impact on sales. The range must have enough variety in order to attract customers. A wide range lowers stockturn but this variable can not be considered essential since the retailer does not, on practical level, have a choice as to whether to include only one type of SKU or thousands of different SKUs in the collection. The width of assortment kept available at stores is more a commercial question for creating store traffic and for attracting customers.

1.4. Successful Sourcing Strategies

The analyses in this study are based on case study data. The data collected from the three case study firms are not by any means statistically representative regarding the whole industry. The information was used as a guideline rather than as exact values. The model of this research was developed on a theoretical basis and the equations are universal and they can be used in different kinds of retailing environments as long as the business is seasonal and the products have a fashion content.

The main trade-offs in selecting a sourcing strategy are offshore or local sourcing and up-front or replenishment buying. Due to the lead times, replenishment buying is possible with local sourcing only, unless costly air freight is used. Offshore sources offer attractive prices, often 30% to 40% lower than European sources. Use of POS information as basis for demand forecasts is possible only with quick replenishment deliveries. The findings of this research can be summarized by saying that the following sourcing strategies and policies contribute to retail success of seasonal fashion products:

1. When buying all products up-front with deliveries prior to the selling season or when using up-front / replenishment buying mix with a very limited number of replenishment deliveries, offshore sourcing is more profitable than buying from local sources.

2. Up-front buying with deliveries prior to the selling season is less profitable compared to mixing up-front and in-season replenishment deliveries especially when POS information is used for improving forecast accuracy.

3. Quick Response and Vendor Managed Inventory strategies yield better retail performance than Traditional up-front buying from low-cost offshore sources providing that local purchase prices are less than 40% higher with QR and less than 23 % with VMI. The most successful strategy is QR when POS information is shared between the retailer and supplier making it possible to produce and deliver according to actual demand.

4. Retail performance can be improved by increasing the number of annual selling seasons, providing that sourcing decisions and product deliveries are made separately for each season.

5. Buying the merchandise store-ready with direct-to-store shipments improves profitability as the distribution center inventory is eliminated.

6. Over-buying the season slightly is more profitable than buying according to forecasted demand volume, as some of the stockouts and lost sales caused by forecast error can be eliminated. Large scale over-buying is not profitable as the average mark-down percent is so high that hardly any gross margin can be earned during discount sale.

7. The ratio of different SKUs available at store to the total number of SKUs sold is around 6 %. Large assortment slows down stockturn, but this variable cannot practically be considered as a tool for inventory management, since the reasons for the width and size of the assortment are more of a commercial nature.

8. Reducing of lead times in general and particularly between demand forecasting and the selling season improves forecast accuracy, which has a positive effect on profitability.

Apparel retailing is a very global business. The recent changes in sourcing strategies have had enormous social consequences in the industrialized countries. In the EU alone more than 900,000 jobs in the textile and garment industry have been lost during the past ten years due to outsourcing by retailing and industry (Euratex 1998/2). One of the main contributions of this research are the findings suggesting that the best retail performance can be achieved through cooperation with local (European) industry by implementing such strategies as Quick Response and Vendor Managed Inventory. On practical level this means finding supply partners locally or in nearby areas from where transport and communications can be quickly and easily arranged.

2. Areas for Further Research

The focus of this research is retail performance. Different sourcing strategies and policies were studied and compared on the basis of their impact on the profitability of the retailer. The findings point out that the most successful sourcing strategies are those where suppliers and retailers cooperate and share POS information. Quick Response seems to be the most profitable strategy. Vendor Managed Inventory strategy was also found to be more productive than traditional up-front buying, at least from the retailer's point of view. An interesting research area would be to focus on the whole supply pipeline, i.e. manufacturer, wholesaler and retailer. What are the critical success factors from the total pipeline's point of view? Is QR still a strategy that contributes to all the links in the pipeline? What about VMI? Perhaps it would be possible to measure what added value different strategies and policies create for each member in the pipeline.

The customer/supplier relations in the normal merchandising pipeline make communications inflexible. Companies are not always willing to share information. Margins and mark-downs are regarded as confidential, and each member tries to maximize his own profits. Vertical marketing systems combining manufacturing, wholesaling and retailing are set up on a corporate or contractual basis. Within such a system information flows freely and quickly. Vertical marketing systems may be more successful than traditional ones, as they are better equipped to share and use POS information, which, as found out by this research, plays such a central role in improving retail performance.

This research concentrates on the internal business process and financial measures. It would be interesting to analyze the full range of measures, including financial, internal business process, customer, and learning and growth, and come up with a universal balanced scorecard for seasonal retailing fashion goods (Epstein, Manzoni, 1997).

Retailing in general is a widely studied subject. But there has been relatively little in-depth research on seasonal fashion product retailing, such as garments, shoes, etc., despite the fact that the business is so global and affects an enormous number of jobs as mentioned earlier. Seasonality and the fashion content makes the subject complex but on the other hand, apparel retailing offers a wide range of untouched and challenging study areas.

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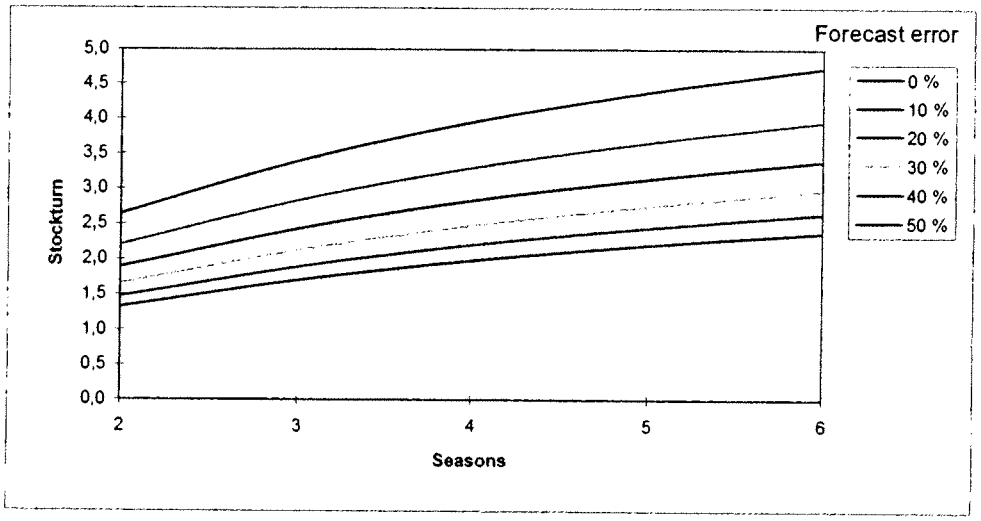
LIST OF ENCLOSURES

ENCLOSURE 1

(Figure 46)
Stockturn with various number of seasons and at different forecast errors
when Sv= 20000000 dollars
s = 90 %
t= 5 %
Ldc = 1 month
l = 2

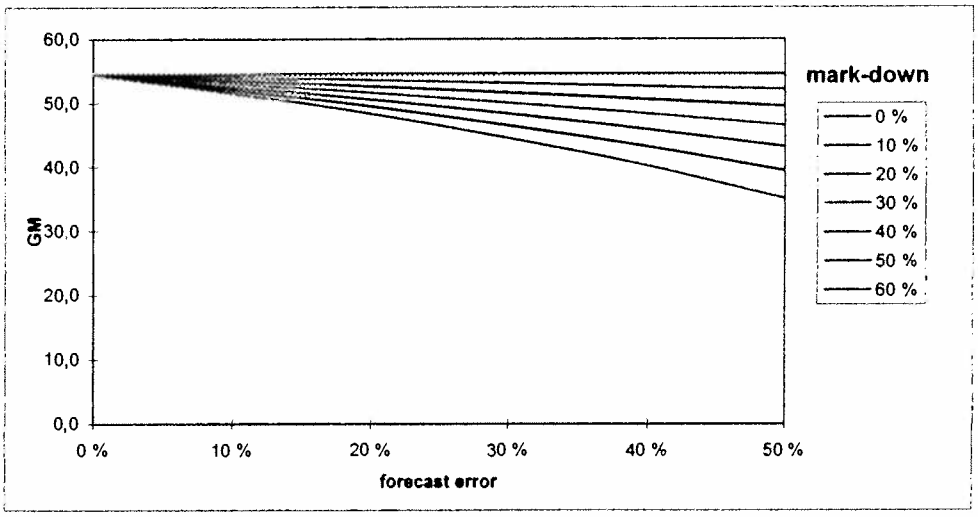
Forecast error	No. of seasons per year				
	2	3	4	5	6
0 %	2,6	3,4	3,9	4,4	4,7
10 %	2,2	2,8	3,3	3,7	3,9
20 %	1,9	2,4	2,8	3,1	3,4
30 %	1,7	2,1	2,5	2,8	3,0
40 %	1,5	1,9	2,2	2,4	2,6
50 %	1,3	1,7	2,0	2,2	2,4



ENCLOSURE 2

(Figure 47)
Gross Margin % as a function of forecast error and average mark-down %
when m = 2,2

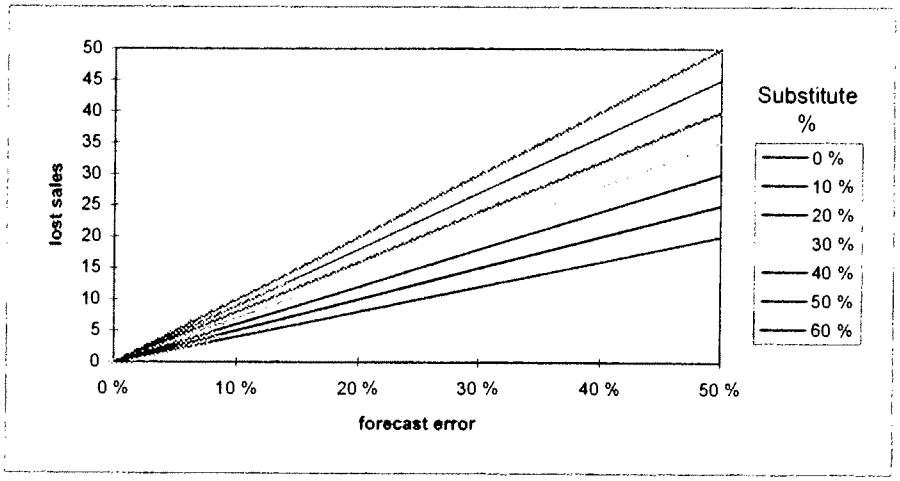
Mark down %	Forecast error %					
	0 %	10 %	20 %	30 %	40 %	50 %
0 %	54,5	54,5	54,5	54,5	54,5	54,5
10 %	54,5	54,1	53,6	53,1	52,7	52,2
20 %	54,5	53,6	52,7	51,6	50,6	49,5
30 %	54,5	53,1	51,6	50,0	48,3	46,5
40 %	54,5	52,7	50,6	48,3	45,9	43,2
50 %	54,5	52,2	49,5	46,5	43,2	39,4
60 %	54,5	51,6	48,3	44,6	40,2	35,1



ENCLOSURE 3

(Figure 48)
Lost sales as a funciton of forecast error and substitute buying %
when m = 2
d = 50 %
Cv= 50

Substit. %	Forecast error %					
	0 %	10 %	20 %	30 %	40 %	50 %
0 %	0	10	20	30	40	50
10 %	0	9	18	27	36	45
20 %	0	8	16	24	32	40
30 %	0	7	14	21	28	35
40 %	0	6	12	18	24	30
50 %	0	5	10	15	20	25
60 %	0	4	8	12	16	20

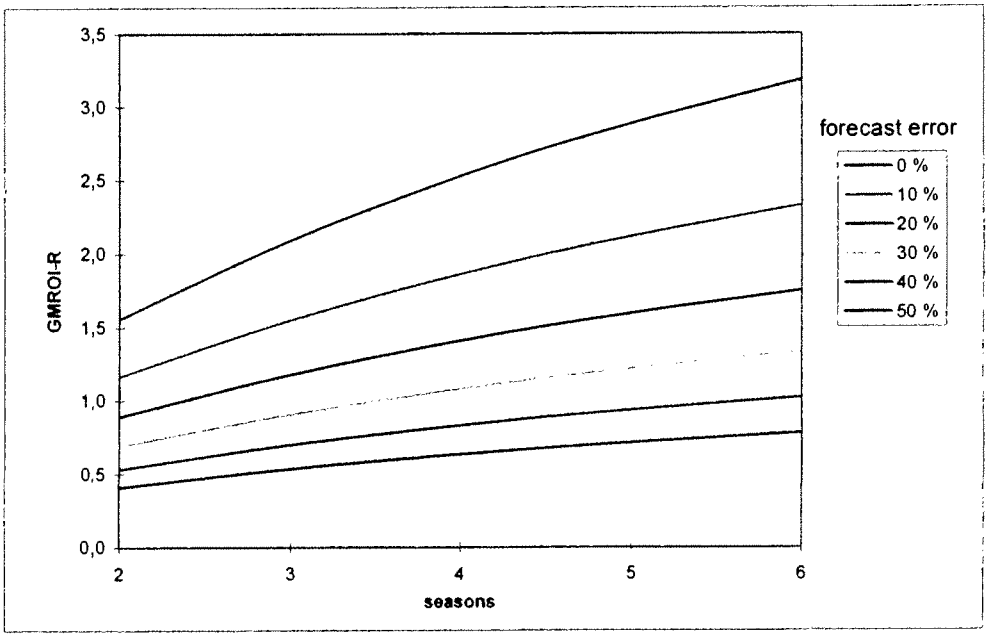


ENCLOSURE 4

(Figure 49)
GMROI-R as a function of no. of seasons and forecast error
when:

m=	2,20
d =	0,50
s =	0,90
t =	0,040
Sv =	10000000
l =	2

Forecast error %	No. of seasons per year				
	2	3	4	5	6
0 %	1,6	2,1	2,5	2,9	3,2
10 %	1,2	1,6	1,9	2,1	2,3
20 %	0,9	1,2	1,4	1,6	1,7
30 %	0,7	0,9	1,1	1,2	1,3
40 %	0,5	0,7	0,8	0,9	1,0
50 %	0,4	0,5	0,6	0,7	0,8

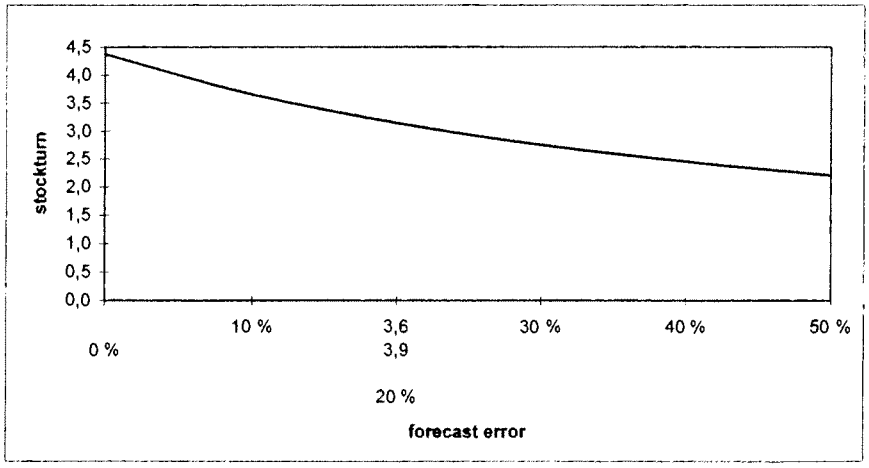


ENCLOSURE 5

(Figure 55)
Stockturn with various number of seasons and at different forecast errors

when	Sv=	20000000	dollars		
	s =	90 %			
	t=	5,00 %			
	Ldc =	1	month	0,5	0,25
	I =	2			

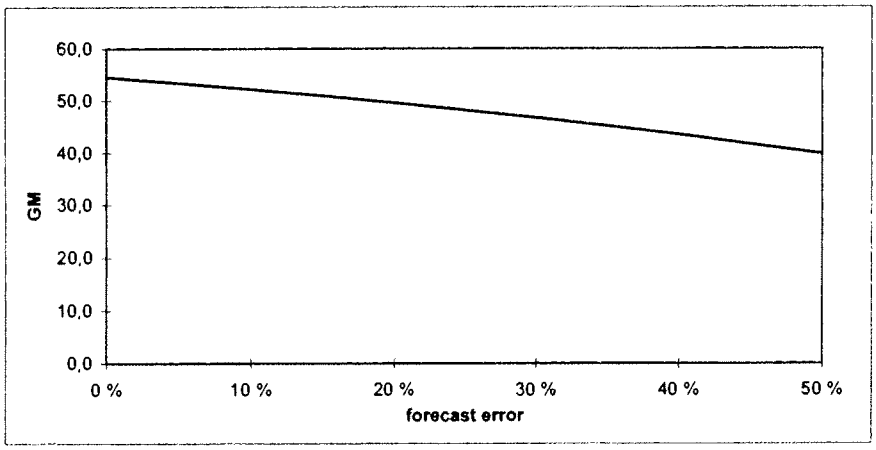
Forecast error	No. of seasons per year		
	5	5	5
0 %			4,4
10 %			3,7
20 %	3,9	3,6	3,1
30 %			2,8
40 %			2,4
50 %			2,2



ENCLOSURE 6

(Figure 56)
Gross Margin % as a function of forecast error and average mark-down %
when m = 2,2

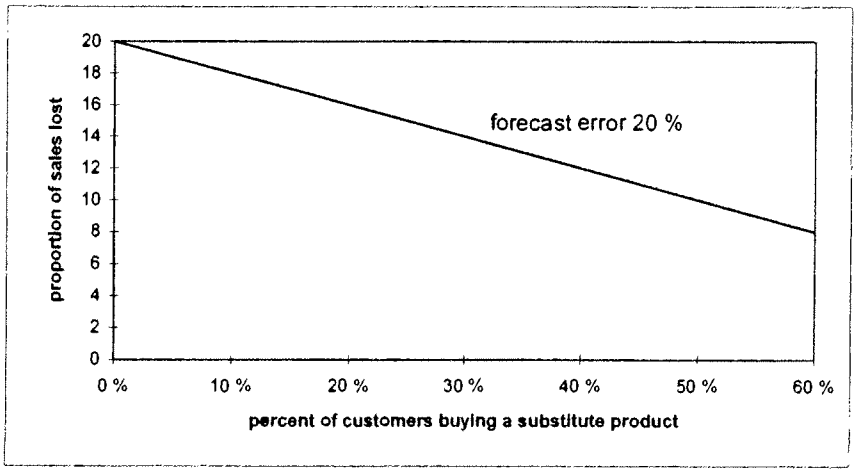
Mark down %	Forecast error %					
	0 %	10 %	20 %	30 %	40 %	50 %
49 %	54,5	52,2	49,6	46,7	43,5	39,8



ENCLOSURE 7

(Figure 57)
Lost sales as a funciton of forecast error and substitute buying %
when m = 2,2
d = 49 %
Cv= 50

Substit. %	Forecast error %					
	20 %	30 %	40 %	50 %	0 %	10 %
0 %	20					
10 %	18					
20 %	16	24	32	40	0	8
30 %	14					
40 %	12	18	24	30	0	6
50 %	10					
60 %	8					

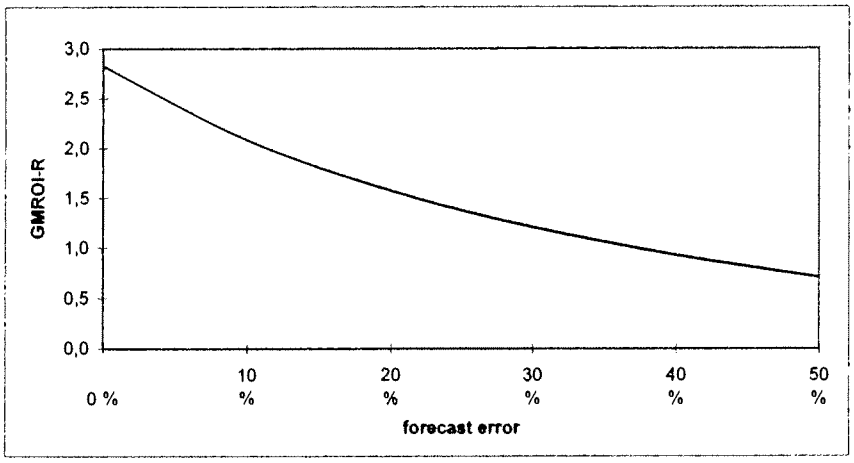


ENCLOSURE 8

(Figure 58)
GMROI-R as a function of no. of seasons and forecast error
when:

m=	2,20
d =	0,50
s =	0,90
t =	0,060
Sv =	10000000
I =	2

Forecast error %	No. of seasons per year
	5
0 %	2,8
10 %	2,1
20 %	1,6
30 %	1,2
40 %	0,9
50 %	0,7

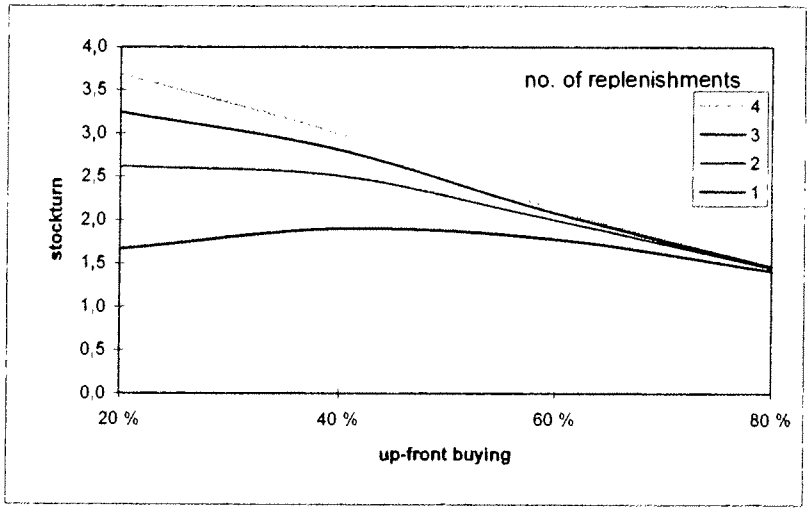


ENCLOSURE 9

(Figure 59)
Stockturn at various ratios of up-front and replenishment buying

when	Su =	1000000		E(upfront)	26 %
				E(replen.)	12 %
	s =	90 %			
	t=	6,00 %			
	Ldc =	1	month		
	l =	2			

		Up-front buying	No. of replenishments			
l(upfront)	l(replen)		1	2	3	4
206000	550000	20 %	1,7	2,6	3,2	3,7
358000	426000	40 %	1,9	2,5	2,8	3,0
510000	302000	60 %	1,8	2,0	2,1	2,1
662000	178000	80 %	1,4	1,5	1,5	1,5

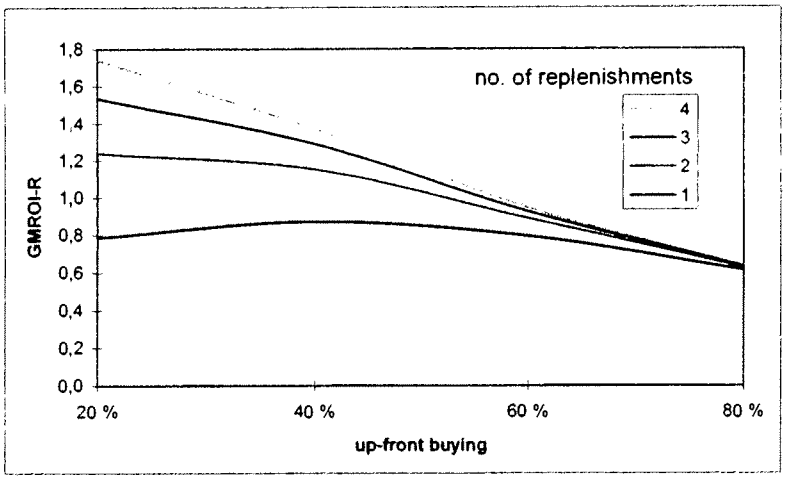


ENCLOSURE 10

(Figure 60)
GMROI-R at various ratios of up-front and replenishment buying

when	Su =	1000000		E(upfront)	26 %
	m=	2,2		E(replen.)	12 %
	s =	90 %			
	t=	6,00 %			
	Ldc =	1	month		
	I =	2			
	d=	49 %			

I(upfront)	I(replen)	Up-front buying	No. of replenishments 1	2	3	4
206000	550000	20 %	0,8	1,2	1,5	1,7
358000	426000	40 %	0,9	1,2	1,3	1,4
510000	302000	60 %	0,8	0,9	0,9	0,9
662000	178000	80 %	0,6	0,6	0,6	0,6

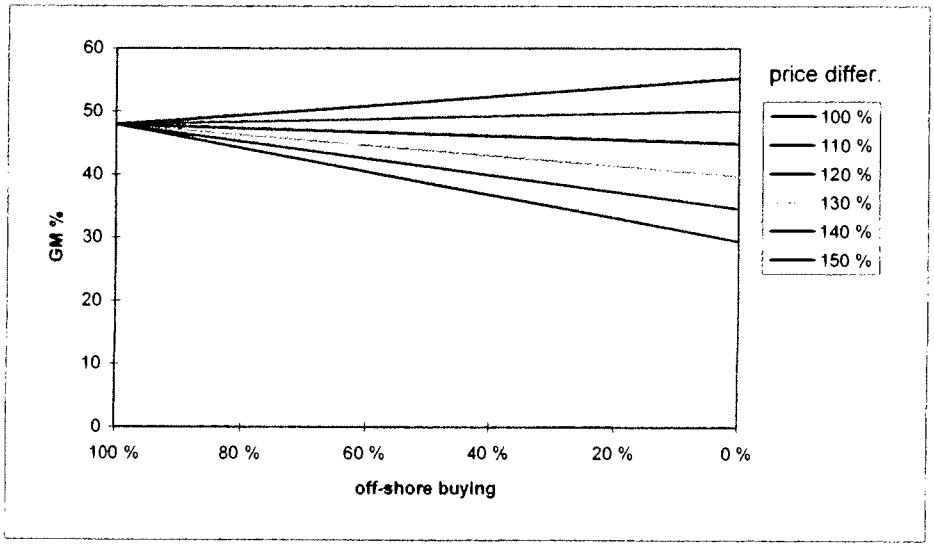


ENCLOSURE 11

(Figure 61)
GM percentage at various offshore/nearby sourcing ratios, when

	offshore	local
m =	2,2	
Sv =	220	220
Cv =	100	140
z=	40 %	40 %
E =	26 %	12 %
d =	49 %	49 %

		Off-shore sourcing					
		0	0,2	0,4	0,6	0,8	1
		100 %	80 %	60 %	40 %	20 %	0 %
Price difference	100 %	48	49	51	52	54	55
	110 %	48	48	49	49	50	50
	120 %	48	47	47	46	46	45
	130 %	48	46	45	43	41	40
	140 %	48	45	43	40	37	35
	150 %	48	44	40	37	33	29
break ev.	114 %	48	48	48	48	48	48

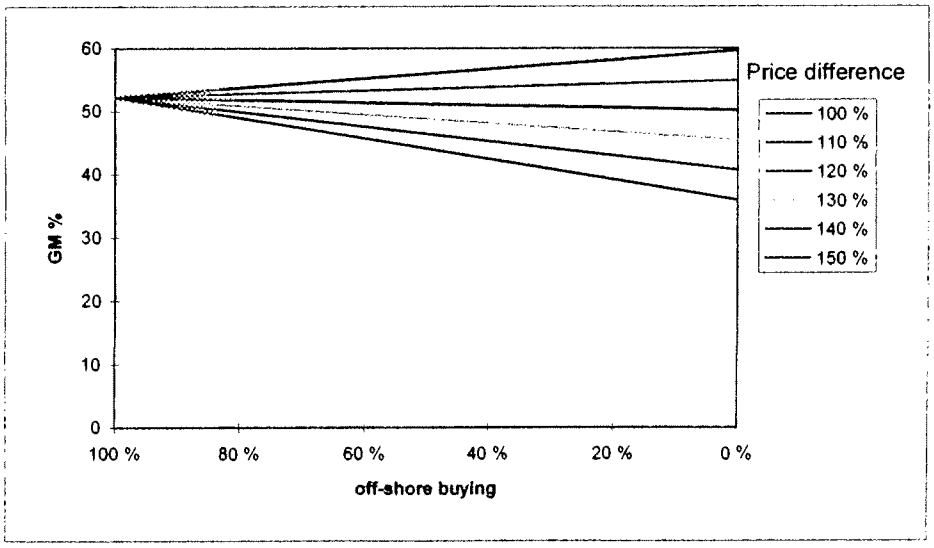


ENCLOSURE 12

(Figure 61, testing m)
GM percentage at various offshore/nearby sourcing ratios, when

	offshore	local
m =	2,4	
Sv =	240	240
Cv =	100	140
z=	40 %	40 %
E =	26 %	12 %
d =	49 %	49 %

		Off-shore sourcing					
		0	0,2	0,4	0,6	0,8	1
		100 %	80 %	60 %	40 %	20 %	0 %
Price difference	100 %	52	54	55	57	58	60
	110 %	52	53	53	54	54	55
	120 %	52	52	51	51	51	50
	130 %	52	51	49	48	47	45
	140 %	52	50	48	45	43	41
	150 %	52	49	46	42	39	36
break ev.	116 %	52	52	52	52	52	52

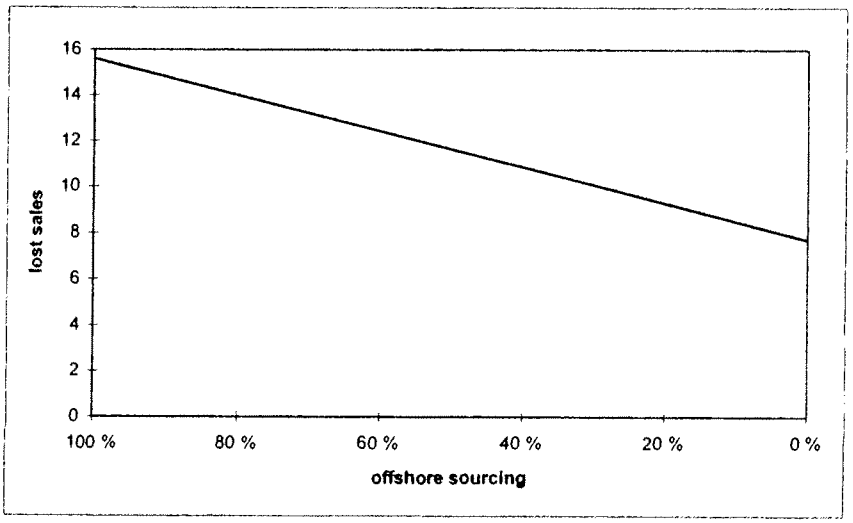


ENCLOSURE 13

(Figure 62)
Lost sales at various offshore/nearby sourcing ratios,
when

	offshore	local
m =	2,2	
Sv =	220	220
Cv =	100	140
z=	40 %	40 %
E =	26 %	12 %
d =	49 %	49 %

Off-shore sourcing					
0	0,2	0,4	0,6	0,8	1
100 %	80 %	60 %	40 %	20 %	0 %
16	14	12	11	9	8

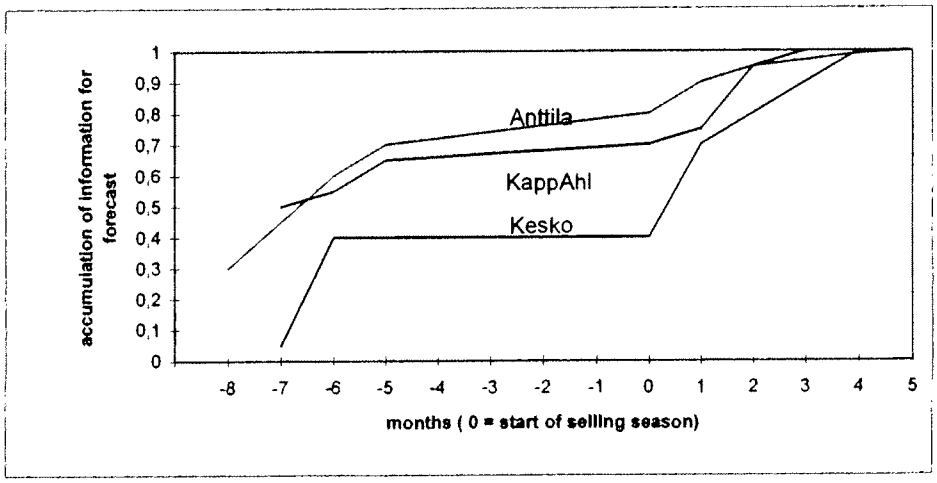


ENCLOSURE 14

(Figure 72)

Illustration of accumulation of forecasting information for a season when the sales results at the end of the season represent 100 % knowledge of season's sales

months	Kesko	Anttila	KappAhl	Average
-8		30 %		
-7	5 %	45 %	50 %	
-6	40 %	60 %	55 %	
-5	40 %	70 %	65 %	
-4	40 %	72 %	66 %	
-3	40 %	74 %	67 %	
-2	40 %	76 %	68 %	
-1	40 %	78 %	69 %	
0	40 %	80 %	70 %	
1	70 %	90 %	75 %	
2	80 %	95 %	95 %	
3	90 %	97 %	100 %	
4	100 %	99 %		
5		100 %		

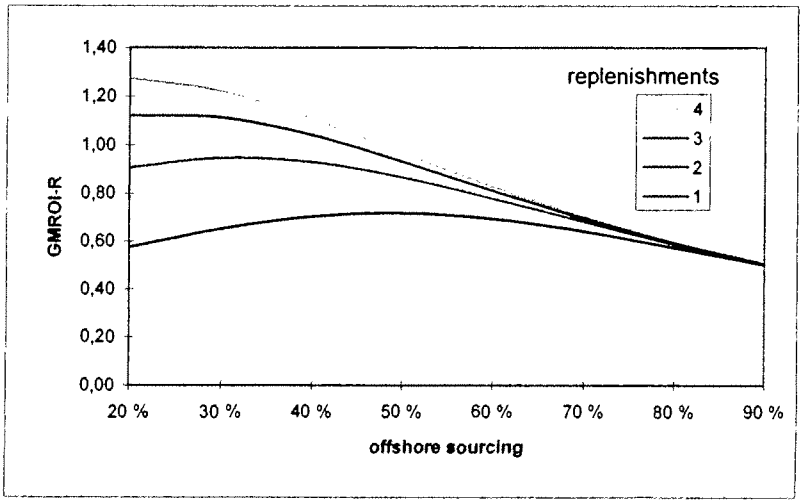


ENCLOSURE 15

(Figure 63)
GMROI-R at various ratios of upfront and replenishment buying
when price difference local/offshore is 40%

when	Su =	1000000		E(upfront)	26 %
	m(offsh.)	2,2		E(replen.)	12 %
	m(local)	1,6			
	s =	90 %			
	t=	6,00 %			
	Ldc =	1	month		
	l =	2			
	d=	49 %			

		Offshore buying	No. of replenishments			
l(upfront)	l(replen)		1	2	3	4
206000	550000	20 %	0,58	0,91	1,12	1,27
282000	488000	30 %	0,65	0,95	1,11	1,22
358000	426000	40 %	0,70	0,93	1,04	1,11
434000	364000	50 %	0,72	0,87	0,93	0,97
510000	302000	60 %	0,69	0,78	0,81	0,83
586000	240000	70 %	0,64	0,68	0,70	0,70
662000	178000	80 %	0,57	0,59	0,59	0,60
738000	116000	90 %	0,50	0,51	0,51	0,51

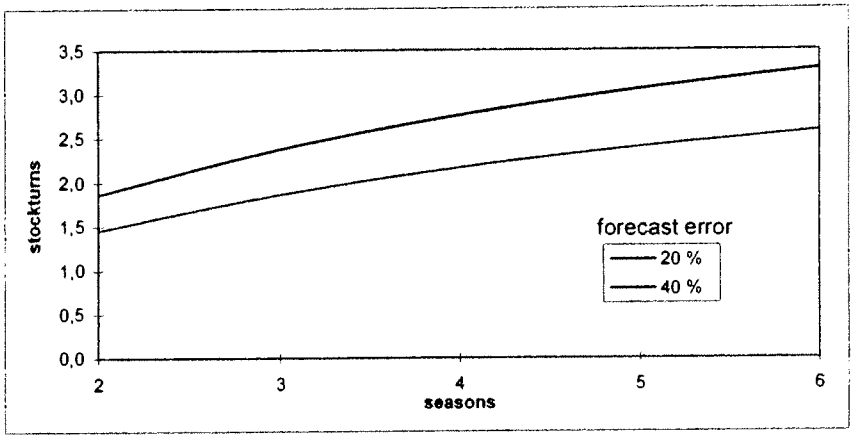


ENCLOSURE 16

(Figure 64)
Stockturn with various number of seasons
when (testing stockturn)

Sv=	10000000
s =	90 %
t=	6,00 %
Ldc =	1 month
l =	2

Forecast error	No. of seasons per year				
	2	3	4	5	6
20 %	1,9	2,4	2,8	3,1	3,3
40 %	1,5	1,9	2,2	2,4	2,6

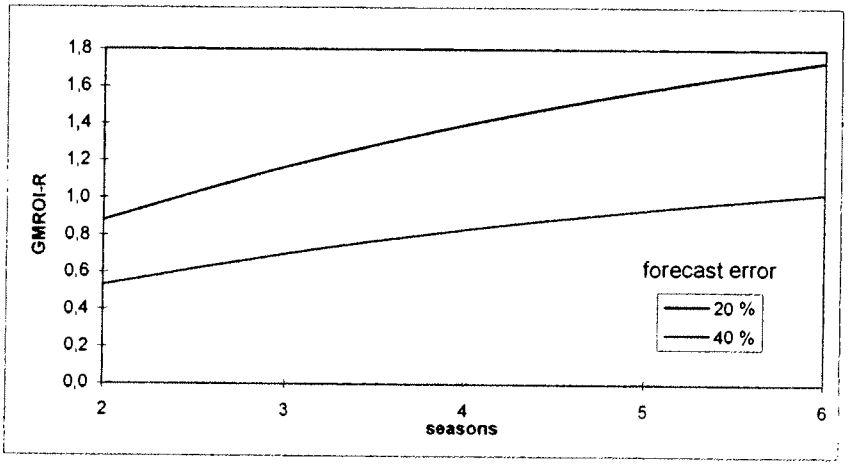


ENCLOSURE 17

(Figure 65)
GMROI-R as a function of no. of seasons and forecast error
when (testing no. of seasons)

m=	2,20
d =	0,49
s =	0,90
t =	0,060
Sv =	10000000
I =	2
Ldc =	30

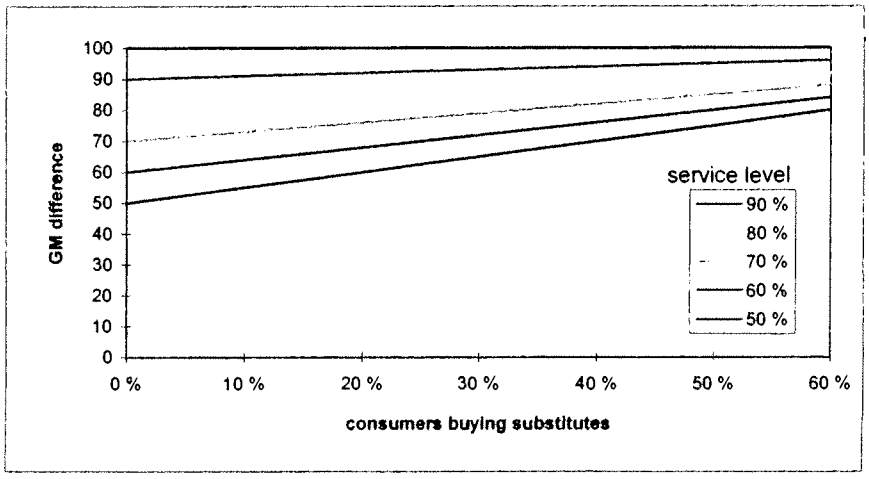
Forecast error %	No. of seasons per year				
	2	3	4	5	6
20 %	0,9	1,2	1,4	1,6	1,7
40 %	0,5	0,7	0,8	0,9	1,0



ENCLOSURE 18

(Figure 66)
GM variance due to service level
when (testing service level)
m = 2,2
Cv = 100

(z) Substit %	Service level					
	100 %	90 %	80 %	70 %	60 %	50 %
0 %	100	90	80	70	60	50
10 %	100	91	82	73	64	55
20 %	100	92	84	76	68	60
30 %	100	93	86	79	72	65
40 %	100	94	88	82	76	70
50 %	100	95	90	85	80	75
60 %	100	96	92	88	84	80

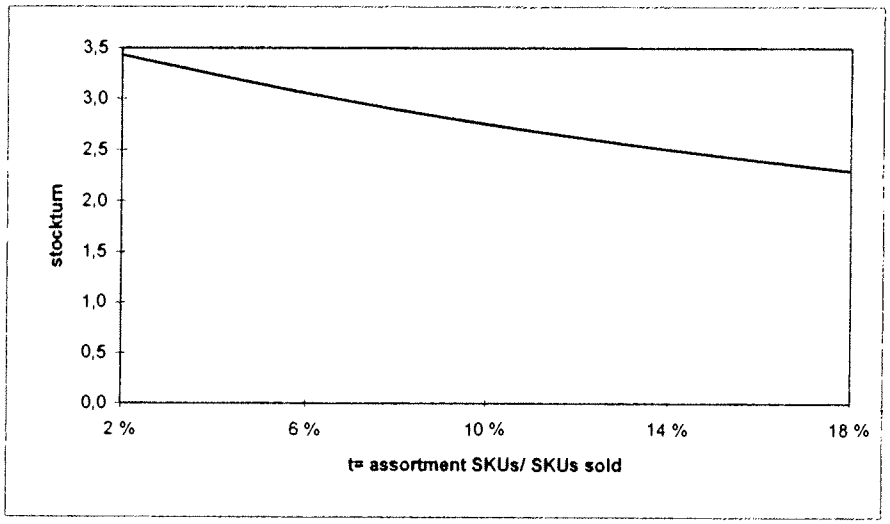


ENCLOSURE 19

(Figure 67)
Stockturn with various numbers of SKUs in total assortment
when (testing stockturn)

Sv=	10000000
s =	90 %
t=	6,00 %
Ldc =	1 month
l =	2

Forecast error	No. of seasons per year				
	5	5	5	5	5
t=	2 %	6 %	10 %	14 %	18 %
20 %	3,4	3,1	2,8	2,5	2,3



ENCLOSURE 20

(Table 20)
Stockturn in QR, VMI and Traditional strategy

when		QR	VMI	Tradition.
	Sv=	1000000	1000000	1000000
	s =	90 %	90 %	90 %
	t=	6,00 %	6 %	6 %
	Ldc =	0 month	0	1
	l =	2	2	2
Initial delivery for		3 weeks	3	12
Replenishment for		1 week	1	0
Delivery weeks/sson		12	12	12

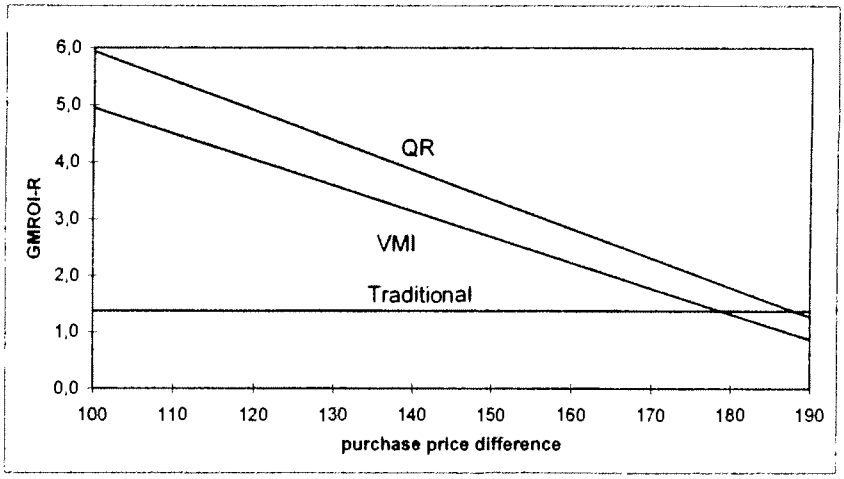
Forecast error	No. of seasons per year		
	4	4	4
5 %	11,4	10,0	3,1
10 %		10,0	
20 %			3,1
I (initial) =	88375	88375	191500
I (repl.) =	65458	65458	
I (aver) =	75278	75278	191500

ENCLOSURE 21

(Figure 71, table 20)
GMROI-F comparisons

when testing		QR	VMI	Tradition.
	Sv =	1000000	1000000	1000000
buying price differen.		140	140	100
	m=	1,6	1,6	2,2
	d =	49 %	49 %	49 %
	s =	90 %	90 %	90 %
	t=	6,00 %	6,00 %	6,00 %
	Ldc =	0 month	0	1
	I =	2	2	2
Initial delivery		3 weeks	3	12
Replenishment		1 week	1	0
Delivery weeks/seas		12	12	12

	Forecast error	Price difference	No. of seasons per year		
			4	4	4
			QR	VMI	Trad
		100	5,9	5,0	1,4
		110	5,4	4,5	1,4
		120	4,9	4,0	1,4
		130	4,4	3,6	1,4
QR =	5 %	140	3,9	3,1	1,4
VMI =	10 %	150	3,3	2,7	1,4
TRAD =	20 %	160	2,8	2,2	1,4
		170	2,3	1,8	1,4
		180	1,8	1,3	1,4
		190	1,3	0,9	1,4
Break even test		178	1,9	1,4	1,4
I (initial) =			88375	88375	191500
I (repl.) =			65458	65458	
I (aver) =			75278	75278	191500

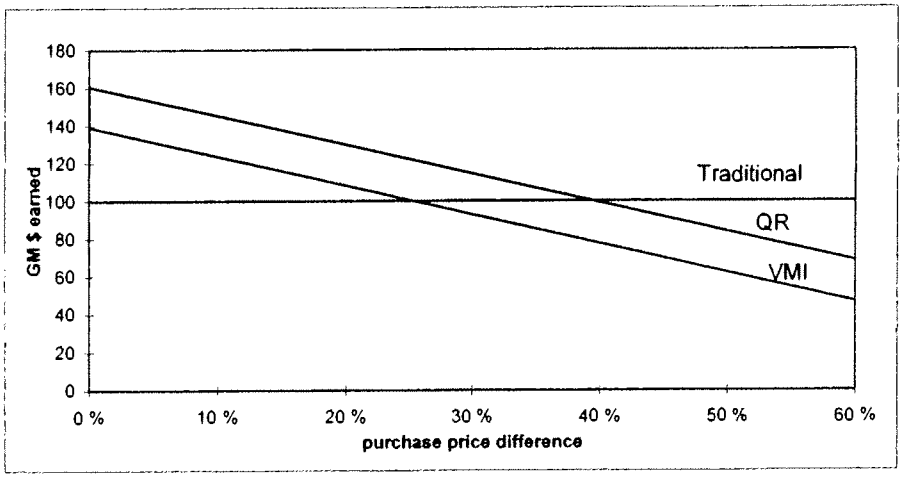


ENCLOSURE 22

Comparing GM $ earned	QR	VMI	Tradit.
E=	5 %	10 %	20 %
Sales pcs	1150	1100	1000
Purchase pcs	1208	1210	1200
m=			2,2
d=	49 %	49 %	49 %
Unit price $	100	100	100
Purchase price $			45
Sales at first price (pcs)	1093	990	800
Sales marked down (pcs)	58	110	200

GM $ earned

Purchase price difference			
0 %	57296	49610	35655
10 %	51808	44110	35655
20 %	46319	38610	35655
30 %	40830	33110	35655
40 %	35342	27610	35655
50 %	29853	22110	35655
60 %	24364	16610	35655
25,5 %	43300	35585	35655
Purchase price difference			
0 %	161	139	100
10 %	145	124	100
20 %	130	108	100
30 %	115	93	100
40 %	99	77	100
50 %	84	62	100
60 %	68	47	100
	121	100	



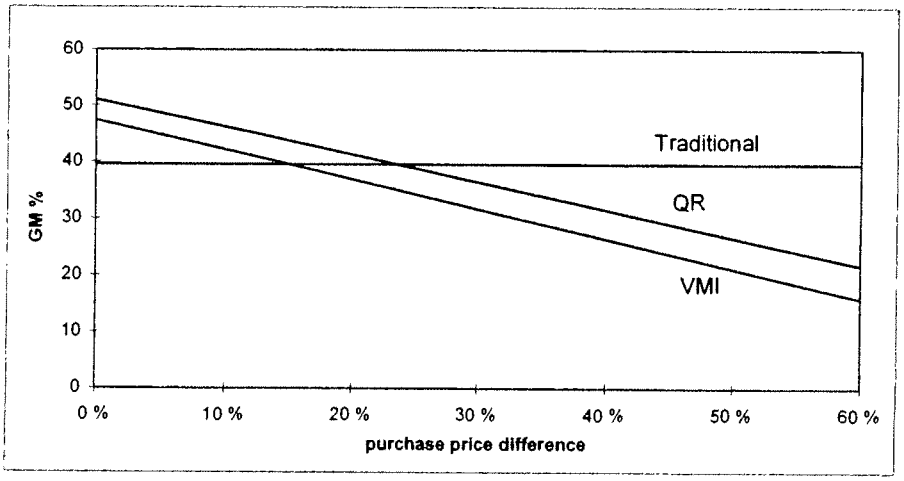
ENCLOSURE 23

(Figure 70)
Comparing GM percentage

	QR	VMI	Tradit.
E=	5 %	10 %	20 %
Sales pcs	1150	1100	1000
Purchase pcs	1208	1210	1200
m=			2,2
d=	49 %	49 %	49 %
Unit price $	100	100	100
Purchase price $			45
Sales at first price (pcs)	1093	990	800
Sales marked down (pcs)	58	110	200

GM $ earned

Purchase price difference			
0 %	51	47	40
10 %	46	42	40
20 %	41	37	40
30 %	36	32	40
40 %	32	26	40
50 %	27	21	40
60 %	22	16	40
Break even test: 15 %	44	40	40



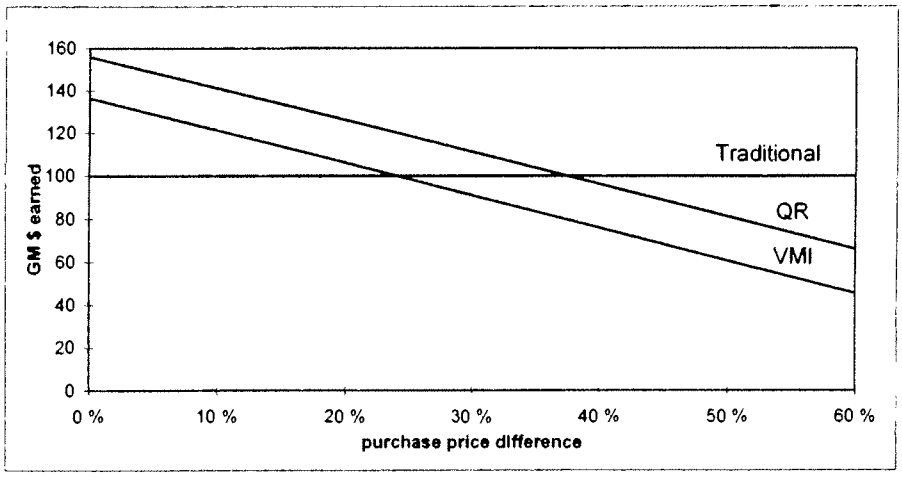
ENCLOSURE 24

(Figure 69)
Comparing GM $ earned when considering substitute buying

	QR	VMI	Tradit.
z=	20 %	20 %	20 %
E=	5 %	10 %	20 %
Sales pcs	1162	1122	1040
Purchase pcs	1220	1234	1248
m=			2,2
d=	49 %	49 %	49 %
Unit price $	100	100	100
Purchase price $			45
Sales at first price (pcs)	1103	1010	832
Sales marked down (pcs)	58	112	208

GM $ earned

Purchase price difference			
0 %	57869	50602	37081
10 %	52326	44992	37081
20 %	46782	39382	37081
30 %	41239	33772	37081
40 %	35695	28162	37081
50 %	30151	22552	37081
60 %	24608	16942	37081
24,0 %	44565	37138	37081
Purchase price difference			
0 %	156	136	100
10 %	141	121	100
20 %	126	106	100
30 %	111	91	100
40 %	96	76	100
50 %	81	61	100
60 %	66	46	100
	120	100	

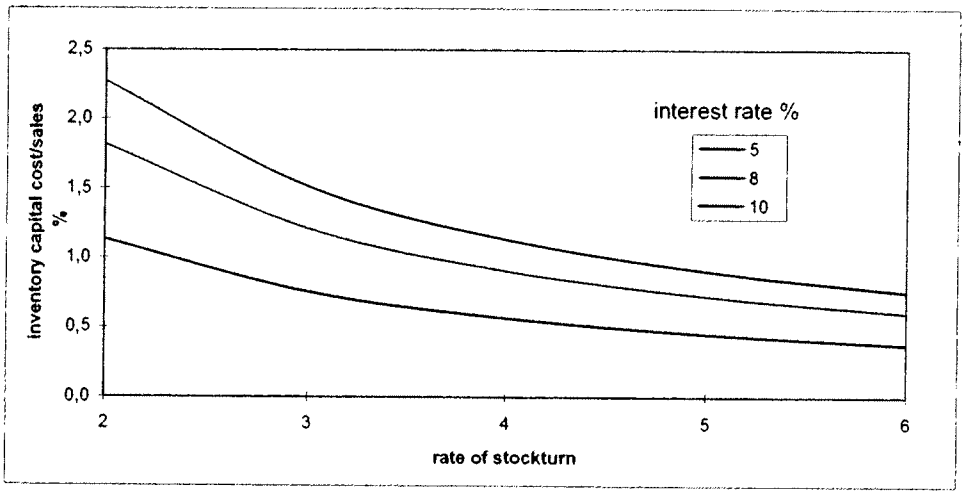


ENCLOSURE 25

(Figure 68)
Impact of inventory capital costs as percentage of sales
at different rates of stockturn

m= 2,2

i	Stockturn 2	3	4	5	6
5	1,1	0,8	0,6	0,5	0,4
8	1,8	1,2	0,9	0,7	0,6
10	2,3	1,5	1,1	0,9	0,8



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