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PRODUCT DIFFERENTIATION: DOES IT PROVIDE COMPETITIVE ADVANTAGE FOR A PRINTING PAPER COMPANY?

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Abstract:

The aim of this thesis was to contribute to the knowledge and understanding of product differentiation in the context of printing papers. The motivation for this thesis emerged from unsolved problems encountered when the author worked in two product differentiation projects at two different paper mills in Finland in the 1980's and 1990's.

The number of non-standard printing papers such as MFC, SC A+, SC A++, SC B, FCO and WSOP papers has been on the increase; this has resulted in additional complexity both for the producer and the customer. The differences between printing paper grades have simultaneously diminished and developing printing technology has reduced differences between paper grades. This study answers the following questions: What is product differentiation in the context of printing papers? Can product differentiation be used to improve the competitive advantage of a printing paper firm? If so, how should product differentiation be organized and applied in practice as part of a firm's strategy?

A holistic view of the research area was chosen to increase understanding of this increasingly important and very complex area. The theoretical part first operationalises the key concepts which are important in the phenomenon of product differentiation in general and in this study in particular, and then examines various level business strategies. This study primarily follows a resource-based approach.

Empirical data was collected through 37 in-depth personal interviews in 1999 and 2000. The sample represents four Finnish paper industry companies, its customers (publishers, printers, merchants), its suppliers (both machine and chemical), as well as consultancy companies, the Finnish Technology Agency and a bank. The sample of paper industry experts is cross-functional. It covers management, business development, marketing and sales, production, R&D, technology and procurement. The study applies qualitative research methods and uses conceptual and action analytic research approaches.

Product differentiation of printing papers is today a poorly managed, complex process. It is rather a random, unintegrated activity, separated from the business strategy. Product differentiation has mainly been driven by eroded profits at a paper machine line; it is not an integrated part of a customer's strategy. The bond between a differentiated product and a customer's process is rather weak: customers tend to change to better quality standard products when a downturn starts and price difference diminishes. This finding suggests that product differentiation in the context of printing papers is rather a product proliferation, a wasted opportunity, than a real value-adding action. Other important drivers for product differentiation were found to be customer needs based reasons: a new end-use application, and price. New paper manufacturing technologies, new minerals and chemicals function rather as the strategic means to enable product differentiation than as real drivers. One motive or driver is not in itself strong enough to cause product differentiation but we need many of them. We also need a

support process, high level strategic marketing skills, updated information of a dynamically changing business environment and strong cost control.

The research findings indicate that the role of initiator in this process is gradually moving from the paper producer towards the customer. Product differentiation used to be strongly manufacturer's technology pushed; presently it is both manufacturer's technology pushed and customer technology pushed. In the future it will continue to be technology pushed but increasingly the advertiser and the consumer will pull.

The findings of the research also indicate that value-based pricing should be considered for differentiated printing papers as an alternative to traditional cost-based pricing. The most important internal barrier for product differentiation is the unclear position of a differentiated paper compared with the existing product portfolio reflecting a lack of strategy. Timing in relation to a business cycle is important when launching a differentiated product into a market. The optimal time is the start of an up cycle.

The cost leadership strategy will continue to remain the leading strategy for a printing paper industry company. Product differentiation will function in a supporting but important role. The difference in product differentiation is primarily made through knowledge, skills and capabilities.

The thesis research gives a new meaning to product differentiation of printing papers. It also gives recommendations to paper industry management about what to take into consideration, avoid and strengthen when starting a product differentiation project. A solution must be tailored to a purpose because the starting point for each product differentiation project will vary.

The main claim of this dissertation is:

Product differentiation – as defined in this thesis - can provide competitive advantage for a printing paper company if it is based on the coordinated use of various knowledge, skills and capabilities within the firm. Product differentiation should start with an understanding of customers' earning logic and future needs. If based on intangible assets, product differentiation is not a sustainable competitive advantage unless it is an integrated element of a customer's strategy. Brand building could be more effectively used to support product differentiation.

Now that the majority of Southern Germen is lying on beaches outside the country I am writing the final words to finish this study under the hot Bavarian sun. When I started the study about six years ago I could not imagine finishing it in Augsburg; but this current situation reflects the continuous consolidation of the printing paper industry as well as the internationalisation of Finnish paper industry companies. At the same time I am saying goodbye to a project which has filled a major part of my spare time for last six years, more than a reasonable amount for my family. This project has certainly been the most challenging one so far in my life – a learning opportunity beyond compare - and it has impacted a lot on my thinking on strategies and sales & marketing in particular.

The roots of this dissertation lay in unsolved practical problems of a paper industry manager in the area of strategy, more precisely product differentiation. I was personally involved in two projects in Finland. The first one was a product reorientation project at a small scale paper machine during the 1980's. The second was a large scale, brown field paper machine project during the early 1990's in which a new differentiated printing paper grade was developed utilising the newest paper manufacturing technology and launched to novel end-use markets.

There are numerous people whom I would like to thank for making it possible to complete this project. First and foremost I would like to thank my supervisor Professor Hannu Paulapuro from Helsinki University of Technology for providing supervision, guidance and encouragement throughout the whole doctoral process. I would also like to express my warmest gratitude to my instructor, Professor Jorma Saarikorpi, who has been involved in this project from the first tutorials onwards, and Professor Kari Ebeling who has guided me and given the invaluable comments on drafts of this dissertation. The feedback from both pre-examiners, Dr Zoltán Szikla, the current vice president of Dunapack, Hungary, and Dr Liisa Välikangas, the current managing director and co-founder of Woodside Institute, California, has helped me to improve the quality and readability of this dissertation a lot. I owe my sincere thanks to you. My very special thanks are extended to Professor Martti M Kaila for his encouragement to continue from the full MBA program to a doctoral dissertation in the area of strategy. Without his encouragement this dissertation would have never even been started.

I also want to thank Dr Pasi Sajasalo from Tampere Technical University whom I only got to know during the last steps of my dissertation for his interest, time to read and valuable comments on a draft, and Dr Eeva Jernström, who completed her doctoral thesis a few years ago, for her encouragement and advice during the past years. As a result, the quality of this dissertation was much improved.

I also want to take this opportunity to thank Mr Matti Sundberg, the last CEO of Valmet Oyj, Dr Markku A Karlsson and Mr Jyrki Mustaniemi, for the opportunity to get an insight into a paper machine and systems supplier's world in the years 1999 and 2000 a most innovative atmosphere. I also owe thanks to Mr Mads Asprem, senior paper industry analyst, for his sharp criticism and most inspiring thoughts on the status, developments and competitiveness of the European paper industry over the years.

In the most critical phase of the study in late 2001 Mr Pauli Hänninen, Lic. Tech., current Senior Vice President, Operations, Fine Paper Division in UPM-Kymmene, and Mr Markku Tynkkynen, current President of Magazine Division in UPM-Kymmene, made it possible to concentrate fully for a short period on finalising the first full manuscript of the dissertation. I give my sincerest thanks to you. Without that opportunity I most likely would not be at this point.

Furthermore, this dissertation would not have been possible without the time and interest of the 37 high level, experienced paper industry informants who gave valuable insight into the empirical part of this dissertation and helped to increase my understanding of product differentiation of printing papers. Thank you for your time and rewarding discussions.

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I also thank the Foundation of Economic Education for the financial support at the beginning of this research project.

My parents' encouragement to continuously develop and learn new skills and capabilities and take bold decisions when necessary have guided me throughout my life. Sanni and Risto, thank you very much.

My own family has been my source of strength and happiness throughout this long research project. Eero, Katariina and Heikki, my sincere thanks for your support and patience. You have shown understanding for my intensive "hobby" beyond compare. Without you the completion of this thesis would not have been possible.

Herculesbrunnen, Augsburg
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Ainomaija Haarla

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List of Abbreviations

R&D	research and development
EDSF	The Electronic Document Systems Foundation
I/O Model	Industrial Organisation Model
R/B Model	Resource-Based Model
FMS	flexible manufacturing system
TQM	total quality management system
EV	economic value
ROCE	return of capital employed
NPD	new product development
TAMO	components of innovation arena; technology, application, market/customer, organisation
OECD	Organization for Economic and Cultural Development
RCF	recycled fibre, one of the raw materials of printing papers
WACC	weighted average cost of capital
KBA	König-Bauer, a printing machine manufacturer
PM	paper machine
PCC	precipitated calcium carbonate
TMP	thermo-mechanical pulp
CTMP	chemi-thermo mechanical pulp
IT	information technology
ICT	information and communication technology
USD	United States (US) dollar
GDP	gross domestic product
RIT	Richmond Institute of Technology
M&A	mergers and acquisitions
JPC	Jaakko Pöyry Consulting
DIP	deinked pulp

PPS	Parker Print Surf [1)]
ETLA	The Research Institute of the Finnish Economy
HUT	Helsinki University of Technology

Definitions for printing paper grades such as MFS, SC C, SC B, SC, SC Cat, SC A+. SC A++, ESA, FCO, MFC, WSOP, LWC, LWCO, WFC and WFU are given in Appendix 1.

[1)] Surface roughness of a printing paper is measured by the Parker Print Surf method, ISO 8791-4 (Levlin, J-E., 1999)

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1 Introduction

This study deals with product differentiation in the printing paper industry. It seeks to increase understanding of a product differentiation as a phenomenon, its drivers and motives, supporting forces and barriers as well as value chain actors and their roles in this process from a paper manufacturer's perspective. This thesis defines a new meaning for product differentiation of printing papers and suggests how to organise and manage a product differentiation project in the context of printing papers.

The aim of this chapter is to give a reader an overview of the background to the research, to introduce the research questions, the objectives and also research strategy and methodology as well as the scope and limitations of the study and finally introduce the structure of the thesis.

1.1 Background

Management's reality when starting the research

The roots of this thesis are to be found in two projects in which the author participated in the 1980's and the early 1990's and later observations when working as a business development director for a Finnish paper company: Why are an increasing number of differentiated printing paper grades being conceived? What is understood by the term 'product differentiation' and what is it as a phenomenon? Can product differentiation be a source of competitive advantage for a paper firm? Why are differentiated products produced by the Finnish paper industry companies in particular? Is it a result of more diversified customer needs? Or is it simply a short-term survival strategy or even a reaction to the declined profits of a paper machine line with old technology and poor quality products? Is it a result of changed, more customer focused paper company strategies or is it a response to increasing competition created by rapidly emerging electronic media? Is it a managed process and an integrated part of a paper company strategy? Is it a result of an increasing number of paper machines within the same

company due to recent mergers and acquisitions and improved opportunities to differentiate or a result of a company-wide product optimisation? Is it a result of a systematic innovation and R&D work in the company? Who is the primary driver for this development in the value chain, the customer, the supplier or the paper maker? And how should the whole process be organised and managed so that it improves the competitiveness of the printing paper company? What can we learn from success stories and failures?

Product – printing paper

Printing paper is an intermediate industrial material, which functions as a raw material to a publisher or to a printer to be converted into consumer products such as magazines, catalogues, newspapers and books. A current functional use of a printing paper is to collect, distribute and store information (Helbling and Page, 2001). Printing papers are, for the main part, commodities. Critical paper technical properties of standard printing paper grades such as brightness, opacity and paper gloss are on the same level at the same basis weight regardless of a manufacturer. The prices of standard grades are transparent and easily available. The end-use of a paper defines how much a buyer can pay for paper. The printing method has a dominant role as regards the physical requirements of the paper. In addition, end-use and a colour content has an impact on physical attributes of paper. However, there are also other, functional requirements for a printing paper: the paper should support the message and the image of the final product for example. Product differentiation supports these needs. Diversification of the end-use markets, for example, the growth of a number of special interest magazines and for specific end-user targeted catalogues, also supports the broadening of paper grade supply. (Price, 2002) A differentiated product can also be created to a new PM (Nachman, 2002).

Continuous development of paper manufacturing technology, especially in the sub-processes of coating and calendering, but also by using new

combinations of raw materials has enabled new paper technical property combinations to printing papers and often at a lower price.

Standard printing paper grades are interchangeable whereas differentiated papers seldom are. Printers typically simultaneously use papers from three to five suppliers to minimise the risk to the publishing schedule. The use of branding among printing papers is increasing. There is no generally accepted or standardised paper grade classification. Instead, there are many classifications in the global markets. (Appendix 1)

Customers

The customers of a printing paper firm are typically publishers, printers and/or merchants. Consolidation and globalisation are also ongoing phenomena in the customer industries. This development supports the broadening of the product range: global customers with their diversified paper needs want to deal with global suppliers with a broad product offering. Digitalization of all the information is a powerful change agent for publishers and printers. The quality of contents will remain the most important competitive factor whether it is printed or electronic (Rauramo, 1999; Brown Anderson, 2003).

Differentiation and differentiated product

'Differentiation' as a term can be understood in many ways such as those given by Chamberlin, 1933; Scheuing, 1974; Kotler, 1998; Porter, 1985; O'Schaughnessy, 1984. It can also appear on many levels including product, total product offering and the company. Chamberlin elaborated on a concept of product differentiation in his book “The Theory of Monopolistic Competition” as early as in 1933. He offered product differentiation as the explanation for a downward falling demand curve of an individual product. Chamberlin suggested that the demand is also dependent on the style of the product and selling activities in addition to pricing. He noticed the importance of non-price competition: **reducing price competition is the primary aim of differentiating a product. To benefit from differentiation**

a seller must be able to identify customers, who benefit from differentiation and are ready to pay for it. Scheuing (1974) has stated that 'product differentiation is … generally a requirement for market segmentation'. In addition to definite what is differentiation, it is important to comment on two other questions: **differentiation with respect to what** and **differentiation in whose eyes.** In literature two main streams of approaches to differentiation can be found, one of an economist (for example Aalto-Setälä, 1999; Markowitz, 1994) and the other of a marketer (for example Schneider, 1993). This study investigates product differentiation from a strategist's perspective by assessing product differentiation as a possible source of a competitive advantage in a printing paper firm. The current research concentrates on a product-level differentiation.

'Differentiated product' as a term is not self-explanatory and needs a clear definition. ‘Modified products’, 'niche products', ‘intermediary paper grades’ and ‘upgraded’ or ‘downgraded’ papers are the other terms which are used in a mixed manner when describing a differentiated product. In the light of the pre-understanding **a differentiated printing paper in this study means a non-standard paper used for printing newspapers, magazines, catalogues, directories, advertisement material and books, which offers a positive value to the customer in comparison to a standard reference product.** Typically differentiated printing papers are improved newsprint grades – MFS papers – or SC A+, SC Cat, SC A++, SC B, SC C, MFC, FCO, WSOP and the Galerie Light type of semi-mechanical papers. These include also printing equipment specific papers for instance in digital printing. Reference products in this study are typically standard paper grades such as standard newsprint, standard SC for rotogravure printing, standard LWC for offset printing as well as standard WFU and WFC. The main printing paper grades as well as various global classification systems are described in Appendix 1 (Haarla, 2000b).

Competitive advantage

A firm is said to have a competitive advantage when it is implementing a value creating strategy which is not simultaneously implemented by any current or potential competitor. A firm is said to have a sustainable competitive advantage when other existing or potential competitors are unable to duplicate it or it proves to be too costly to imitate (Porter, 1985). When following a resource-based view of the strategy, a firm's resource must be valuable in exploiting opportunities and/or neutralizing threats, it must be rare, imperfectly imitable and there cannot be equivalent substitutes for this resource in order to be sustainable (Barney, 1991).

Typical features of the printing paper industry

The printing paper industry is a global industry, which is based on renewable raw material. Printing papers made 43% of the global paper and board consumption which figure was 297 million tons in 2001 (Jaakko Pöyry Consulting, 2002). Printing papers, instead, dominate in the product portfolios of the Finnish companies: that share was 84% out of 34 million tons in 2000 including foreign mill capacities. Paper demand has grown and is expected to continue to grow at an average of 2,5 to 3% per annum until 2010. This figure varies according to paper grade and to both geographical and end-use market (Jaakko Pöyry Consulting, 1999; RISI 2002). General economic activity and consequently advertising are the most important demand drivers. Demand growth has traditionally tracked with GDP but recent development refers to more varying patterns between printing paper grades. Its products are reusable. Raw material intensity is a typical feature of printing papers. Availability, price and processability of raw materials, customer proximity and skills, capabilities and knowledge-base are some of the factors that determine, which products are produced and where.

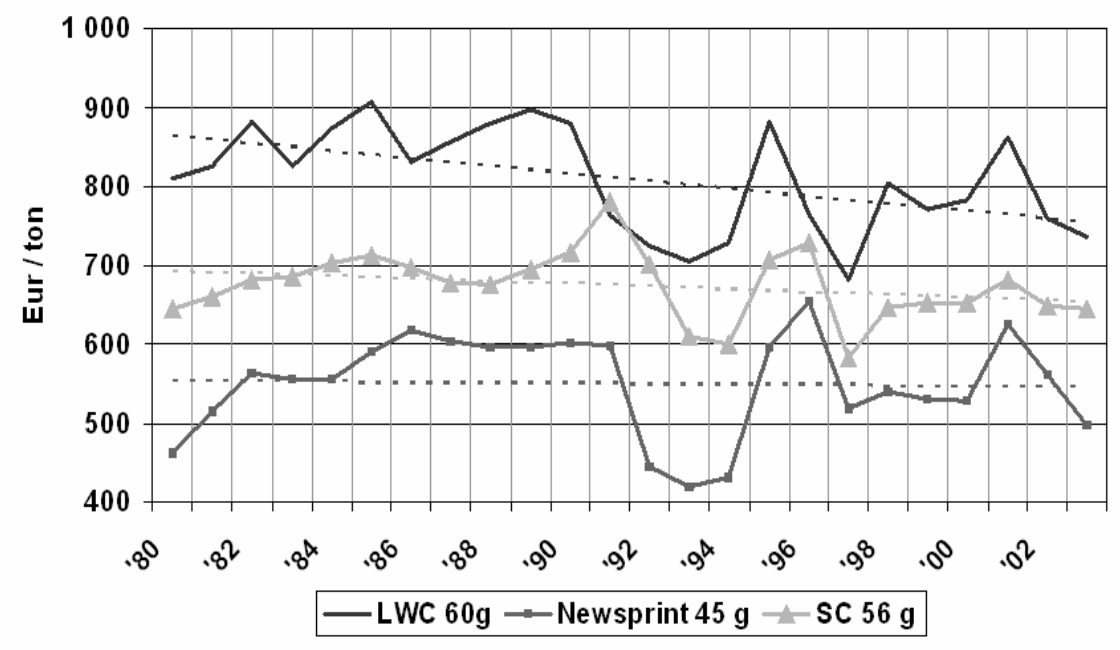
Overall profitability of the printing paper industry has been rather modest. Long term, over cycle ROCE targets are typically around 13%. WACC has, however, seldom been exceeded in practise (Carroll, 1999). Profitability typically varies along the cycle and timing of the investments. Profitability of the Finnish printing paper industry has also been impacted by the

devaluation of the local currency until Finland joined the European Monetary Union. Profitability has not been showing a clearly improving trend despite the countermeasures such as consolidation. It is very difficult to unambiguously verify whether an increasing number of differentiated papers has had a positive impact on the paper firms' profitability: the profitability figures by paper grade are highly confidential and many other simultaneous measures to increase profitability have been taken.

The paper industry has a long, multi-step value chain, containing many points where stocks and inventories can accumulate. Typically one-month production can be in a pipeline from a mill to a customer, but 60 to 90 days stock in the pipeline is not uncommon – with the exception of a local business such as newsprint. Stocks and inventories are accumulated at many points in the chain. They can take the form of tangible stocks in terms of producer, harbour, customer, ship/train stocks or intangible stocks such as an order backlog (Perkola, 2000). In addition to cost-effective production, the efficiency of the logistical chain is another key factor. Inability to control material and information flows - which move in opposite directions - and take necessary action - such as production curtailments early enough can easily lead to imbalances in the markets. Factors influencing the success of the management of the value chain in the paper industry are know-how, skilled personnel and product/market optimization. Increasing customization of products puts pressure on paper companies to cut the long logistics and distribution chain.

Cyclicality is one of the typical features of the printing paper industry. Schumpeter (1934) proposed a three-cycle model of economic fluctuations: Kitchin's inventory cycle 7 to 11 years, Kuznets' infrastructural investment cycle 15 to 25 years and Kondratieff's long cycle 45 to 60 years. The paper industry is a business with its seasonal, annual and business cycles and is very much affected by a general economic situation. Up to the mid 1990's, 7 year business cycles were prevalent. Nowadays, these cycles last from between just 2.5 and 3 years, sometimes even less. This is why the timing

of any investment is crucial. It has been proposed that cyclicality is created by an investment cycle (Suhonen, 2001). Cyclicality is believed to level off with on-going consolidation and vertical integration upstream. Downstream actions are rare. The reasons behind cyclicality lie in the paper industry itself (Whitehead et al, 1999). Perkola (1998; 2000) claims that the cycles result from the ways in which producers and customers increase or decrease their inventories. It is hard for an individual company to visualise the impact of its own decisions. In the forest industry, the decision-makers typically react to short term phenomenon in a similar way – at least regionally – and thus reinforce or balance the development which leads to a new cycle. Inventories typically dampen the very short-term cycles but amplify the long term ones. The further a business is from the customer end of the chain, the more severe the cycles become. Hazley (2000) also states that "…in general, the closer a company is to the end-user, the smaller the price fluctuation of the product". Figure 1.1 on long term price variations of selected European publication papers illustrates cyclicality.



Source: PPI

Figure 1.1: Price development of selected European publication papers as of 1980

Economies of scale and the level of the manufacturing technology are important means of achieving cost competitiveness, the latter also impacting heavily on achievable product quality. These two factors together with good command of a long value chain are the most important competitive factors. The basic development of the manufacturing technology is very much in the hands of paper machine suppliers. However, the paper companies contribute to the manufacturing technology through optimisation of the running conditions and through high efficiency of operations.

The paper industry is a process, broad technology industry, where different scientific disciplines (e.g. materials science, information science, chemistry and physics) and different technologies (e.g. automation technology, information technology, chemical engineering and biotechnology) are applied (Lindström, 1996). The paper industry differs from some other mature, scale intensive, sectors such as the steel and the traditional chemical industry: in that integration with information technology has contributed significantly to improvements in process technology. This same development can be seen in the supply industries such as the mineral and the chemical industry. Productivity has markedly improved due to technological advancements and improved control of the process. Technology development has enabled the development of new products. Intelligent labels and packages are recent examples of how the utilisation of advances in information technology has affected certain fibre based materials. For this reason the paper industry has favourable preconditions to put new business models based on the use of the Internet and other electronic media tools into use and consequently improve customer service, or procurement, for example (Saarikorpi, 2000).

Capital intensity and high investment costs of the printing paper industry are other typical features. Ebeling (2002) gives an interesting example: the ratio of investment cost to annual sales volume generated by the investment is in the case of RCF based newsprint mill 2.5 to 3 when the corresponding figure in a new steel plant is 2 to 3 and in a cellular telephone plant is 0.3 to

0.5. The payback period for a new printing paper machine usually ranges from 9 and even close 15 years depending on the timing of the market launch. The lifetime of a paper machine can be 20 years. However, paper manufacturing technology develops at a much faster rate. A major new technology is introduced once in five to seven years and this has enabled higher production efficiencies as well as better and more even quality. So, through reinvestment the practical usage time of a paper machine can be extended from 20 years to much longer. Economies of scale are vital in keeping production costs down. Smart capital deployment is essential. The size of the investment has increased in the continuous search for economies of scale. In order to stay cost-competitive, a paper machine has to be rebuilt on average once every 15 years. Major new investment is often an irreversible step.

Cost competitiveness is the most important success factor for a paper machine line producing standard papers. Cost competitiveness can be lost for many reasons, such as old technology resulting in lower production within available time (machine hour) and in unacceptable quality, or unavailability and high price of production inputs such as fibres, minerals, energy and manpower, or a distance and high transportation costs and also high finance costs.

Environmental friendliness and minimum use of resources are also important competitiveness factors (Paulapuro, 1999). The former is an important element in a good corporate citizenship. The latter has an impact on image and is important as a cost factor.

To be a low cost producer in the paper industry requires low cost and abundant fibre supplies, energy supplies, control of timberlands and global sites. A low cost producer is also dependent on the availability of a certain type of fibre and also prescient investments in addition to economies of scale. Investments in new technology are vital in order to guarantee high efficiencies. Capital reinvestments are one of the few critical success factors

which management can control and which determine a company's own availability to earn costs of capital over a cycle. To get a competitive advantage from an investment requires a manufacturer to have a broad skills, capabilities and knowledge base or access to those resources.

The ownership structure of the paper industry, the Finnish paper industry in particular, has changed significantly in 1990's. Foreign ownership and the number of institutional investors have increased leading to increased profitability demands over the cycles.

It takes between five and seven years to develop a new product, which is why incremental product improvements are typical. Rohweder stated in his dissertation "Product reorientation in the Finnish Paper Industry" (1993) that "…paper industry product development typically results in minor innovation in terms of the change in new product attributes compared with existing products in the market". Radical new product innovations are introduced to the markets relatively rarely. Process innovations are more common than product innovations (Autio, 1997). In the capital intensive industry we have to live with the same steel in the ground for 10 to 20 years. Therefore, the innovation activity in the paper industry focuses on producing the same product with better properties and with lower costs. Innovations are focused on paper manufacturing process and its sub-processes. Schienstock and Hämäläinen (2001) have for example stated that "so–called low-tech industries see significant productivity increases due to the fact that they become intensive users of modern ICT and increasingly adopt technology-intensive production techniques. In the traditional sense, their products are not seen as high-tech but their production processes become more technology-based."

The role of the supplying industry in the area of research and development is very important for the paper industry: those companies devote between 3.0 and 4.0% of their annual turnover to R&D whereas a corresponding figure for the paper industry is approximately between 0.4 and 0.9%

(Lukkari, 2003, p.17). It is however to remember that the paper industry generates turnover during 365 days per annum and 24hours per day.

Forces of change in the printing paper industry are discussed in Chapter 3.1.

Until recently printing paper companies have mainly followed a cost leadership strategy. However, we can now see a parallel development towards more customer focused approaches (Autio et al., 1997) and the adoption of various differentiation strategies. Johnson and Scholes (1989) have elaborated the impacts of different strategies on the need of key resources, organisational structures and on requirements for production machinery. Lilja et al. (1991) have desribed the evolving business recipe in the pulp and paper industry on the global, European and Swedish-Finnish contexts.

1.2 Research questions

In the literature there is a limited understanding of the drivers and motives for product differentiation as well as the mechanism through which differentiated products have emerged in basic industries and in the paper industry in particular. Rohweder confronted this issue in his doctoral dissertation (1994). He focussed on producing an empirically based description of the product development process and its context within the Finnish paper industry. He also identified factors underlying the performance of such a process. More recently Jernström commented product differentiation in her doctoral dissertation “Assessing the Technical Competitiveness of Printing Papers” (2000). Here, product differentiation is seen as one element of competition in its widest form including both tangible and intangible features of products. She states that “in fact, a leadership position in a stalemate industry field, where competition is fierce, is reached by competitors, who achieve lowest delivered costs and/or highest differentiated position.” Jernström highlights the difficulty of defining

differentiation. Motives and drivers for neither a product differentiation in the paper industry nor a product differentiation process have been described. As a partial reason for the existence of plentiful differentiated products in the Finnish printing paper companies has also been a desire to have an extended life time for an old paper machine – invested steel in-bedded in the ground - through making in some critical properties differing products compared to commodities.

The main body of academic literature on product differentiation approaches the issue from either the perspective of economic theory – typically from the perspective of pricing - or the perspective of marketing theory. Aalto-Setälä´s doctoral dissertation “Economics of Scale, Product Differentiation and Market Power” (1999) and Markowitz' “Essays in Industrial Economics: Joint Research Partnerships, Patent Races and Product Differentiation” (1994) represent the 'economic theory' approach. Schneider's doctoral dissertation "An inquiry into the consequences of product differentiation in thirty industries using a case study methodology" (1993) approaches the issue from the marketing perspective. The current thesis takes a strategist's approach. Academic literature largely focuses on consumer markets, not on business-to-business markets.

The underlining research questions of the study are presented in Table 1.1.

The answer to the research question No. 1 is based on:

- literature analyses on differentiation with multiple perspectives
- in-depth, personal expert interviews and careful interpretation of the results
- analyses of the history of product differentiation in the Finnish forest industry via interviews
- analyses of successful and unsuccessful product differentiation cases in the Finnish printing paper industry.

Table 1.1: The underlining research questions of the study

1. What is product differentiation in the printing papers' context?
2. Can product differentiation be used to improve the competitive advantage of a printing paper firm?
3. If so, how should product differentiation be organised and applied in practice as a part of the firm's strategy?

The underlining research question No. 1 is approached through more specific research questions which are the following:

What are the primary motives and driving forces behind the emergence of differentiated printing paper grades?

What are the preconditions[1)], internal and external enablers[2)] and internal and external barriers[3)] behind the emergence of differentiated papers?

What are the key success and failure factors of product differentiation?

What do success stories and failures tell us?

Who directs product differentiation usually and who should direct it?

Have the drivers for product differentiation changed over time and will they continue to change?

Answers to the questions No. 2 and No. 3 are based on the findings and conclusions of the current research.

1) A precondition is a basic requirement which must be met before product differentiation can occur.
2) An enabler is a factor which makes product differentiation possible.
3) A barrier is a fact or action which can prevent product differentiation from becoming a reality.

1.3 Objectives

The overall objective of this thesis is to analyse and describe product differentiation as a phenomenon in the case of printing papers in order to assess whether product differentiation can be used to improve the competitiveness of a printing paper firm within the paper industry.

The detailed objectives of the study are as follows:

1. To review and analyse relevant literature on competitive advantage, differentiation as a strategic choice and combine it with the experience of the author

2. To generate a set of themes on the basis of literature analyses and the author's own experience in order to test the motives and drivers behind product differentiation within the printing paper industry

3. To gather more specific information on phenomenon of product differentiation through in-depth personal interviews with industry experts throughout the value chain and consequently to increase the understanding of this phenomenon

4. To redefine product differentiation in the printing paper industry

5. To develop a framework for a product differentiation process of printing papers

6. To evaluate product differentiation's role as a source of competitive advantage for a firm

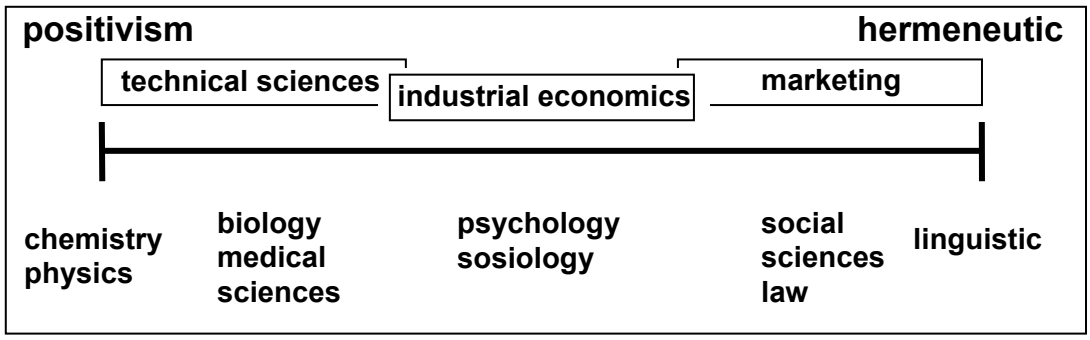
7. To give advice to a paper industry firm, its suppliers and its customers on managing and organising a product differentiation process.

This thesis does not aim primarily to answer the question "what differentiates success stories from failures?" – successful and unsuccessful product differentiation cases are used to build up an action list for management. Through taking a holistic approach this thesis seeks to increase understanding of the entire product differentiation process, the roles of various players and time constraints in order to make recommendations; what to take into account, what to avoid, how to organise and manage the differentiation project.

1.4 Research strategy and methodology

This research draws from more than one science. Those sciences are technical science (paper technology), economics (industrial economics in particular) and marketing.

Different sciences follow different research approaches. Figure 1.2 shows where as regards scientific paradigm paper technology, industrial economics and marketing are positioned. This means that no clear scientific tradition exists in which this thesis study can be positioned.



Source: Adapted from Olkkonen (1993).

Figure 1.2: Methodological flow of sciences

This study examines areas which have been subject to a new area of research. No published research could be identified which could have provided an existing theoretical frame of reference for testing product

differentiation in the context of printing papers. The extension of available frameworks was also considered but rejected because it provided too narrow a scope.

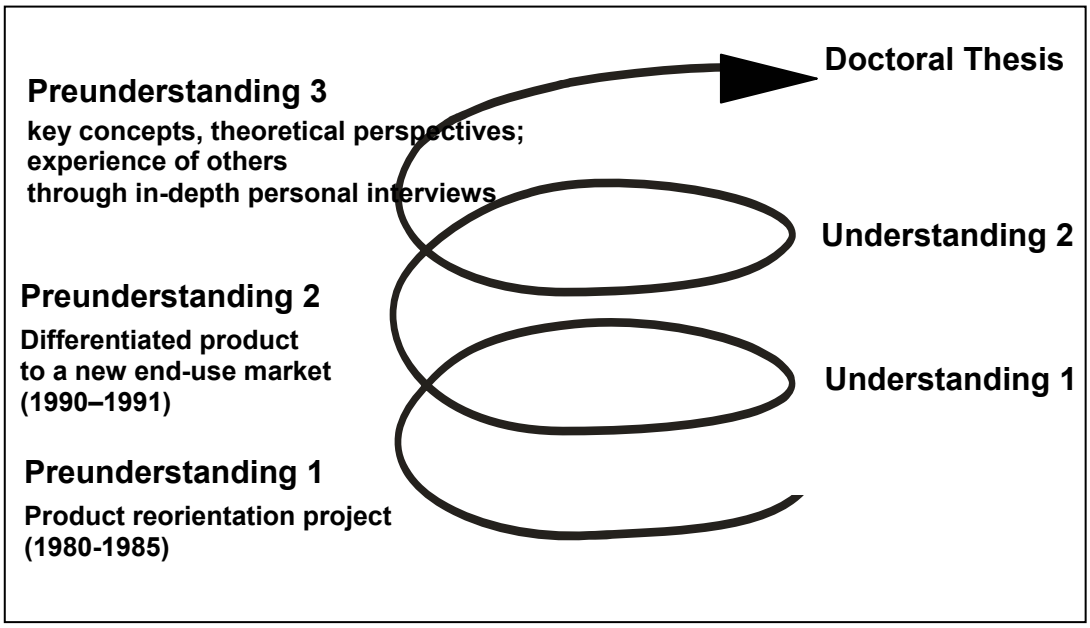
The primary aim of the current research is to increase understanding of product differentiation as a phenomenon in the paper industry in order to assess whether product differentiation can be used to increase the strategic competitiveness of a firm. As such a strategic issue and having many different definitions it was not possible to get quantitative and comparable data and a statistically representative sample for the research. Furthermore, a restricted theoretical approach was rejected because the principal aim of this study was to increase understanding of increasingly taken action, product differentiation. Therefore, a positivistic approach in which the quantitative approach is typical would not have been possible. **A hermeneutic approach** was considered more appropriate for the current research. In the doctoral dissertations of paper technology a positivistic approach is, however, a more commonly used approach. That is why the research methodology is presented in detail.

According to Gummesson (2000) typical features of the hermeneutic paradigm are as follows: 1) the research concentrates on understanding and interpretation; 2) the starting point is primarily inductive; the researcher's attention is less focused and is allowed to "float" more widely; 3) the distinction between facts and value judgements is less clear- recognition of subjectivity; preunderstanding which can be "tacit" knowledge plays an important role; 4) data is primarily non-quantitative; and 5) - the researchers partially create what they study, for example, the meaning of a process or a document.

This research employs the features of hermeneutic paradigm.

Figure 1.3 illustrates the hermeneutic spiral of the study – a knowledge adding iterative process - which can be illustrated by two statements: "no

understanding without preunderstanding" and "an understanding of the parts assumes an understanding of the whole" (Gummesson, 2000).



Source: adapted from Gummesson (2000).

Figure 1.3: The Hermeneutic Spiral

Prior to starting the current research the author had become familiar with the understanding of the phenomena by working at the heart of one product reorientation project from idea generation through to market launch. More recently, the author was responsible for the technical marketing of a differentiated printing paper from a new paper machine line to the new market.

Prior to this research the author's understanding of product differentiation in the printing papers was as follows:
The printing paper industry has traditionally followed 'cost leadership' strategy. Since the mid 1990's the number of intermediary, non-standard printing papers has been on the increase. The question of whether product differentiation can be used as an element of a paper firm's strategy to improve its competitiveness, arose.

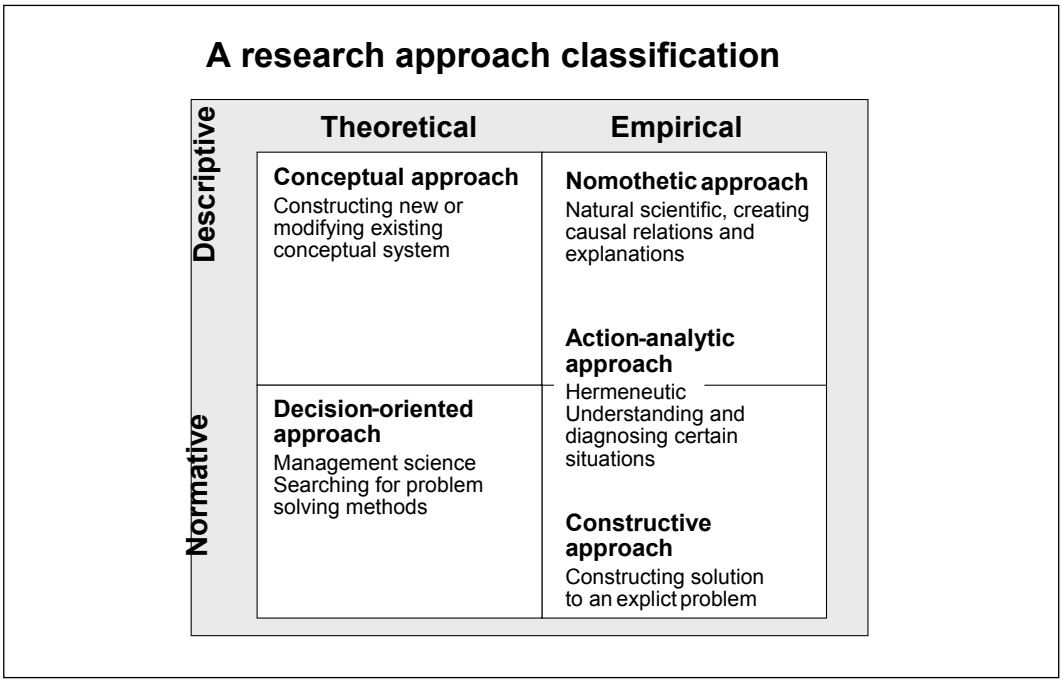
Typically product differentiation of the printing papers is a diffuse, poorly understood concept to be used as an active element in a firm's strategy. One precise definition of product differentiation does not exit but many interpretations depending on a person's orientation. The same concerns apply to a differentiated printing paper. In differentiation both rivals and customers have importance: differentiation defines a firm's position in relation to its competitors by offering a differentiated product. Customers finally decide, whether a product is differentiated or not, through their value perception.

In literature on different scientific disciplines there are various classifications for hermeneutic approaches. Using the approach of Kasanen et al. (1991) this research could best be described as using two approaches: the **conceptual approach** and the **action analytic approach.** The conceptual approach is used in two ways in this research: firstly, to describe product differentiation in the light of pre-understanding, and secondly to give a new meaning for product differentiation in the context of a printing paper firm. The action analytic approach in which the researcher is the central tool is used for gathering empirical data from product differentiation in the Finnish printing paper industry. Figure 1.4 illustrates the research approach classifications of Kasanen et al.

The purpose of the **conceptual approach** is to build new concepts, renew old theoretical frameworks or build new hypotheses. This approach is mainly directed at describing reality and not at making an effort to understand it. That is why the conceptual approach is described as a descriptive approach as opposed to normative. The focus of the approach is on thinking, theoretical research and theory creation. Although, the approach normally uses current theories and doctrines to build new concepts, empirical material may be used for testing purposes. This gives empirical research a somewhat peculiar position in this approach. On the other hand, empirical research is not usually carried out in the course of research. However, other empiria have been used previously to test current doctrine and concepts.

The conceptual approach is, in a sense, a natural phase in every research project when analyses of concepts, current theories and doctrines are made. *In this study the conceptual approach has a specific role.*

The results are often statements or recommendations. The new concepts are tested through argument and seldom really verified.



Source: Kasanen et al. (1991).

Figure 1.4: Research approach classification

The main objective of the **action analytic approach** is to understand the reality that is close the observer. Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of science by joining collaboration within mutually accepted ethical framework. This means abandoning the paradigm that reality is objective and independent. Rather, the action analytic approach sees reality as a part of the environment where the researcher or observer is one of the subjects that influence the phenomenon in real life. This attitude raises the question of the researcher's interests and attitudes and their consequences

on the results achieved during the research process. Normally the researcher is obliged to report on these issues in a more detail than in other approaches. There is no stated, approved methodology in the action analytic research approach.

Empirical material has a limited, but important role in action analytic research. Normally only a few subjects are studied in detail. This leads to applicability and generalissability problems. Also the representativeness of research objects is one of the criteria used in object selection. The researcher is required to demonstrate that the objects are applicable and valid considering the requirements of the research. Typical cases used to select objects, are average or extreme cases. The loss of generalissability is the cost that this approach is (willing) to pay for a deeper understanding of certain phenomena. This does not mean that the relevance of this kind of study is lost in the process, quite the contrary. Action analytic research is important in seeking new theories and constructs, especially as a groundwork for more detailed studies. In the deductionist tradition this approach is highly recommended as the first visit to areas that have not been visited before. The action analytic approach often results in a conceptual system or language.

Several writers have described the characteristics of the action analytic approach. Riordan (1995) for example has stated that action research establishes conditions for the development of other research approaches. The aim is not only that the researcher comes to know more about the system but that people within the system should also learn more about themselves. Gummesson (2000) has stated that during the project the parties involved should learn from each other and develop their competencies. Gummesson has also stated that action research is primarily applicable to the understanding and planning of change processes in social systems such as business companies.

The **nomothetic approach** is closely linked to the traditional positivistic and natural scientific background. The main objective is to explain causalities. The nomothetic approach regards reality as objectively observable, and independent to the observer. Extensive field material is used to confirm the reliability and the validity of the results. So the empirical part of the research is emphasised in this approach. A number of commonly accepted methodologies also exist. The research results normally conform to 'laws'. The downside to this approach is the averaging of the results, which are linked to the doctrines of the approach. This averaging lacks the ability to react to different environments and conditions in the corporate environment conditions.

So, in the nomothetic approach, hypothesis building is based on a statistically verified correlation between variables. Scientific knowledge and understanding are extended mainly through statistically verified results. Also the independence of the observer seeks the testability of the results. This is logical because the basis of the approach lies in natural sciences, where empirical validity is gained through experiments and replication.

The nomothetic approach is not suitable for this research because the target of this research is to understand product differentiation as a phenomenon in the printing paper industry, not to explain causalities. No empirical material was available on the research phenomenon and it could not have been possible to gather this material to validate the research results because of the highly confidential nature of the research area.

The objective in the **decision-oriented approach** is to create a problem solving methodology. This is based on positivism, the micro theory, and the decision-making theory or game theory. Typical models of this are simulation models and mathematical formulae. The decision-oriented approach is established in current doctrines and knowledge of interdependencies between certain variables. The approach also constructs the model through thinking and logic. Empirical material is used to at least

test and validate the resulting model. The results are evaluated with logic behind the model and validity of the results. Applicability is also evaluated, but to a lesser degree. The decision oriented approach could not have been used for the present research because it seeks a solution to a certain explicitly defined situation or problem in making the decisions in the organisations, not in increasing understanding of the research phenomenon. In future studies of the same area and with a more specific scope, the decision-oriented approach could be considered.

The main goal in the **constructive approach** is to build new constructs that work closely with the current doctrines or theories. This construct may be a model, plan, scheme or other construct design for the purposes of management problem solving. The results of the research are evaluated based on novelty and applicability in the progress of scientific knowledge. The demonstration and validation of practical usability is also important in evaluating the results (Olkkonen, 1993). This differentiates the constructive approach from decision-oriented research. The novelty of the results is very important because if nothing new is created, the central assumption of this approach is not fulfilled. Also, if nothing new is created the research is more testing of the current paradigm or theory and therefore more like the action analytic approach.

Research following constructive approach is usually carried out using limited empirical material, for example, a limited number of cases which are studied in great detail. This naturally leads, just as in the action analytical approach, to problems of generality and applicability considerations. On the other hand, detailed study gives the researcher a profound understanding of the cases and all the means needed to demonstrate accurate observations of the phenomena.

The constructive approach was considered at the beginning of this study. It could not, however, be applied in this study, because relevant doctrines and theories could not be found for this purpose. As far as this thesis is

concerned, increasing the understanding of product differentiation phenomenon is the primary aim. In later investigations the constructive approach could be considered.

The current study is qualitative by nature due to the primary aim of the research to achieve a holistic, in-depth view of product differentiation and increase understanding of this phenomenon (Stake, 1995). The study primarily uses **qualitative data**. **Quantitative methods are followed only in a supporting role** - the classification of interview results. More specifically, they were used to give average rating and deviation for pre-delivered alternative drivers and motives of product differentiation using a scale of one to ten.

Because of the novelty and complexity of the research area the empirical section was carried out using a **case study approach** (Eisenhardt 1989**;** Stake 1995; Yin 1989). Gummesson (2000, p. 87) states that "case studies can be of particular value in the applied social sciences where research often aims to provide practitioners with tools". This study meets the important criteria for a case study (Yin, 1989, p. 17): it attempts to answer two questions which are typical for a case study, why and how: **why** product differentiation takes place in the printing paper industry and **how** product differentiation should be organised and managed – **in addition to what** is product differentiation in the paper industry? Before deciding upon the case for the study for example following characteristics were considered: time span, region, historic and economic importance and the like hood of obtaining reliable data within a reasonable time and at a reasonable cost.

A case study may be intrinsic or instrumental (Stake, 1995). In an intrinsic case study the case is the primary interest of the study, based on a need to learn about the particular case. In an instrumental case study the primary interest is a research question, a need for general understanding. This research makes use of an instrumental case study.

A single case study approach was chosen for the current research to collect empirical data. The case used in the current research is the Finnish paper industry cluster. All research questions can be studied through the chosen case. In addition, in the instance of little investigated, complex research area it is important to provide an intensive analysis on the variety of it. A multiple case study may be justified after this pioneer study. Yin (1989) presents three alternative rationales for a single-case approach: the case must be either critical, unique or revelatory. The chosen case can be classified as being both unique and revelatory. Stake (1995) has stated that the case does not necessarily need to be the unit of research. In this study the unit of research is a printing paper firm.

Data collection has been explained in detail in Chapter 4.1: methods in Chapter 4.1.1, population and the sample of interviews in Chapter 4.1.3 and testing of an interview protocol in Chapter 4.1.4. The interview protocol is as Appendix 3.

1.5 Scope and limitations

The research primarily focuses on increasing understanding on product differentiation as a phenomenon in the paper industry and secondarily the role of product differentiation to the strategic competitiveness of a firm. This thesis primarily follows a resource-based view of competitive advantage. A resource-based view of competitive advantage was chosen because the goal was to get a holistic view on the research area. The alternative, industrial organisation view, would have been of too a limited scope. Barney (1991) defines a resource-based view of competitive advantage in the following manner: "The firm is a collection of resources and a set of functions to convert the resources into a competitive advantage."

This study looks specifically at product differentiation in the printing papers product group. Product differentiation was selected as the subject of this research because of the limited understanding of the whole phenomenon

and its role and opportunities as a strategic mean. Some practical problems, which the author experienced in her recent work as Marketing VP of a Finnish machine and system supplier and as a Business Development Director of a paper firm, raised a real need to understand product differentiation more deeply.

Those practical problems were:

- Increasing overall complexity of the business environment. In the case of a paper manufacturer, the management of raw materials for example has become more complex, and in the case of a printer paper stock management has become more operose.

- Misleading statistics, where new differentiated paper grades are mis-positioned in the absence of commonly agreed paper grade classification standards, resulting for example in false investment decisions both by a paper manufacturer and/or a chemical supplier in extreme cases.

- Increasing market instability due to more frequent substitution, substitution by both, competing paper grades and electronic media.

- Pressure to upgrade standard printing papers, which increase their manufacturing costs.

- Unclear positioning of differentiated papers and pricing problems when using cost-based pricing.

The unit of analysis is a paper industry firm. The applied approach is the one of the Finnish paper industry firm. Empirical data including cases of success and failure are restricted to the Finnish paper industry. Finnish paper companies and the supporting forest cluster have been the leaders in developing differentiated products in the last 25 years – the time span of

ongoing research. Price (2002) gives one recent example. The development of the printing papers range since 1965 is presented in Appendix 2.

Alternatively the case could have been on the Canadian printing paper industry, where many old profit eroded newsprint paper machines have recently been upgraded in order to produce more value added uncoated or coated papers (Oinonen and Malashenko 2000; Färm, 2001; Tuomisto, 2001; Cody, 2002). That approach was rejected in this study as assessing the importance of the forest cluster in the emergence of intermediary grades. This assessment would not have been possible to make in the Canadian case. Another reason was a more practical one: to reach such coverage of various industry actors would not have been possible in a reasonable time and at reasonable costs.

Profitability assessments of differentiated papers compared with standard printing papers – if important when evaluating the success of product differentiation - were left outside the scope of this study, because data was not available due to confidentiality reasons. Public data proved to be misleading due to classification problems of non-standard printing paper grades.

Basis weight is sometimes used to differentiate printing paper grades, but this is not the case in this study. Differentiation through services was considered beyond the scope of this study, too.

Although the differentiation is often based on the total offer in stalemate industries and not on a modification of the generic product itself according to Levitt (1980), the focus of the present study is only on product.

1.6 Organisation of the thesis

The first chapter sets forth three underlining research questions that will be examined in this dissertation. A definition for a differentiated product (a printing paper) is given to describe the understanding of the concept at the

beginning of research. Background has been described to provide a framework for the thesis and to point out the importance of the chosen topic. The first chapter also identifies the objectives and limitations of the research and also presents the research strategy and methodology for the research.

Chapter two defines the main concepts discussed in this dissertation: product, product differentiation, substitution, customer segmentation, branding, innovation and research and development. It also describes strategic competitiveness and competitive advantage and reviews various strategic approaches. It also discusses their applicability in the chosen field thus forming a theoretical foundation for the study.

Chapter three describes the industry environment and the actors: forces of change in the printing paper industry, products, compares print media with electronic media, describes customers and also briefly suppliers.

Chapter four focuses on presenting the results of the empirical section of the research. It begins by explaining data collection - methods used, population and sample as well as the testing of an interview protocol. It continues by introducing propositions to be tested in 37 personal in-depth interviews to find out motives and drivers for product differentiation. It then presents the results of propositions testing as well as other interview results. It also provides answers – in addition to what product differentiation is within the printing paper industry - to the questions: **why** does it take place, **when** and **how** does it happen, **who** makes it happen and **what** are **the consequences**. It also compares the research findings with the author's experience. Reliability and validity analysis of this research is presented as the second last issue of Chapter 4.

Chapter five first summarises the main findings of this study. Then it answers two questions: What is product differentiation in the context of a printing paper company on the basis of this research? Can product differentiation be used to improve the competitiveness of a printing paper

firm? It continues shedding light on theoretical contributions and managerial implications of the study, the latter by giving recommendations as regards management actions for product differentiation projects.

Limitations of the present research and directions to further studies are discussed in **Chapter six.**

The structure of this thesis is presented in Figure 1.5.

2 Key concepts and theoretical perspectives

2.1 Key concepts

This chapter begins by presenting the key concepts used in this research. The relatively broad review of product, product differentiation, substitution, customer segmentation, brand, innovation and research & development is justified because product differentiation is a complex research area and the amount of research results and literature on product differentiation in the application area basic industries is rather limited. The increasing importance of product differentiation as a strategic choice among the printing paper producers and the use of the terms in a mixed manner also require careful clarification of the concepts. Planning of an interview protocol and carrying out in-depth interviews necessitated clear concepts, too.

It continues by reviewing the relevant literature concerning strategic competitiveness, competitive advantage and alternative strategic approaches on a firm, business and mill level. It also discusses strategic competitiveness of a printing paper firm as well as integrating technology and business strategy.

Introduction

including research strategy and methodology

Chapter 1

Study foundations:

Key concepts
Theoretical perspectives
Chapter 2

Printing paper industry
Chapter 3

Researcher's own experience

Preliminary definition for product differentiation

The results of the empirical section:

Data collection
37 in-depth personal interviews with analyses
Successful cases and a failure
Reliability and validity of the research
Comparison between research findings and the author's experience
Chapter 4

Conclusions and recommendations:

Key findings
A new definition for product differentiation in the context of printing papers
Can product differentiation be used to improve the competitiveness of a printing paper company?
Theoretical contributions
Managerial implications including recommendations for management actions
Chapter 5

Limitations of the study and directions for further research

Chapter 6

Figure 1.5: The structure of the thesis

2.1.1 Product

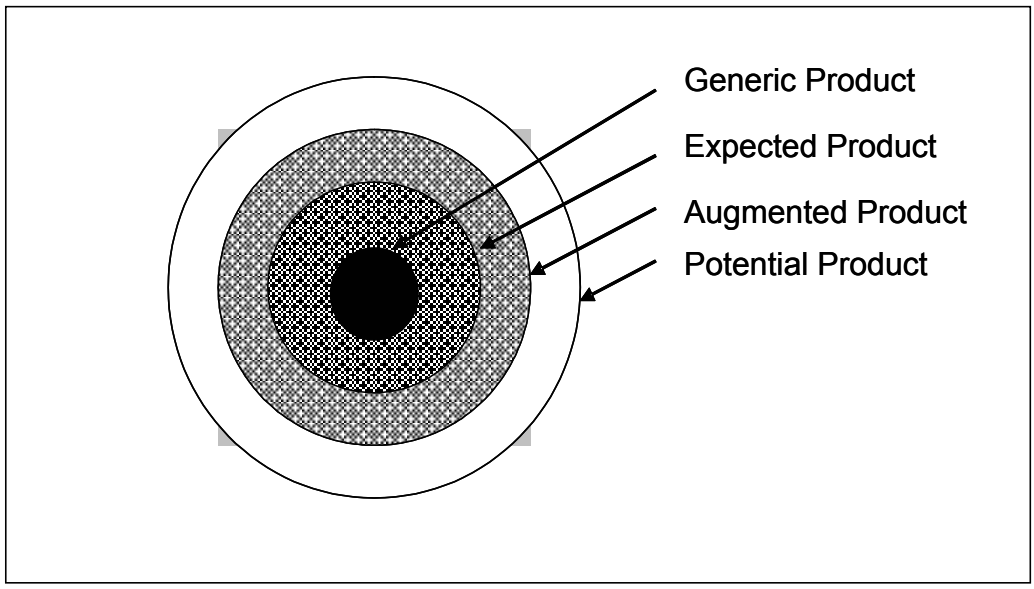
The product is the central element in a printing paper manufacturer's earning logic. The product - printing paper - together with related services form an offering to a publisher, printer or a merchant.

The concept of ‘product’ can be defined in various ways. Doyle (1994) defines a product as "anything that a firm offers to satisfy the needs or wants of customers". This can be a physical object such as a soft drink or a printing paper, but it can also be an intangible service such as a technical advice or just-in-time delivery. The key point is that products are not bought for their own sake but to satisfy a need or a want. The product offer can for example contain the entire product-service package including technical service, product training, payment conditions, promotion, and distribution in addition to product’s physical attributes.

According to Kotler (1998) a product is ”anything which can be offered to a market for attention, acquisition, use or consumption, that might satisfy a want or need”. The product is the first and the most important element of the marketing mix. Kotler (1998) identifies two levels in a product, which he labels **the core product** and **the augmented product**. The core product refers to the minimum benefit provided to meet the buyer's basic needs. It answers the question: what is a buyer really buying? These qualities of products or services are normally taken for granted and are also the easiest for competitors to copy. The augmented product provides a range of basic ancillary services which are not associated with the core product. These include guarantees, credits, and purchase terms, customer service, installation, training, consulting and delivery. These distinguish the company’s offer from competitor’s offers.

Levitt (1986) and de Chernatony & McDonald (1992) distinguish four different levels within the total product concept. **The generic level** meets the buyer’s basic needs. It is the easiest concept to copy and seldom

provides any base for differentiation. **The expected level** satisfies minimum purchase conditions such as availability and functional capabilities. **The augmented level** provides additional values such as delivery information and product training. It satisfies both rational and emotional needs. This type of product can be positioned according to an end-use, end user or according to a specific product attribute. **The potential level** embeds more intangible, emotional factors than rational factors. We can usually affect this level by branding products. On 'potential level' products as such can be similar. Figure 2.1 presents the total product concept.



Source: adapted from Levitt (1986).

Figure 2.1: The total product concept

Printing paper is an intermediary industrial material, which functions as a raw material for a publisher or a printer which is then to be converted into a final printed product. Both the level and uniformity of physical properties are important to a converter. That is why *printing papers are differentiated on the basis of physical product attributes* such as basis weight, thickness, gloss, opacity, brightness, smoothness, surface strength and oil absorption *rather than according to psychological attributes,* which is usually the case with consumer products and markets. The situation in standard printing papers is close to pure (perfect) competition, where an offer is planned in

response to basic and essential needs and in markets where purchasing decisions are rational and concentrate on price or are dominated by it (Tuominen, 1998).

Product family

In many industrial sectors a wide product variety is becoming commonplace. Global operations must be able to adapt to different environments, regulations and cultures. In order to satisfy the needs of a specific customer segment companies develop **product families.** Within printing papers, for example SC papers form a product family with sub-grades such as SC B, standard SC, SC A+ and SC A++ papers. To manage the emergence of product families companies specify components similar to products. These underlying product components are called **product platforms.** According Mayer and Utterback (1993) ”a robust platform is the heart of a successful product family serving as a foundation for a series of closely related products”. Wheelwright & Clark (1992) mention three important characteristics which products must have in order to function as a platform:

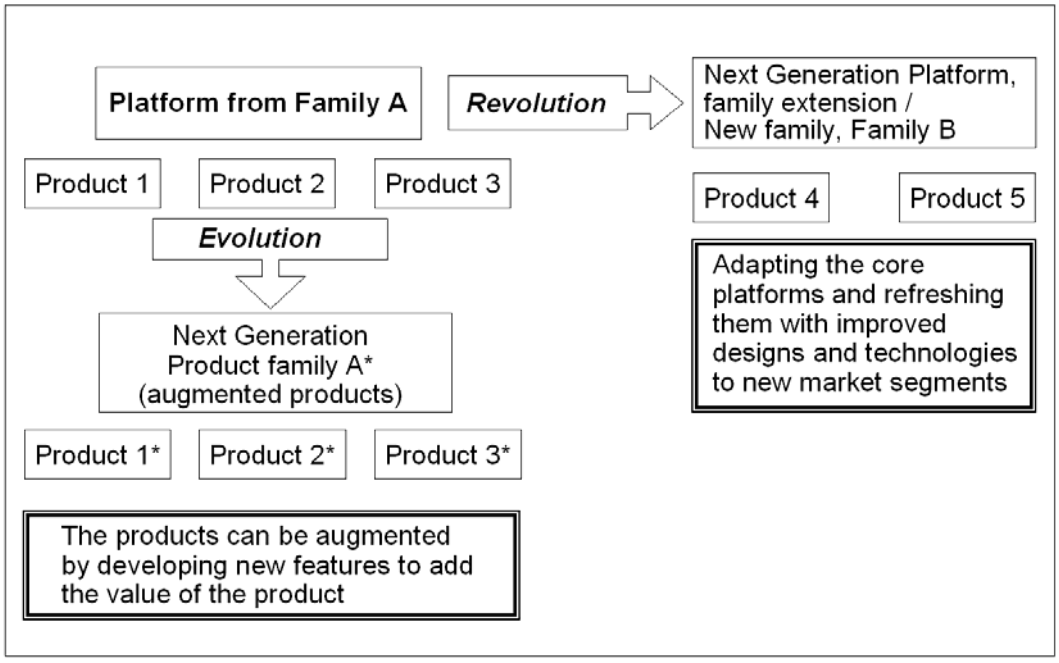
- established core performance capabilities which match with primary needs
- the support of an entire product generation
- a link to previous and subsequent generations of products.

Individual products and product families are the offspring of product platforms which are enhanced over time. Successive product platforms are themselves perceived to be the results of a firm’s underlying core capabilities. Therefore, in order to utilise those core capabilities effectively, product development should be managed by concentrating on levels of product platforms and product families. If product families share good mutual platforms, new product variants can be developed quickly by extending platforms (Wheelwright & Clark, 1992).

Large product families do not come for free: this complicates sales, sets higher demands for pricing strategies, increases inventories and may cause

decreased production efficiencies. Building-up large product families is easier in bigger (printing paper) firms than smaller ones due to a larger number of paper machines and broader and more versatile resource base. In any case, big firms must also solve the problems related to pricing and inventories.

In the process of extending the platforms, two processes can be identified: **an evolutionary process** and **a revolutionary process.** Figure 2.2 describes the product family approach to new product development.



Source: Adapted from Meyer & Utterback (1993).

Figure 2.2: The product family approach to new product development

In the evolutionary process, developing new features to add value to the next generation product augments the available products. With these specific products different *complementary market applications* can be targeted. The customer demands in these segments typically vary: In order to satisfy these customer needs, it should be possible to scale up or scale down products. In the printing papers this means that a firm is able to offer lower quality less expensive solution during downturn for the same end-use.

The next generation products are, however, rapidly copied by the competitors.

In the revolutionary process, however, the core platforms are adapted and refreshed with improved design and technologies *to new market segment. (new end-use areas).* When entering into new market segments, the existing products or families can be used as branches to extending the product range of the family or create new product families. In the expansion process existing and new technical skills, market knowledge and manufacturing capabilities can be utilised. Naturally, a revolution in terms of the core product also provides the basis for differentiation between the competing products.

Evolutionary and revolutionary processes are highly industry specific. In the printing paper industry the evolutionary approach has been dominating. The rate of really new products has been slow.

We can also evaluate product enhancements through three dimensions, in which y-axis represent product, x-axis market and z-axis production method. The easiest changes to carry out in the process industries are those to be found on the level of product/production method, somewhat more difficult on the level of product/market and the most difficult are those cases in which all three parameters – product, market and production method – simultaneously vary.

2.1.2 Product differentiation

No one definition exists of what exactly constitutes differentiation. Jernström (2000) refers to this issue in her doctoral dissertation by saying: *"In fact, it is difficult to define differentiation".* There are also different approaches to differentiation, for example, one of a marketer, one of an economist and one of a strategist as well as many levels such as a product level, product & service offering level and firm level.

Scheuing (1974) defines differentiation as *"adding variations of one product which will compete with it within the same market".* Scheuing points out substantive differences in products. Kotler (1998) takes a broader approach covering any aspect of the total offering by stating *"differentiation is the introduction of differential features, quality, style or image of brands as a basis for commanding a premium".* Chamberlin (1965) elaborated on the concept of product differentiation which was offered as the explanation of a downward-falling demand curve of an individual product. Accordingly, Chamberlin suggested that *demand is also dependent on the style of the product and selling activities – in addition to pricing*. *By differentiating its product offer, a firm may establish a quasi-monopoly, which will, to a certain extent, give a firm more freedom of pricing instead of being a mere 'price-taker'.* In short, Chamberlin noticed the importance of non-price competition, which at firm level can be met by creating certain product attributes and/or product variation, so that differentiation can take place.

Porter (1985) suggests the following rationale behind differentiation: "*a firm differentiates itself from its competitors, if it can be unique at something that is valuable to buyers".* He continues that ***the sources for differentiation are not well understood***. They can stem from anywhere in the value chain. *Differentiation is a much broader concept which encompasses more than any one factor such as quality, for example. For industrial, commercial and institutional buyers, differentiation requires that a firm be uniquely able to create competitive advantage for themselves* (Porter, 1985).

Calori and Ardisson (1988) define differentiation in a following manner: *"It is a position in which the offer of a given competitor has some valuable, distinctive characteristics for the customers. Those characteristics must fulfil the following criteria: they must be perceived by customers, defensible from imitation by competitors and valuable for the supplier either through higher market share and/or higher margin".*

O'Shaughnessy (1984) takes the economists' view by saying that *any non-price differences constitute differentiation.* The idea that product differentiation softens price competition is prevalent in micro-economic literature. It is motivated by a problem known as the Bertrand paradox (Bertrand, 1987): *"When firms produce homogenous products, price is the only variable of interest to consumers. Consequently, no firm can raise its price above marginal cost without losing its entire market share. In contrast, product differentiation establishes market niches and allows firms to enjoy some market power over these clienteles."*

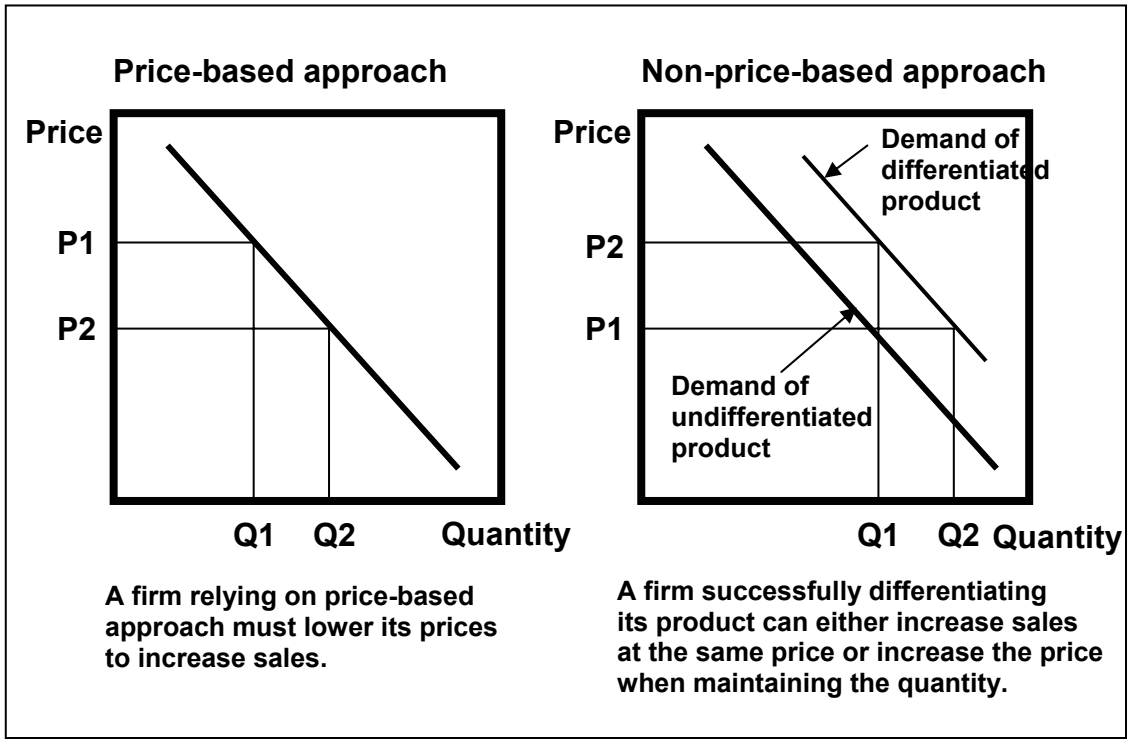
In addition to defining, what is differentiation, it is important to consider two other issues:

- **differentiation with respect to what and**
- **differentiation in whose eyes**.

Regarding the former question, Scheuing (1974) and Foote (1972) for example agree that products are differentiated from those of competitors. Regarding the latter question – differentiation from whose perspective – several writers imply that differentiation is based on customer perceptions. **The connection between the intentions or needs of the supplier and perceptions of the customer is not well explained.** The following chapters attempt to clarify this issue through describing a product differentiation process in the printing paper industry context, identifying the roles of different actors and producing a framework for organising and managing product differentiation process.

Reducing price competition is the primary aim of differentiating a product. By differentiating the product, a seller attempts to reduce the influence of price on demand by creating a distinctive good or service via promotion, packaging, delivery, customer service, availability and other marketing factors. **Successful product differentiation creates value to both customer and manufacturer.** Evans and Berman (1997) call it the

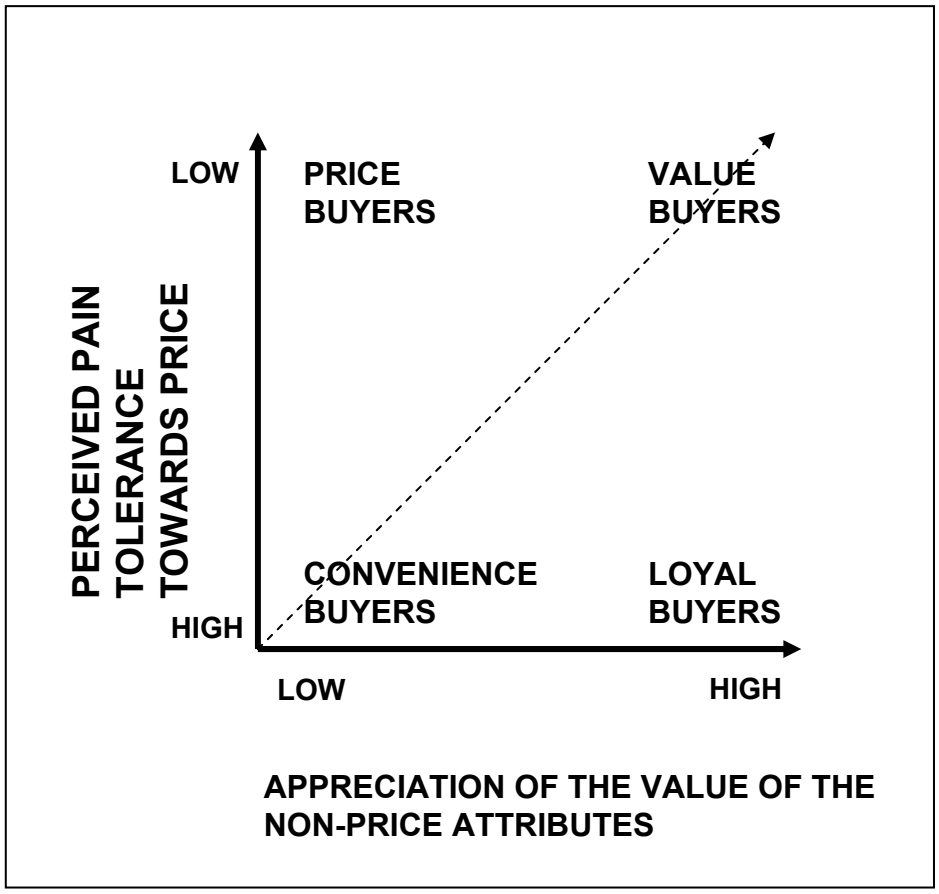
non-price-based strategy. The price-based approach and the non-price-based approach are compared in Figure 2.3.



Source: Evans and Berman (1997).

Figure 2.3: Price-based vs. non price-based strategies

To benefit from differentiation a seller must be able to identify customers, who benefit from differentiation and are ready to pay for it. Customers can be classified as four distinct groups according to Nagle and Holden (1995) - convenience buyers, price buyers, value buyers and loyal buyers – value buyers should be sought out. Figure 2.4 describes the customer classification of Nagle and Holden.



Source: Nagle and Holden (1995).

Figure 2.4: Customer classification according to Nagle and Holden

Differentiated products function also as informative experiments for a producer. In her research, Sällström (1998), has identified the following benefits from experimenting with differentiated products:

- adequacy of learning
- speed of learning
- expected pay-off per period.

Porter (1985) mentions the following *pitfalls of differentiation:*
1) uniqueness that is not valuable to buyers; 2) too much differentiation;
3) too big a price premium which ignores the need to signal value;
4) underestimated costs of differentiation; 5) focus only on the product and not on the whole value chain; and 6) a failure to recognise buyer segments.

Trout (2000) claims in his book “Differentiate or die” and specifically in Chapter ‘Differentiating commodities’ that *“where there is a will, there is a way to differentiate”.*

Levitt (1986) has stated that *you can differentiate anything*. In order to do this it is essential to offer customers more than they think, they need or they expect to get. This requires a good knowledge of customers' and their customers' businesses and logic.

The final step in differentiation is about building a programme to make people aware of your difference. There, however, remains a challenge to implement differentiation strategy.

Product differentiation in the paper industry can take many forms. From raw materials – various fibres and pigments for example - through to production methods – coating and calendering for example - to branding and pricing of printing papers. Customers - publishers, printers and merchants – increasingly need product differentiation to support their differentiation strategies and to provide financial flexibility in this cyclical business.

It can be stated that differentiation is a complex issue. No one unique and generally accepted definition exists and many depend on the researcher's approach and objectives. To summarise there are, however, some important characteristics in differentiation:

- differentiation must add value to both customer and manufacturer
- it must be well communicated
- it must be compared with competition
- it is important from whose perspective differentiation is assessed
- connection between the needs of the manufacturer and the perception of the customer is not well known

- to sell differentiated products requires from sales executives different approach from that of commodity, e.g. good reasoning for why to pay more
- product differentiation is about will and determination.

Product differentiation has not been on focus of research community since early 1990's but is an increasing reality in the printing paper firms.

2.1.3 Substitution

Industrial markets, which the paper industry typically represents, can be characterised in terms of the relationship between buying and selling partners rather than short-term transactions. Möller and Wilson (1995) distinguish three different ways in which buyer-seller interaction can be approached: 1) through exchange, 2) adoption and 3) co-ordination. Firms are bound to each other through multi-level relationships. Customers and suppliers become dependent on each other in many ways. So a change of a supplier will not be made without good reason. Neither are paper grades switched so often for an end-use. Porter (1985) has stated that one method of understanding the adoption of a modified product can be found by employing the concept of substitution. This takes both the propensity to change and the switching costs into account in addition to the relative advantages.

Direct switching costs typically arise as a result of different printing machine adjustments and usage training. The propensity to change is related to factors such as an approaching down cycle, decreased paper budgets and a need for a more economical printing substrate. How, and to what extent, purchasing strategies impact directly on the acceptance of differentiated products is not so well known. That is to say: the willingness to buy is mainly approached from the traditional adoption point of view. Some evidence can be found that early acceptance depends on the attitudes of the managers: specifically, to what extent they generally favour a change (Cohn, 1980). It

is also anticipated that firm size is of some significance. Larger firms can generally devote more resources to the search for information. This in turn then has a considerable impact on the number of possibilities it is possible to identify (Baker, 1975).

Two types of substitution occur in printing papers: 1) substitution of print media by electronic media and 2) substitution within the print media. Different drivers exist for both developments.

In substitution between printing papers there are, in effect, two different types of forces: short term and long term (Haarla, 2000b). Both the short-term actual situation and the long-term development simultaneously affect the final outcome. The strongest short-term forces are the supply/demand balance and the price difference between competing grades. Long term influences on substitution include decreasing quality differences between printing paper grades, the widening of a product range, the development of printing technology for a unifying effect, the development of paper production technology with new coating and finishing applications and pressure from advertisers and consumers in the form of environmental demands.

The general economic situation and the supply/demand balance have had – according to a writer's experience - an impact on the direction of substitution. When the economy is weakening there is an increasing pressure to downgrade, to move towards lower quality, more economical paper grades which are good enough for the end-use. Typical examples of this are switches from LWC to SC or from WFC to LWC. Quality differences in printed products are often minimal to an advertiser and hardly visible to an end-user, consumer.

An article by Oinonen and Malashenko (2000) contains examples of how newsprint is increasingly substituted for more value added printing paper grades.

Electronic media will change print media, particularly the use of printing papers. It will simultaneously also create new needs. How the quality of mechanical technologies for producing and distributing publications will develop and at what cost, are two key drivers (EDSF, 2001). The third important driver stems from human behaviour: will consumers prefer information in typographic rather than in audio or video form. (EDSF, 2001; Onabe, 2001) This issue is referred to in more detail in Chapter 3.4.

The substitution mechanism within the printing papers range is not well known and requires further research.

2.1.4 Market segmentation

Market segmentation and positioning of products are two fundamental marketing tasks (Doyle, 1994). Scheuing (1974) has stated that ***"product differentiation is ... generally a requirement for market segmentation". To get the most value out of product differentiation you have to know to whom to offer differentiated products. Market segmentation is an important means of the differentiation process because it helps a firm to understand the needs of separate customer groups.*** It offers a firm the chance to meet customer needs more effectively as well as its own needs. According to Kotler (1998) market segmentation means "subdividing a market into distinct and meaningful subsets of customers who might merit separate marketing programming and effort".

According to Doyle (1994) the motives for market segmentation are as follows:

- better matching of customer needs; creating separate offers for each segment provides customers with better offers
- enhanced profits; customers differ in their price sensitiveness and by segmenting the markets a marketer can raise an average price and enhance profits. There are negative factors in segmenting customers such as additional costs of producing multiple instead of one offer,

smaller volume in an additional premium segment than in the mass market offer and an additional product would cannibalize the sales of the current product. Doyle argues that the marginal revenue often vastly outweighs the negative factors.

- enhanced opportunities to grow
- *retaining customers by offering, for example, a differentiated product to meet a customer's changed need*
- targeted communication to increase effectiveness
- market segment share; 'It is generally share rather than size which determines profitability' (Doyle, 1994)

The bases for segmentation differ in their sets of need and profiler variables between a consumer market and an industrial market, although analogies exist in the basic approach.

Before market segmentation of industrial markets can take place, the characteristics of the customers must first be described. The needs of the industrial customers depend on their strategy, their operating environments as well as personal characteristics and relationships with individual buyers within the organisation. A buyer in a static, commodity business is likely to be highly cost-oriented whereas a buyer working for a dynamic, high value-added segment may be geared more to the performance-enhancing features of the product or the seller's speed of response.

According to Doyle (1994) the most common profilers in industrial markets are:

- industrial end-user**;** in terms of printing papers a publisher, printer or merchant
- organisational type*;* public or private sector
- size of the organisation*;* big, small, national, multinational
- geographical location*;* local city, region, country, continent
- application; in terms of printing papers an end-use such as newspaper, magazine , supplement, catalogue, book, copy, advertisement

- usage; for example, a heavy or light user, a loyal or non-loyal user
- purchasing organisation; for example centralised or decentralised, purchasing policy and criteria, nature of the decision making unit.

With reference to printing papers there is another important aspect to consider. That is the importance of a paper as a cost component of the end product (application). It varies by application from newsprint's 60 to 70% to a sales catalogue's 3 to 5%. So, this means that it is important to identify those segments where paying ability for differentiated papers is high.

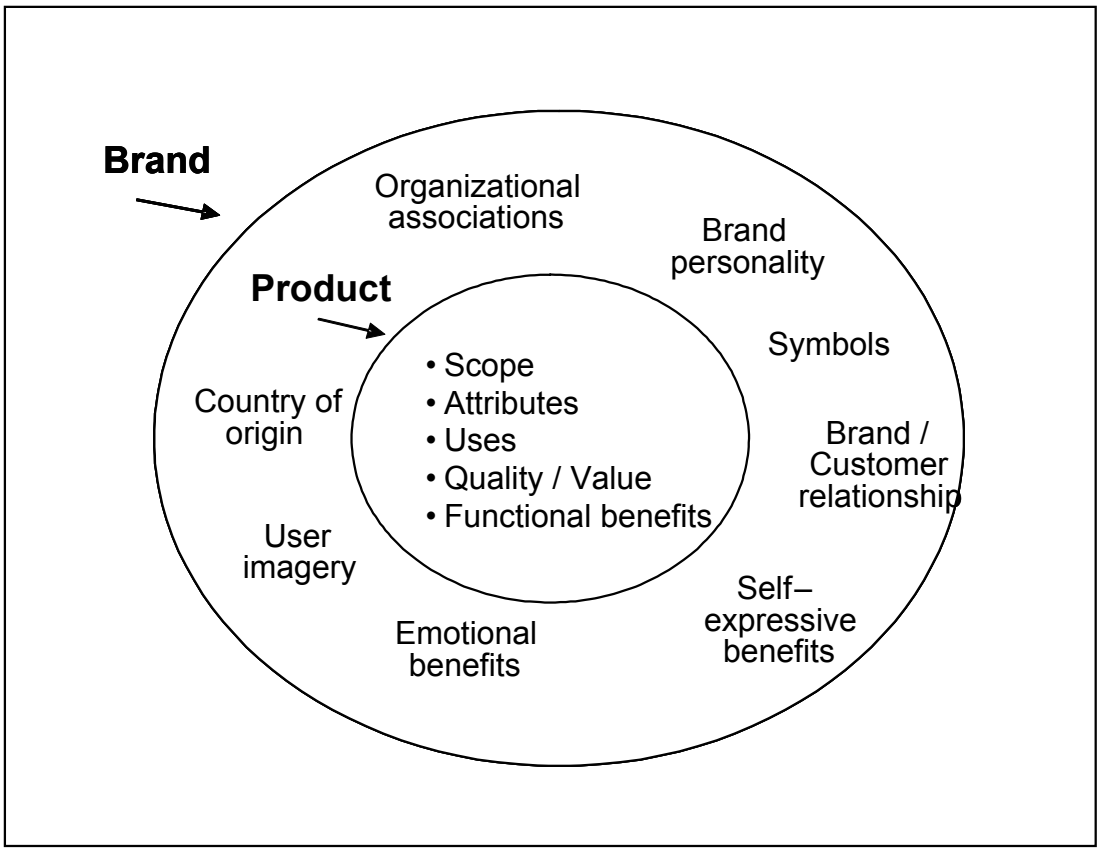
2.1.5 Branding

2.1.5.1 What is a brand?

Brand is *the sum of all the information about a product, a service, or a company that is communicated by a name or related identifiers, such as logos or other visual cues. The brand is not the name itself; a corporate name that does communicate anything of substance is not a brand. The attributes of the planned brand exists in the eye of the beholder and reflects an accumulation of both the communications that the person has received concerning the product, service, or company and the experiences that he/she has had with it"* (Mercer Management Journal, Number 12, 2000) .

Aaker and Joachimsthaler (2000) define a brand in the following way: *it is that which remains after the impact of attributes has been subtracted. The product includes characteristics such as product scope, product attributes, quality/value, uses and functional benefits. A brand includes these product characteristics and a lot more: user imaginary, country of origin, organisational associations, brand personality, symbols and brand/customer relationships.*

Figure 2.5 summarises the distinction between a product and a brand.



Source: Aaker and Joachimsthaler (2000).

Figure 2.5: Brand vs. product

In addition to functional benefits, a brand potentially delivers emotional benefits and self-expressive benefits.

Kotler (1998) has stated that *a brand is not only a name but also a deep set of meanings*. If a company treats a brand only as name it misses the point of branding.

Kapferer (1992) and Murphy (1990) define a brand as *an agreement or an alliance between the seller and the buyer.* A brand enables a buyer to make a purchasing decision with confidence and provides a seller with higher volumes, often higher margins, provides easier acceptance of new products and greater certainty for future demand. A brand is *a seller's promise, a sort of guarantee, to provide customers with consistent quality, performance and*

benefits. The brand protects the customer and the producer from competitors, who attempt to provide products that appear identical. And according to trademark law, the seller has exclusive rights to use the brand name (Pettis, 1995).

Branding is a brand-related action. This means a way of thinking of the company and its products and services as a set of tangible and intangible attributes and values which are distinctive, appropriate, consistent and prosecutable (Kotler, 1998). In branding, companies aim to fulfil the expectations of particular groups of customers by consistently providing an appropriate combination of attributes. Branding should be regarded as a strategic device, influencing both the company itself and its customers.

Branding has an input and an output process. The input process is about auditing the capabilities of the firm and evaluating external factors in order to create added values and to construct a coherent marketing approach which uses all the elements of the marketing mix. Once there is a clear internal appreciation of the brand's added values, a holistic strategy needs to be developed and integrated, adding values into all parts of the supply chain. The output process, in turn is about the consumers' perceptions which may not always be the same as those the marketer intended. The brand exists in consumers' minds and is thus always subjective (de Chernatony and McDonald, 1992).

Due to the growing recognition of brands as valuable assets to a firm, the concept of brand equity in particular has been the focus of research by academic institutes as well as by industrial firms. Aaker (1991) defines *brand equity* to be "a set of brand assets and liabilities linked to a brand, its name and symbol which add or subtract from the value added by a product (or service) for a firm and/or for that firm's customers". Brand equity refers to the power and values, which a brand has in the market place. Brand equity has four elements, which guide brand development, management

and measurement: 1) *Brand awareness* is an often under-valued asset. Awareness, however, has been shown to affect perceptions and even taste; 2) *Perceived quality* influences brand associations and it has been empirically shown to impact on profitability; 3) *Brand associations;* can include capturing user imagination, product attributes, new circumstances, organisational associations and symbols. Brand management frequently focuses on brand associations and their management; 4) *Brand loyalty* is at the heart of any brand's value. The concept is to strengthen the sides and intensity of each loyalty segment (Aaker and Joachimsthaler, 2000).

2.1.5.2 Branding in industrial markets

Aaker (1991) identifies two major benefits which branding can offer in the industrial markets: firstly, it assists the manufacturers in segmenting the market, thus enabling them to create a distinctive image to carve out a market niche which will provide a foundation for price differentiation. Secondly, in giving a producer the opportunity to attract and retain a set of customers, and by decreasing vulnerability to competitor promotional activity, it increases sales stability and long term profit. Enhanced brand loyalty is of particular importance when competitors innovate and obtain product advantages.

Sinclair and Seward (1988) investigated the effectiveness of branding an industrial commodity product, which previously used no branding. The product in question was structural panel. Promotion relied on production-oriented marketing in order to generate large sales volume and to gain cost effectiveness in product distribution. A substitute product appeared in the market and the marketing philosophy had to be changed. Ultimately, the company could not get any premium prices through branding. This study suggested that primary attention is to be paid to promotional and marketing support when launching new brands. In order to avoid customer confusion arising from competitive offers - which are inevitable - the importance of educating the end-user about basic product attributes and the means of

identifying them was stated as being crucial. De Chernatony and McDonald (1992) criticises the case by saying that no real added value was developed and that only the names were put into use.

Although branding literature is wide, branding as a means of differentiation in the printing paper industry is still underdeveloped, and only a limited amount of an academic research in this specific area exist. Rare examples include Rosenbröijer's studies in 1995 and 1998, Rytkönen's Master's Thesis in 1996 and Lilja's Master's Thesis in 1999.

Rytkönen (1996) found in his research the following points favouring branding in the industrial markets:

1. Differentiation from positioning towards competition provided that the value added is based on features that have real value for the customer. This in turn gives leverage to premium pricing policies as the perceived power of the producer in the industrial chain increases through pull-demand from the end-user side.

2. Increasing customer loyalty decreases pressure on price, acting as a buffer against competitive actions.

3. New brands can be introduced under the umbrella of well-established family or company actions.

4. A previous mainly transaction-oriented, buyer-seller relationship becomes more institutionalised due to more complicated product offering. Increased co-operation in the form of marketing support and technical co-operation vis-à-vis the end-user is required. The focus of industrial marketer shifts from reactive selling to customer relationship management.

Because industrial customers normally have several contact points with the supplier company the need for a coherent external and internal marketing program increases. It ensures that the customer feels the commitment of the whole organisation behind the brand. Rytkönen has also found in his research that brands in the industrial markets must take into account the needs of everyone in whole chain.

Lilja investigated in his Master's Thesis (1999) the branding of finished reeled printing and writing papers. He draws the conclusion that the branding process has four layers: product platforms, types of identity for products, product portfolio structure and an extended product. Although technical features provide a good basis for entering the branding process there is, however, a threat that the technical features could be copied by the competitors - even at a short notice. As a result, competing products are entering the markets. For this reason a technical innovation alone is not enough for a producer. Instead more distinct identities are needed for the product. An augmented level of product is becoming increasingly important.

According to Lilja's research the following four factors can be used as the basis for differentiation for reeled printing and writing papers:

- differentiation by a technological intention ´
- differentiation by a wide product range
- differentiation by a top level customer reference and
- differentiation by bundling activities with products.

Some success stories exist in branding in the paper industry. A good example is the case of Conqueror, a business stationary product made by Wiggins Teape (Industrial Marketing Digest, 1987). Key success factors in this case were the following: broadened product range, improved customer service, the unique opportunity to learn the business logic of the major part of the value chain through owning a paper mill, and the unique and bold decision to change a merchant. Other widely known brands are Xerox and Canon copy papers, the brands of the office equipment manufacturers.

Hennig (2000) has stated that service, product and relationships are the real issues for paper branding in the future. Kilpi (2003) presents branding as a real value creation tool for a paper company through creating a bond between the producer and the user.

To summarize, branding can function as one alternative means of product differentiation, at minimum to support it.

2.1.6 Innovation and Research & Development

Innovation is regarded as a major source of company's competitive advantage. It also is the means by which organisations anticipate and fill customer needs and also the method by which organisations utilize technology.

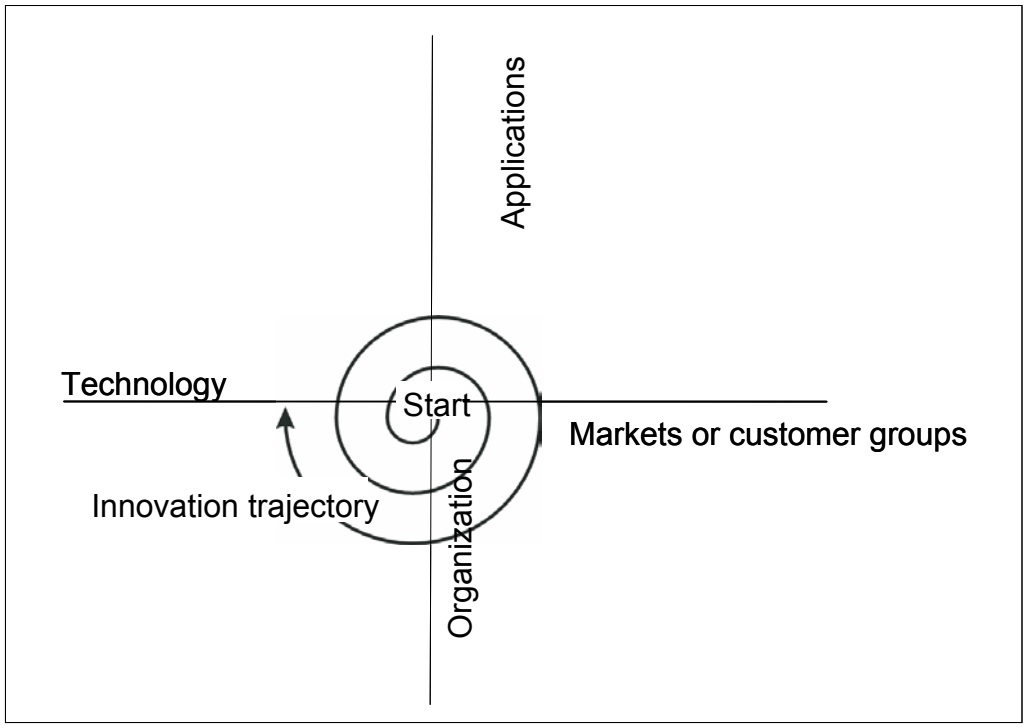
The literature on innovation and innovation success is vast and covers numerous perspectives, levels of analyses, and objectives (for example Cooper,1990; Craig and Hart,1992; Lilien and Yoon,1989; Rothwell,1992; von Hippel,1988). There have been basically two views of innovation: in one view innovation and innovation success is closely linked to technological change and research & development activities. This is to be found in the industrial economics literature. In another view, mainly taken in the marketing literature, innovation is regarded as detection and fulfilment of unfilled needs and wants of potential customers, and the innovation success is there closely linked to the concept of degree of market orientation of the innovative company. More recently the literature has emphasised the need for a balance of two views and importance between the interplay with R&D (technology push – a recognition of a new technology solution to satisfy the potential need) and market orientation (market pull – recognition of potential customer need/want) for successful innovation to occur (Burgelman and Sayles,1986; Cooper,1984b; Crawford,1997; Nyström,1990).

Autio et al. (1991) define innovation as follows: innovation is *"a commercially successful, essentially new or an essential improvement of a system, process, method, product, or service, which has been widely accepted into use".* In this broad meaning innovation does not depend only on technological, but also on other critical capabilities such as manufacturing, marketing, and distribution and human resource management.

Four dimensions define the innovation arena (Janszen, 2000). Those are technology, applications, market segments or customer groups and organisation, also called TAMO. Figure 2.6 presents the dimensions of innovation and the innovation arena. Within this arena we can position companies with respect to their TAMO dimensions. A change from one position to a unique and new one in this arena is an innovation and the consequence of the company's innovating activities.

When we consider the subsequent track and timescale of innovations in time of a certain organisation, we obtain an innovation trajectory. The innovation arena helps us not only to define the world we need to consider when studying innovation, but also to focus and define the scope of our innovation strategy and activities. A TAMO concept reflects the holistic nature of successful innovation management.

Janszen (2000) emphasizes the systemic nature of innovation by stating that innovation – as well as new product development (NPD) - are non-linear phenomena with non-linear behaviour such as biological or socio-economic systems. Without knowing the system dynamics it can be hazardous to predict the behaviour of the system. Typical to such systems is path- dependency associated with 1) the existence of reinforcing loops and lock-in (balancing) phenomena, 2) evolution & co-evolution, 3) two or more elements influence each other and 4) self-organisation.



Source: adapted from Janszen (2000).

Figure 2.6: The innovation arena defined by technology, applications, market/customer and organization with innovation trajectory

Peters (1997) has summarised the main attributes of innovation in his model ”The Circle of Innovation” **.** He especially refers to a number of psychological and emotional aspects of innovation.

Innovations can be classified according to various criteria, for example 1) according to an amount of change (Burgelman and Maidique, 1988; Abernathy and Clark, 1985, Henderson & Clark, 1990), 2) according to scale and scope or 3) according to risk and impact (Petit-Gras, 1998).

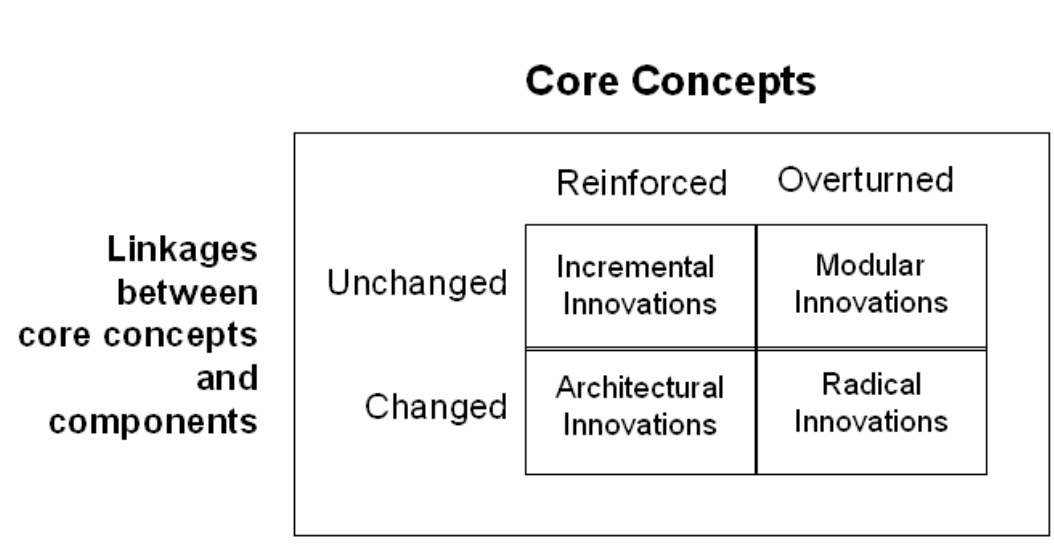
Incremental innovations are typical in basic industries such as paper, steel and standard chemical industry. They involve the adaptation, refinement and enhancement of existing products and services and/or production and delivery systems (Burgelman and Maidique, 1988). These innovations require minor improvements and slight adjustments. They often call for considerable skills and ingenuity and have significant economic value. Incremental innovations tend to reinforce the competitive position of

the firm, because these are built on core capabilities (Abernathy and Clarke, 1985). If only incremental changes are carried out, a company may face the risk of loosing the capability to adapt to radical change regardless of the origin of an idea (Schienstock and Hämäläinen, 2001).

Radical innovations which are fundamental changes (Burgelman and Maidique, 1988) **are rare in the capital intensive process industries including the paper industry.**

Architectural innovations in which the core is the configuration of the established system so that existing components are linked together in a new way (Hendersson & Clark, 1990) **are presently relative seldom occuring in the process industry.**

Figure 2.7 describes a framework for defining innovation according to core concepts and linkages between core concepts and components.



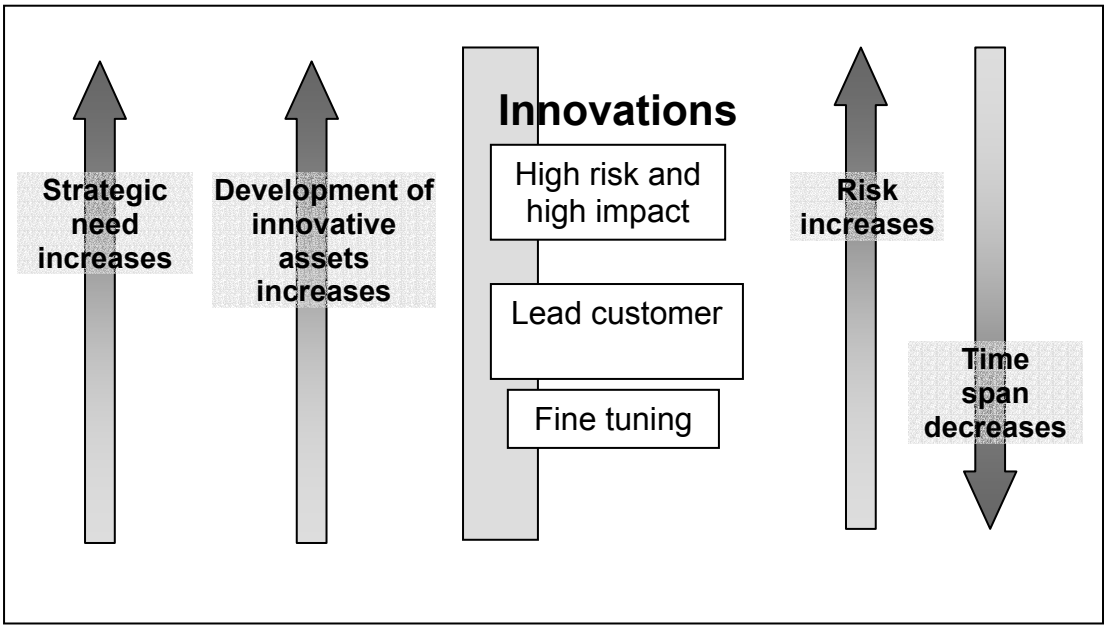
Source: Haarla (1998).

Figure 2.7: Types of innovation according to core concepts and linkages between core concepts and components

Innovations can also be classified according to scale and scope in the following way: incremental innovations occur more or less continuously in any industry, and these types of innovations refer most often to the development of a product in an industrial firm. Most innovations resulting from existing firms strategies are incremental in nature. Radical innovations are discontinuous events that result in a fundamental change in a specific way. In the process industry the development of a manufacturing process functions as a means of innovation.

New technological systems often involve interrelated clusters of innovations, which encompass far-reaching changes in technology; affecting several branches of the economy. Technical revolutions are new techno-economic paradigms that are so far-reaching in their effects that they have a major influence on the behaviour and structure of the entire economy. In the process industry they may arise from outside that specific industry.

Petit-Gras (1998) classifies innovations according to risk and impact in the following way: *High risk and high impact innovations* are long term – up to 10 years – and produce new products or services. One example of this is SC A+, a differentiated printing paper grade among the SC product group. *Lead customer innovations* are medium term and often done in tight co-operation with a leading customer. Coated papers for digital printing are good, recent examples of lead customer innovations. *Fine-tuning innovations* – corresponds to incremental innovations - are continuous, incremental innovations in practice, problem solving in the paper industry. Increasing the surface strength of LWCO paper for the ever-faster offset printing machine is an example of a fine-tuning innovation. Figure 2.8 describes innovation types according to risk, time span, strategic need and deployment of innovation assets.



Source: Petit–Gras (1998).

Figure 2.8: Innovations according to risk, time span, strategic need and deployment of innovation assets.

In the printing paper industry the innovations are typically incremental by nature. Song and Montoya-Weiss (1998) have investigated whether the development of a really new product requires a different approach from that of incremental new products. They found that four sets of new product development activities – strategic planning, market analyses, technical development, and product commercialisation – are key determinates of new product success for both really new products and incremental products. However, according to their research, strategic planning and business and market opportunity analyses activities play contrasting roles for the two types of products. Working to improve the efficiency in business and market opportunity analyses maybe counter productive for really new products but it can increase the profitability of slightly changed products. Conversely, improving the proficiency of strategic planning activities has a positive effect on the profitability of really new products but it has a negative effect on incremental products.

Abernathy and Utterback (1978) have investigated patterns of industrial innovations. They conclude that a production unit's capacity and methods of innovation depend critically on its stage of evolution from a small technology-based enterprise to a major high-volume producer, which typically the paper industry currently represents. The changing character of innovation and its changing role in corporate advance is described in Figure 2.9.

Abernathy and Utterback (1978) distinguish three types of industries, based on an industrial life-cycle model: first, industries that are in the first 'fluid phase' of their life cycle. Current examples can be found in new areas of technology sector such as certain software and biotechnology companies. Industries in the middle of their life cycle are in the 'transitional' phase. In this phase the technology is typically constantly reorganised and evolving fast.

Management issues	Fluid phase	Transitional phase	Specific phase
Innovation	Frequent, major product changes	Major process changes required by rising demand	Incremental for product and with cumulative improvements in productivity and quality
Sources of innovation	Industry pioneers, products' users	Manufacturers, users	Often suppliers
Products	Diverse designs, often customized	At least one product design, stable enough to have significant production volume	Mostly undifferentiated, standard products
Production process	Flexible and inefficient major changes easily accommodated	Becoming more rigid, with changes occurring in major steps	Efficient, capital-intensive and rigid; cost of change high
R & D	Focus unspecified because of high degree of technical uncertainty	Focus on specific product features once dominant design emerges	Focus on incremental product technologies; emphasis on process technology
Equipment	General purpose, requiring skilled labor	Some subprocesses automated, creating islands of automation	Special-purpose, mostly automatic, with labour focused on tending and monitoring equipment
Plant	Small-scale, located near user or source of innovation	General- purpose with specialized sections	Large-scale, highly specific to particular products
Cost of process change	Low	Moderate	High
Competitors	Few, but growing in numbers with widely fluctuating market shares	Many, but declining in number after emergence of dominant design	Few, classic oligopoly with stable market shares
Basics of competition	Functional product performance	Product variations; fitness for use	Price
Organizational control	Informal and entrepreneurial	Via project and task groups	Structure, rules and goals
Vulnerability of industry leaders	To imitators and patent challenges, to successful product breakthroughs	To more efficient and higher-quality producers	To technological innovations that present superior product substitutes

Source: Abernathy & Utterback (1978).

Figure 2.9: **Three phases of industrial innovations**

One example of this is microelectronics. Industries that are in the mature, specific phase include petrochemicals, paper and steel. This classification was justified at the time of conception, but the industry has recently turned out to be more dynamic.

Some critics have been posited to Abernathy's and Utterback's approach: they take the development process of the sector, expressed as the industry life cycle, as their starting point. The industry life cycle gives us further clues to why companies innovate in certain ways. It does not, however, take into account the characteristics of certain technology.

A differentiated product is often a result of incremental innovation.

In other industries such as in medical and biotechnology industries innovations typically take place by small start-up companies, which operate on venture capital funding while bigger companies buy them out.

To be able to permanently innovate and to implement, knowledge management is paramount (Janszen, 2000). A message from the paper industry, however, points out that knowledge management alone is not enough (Stade, 2001). Very few paper industry companies seem to have the patient money to support long-term innovation.

Sanchez emphasises knowledge management in product creation, too (Sanchez, 1996). Three levels of knowledge - know how, know why and know what – must be recognised and managed strategically in network based product creation process. Also Rothwell (1992) emphasises industrial innovation as a process of know-how accumulation or a learning process involving elements of internal or external learning. The key factors to enhance this know-how and learning are evident in Finland, because all the components are present in the forest industry cluster.

Innovations and the business strategy

Innovations must be linked with the business strategy. In the past, however, innovations seldom seemed to be an integrated part of the business strategy:

- some studies indicate that there is a correlation between a lack of strategic connection and innovation failure (Dougherty and Hardy, 1996)
- some other studies point out that mergers, acquisitions and divestitures, the action the paper industry is currently taking, are, for instance, strategic choices of the firms which compete against innovation consuming a lot of management time and attention (Hitt et al., 1996).

Innovation should, however, be an integral part of the value creation for both customers and the company and help make products and whole offerings different from those of the competition.

Figure 2.10 describes the evolution of paradigms in innovation management since the 1970's (Roussel et al., 1991; Rothwell, 1992, 1994).

Generation of R&D Focus / Business School	Knowledge 1970's	Products 1980's	Business 1990's	Customer 2000's
Learning School			X	
Entrepreneurial School			X	
Positioning School		X		
Planning School	X			
Design School	X			

Figure 2.10: Evolution of paradigms in innovation management

In the first generation, R&D function was very isolated and geared towards generating *knowledge*. R&D management co-operated internally with the marketing and production functions. In the second generation the R&D function concentrated on generating specific *products*, but was still rather isolated from the business. The third generation R&D is more *business* oriented. Networking is typically broader and also covers strategic management and even top management. However, it follows more the supply chain than the demand chain logic. **Capital intensive industries such as the paper industry typically fall in between second and third generation in their R&D operations. The integration of R&D – as well as the whole technology function – with marketing and business is weak and consequently, the use of the total knowledge pool of a firm is inefficient.** The fourth generation model, c*ustomer* model, differs from the earlier business models for example in the following ways. It has 1) further integration of functional disciplines and business process orientation; 2) a concurrent way of working instead of sequential procedures; 3) more flexible use of scientific and technological expertise; and 4) the main functional links are marketing, consumer, market research and R&D – the demand chain.

The third and fourth generation of R&D are driven by developments in IT and concentrated on networking with suppliers and other partners.

The companies are on their way to be more open to external signals. There is an increasingly independent, informed consumer at the end of the long forest industry demand chain. Accompanying trends have included a change from R&D management - as the management of creative individuals and the generation of ideas - to project management.

The following issues are to be born in mind when planning a connection between innovation and business strategy (Haarla, 1998):

- innovation should be a managed process
- innovation should support and be an input to business strategy leaving at the same time some room for spontaneous actions

- readiness to take and manage risks as a precondition for innovations
- innovation takes place at different parts of the organisation; so internal communication on strategy and the vision behind it is important
- various functional parts of the organisation should be integrated into the innovation process including the customer, but also machine and raw material suppliers.

Research & Development as a part of innovation

Research and Development is one element of the innovation process. Ruscati Manual (OECD, 1981) defines research and development (R&D) in the following manner: ”Research and Development is a part of the innovation process consisting of the scientific, technical, commercial and financial steps necessary for successful development and marketing of new or improved manufactured products, commercial use of new or improved processes or equipment or the introduction of a new approach to a social service". So R&D is only one step in the innovation process.

OECD defines high tech, medium tech and low tech industries according to their R&D expenditures (Autio et al., 1997): sectors that spend more than 4.5 % of their sales on R&D are high tech industries, sectors that spend between 1.0 and 4.5% of their sales on R&D are classified as medium tech and sectors that spend less than 1.0 % of their sales on R&D are classified as low tech. According to this classification pulp, paper and paper products industries are most commonly located in the "low tech" category.

In printing papers, R&D investment is typically at the low level of 0.7% of sales value. R&D investments have gradually increased during the research period from the level of 0.5% towards 0.7% on an average (Metsäteollisuus ry, 2003). The structure of the industry has, however, simultaneously, changed and the R&D investments are in more efficient use. It is difficult, however, to quantify the R&D investment exactly in the paper industry companies because R&D is also done as a part of the normal production

process and not allocated as a research cost. Also, R&D work is often done by upstream and downstream operators such as machine and system suppliers as well as by mineral and chemical suppliers and also printers and converters. In addition, in the process industry the relative input of R&D is related to turnover produced in 365 days and during 24 hours per day resulting in a low figure. In many other industries it is related to 5 days week and 8 hour day. This low figure compared to electronics industry for example can also be explained by the long life cycles of the products and the fact that the start up of the production of a new paper grade requires significant capital resources. Jointly agreed and explicitly followed rules for quantifying R&D investments are also missing.

Paper machine manufacturers spend 3 to 4 % of their sales value on R&D (Laurila, 2003) and chemical suppliers even more, close to 5 % (Karlsson, 1999). The latter figure has been increasing in recent years (compared to OECD statistics, 1995, 3 to 4%). According to Karlsson, technology networking is the way to operate in global environment, where competence development is a key process. 'Know-how' and 'who knows' are the key attributes.

If we include the R&D expenditures of the suppliers for example which are necessary for the whole, the paper industry is in fact a 'medium tech' industry according to the OECD's classification.

Ojainmaa (1994) has stated that strong technological knowledge arises predominantly from the interactive links between the pulp and paper industry, engineering industry and the research institutes, which together form a dynamic technology system. Owing to the broad co-operation profiles of Finnish producers, competitive advantage based on the manufacture of paper machines and equipment may not prove sustainable in the long term especially, since technologies diffuse rapidly through the technology system and significantly simpler production technology solutions are ultimately available to all producers also globally.

R&D in the paper industry can be divided into *basic research* **-** typically research on fibre properties and carried out by universities and research institutes – and *applied research* – for example optimising coating recipes for certain process conditions. This is carried out by paper manufacturing companies. Between these two is *supportive research***.** This is carried out by forest industry companies or machine or chemical/mineral suppliers. Applied research is focused on process and product improvements rather than completely new process solutions or novel products.

Rohweder (1993) indicated that ”paper industry product development typically results in minor innovations in terms of the change in new product attributes compared with existing products on the market”. He also stated that the market and market-related issues receive too little attention compared with technology-based quality and price competitiveness issues. Suppliers have been regarded as the most important source of technological change.

Since 1916 the joint research work on the area of basic and applied research has been done at Keskuslaboratio (the research laboratory of the Finnish paper industry). Higher education of paper engineers (MSc to the doctoral level) was initiated by Helsinki University of Technology 60 years ago (1941). The joint marketing organisation Finnpap (1918 up to 1996) had access to global markets and could capture and during the last decades translate customer ideas into paper grades and together with the mills translate these ideas into to practical actions (Heikkinen, 2000).

The situation in Finland has significantly changed over the years. In the 1950's and 1960's the Finnish forest cluster relied on foreign licences. In the 1970's and 1980's this technology was further developed through the forest cluster's own innovations (symformer technology, Kamyr cooking, wood procurement practices and numerous process automation applications for example) and in the 1990's Finnish companies became the leaders of technology development in the area of paper manufacturing. The newest

technology is increasingly being bought and put into use through new investments (Lammi, 2000).

R&D input of the Finnish forest cluster in 2001 was as follows: the investment of the cluster EUR 250 million, out of which forest industry companies EUR 110 million, suppliers EUR 100 million and EUR 40 million to universities and research institutes. In addition, TEKES, the national technology agency, supports the forest industry cluster by EUR 45 million.

Larsson (1998) identifies in the industrial R&D the following six drivers for change up to 2008: information technology, globalisation technology, growing diversity of the work force, integration of technology planning and the business strategy, partnership and alliances, and customer power.

In the light of pre-understanding the role of R&D in product differentiation has been supportive. In many cases R&D is not integrated with business and remains therefore too far from the customer interface.

2.2 Theoretical perspectives

2.2.1 Strategic competitiveness and competitive advantage

Strategic competitiveness

Firms seek strategic competitiveness and above-average returns. Above-average returns – returns in excess of what investors expect to earn from other investments with similar levels of risk – allow a firm to simultaneously satisfy all of its stakeholders.

To achieve strategic competitiveness and to earn above-average returns, a firm analyses its external environment, identifies opportunities in that environment, determines which of its internal resources and capabilities are core competencies and selects an appropriate strategy to implement them (Collins and Montgomery, 1995). There are two main schools as to how to

achieve strategic competitiveness: *The Industrial Organization Model (I/O Model)* – which is discussed in detail in Chapter 2.2.3 with critique - argues that the external environment is primarily determinant of the firm's strategies. Above-average returns are earned when the firm locates an attractive industry and successfully implements the strategy dictated by the characteristics of that industry. The more recent *Resource-Based Model (R/B Model)* – which is discussed in depth in Chapter 2.2.4 and the critique posited - assumes that each firm is a collection of unique resources and capabilities which determine a firm's strategy. In this model above-average returns are earned when the firm uses its valuable, rare, costly-to-imitate and nonsubstitutable resources and capabilities to establish a competitive advantage over its rivals. For reference, the development of strategic thinking is presented in Table 2.1.

Many firms face increasing global competition. The paper industry does not make an exception. Today firms typically compete in a global economy that is complex, highly uncertain and unpredictable. The global economy rewards effective performers. Success in the new competitive landscape requires specific capabilities including the ability to:

- use scarce resources wisely to maintain the lowest possible costs
  -- in the paper industry, for example, local fibre resources

- constantly anticipate frequent changes in customers' preferences
  -- a recent example from the paper industry: five years ago glossy paper was demanded by U.S. publishers for high-end magazines, brightness was later emphasised

- adapt to rapid technological changes
  -- an example from the paper industry: the sizer has replaced the size press

- identify, emphasise and effectively manage what a firm does better than its competitors
    -- one example from the paper industry: increasing focus on a firm's own services in terms of competitor, market and technology intelligence

- continuously restructure a firm's operations so that objectives can be achieved more efficiently

- successfully manage and gain commitment from a culturally diverse workforce: a real challenge for the globalising paper industry today.

Table 2.1: Development of strategic thinking

The Design School (e.g. Andrews, Christensen)	The process of conception
The Planning School (e.g. Ansoff, Lorange)	The formal process
The Positioning School (e.g. Porter, Hax)	The analytical process
The Entrepreneurial School (e.g. Ohmae, Prahalad, Bennis & Nanus)	The visionary process
The Learning School (e.g. Senge, Nonaka & Takeuchi)	The process of emergence

Source: Mintzberg (1998).

Burgelman (2002) has recently investigated the strategy making and organisational learning at Intel, product proliferation in particular, and should be included among the representatives of the Learning School in Table 2.1.

Competitive advantage

According to Barney (1991), *a firm has **a competitive advantage** when it is implementing a value creating strategy which is not simultaneously being implemented by any current or potential competitors. A firm is said to have **a sustainable competitive advantage** when it is implementing a strategy which existing firms or potential competitors are not implementing simultaneously and who are unable to duplicate it or find it too costly to imitate.* So, competitive advantage and sustainable competitive advantage do not focus only on a firm's competitive position vis-à-vis firms that already operate in the industry. *The latter also includes the expansion of the time perspective from present to future.* This does not mean, however, that the advantage will last for ever. Unanticipated changes in the economic structure of an industry – called "Schumpeterian Shocks" (Schumpeter 1934 and 1950; Rumelt & Wensley, 1981; Barney 1986c) or emergence of disruptive technologies (Christensen, 1997) may nullify competitive advantages. However, a sustained competitive advantage is not nullified when competing firms duplicate the benefits of that competitive advantage (Barney, 1986c). Understanding how to exploit its competitive advantage is necessary for a firm to earn above-average returns.

To have the potential for a sustainable competitive advantage a firm's resources must have following attributes: it must exploit *valuable* opportunities and/or neutralise threats within the firm's environment, it must be *rare a*mong a firm's current and potential competition, it must be *imperfectly imitable* and therefore *cannot be strategically equivalent substitutes* for this resource (Barney, 1991).

Understanding the sources of sustained competitive advantage for firms, has become a major area of research in the field of strategic management (Porter, 1985; Rumelt, 1984; Barney, 1991). Since the 1960's, a single organizing framework (Figure 2.11) has been used to structure much of this research (Andrews, 1971; Ansoff, 1965; Hofer and Schendel, 1978).

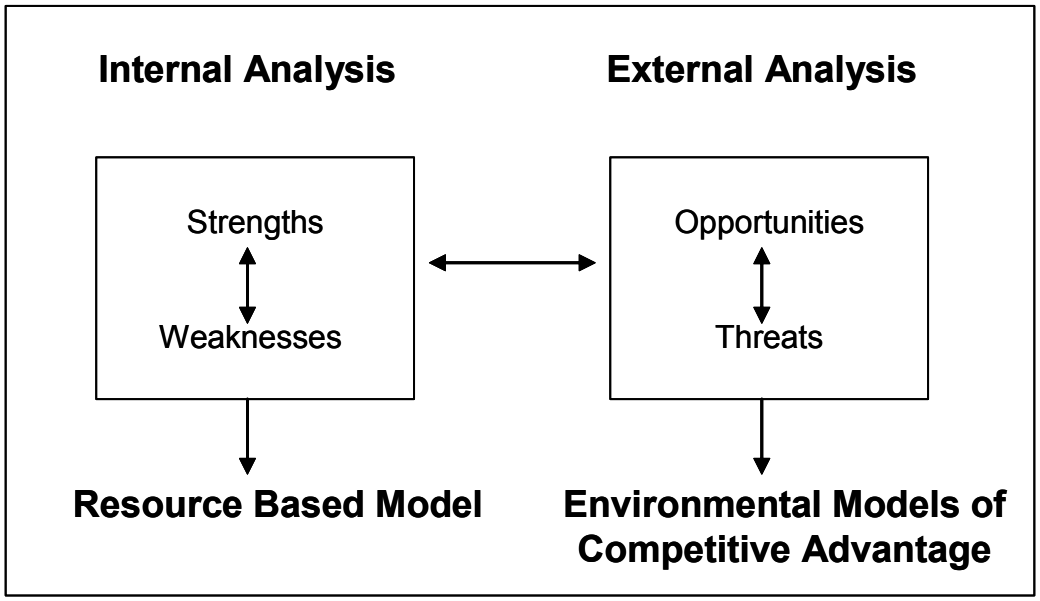


Figure 2.11: The relationship between traditional SWOT analysis, Resource-Based Model and environmental models of competitive advantage

This framework suggests that firms obtain sustained competitive advantages by implementing strategies that exploit their internal strengths, through responding to environmental opportunities, while neutralizing external threats and avoiding internal weaknesses. Most research on sources of sustained competitive advantage has focused either on isolating a firm's opportunities and threats (Porter, 1980 and 1985), describing its strengths and weaknesses (Hofer & Schendel, 1978; Penrose, 1958; Stinchcombe, 1965), or analyzing how these are matched to choose strategies.

Although both internal analyses of organizational strengths and weaknesses – Resource-Based Model - and external analyses of opportunities and threats – The Internal Organizational Model - have received some attention in the literature, work done in latter half of 1970's and during the first half of 1980's focused primarily on analyzing a firm's opportunities and threats in its competitive environment (Lamb, 1984). The work – by Caves and Porter, 1977; Porter 1980 and 1985 – has attempted to describe the environmental conditions that favour high levels of firm performance. Porter's "five forces model" (Porter, 1985), for example, describes the attributes of an attractive industry and suggests that opportunities will be greater and threats less

powerful in these kinds of industries. ***Porter's model focuses on how a firm's environment impacts on its competitive position but puts little emphasis on the impacts of a firm's internal attributes on its competitive position.***

Shortcomings of external environmental-oriented strategies are posited in Chapter 2.2.3.

However, because the I/O Model examines the link between a firm's internal characteristics and performance, a resource-based view of competitive advantage obviously cannot build on these same assumptions. The resource-based view of the firm substitutes two alternative assumptions in analysing sources of competitive advantage:

- first, this model assumes that firms within an industry may be heterogeneous with respect to the strategic resources they control

- second, this model assumes that these resources may not be perfectly mobile across firms and thus heterogeneity can be long lasting.

The Resource-Based Model of the firm examines the implications of these two assumptions for the analysis of sources of sustained competitive advantage. For example Grant (1991) has stated that because of the rapid pace of environmental change, firm specific technological resources and capabilities provide a more durable basis for strategy formulation than the firm's position in the industry.

The R/B view complements the I/O view and that is why it is seen as a potential tool in strategic management (Peteraf, 1993; Mahoney & Pandian, 1992) as Figure 2.11 indicates. Miller and Shamsie (1996) have stated that the R/B approach counterbalances and complements the industry approach. Barney (1991) summarises the idea as follows: ***"Environmental models help to isolate those firm attributes that exploit opportunities and/or***

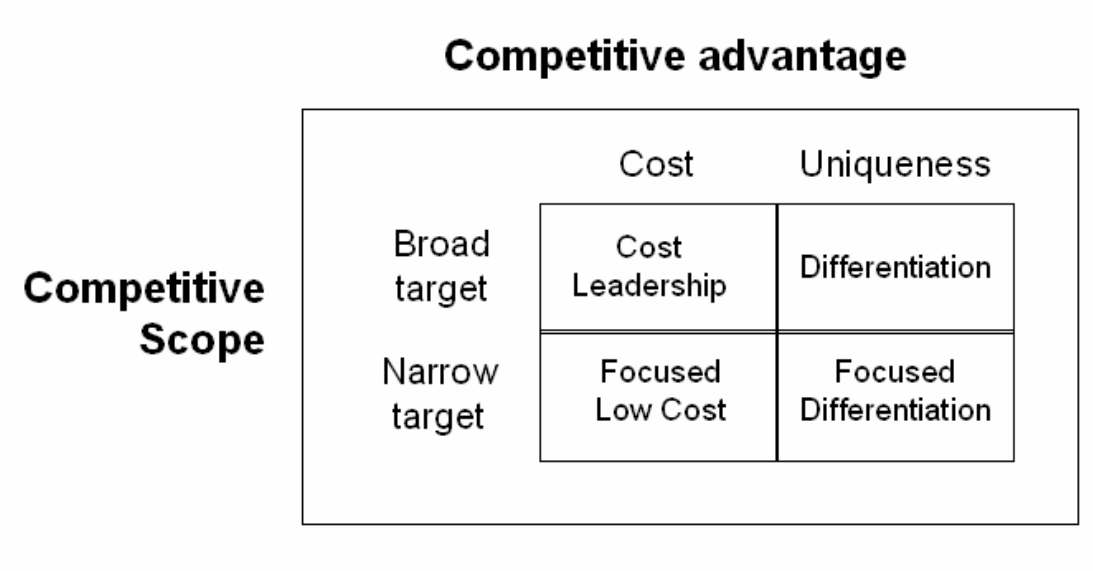
neutralize threats, and thus specify which firm attributes can be considered as resources. The resource-based model then suggests what are the additional characteristics that these resources must possess if they are to generate sustained competitive advantage".

The R/B model is not without its shortcomings either. They are referred to in Chapter 2.2.4.

2.2.2 Various business level strategies

Business-level strategies are about a firm's position within an industry relative to that of its competitors. It is, important to remember, that customers are the foundation of any successful business level strategy: selecting, identifying as well as the method and means of fulfilling customer demands are key to this. When selecting a business level strategy, a firm has to evaluate two types of competitive advantages. Whether it has lower costs than a rival or the ability to differentiate and command a higher price which exceeds the extra costs of producing it (Porter, 1985). Companies which have established favourable industry positions are better able to cope with the five forces of competition. Thus favourably positioned firms may have the competitive advantage over their industry rivals. Originally, it was determined that firms choose from four generic strategies to establish and exploit a competitive advantage within a particular competitive scope**:** *cost leadership, differentiation, focused low cost and focused differentiation.* These four generic strategies are illustrated in Figure 2.12.

A fifth generic business-level strategy, the *integrated low-cost/differentiation strategy,* has evolved through a firm's efforts to find the most effective ways to exploit their competitive advantages.



Source: Porter (1980).

Figure 2.12: Four generic strategies

Competitive scope has several dimensions, including the group of products and customer segments served and the geographical array of markets in which a firm competes. Competitive advantage is sought by competing in many customer segments when implementing either the cost leadership of the differentiation strategy. In contrast, by implementation of the focus strategies, a firm seeks either a cost advantage or a differentiation advantage in a narrow competitive scope or segment.

None of the five business-level strategies is inherently universally superior to the others. The effectiveness of each strategy is contingent on the opportunities and threats within the firm's external environment and the possibilities permitted by the firm's unique resources, capabilities and core competencies.

A cost leadership strategy is an integrated set of actions designed to produce products at the lowest cost, relative to competitors, with features that are acceptable to customers. In the new competitive landscape it is increasingly difficult for firms implementing this type of strategy to differentiate between product features that are standard and those which

provide benefits exceeding the price the company's target customers are willing to pay (Anderson & Narus, 1995). Successful implementation of the cost leadership strategy requires a consistent focus on driving costs lower than a competitor's costs. Porter (1980) identified 10 major cost drivers that are linked to low-cost strategies, virtually all of which are linked directly or indirectly to the resources and management of manufacturing operations. Table 2.2 (John and Harrison, 1999) provides illustrative examples of the linkages between Porter's cost drivers and manufacturing resources and capabilities. The firms driving this strategy often drive their costs lower through investments in efficient scale facilities, tight cost and overhead control, and cost minimisation's in such areas as service, sales force, and R&D.

A firm's value chain determines which parts of its operations create value and which do not.

Companies that cannot perform all the activities presented in Table 2.2 lack sufficient resources and capabilities and also the core competencies required to implement the cost leadership strategy successfully.

When implementing the cost leadership strategy, firms must be careful not to ignore sources of differentiation valued by customers such as after sales service or product innovations, for example. Attention to these details ensures the firm's products provide customers with a level of quality that at least meets and often exceeds their expectations relative to the purchase price.

Table 2.2 Linkages between cost drivers and manufacturing resources and capabilities: Porterian approach

	Manufacturing application	Manufacturing capabilities contributing to advantage
Cost drivers:		
Economies of scale	Factory, equipment and logistics scale	Cost minimization factory size, effective facility design, management of overhead and indirect activities
Learning	Direct labor learning	Continuous improvement of work methods, training of employees, incentives to learn and to incorporate that learning into routine work methods.
	Indirect labor learning	Process improvements leading to improved, cost reductions, and faster, more cost-effective product launches.
Capacity utilization	Factory utilization	Ability to plan and manage capacity effectively to avoid high costs of underutilization facilities (technology choices, workforce policies, scheduling procedures, use of stop-gap measures)
Linkages	Linkages with suppliers and distributors	Systems view of cost interdependencies: higher-quality raw material may increase input costs, but decrease overall costs from reduced rework. JIT is an example of improved linkages between suppliers, distributors and the internal production stages.
	Linkages with marketing and product development	Early involvement with product design leading to lower-cost manufacturing processes stability linked to better customer information from marketing
Integration	Backward into suppliers, forward into distribution	Ownership, rather than management, of linkages can lad to cost advantage if there is system-wide capacity balancing, and maintenance of quality and innovation standards.
Timing	Timing of new capacity, new facility, and new technology investments	Management understanding of technology choices, market demand, facility size and contingent competitor actions
Location	Location of plants, warehouses	Lower fixed costs and lower transportation costs.
Discretionary policies that affect costs	Factory costs	Number and variety of products produced within a plant influence cost structure. Number and variety of customer groups served by a plant influence cost structure.
	Process technology	In addition to affecting scale, influences labor skills needed, production efficiencies and costs of changeover, all of which underlie costs
	Raw material specs	Quality and price o raw materials influence product costs
	Human resource policies	Reqruiting and training o skilled labor, evaluation of capabilities, and rewards, all of which influence productivity and cost structures
	Production scheduling	Scheduling procedures including lot sizing, inventory holding, run lengths, and frequency of schedule changes influence cost structures
	Delivery policies	Flexible delivery promises allow manufacturing to manage a more stable, efficient system

Source: adapted from John and Harrison (1999).

The cost leadership strategy is not without risks. There are at least three types of risks to be identified: Firstly, the low-cost leader's manufacturing equipment could become obsolete due to a competitor's technological innovations. These innovations may allow rivals to produce at costs lower than those of the original cost leader. The second risk is a result of narrow focus. Due to a desire to focus on continuously driving costs lower, firms implementing a cost leadership strategy sometimes fail to detect significant changes in customers' needs or in competitors' efforts to differentiate what has traditionally been a undifferentiated, commodity-like product. The third risk lies in imitation. Competitors can sometimes successfully learn how to imitate the low-cost leader's strategy. When this occurs the low-cost leader is forced to find ways of increasing the value provided by its goods and services. Usually, this value is increased by selling the current product at an even lower price or by adding features which customer's value while maintaining price.

A differentiation strategy is an integrated set of actions designed to produce products that customers perceive as being different in ways that are important to them. Other than costs, the unique attributes and characteristics of a firm's product provide value to customers.

Because a differentiated product satisfies a customer's unique needs, firms implementing the differentiation strategy charge premium prices. Products can be differentiated according to elements that are valued by a group of customers. Differentiating factors can be, for example, unusual features, responsive customer service, rapid product innovations and technological leadership. The challenge lies in recognising which features create value for the customer. Firms using this strategy seek to differentiate their products from competitor's goods or services in as many dimensions as possible. The smaller the similarity to the competitors' products, the more buffered a firm is from competition with its rivals.

John and Harrison (1999) claim that manufacturing may also serve as a source of competitive advantage within a differentiation strategy. The ability of a firm to differentiate its products or services is determined, in whole or in part, by the skills of employees, the capabilities of processes and technologies, and the routines enacted by manufacturing management (Hayes and Wheelwright, 1984; Kotha and Orne, 1989). Illustrative examples of the linkages between Porter's sources of uniqueness and manufacturing resources and capabilities are shown in Table 2.3.

Table 2.3: Linkages between uniqueness drivers and manufacturing resources and capabilities: Porterian approach

	Manufacturing application	Manufacturing capabilities contributing to advantage
Uniqueness drivers:		
Policy choices associated with 'availability'	Capacity or inventory available to provide delivery as requested	Sizing to capacity, timing of capacity additions to 'lead' demand choice of flexible process equipment, training of flexible workforce, effective product scheduling, supplier management to assure available material, end-item inventory holdings policies, locating facilities close to customers
Policy choices associated with 'quality'	Quality specifications and tolerance, with ability to improve over time	Supplier management to assure quality materials, workforce training, equipment tolerances and reliability, maintenance programs, process control systems
Policy choices associated with 'rapid new product introduction'	Product-process development	Flexible equipment, flexible workforce, available capacity, early involvement with product design to avoid delays
Product uniqueness	Process support for product uniqueness	Linkages with suppliers, maintenance of standards, cost reduction efforts that allow the form of product uniqueness to be realized tat reasonable cost
Responsiveness to special customer request	System-wide flexibility and responsiveness to schedule changes	Flexible equipment, employees, raw material ordering and scheduling to support rapid schedule change
Custom design	System-wide flexibility and responsiveness to design changes	Flexible equipment, employees, raw material ordering, and scheduling to support custom product offerings

Source: adapted from John and Harrison (1999).

To sustain a competitive advantage the resources and capabilities should be difficult for competitors to imitate. In general, the internal workings of a manufacturing plant are not readily observable, and, in many cases, manufacturing management uses extreme procedures to maintain the secrecy of operations. Custom-designed process equipment, worker experience, and the accumulation of incremental process improvements made over time can create a store of manufacturing capability that is difficult to observe or imitate (Abernathy and Utterback, 1975; Hayes and Wheelwright, 1984). Whereas a competitor's engineers can investigate what are the raw materials used, in which relation and how they are treated they rarely know for sure how it was produced or the sources of and degree of efficiency and effectiveness with which it was produced. This causal ambiguity makes imitation difficult (Barney, 1991; Rumelt, 1984).

A firm's value chain can also be used to determine if it can link the activities required creating value through implementation of the differentiation strategy.

Companies without the core competencies needed to link these activities cannot expect to implement the differentiation strategy successfully.

The risks associated with the differentiation strategy are as follows:

Firstly, a customer group may decide that the difference between the differentiated product and the low-cost leader's product are no longer worth a premium price

Secondly, a differentiated product is not able to facilitate the type of value for which customers are willing to pay a premium price

Thirdly, the ability of competitors to provide customers with products which have features similar to those associated with the differentiated product, but

at a lower cost. In this case knowledge can narrow customers' perceptions of the value of a firm's differentiated features.

Integrated low-cost/differentiation strategy: In global markets, especially, a firm's ability to blend the low-cost and the differentiation approaches may be critical to sustaining competitive advantages (Lei et al., 1996). Compared to firms relying on one dominant generic strategy for their success, a company capable of successfully implementing an integrated low-cost/differentiation strategy should be better positioned to adapt quickly to environmental changes, learn new skills and technologies more quickly and effectively leverage its core competencies across business units and product lines.

A key incentive to firms to successfully implement the integrated strategy and earn above-average returns is that the benefits of this strategy are accumulative: "Differentiation leads to premium prices at the same time that cost leadership implies lower costs" (Porter, 1985). Thus the integrated strategy allows firms to gain competitive advantage by offering two types of value to customers:

- some differentiated features, but often fewer than those provided by the product differentiated firm

- relatively low costs, but not so low as the products of the low-cost leader.

In these cases there is a special focus on R&D activities to find the ways to differentiate. Firms have to be strategically flexible in order to successfully implement the integrated low-cost/differentiation strategy. The strategic flexibility of a firm can be increased, for example, through flexible manufacturing systems (FMS); the use of information networks across the firm, and total quality management systems (TQM).

The potential of the integrated strategy in terms of above-average returns is significant. But, with this potential come substantial risks. The biggest risk is becoming 'stuck in the middle': a firm fails to establish a leadership position in its chosen competitive scope either as the low-cost producer or as the differentiator. Being 'stuck in the middle' prevents firms from dealing successfully with the five competitive forces and from earning above-average returns. Not having a clear and identifiable competitive advantage comes from a firm being stuck in the middle. When an industry's structure is highly favourable or when a firm is competing against others that are in the same position, such firms can only earn average returns.

A focus strategy is an integrated set of actions designed to produce or deliver goods and services that serve the needs of a particular competitive segment. A segment can be either a particular buyer group, a different segment of a product line or a different geographical market. The essence of the focus strategy is "the exploitation of a narrow target's differences from the balance of the industry" (Porter, 1985). The foundation of the focus strategy is that a company can, on average, serve more effectively or more efficiently a particular segment than the industry. The success of the focus strategy rests on two pillars: either on a firm's ability to find segments whose unique needs are so specialised that broad-based competitors choose not to serve them, or to locate a segment being served poorly (Porter, 1985).

Firms can create value for their customers in specific and unique market segments by using either one of two different focus strategies: *focused cost leadership,* a strategy adopted by IKEA for example, and *focused differentiation*. When pursuing either type of focused strategies a firm's management meets the same general risks as companies pursuing cost leadership or differentiation strategy on an industry wide basis:

- a competitor may be able to focus on a more narrowly defined competitive segment and "out focus" the focuser

- a loss of competitiveness because of the size and capabilities of a bigger company who enters into the market

- the needs of specific customers may become more similar to those of general customers. The advantages of focused strategy may thus be reduced or eliminated.

Different generic strategies require different key resources (Johnsson & Scholes, 1989). Cost leadership requires cost efficient plants and processes with an ability to renew investment in order to maintain the advantage in these areas. In the paper industry this refers to the reliance on skilful engineers with proper performance measures. A differentiation strategy is more likely to require different sorts of skills and resources. In particular there will be a need for strengths in marketing, research and creativity with the emphasis on product development and engineering and strong links to the value systems throughout the distribution channel. Specific configurations of resources of specific markets or market segments may be needed.

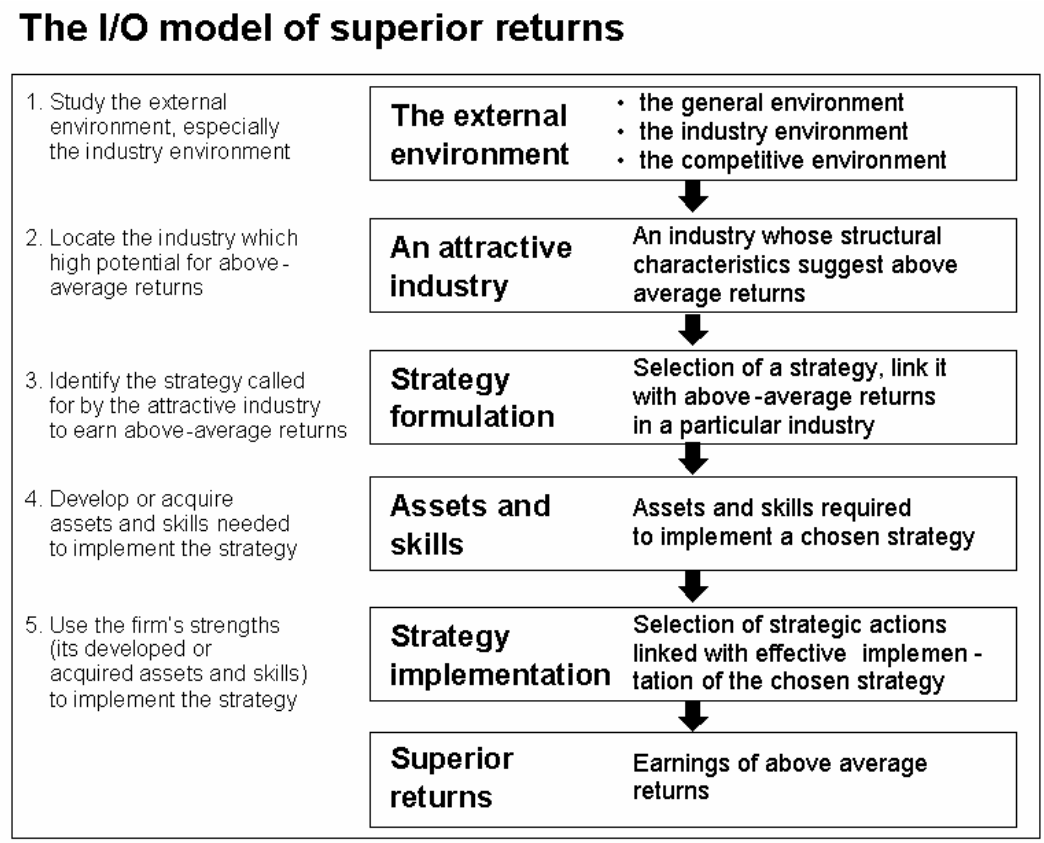
Different strategies also require different organisational structures. An organisation following a cost leadership strategy will need to find the means of ensuring a cost-efficient operation with the emphasis on cost control, whereas an organisation following a differentiation strategy will need higher degrees of creativity and probably a rapid response to problems and opportunities. The cost leadership strategy requires a more mechanistic system of control with clear job responsibilities, frequent and detailed reports on organisational efficiency and cost, and a clear delineation of responsibility for budgets and expenditure. An established structure and organisation which follows a differentiation strategy might need to be more organic in nature, with looser controls, a greater encouragement of informality and creativity within a more decentralised structure, but with a good deal of co-ordination between its various functions. The emphasis is likely to be more on groups of managers relating to problems and

opportunities rather than individual managers or departments being concerned with specific job functions. Organisations trying to follow integrated low-cost and differentiation strategies are likely to find some conflicts in terms of organisational design.

Different strategies also require different production machinery. When following a cost leadership strategy in the paper industry, the most modern and efficient machines – wide and fast - give the optimal result when producing one or few typically standard printing papers. When following a differentiation strategy – known also as a niche strategy - flexibility and sufficient size are more important than achieving great size and having the most modern technology. With limited investment in a coating or finishing part of the paper machine a differentiated paper grade may be achieved. However this does not eliminate a need to carefully check the whole process in order to guarantee the smooth manufacturing of a new product.

2.2.3 Industrial Organisation Model

In the I/O Model (Figure 2.13), which was applied from 1960s through to the 80s, the external environment was thought to be the primary determinant of strategies firms selected to be successful. The industry chosen in which to compete has a stronger influence on a firm's performance than the choices managers make within their organisations (Schendel, 1994). A firm's performance is believed to be predicted by the range of an industry's properties including, economies of scale, barriers to entry, diversification, product differentiation and the degree of concentration (Seth and Thomas, 1994).



Source: Hitt et al. (2001).

Figure 2.13: The Industrial Organisation Model (the I/O Model)

The Industrial Organisation Model has four underlying assumptions grounded in the economics discipline:

Firstly, the external environment with its economic, structural, global, technological, political, legal and demographic attributes is assumed to impose pressures and constraints that determine strategies which would result in above-average returns.

Secondly, most firms competing within a particular industry, or within a certain segment of the industry, are assumed to control similar strategically relevant resources and pursue similar strategies in the light of those resources.

Thirdly, the basic assumption is that resources used to implement strategies are highly mobile across the firms. As a result of resource mobility, any resource difference that might develop between firms will be short lived.

Fourthly, organisational decision-makers are assumed to be rational and committed to acting in the firm´s best interests. This is demonstrated by their profit maximising behaviours. The I/O Model challenges a firm to locate the most attractive industry in which to compete. In this case, competitiveness can generally be increased only when they find the industry with the highest profit potential and learn how to use their resources to implement the strategy required by the structural characteristics in that industry.

The competition within the industry and an industry's profit potential are determined by five forces: threats posed by new entrants, the bargaining power of suppliers, the bargaining power of buyers, the threat of substitute products and rivalry among competing firms. The five forces model suggests that an industry's potential profitability, for example its rate of return on invested capital relative to its cost of capital is a result of interaction between those five forces (Porter, 1985).

Using this tool a firm is challenged to understand an industry´s profit potential and the strategy that should be implemented in order to establish a defensible competitive position. *Typically the I/O Model suggests that a firm can earn above-average returns by manufacturing standardised products at costs below those of competitors by following a cost leadership strategy, or by differentiating products (following a differentiation strategy) for which customers are willing to pay a price premium.*

Above-average returns are earned in the I/O Model when firms implement the strategy dictated by the characteristics of the general industry, and competitor environments.

In the I/O Model above-average returns are determined by external characteristics rather than the firm's unique internal resources and capabilities. Companies that develop or acquire the internal skills needed to implement strategies required by the external environment are likely to succeed while those who do not are likely to fail. By studying the external environment, firms identify what they might choose to do whereas by studying the internal environmental those conditions determine what they can do.

In the I/O framework a firm is viewed as a bundle of market activities and a bundle of resources. The development and effective use of a firm's resources, capabilities, and competencies is understood, instead, through the Resource-Based Model.

The importance of the internal analysis originates in a change in the competitive landscape (Porter 1985; Rumelt et al., 1991).

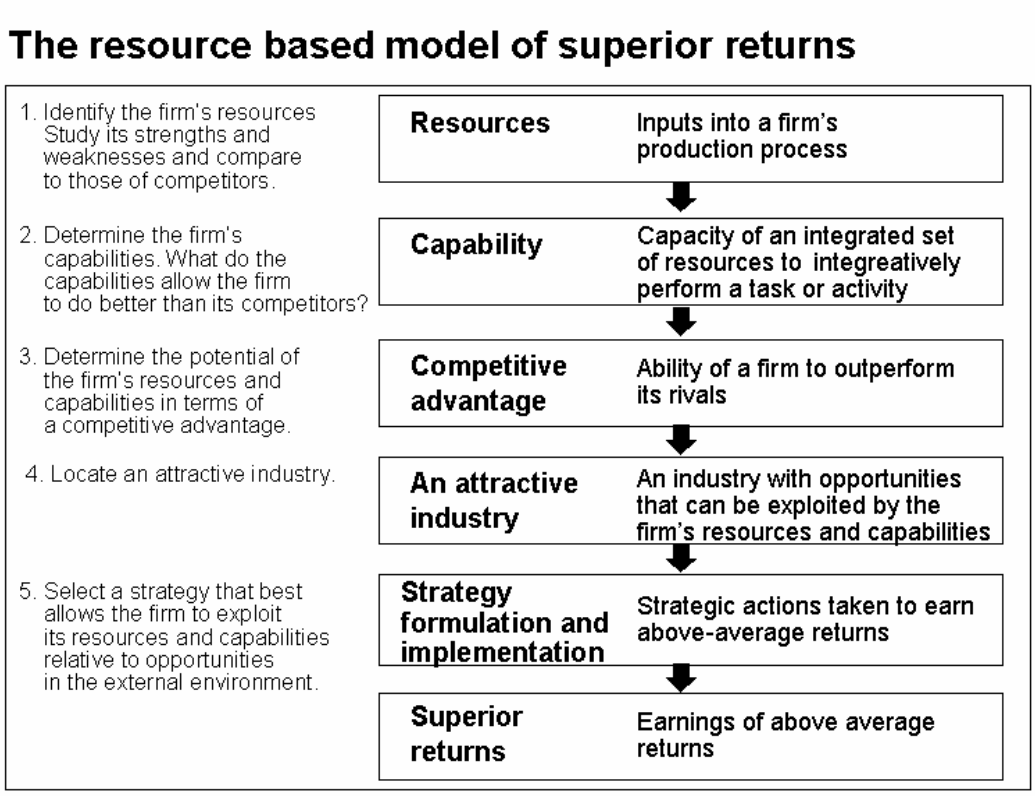
Barney (1991) points out two shortcomings of external environment-oriented strategies:

1. first, these environmental models of competitive advantage have assumed that firms within an industry are identical in terms of strategically relevant resources they control and the strategies they pursue (Porter, 1981; Rumelt, 1984; Scherer, 1980).

2. second, these models assume that should resource heterogeneity develop in an industry or group this heterogeneity would be short lived because the resources that firms use to implement their strategies are highly mobile (i.e. they can be bought and sold in factor markets) (Barney, 1986a; Hirshliefer, 1980)

2.2.4 Resource-Based Model

The basic assumption behind the Resource-Based Model (R/B Model) is that each organisation is a collection of unique resources and capabilities which provide the basis for its strategy and form the primary source of its return. The Resource-Based Model is described in Figure 2.14.



Source: Hitt et al. (2001).

Figure 2.14: Resource- Based Model (the R/B Model)

The roots of the resource-based theory of the firm are in the seminal work of Penrose (1959). She conceptualized the business of a firm as a collection of productive resources, both physical and human, and viewed firm growth as the process of using these resources to exploit the firm's "productive opportunity" and increase the firm's resource base. Barney (1991) defines the resource-based view of the firm as a collection of resources and a set of functions to convert the resources into a competitive advantage. Only some

– not all - of the resources are critical in creating a competitive advantage (Peteraf, 1993). Barney suggests that assets, capabilities, knowledge, skills, information, processes and other organisational attributes are valuable resources when they "exploit opportunities or neutralize threats in a firm's environment".

In the new competitive landscape the R/B Model argues that firms are collections of evolving capabilities that are managed dynamically in pursuit of above-average returns (Williams, 1994). Variations in a firm's performance over time are driven primarily by an organisation's unique resources and capabilities rather than by an industry's characteristics. The R/B Model also assumes that over time, firms acquire different resources and develop unique capabilities. As such, all firms competing within a particular industry may not possess the same strategically relevant resources and capabilities. Furthermore, the R/B Model assumes that resources may not be highly mobile across firms. *The differences in resources form the basis of competitive advantage.* Resources are inputs into a firm's production process. A firm's resources can be classified into three categories: physical capital resources (Williamson, 1975), human capital resources (Becker, 1964) and organisational capital resources (Tomer, 1987).

Resources are both tangible such as a firm's financial, physical, human or organizational resources and intangible such as technological resources (i.e. patents), resources for innovation (i.e. technical employees and research facilities) and reputation (i.e. reputation as perceived by customers, reputation of brand name and perception of product quality) (Hall, 1992).

The value of many tangible resources can be established through financial statements. Financial statements do not account for the values of all the firm's assets in that they disregard some intangible resources. The strategic value of resources is indicated by the degree to which they can contribute to

the development of capabilities and core competencies and, ultimately, achieve a competitive advantage.

The concept of 'firm resources' refers to all assets, capabilities, organizational processes, firm attributes, information, knowledge etc. controlled by a firm which enable the firm to conceive of and implement strategies which will improve its efficiency and effectiveness (Daft, 1983). Firm resources are strengths that firms can use to conceive of and implement their strategies (Porter, 1981).

Individual resources alone may not yield a competitive advantage. It is through combination and integration of sets of resources that competitive advantages are formed. Through continued use of capabilities the capacity for a set of resources to integratively perform a task or an activity become stronger and more difficult for competitors to understand and imitate (Rumelt et al., 1991).

In contrast to the I/O Model, the Resource-Based Model is based on the view that a firm's internal environment, in terms of its resources and capabilities, is more critical to the determination of strategic actions than the external environment. Instead of focusing on the accumulation of resources necessary to implement the strategy dictated by conditions and constraints in the external environment (the I/O Model), the resource-based approach suggests that a firm's unique collection of resources and capabilities provide the basis of a strategy. The strategy chosen should allow the firm to best exploit its core competencies relative to opportunities in the external environment.

Not all of the firm's resources and capabilities have the potential to be the basis for competitive advantage. This potential is only realised when resources and capabilities are valuable, rare, costly to imitate and non-substitutable. Resources are valuable when they allow a firm to exploit opportunities and/or neutralise threats in the external environment. They are

rare when they are possessed by few, if any, current or potential competitors. They are costly to imitate when other firms either cannot obtain them, or are at a cost disadvantage to obtain them, compared to the firm which already possesses them. They are non-substitutable when they have no structural equivalents. When all these criteria are met, resources and capabilities become core competencies.

Core competencies are resources and capabilities that serve as a source of competitive advantage for a firm over its rivals. Often integrated with a firm's functional skills, the development, nurturing, and application of core competencies form the basis of a firm's competitive advantage, its strategic competitiveness and its ability to earn above-average returns.

Successful competition in the new competitive landscape, however, requires that a firm builds and develops a unique set of resources and capabilities. This should be done within the framework of the dynamics of the industry in which a firm competes.

Value chain analysis is used to identify and evaluate a firm's resources and capabilities. In studying their primary activities, such as inbound logistics, operations, outbound logistics, marketing and sales, and support activities (such as procurement), technological development, human resources management and a firm's infrastructure, firms better understand their cost structure and the activities in which they can create and capture value.

The R/B model is not without its shortcomings either. Now that it has been applied for several years, the following shortcomings have been reported. For example:

1. One of the most important criticism is posited towards the resource concept itself. That is especially the case if resources are considered to encompass anything and everything that contributes to the firm's sustainable performance. (McGrath, 1996)

2. Another important critique is posited towards the fact that the resource-based approach has a very weak link to the firm's environment. The impact of operational context has been overlooked. McGrath (1996) points out*:* "While a major strength of the resource-based view is its clear focus on the firm level of analysis this creates a corresponding neglect of context. Competitive outcomes are obviously shaped by many forces, most beyond the boundaries of a given firm. Future theory building would benefit from more comprehensively linking external to internal phenomena". In order to improve environmental conceptualisation she suggests the application of industry evolutionary forces and technology cycles in resource-based analysis.

3. The third critique is posited for concentrating only on a narrow group of positive factors that are relevant to a firm's development. (Montgomery, 1995) In order to enhance the applicability of the resource-based view, a wider perspective on resources should be applied. Montgomery (1995) suggests that a number of resources are advantage destroying rather than competence-enhancing. This argument is well in line with Wernerfelt's (1984) original definition of resources including strengths and weaknesses of the firm.

4. The fourth critique focuses on the fact that little is known about the dynamic return patterns that resources can generate. The value generation potential of resources may depend on time. Mosakowski (1993) has stated: "Understanding the patterns of change and adjustment of the returns generated by a resource may be as, if not more important than understanding the long-run stable level of returns".

5. The criticism has also been posited on the philosophical cornerstones of the resource-based view. According to this critique, creating a normative recipe for combining resources to yield a sustained

competitive advantage may be logically impossible because the development of the best resource combinations is often unique and path-dependent (Conner, 1991).

2.2.5 The strategic competitiveness of a printing paper firm

The strategic competitiveness of a printing paper firm can be achieved by many alternative methods. Important variables are the *manufacturing technology* available at the production line**,** the *availability of requested, reasonably priced raw materials* – for this purpose, suitable fibres and minerals, energy and water – the *potential customer base*, the *effectiveness of logistics* as well as the *skills and capabilities of all the employees.* Also, *the image of a firm necessary to attract young talents* into the industry has gained increasing importance (Niemelä, 2002). Table 2.4 summarises important competitive factors of a printing paper firm.

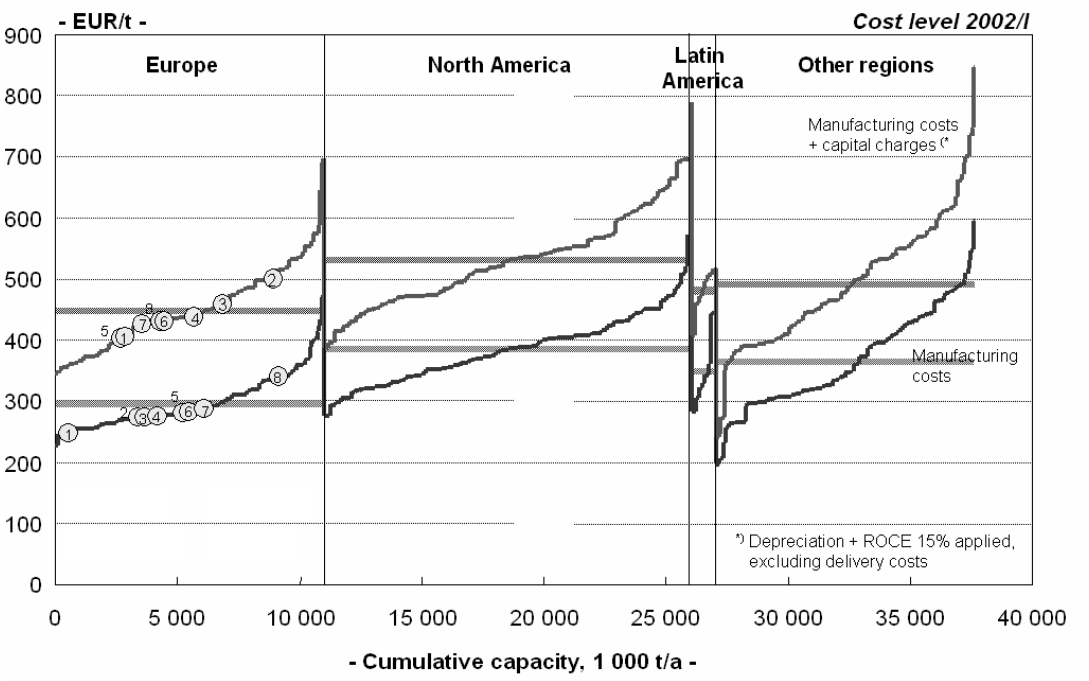
Table 2.4: Important competitive factors of a printing paper firm

Competitive Factors	Scope
Manufacturing Technology	Local
Effectiveness of Logistics	Local
Skills and Capabilities	Local + Global
Availability of Raw Material	Local + Global
Potential Customer Base	Local + Global

The importance of competitive factors varies according to paper grade as the following examples indicate: a newsprint production line - where the value added to fibre is the smallest among printing papers – is better located close to the most economical raw material source – for example in an urban area with a plentiful RCF - and close to the customers to guarantee just-in-time middle-stock-free delivery. A paper machine with the most modern technology guarantees high production efficiency. But this relies on the fact that employees can utilise the newest technology and run the paper

machine effectively. In MFC papers (a differentiated product), the availability of suitable raw materials together with a suitable customer-base and skills and capabilities of the workforce are the most important competitiveness factors. In LWCR, which can be defined as a semi-commodity in relation to newsprint, the most important competitiveness factors are availability of suitable fibres and minerals at the manufacturing site, a large scale and effective paper machine and effective logistics in order to satisfy global markets.

The cost competitiveness of a paper manufacturing line producing a standard printing paper is of vital importance (Diesen, 1998). Figure 2.15 illustrates the global cost curve of standard newsprint in 2002. The shape of the curve varies according to paper grade: in newsprint it is typically steeper than in magazine papers. This reflects a larger variation in the technical age and size of newsprint machines. The relative cost structure of newsprint machines has forced the least cost competitive units to adopt to more value added grades or to shut down.



Source: Jaakko Pöyry Consulting (2002).

Figure 2.15: Relative global cost competitiveness of newsprint

The further left you are positioned in Figure 2.15, the better your paper machine's cost competitiveness is. The costs are estimated for continuous production and based on average operating performance. They are divided into variable and fixed manufacturing costs, distribution costs and capital charges. Capital charges include depreciation and interests. Depreciation is based on straight –line depreciation: 15 years for machinery, 30 years for buildings and 10 years for reinvestments. The interests are calculated as ROCE 15%.

Figure 2.16 describes the typical position of a profit eroded paper machine line where product differentiation is considered an alternative for a major investment: the average manufacturing cost of the product is high and the average value of the product low.

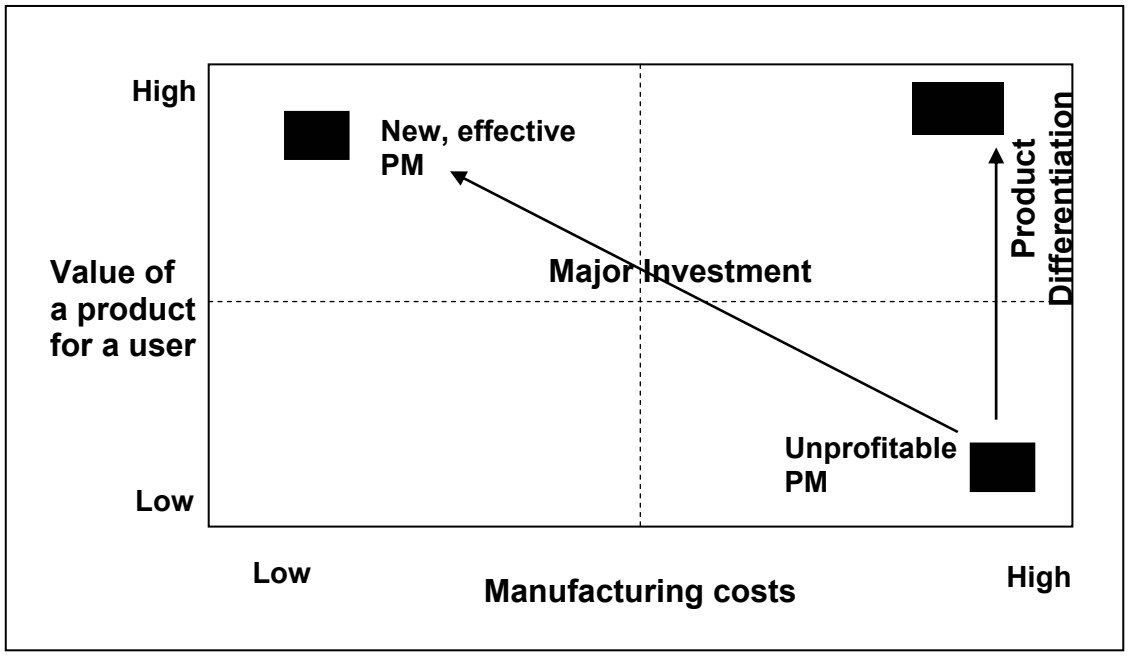


Figure 2.16: Alternative positions of a paper machine after a major and minor investment

With a major investment one can move towards the higher product value for an user and lower manufacturing costs. In a case of product differentiation, one typically moves towards higher product value but manufacturing costs remain on a relatively high level.

Specific features of cost leadership strategy in the printing paper industry

The bulk of printing papers are commodities which differ from each other to only a limited extent. The importance of a paper as cost factor is heavily dependent on its end-use: in top-end sales catalogues, paper can be worth only 5 % of the total manufacturing cost. In newspaper this figure can be close to 70 %. Technology, raw materials and even customers are common to most of the producers. The variable factors – which are only a limited number – include, for example, the availability of skills to use the latest technology, and the method of managing the entire demand chain, especially the customer interface. Whitehead et al. (1999) have stated that operational cost reduction is a necessity in order to 'play the cost game' in the paper industry, but that it does not automatically lead to profitable growth.

The cost competitiveness of a paper machine line is crucial but it is not enough in itself: the whole value chain must be cost effective; from raw materials and inbound logistics through to operations, outbound logistics and marketing as well as sales and services. In any operation, economies of scale, production efficiencies and raw material specific consumption must be considered. The capacities of paper machines - speeds in particular - and consequently efficiencies have been increasing.

In the printing paper industry, the four most important factors affecting profitability are: *operational efficiency, operating rate, sales price* and *currency fluctuations.* Where operational efficiency and operating rate are controllable factors sales prices are only controllable to some extent and currency fluctuations are beyond the paper company's control.

Operational efficiency is the one factor which a producer can affect the most. It is derived from many components such as raw material special consumption and quality as well as the efficiency of deliveries. This means that the paper is in the right place, at the right time, in the right quantity and

of an optimum uniform quality. Operational efficiency can be affected by planned or unplanned shut downs, breaks, wastage as a result of half full deckle and rejected paper reels (Diesen, 1998). The growing size of the paper companies has had a positive impact on operational efficiencies: with a bigger number of paper machines in a company, many paper machines have been able to concentrate on a narrow product range - even a back up has existed. On the other hand, globalisation has brought with it for Finnish companies some very inefficient, out-of-date paper machines.

Operating rate illustrates how well - time effectively - invested capital is put to use. Operating rate is mostly dependent on supply/demand ratio of a manufactured printing paper grade, but a producer can somewhat affect that ratio through smart production planning, well-timed preventive maintenance shut downs or simply managing capacity by shutting down a paper machine. Operating rates vary from one printing paper grade to another. Rates normally vary at a certain point in time because different printing papers are at a different stage of their business cycle. Achieving the maximum operating rate is more the exception than the rule as far as printing paper machines are concerned. Some producers dedicate some paper machines – so called swing machines – which are often old and inefficient, to more than one paper grade. Although this impacts on existing total capacity this action is actually used more to manage profits than capacity. New paper machines have impact on the operating rate of a paper grade, but often the effects are temporary.

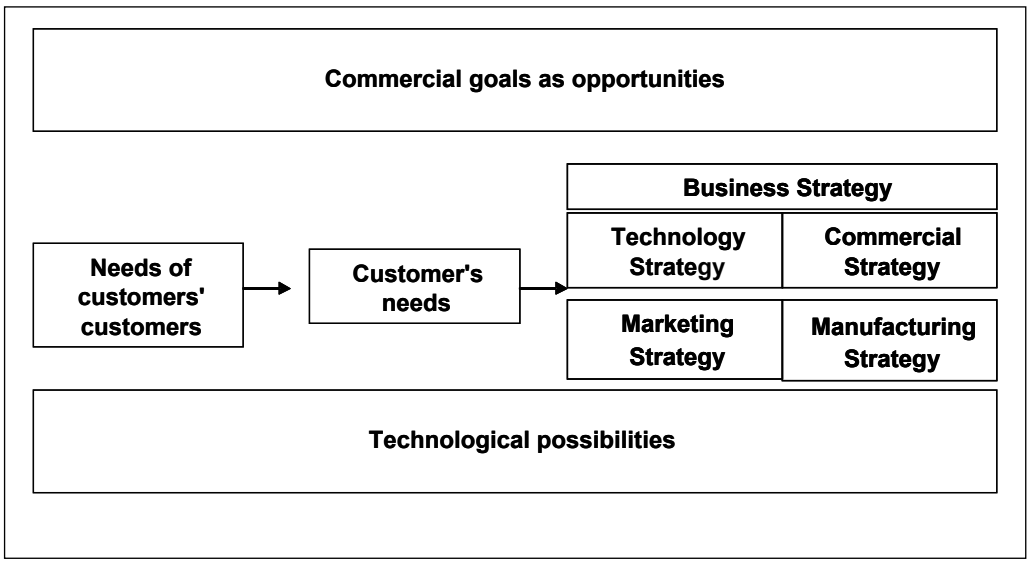
Sales price is the factor which has the single biggest impact on profitability. In printing papers, this has been very transparent - until recently. A decision to deliver an all inclusive branded product together with various services instead of just a standard product such as 54 g/m2 LWC paper for rotogravure printing has decreased this transparency.

Although these are uncontrollable factors, *exchange rates* must also be taken into consideration in global business. In principle it is possible to either

balance the markets or terminate currencies. Foreign exchange rates only explain a part of the competitiveness and even less in the European paper trade after the adoption of euro by many European States (Malinen, 2001).

2.2.6 Integrating technology and business strategy

A technology strategy is a part of a business strategy and is thus dependent on other sub-strategies, such as the competitive strategy, marketing strategy and production strategy adopted by the company. Ebeling (2002) has defined technology strategy of the paper industry in the following way: "Technology strategy provides guidance in operation of the manufacturing processes, in utilizing technology and in maintaining the process equipment plus addresses the various factors affecting competitive advantage of a company (or its division). These include technologies of competitors and customers, trends in key manufacturing technologies, trends in business environment etc." Figure 2.17 shows the position of the technology strategy within a firm's strategy system. Technology contributes to the company's ability to satisfy existing customer needs and also offers the possibility of creating new needs and a competitive advantage.

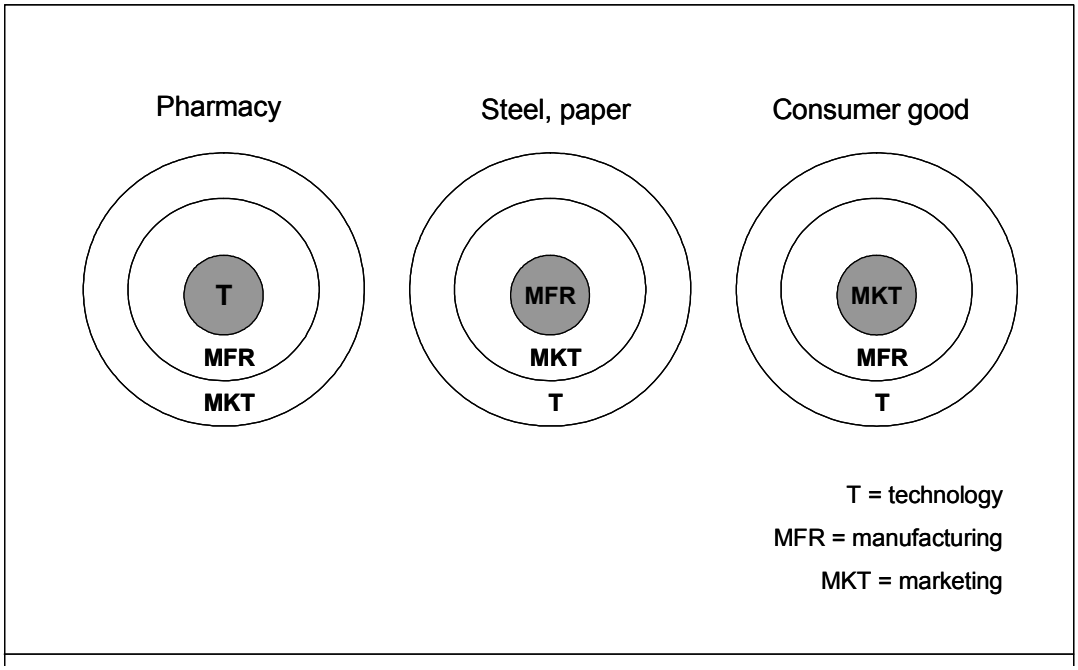


Source: modified from Mölsä and LaPoint (1995).

Figure 2.17: Technology strategy as a part of the business strategy

The role of technology in a printing paper firm is to facilitate cost competitive manufacturing and high levels of quality so that a firm can reach the most cost competitive position on the global supply curve (Figure 2.15) as well as to get access to the most demanding and best paying markets. In the paper industry – as in other capital intensive industries, the technology strategy typically evolves as a result of the business strategy rather than vice versa.

The role of technology differs according to industry. In the pharmaceutical industry, technology is the core, and manufacturing and marketing are supportive functions. In capital intensive industries, such as steel and paper industry, manufacturing is the core. This is due to heavy investments in manufacturing assets. Marketing and technology are instead supportive functions. The main role of technology in capital intensive industries is to improve product and process performance, the development of new processes and products takes second place. Once you have placed "the steel into the ground" you have to live with it 10 – 20 – 30 years and produce the same product with ever better properties and with continuously decreasing manufacturing costs. That is what innovation is in the capital intensive process industry (Schienstock and Hämäläinen, 2001). With fast moving consumer goods the marketing function is the core, and manufacturing and technology supportive functions. Figure 2.18 illustrates the role of technology in three different industries.



Source: modified from Weggemans (2000).

Figure 2.18: The role of technology in three different industries

There are numerous ways through which technology can create value. Top line growth by the help of technology can be achieved through

- product differentiation & incremental innovations
- new product options & breakthrough innovations and/or
- by making completely new value propositions.

Technology can realise bottom line growth in many ways, for example through:

- process performance improvements for example by increasing capacity through debottlenecking
- realising economies of scale for example by closing some small mills and building a new, efficient large mill
- developing new process options
- by process intensification.

These actions typically result in improved margins and better capital and asset utilization and thus increase the value of the company.

Figure 2.19 shows a system for value creation through technology.

The technology function of capital intensive industries primarily creates bottom-line value by its contribution to margin improvement by lowering total manufacturing costs. The cost focus helps to drive down the experience curve and hence delivers a bottom line contribution. Technology can improve the performance of existing assets. It can also help to reduce the capital intensity of new plants for example, through economies of scale and more integrated plants. Furthermore, lower capital intensity helps to reduce vulnerability to profitability cycles.

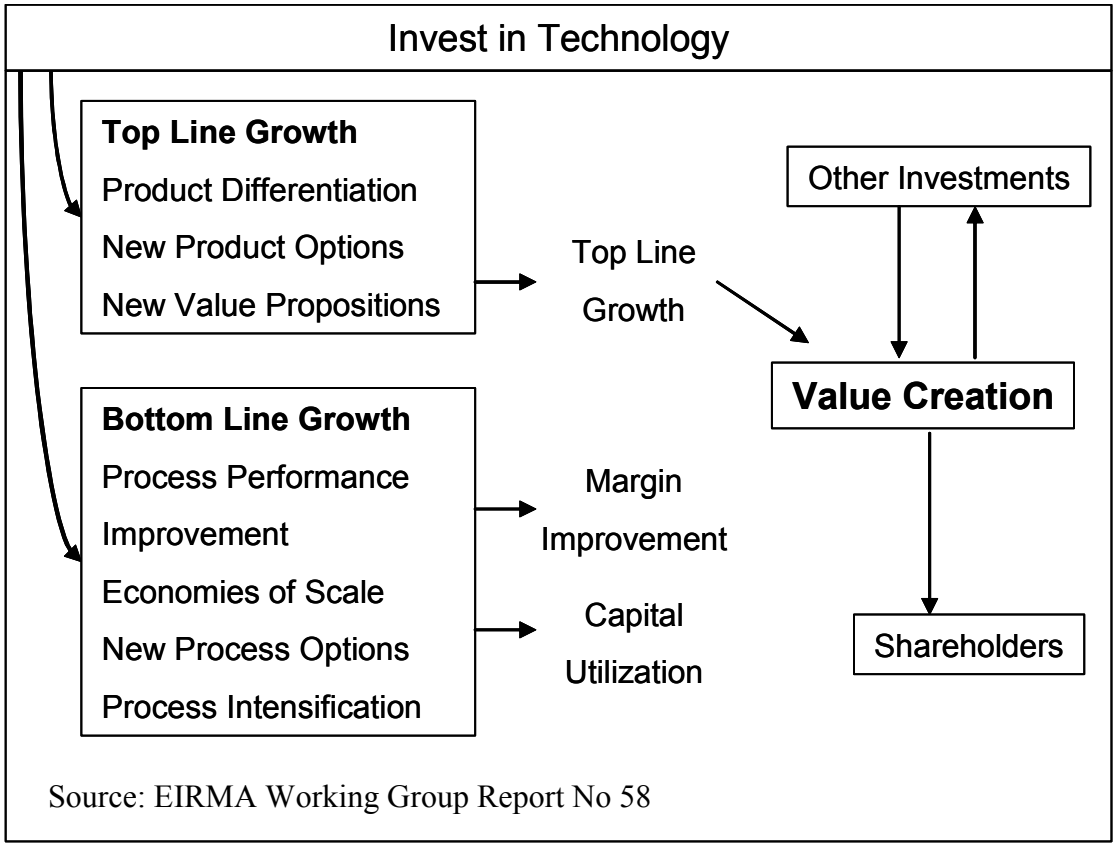


Figure 2.19: Value creation through technology

3 The printing paper industry

Chapter 3 aims to give a reader an overview of the printing paper industry in which the empirical material for this study is collected. It starts by introducing forces of change in the printing paper industry, continues by shedding light on the continuously expanding printing papers spectrum and continues by highlighting changes in customers' demands. Finally it finishes by discussing electronic media and its impacts on print media and in particular, on various end-uses of printing papers. Few comments on consolidating suppliers are also given.

3.1 Forces of change in the printing paper industry

There are a number of forces of change in the printing paper industry: 1) consolidation and globalisation of both paper industry and its customer

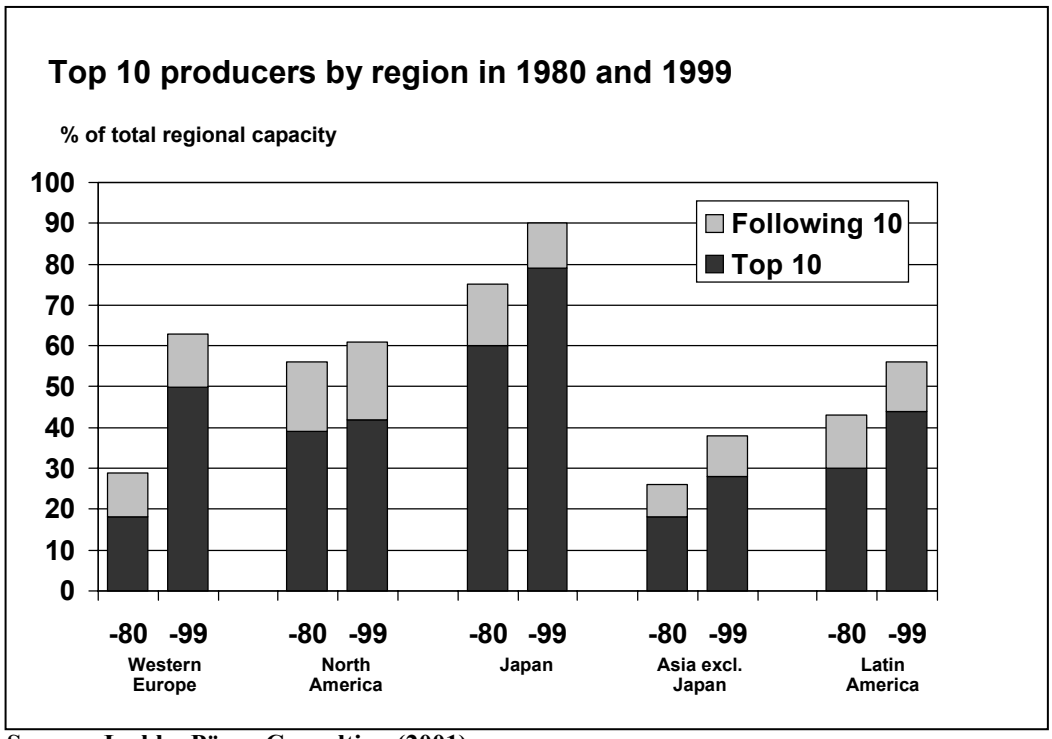
industries; 2) consumers' future media behaviour; 3) developing paper manufacturing and printing technology; 4) a scarcity of optimal raw materials locally and their increasing prices; and 5) a shortage of skilful human capital.

Consolidation and globalisation: Nordic paper companies in particular have led the consolidation and globalisation of the paper industry over the last six years in Europe (Sajasalo, 2003). Lilja et al. (1991) have given light to the issue reflecting the status in early 1990's. North American paper companies have strengthened their role in restructuring the printing paper industry over recent years. One of the key targets of consolidation has been to decrease cyclicality by better managing investments and capacity. Drivers for consolidation have included for example the search for synergies in purchasing and financing on the corporate level, product optimisation potential at the mill level and achieving access to wider markets, and investment optimisation. Regional consolidation is particularly prevalent in Europe as Figure 3.1 indicates. The search for ways to expand competitive advantage and the capability to serve global customers drive globalisation forward according to another view (Malinen, 2001).

Regional consolidation is reaching in some printing paper grades – in coated mechanical papers within Europe for example – the limits of free competition and this is why companies seek growth globally.

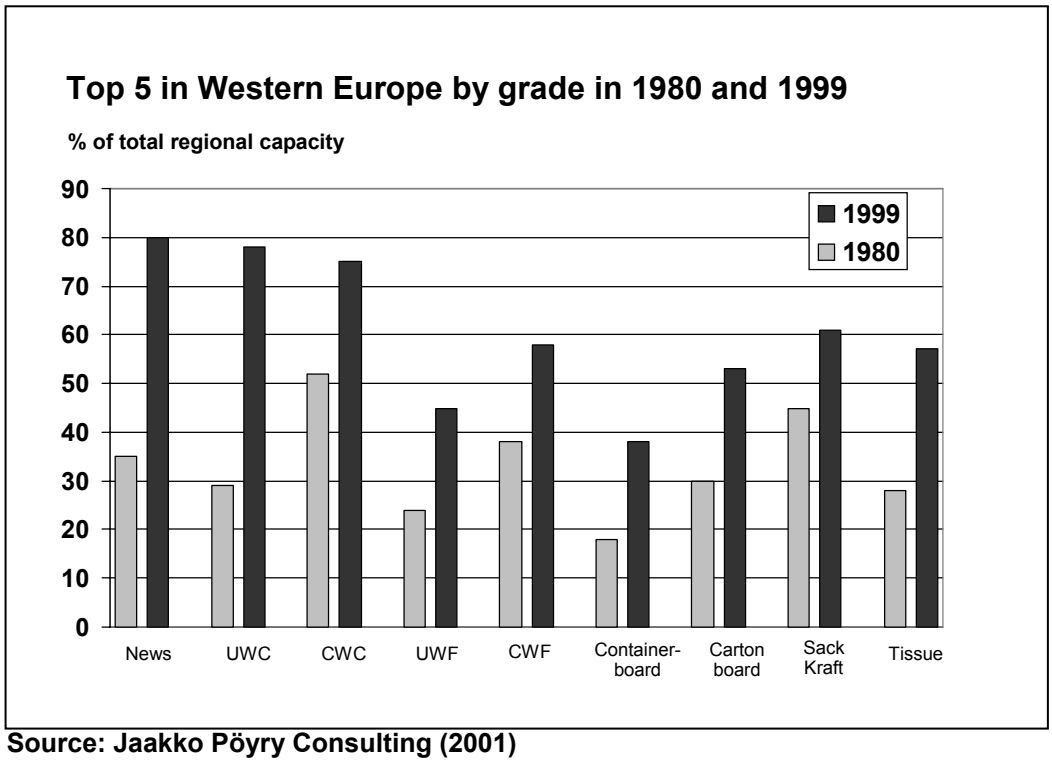
Local/regional consolidation deals have facilitated an increase in size but not necessarily broadened the focus. When expanding is growing further, focus is critical in order to be able on the one hand to achieve an attractive position in a sector globally, and on the other to transfer and develop the competence which may be limited to certain segments.

The top 5 European printing paper manufacturers together with their capacity shares can be found in Figure 3.2. In Western Europe consolidation has been the most rapid in newsprint in years 1980 - 1999.



Source: Jaakko Pöyry Consulting (2001)

Figure 3.1: Regional consolidation: the most rapid in Europe



Source: Jaakko Pöyry Consulting (2001)

Figure 3.2: European product group-based consolidation: the fastest in newsprint

Consolidation has helped to increase cost competitiveness but has not solved profitability problems or increased share values (Seppälä, 2000). It has not yet led to the increased stability of the industry, probably because of the lack of a strong market leader or because no company has been able to use economies of scale so effectively that it would have achieved an 'unmatchable' competitive advantage. Some diseconomies of scale have been realised instead: certain customers have reacted to increasing company size by transferring part of their business to other suppliers. Effectively the paper industry overall is still globally fragmented, although more consolidated regionally. For example International Paper, the number one in production capacity, accounts for 4.2% of the total capacity of paper and board and the top 5 producers account for 16.9% (March 2003). In printing papers the largest producer has 7.8% capacity share and top 5 make 24.3% (March 2003). Global companies are acting locally: efficient manufacturing is based on local fibre resources and products are therefore mainly marketed in the immediate neighbourhood. Consolidation has enabled product optimisation between paper machines and has concentrated on narrowing the product portfolio to one machine. This results in greater production efficiency and more uniform quality.

Consolidation of the Finnish paper industry started in the 1980's and actively continued during the first half of 1990's to form sufficiently strong companies to compete internationally (Näsi et al., 2001; Sajasalo, 2003) . In 2001 the three Finnish paper industry groups, UPM-Kymmene, Stora Enso and Metsä-Serla-Myllykoski, owned approximately 98% of the production capacity in Finland. For reference, the corresponding figures were 60% in 1980 and 70% in 1992 (Ojainmaa, 1994; Metsäteollisuus, 1998). Regional consolidation continued in Europe throughout the 1990's. This development consolidated the whole sector and form globally competitive companies. The U.S. companies are the largest by turnover in the world. They have benefited from their large domestic market. Consolidation took place in the US in the 1980's, especially during the late 1990's and has continued.

Customer industry (merchants and publishers in particular) has also consolidated throughout the 1990's.

Increasing consolidation of the industry has led to a high number of paper machines per company. This development has brought along with it paper machines of different technical age. Typically the paper machines with higher technical age have been converted to produce speciality paper grades. Streamlining the product range of one paper machine has helped to improve production efficiencies and thus competitiveness (UPM-Kymmene's internal statistics).

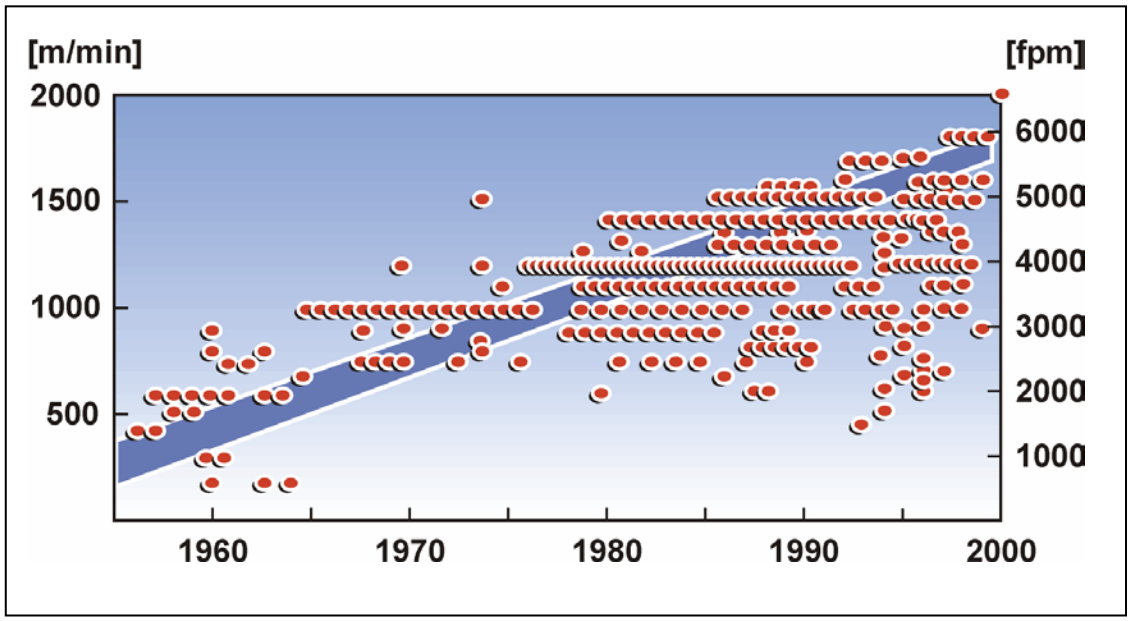
Consumers' future media behaviour: According to a study by the Electronic Document Society (EDSF) in 2001 the consumption of paper is likely to continue to increase over next 20 years in a linear manner, whereas the latest competitor, electronic media, continues to grow exponentially. Both media are expected to support each others growth through co-existence. In end-uses where a reading experience is important, paper will continue to have a strong position (Onabe, 2001). However, an earning concept of the new electronic media - excluding TV and radio – has not yet been defined. Decisive for advertisement allocation is, which media reaches the targeted audience in the most effective and cost competitive manner.

At the end of the long value chain is an informed, interested and integrated consumer, who appreciates more the authenticity that electronic media – such as the Internet - cannot offer. According to futurists, there is an ongoing swing from information to imagination. This theory supports the notion that print media allow the imagination to grow. Paper has remained a large and very competitive medium for communication because of its effectiveness at conveying the message, its easy-to-reach character, its aesthetic appeal and it has remained as cost-effective.

One of the main questions regarding the future of print media is, how quickly the behaviour of consumers will change. The other is, whether typography

will hold its strong position in information transmission as opposed to audio and video (EDSF, 2001).

Importance of technology: Paper manufacturing technology plays a crucial role in determining cost competitiveness, product quality and product differentiation possibilities. A typical modern printing paper machine is built and optimised to produce a narrow product range in the most efficient manner. The huge increase in paper machine width, and in particular, its speed, has improved the productivity of the paper machine line. This development is illustrated in Figure 3.3.



Source: Metso (2002).

Figure 3.3: Design speed development of paper machines 1955-2000

The paper industry through the use of paper machines, has an in-built rigidity. Paper machine suppliers have tried to compensate for this problem by taking a modular approach (Karlsson and Hakala, 2000). This does not mean that it would be more cost effective to master a broad product range at one paper machine line but rather that it will help in investment cost allocation over a longer period, and also facilitate better management of the investment project. Drivers of a paper machine supplier towards a modular approach have previously included the possibility of selling one and the

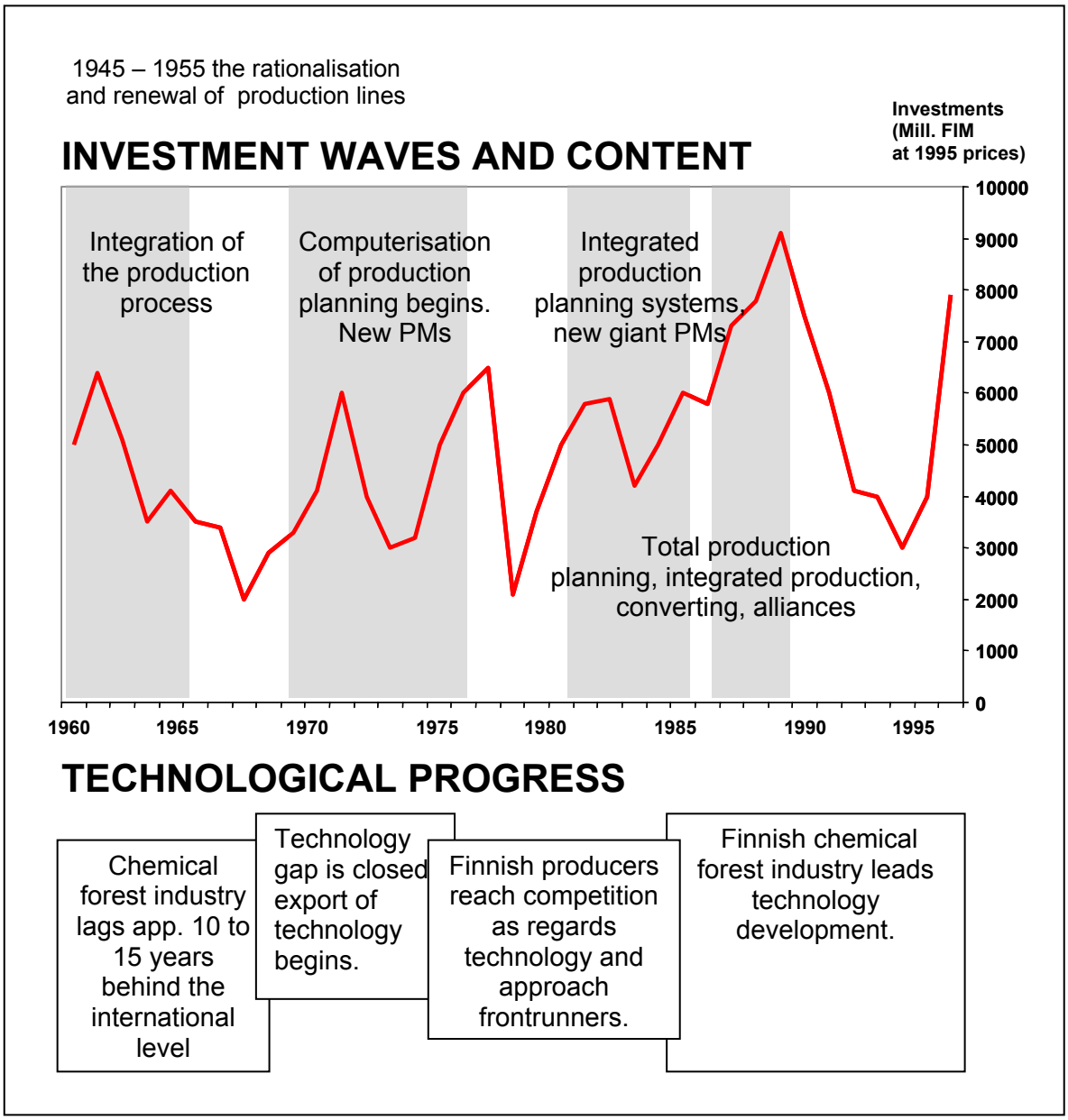
same module to various customers and the rationalization of the development work. There remains, however, the important task for the paper producer of integrating a module into other parts of the process – before and after another module - in order to achieve effective, trouble-free production. The starting point in most of the cases varies. A paper machine manufacturer sees a lot of unused potential to substantially reduce total capital investment through modularization, compact technology, mill engineering and installation management (Karlsson, 2000).

The development of production technology is very much in the hands of paper machine suppliers. Paper manufacturers have outsourced this part of the process development. The role of paper machine and equipment suppliers in the technological systems of the forest cluster has been crucial particularly in Finland. Machine and equipment suppliers' innovations are realized by investments made by paper manufacturers. Figure 3.4 shows how technological competence has developed in Finland through investment waves.

Today, there is one clearly identifiable, and widely used technology which is important for printing paper manufacturing and which was born outside Finland: recycled fibre technology. However, Finnish paper companies have put this technology into use wherever it is economically viable and end-users permit or require it.

Technology, as such, does not make a difference, but the knowledge, skills and ability to use that technology do (Paulapuro, 1993). Indeed, the pace of technological change has not been fast enough to force high cost machines out of production. Instead, they have continued to be used for several more years just to generate profits, so long as the market demand for certain products exists. The change brought by technology has been continuous and incremental in nature. No single technology has been able to make a fundamental change in the printing paper manufacturing process.

The exploitation of the latest technology together with know-how and skills has bolstered the success of the Finnish paper industry.



Source: Lammi (2000).

Figure 3.4 Advancements of technological sophistication of the Finnish paper industry have developed in connection with the industry's investment cycles

Printing technology has also been developed towards more efficient processes and better print quality (Aumiller, 2000). New printing methods in the area of print-on-demand especially have emerged.

Raw materials: In the western world, the paper industry is based on a renewable raw material, wood, and also to a limited extent, non-wood fibres. Alternatively, in China for example non-wood fibres such as straw have traditionally been the important raw material for the paper industry. Recycled fibre (RCF) is an increasingly important raw material, in less demanding paper grades such as newsprint. The largest use of RCF is, however, in packaging grades.

Raw material intensity is typical for the paper industry. The availability, price and processability of raw materials ultimately determine which printing papers are produced and in which region. They can also function as sources of competitive advantage. Nowadays it is economically sound to produce standard newsprint – the commodity of commodities within printing papers - from RCF, close to densely populated urban areas and in the vicinity of printing houses. The quality of RCF, however, restricts the use of RCF to coated mechanical papers: reaching the required brightness level significantly decreases the yield of RCF. There are a number of other reasons such as closeness to customers, which can have an impact on the selection of the product portfolio of a production unit. The long-term availability of suitable fibre has recently increased in importance particularly when considering a new mill. A tendency to adjust the relation of fibres and minerals towards more economical minerals, which simultaneously improves the quality of a printed product, continues.

Skilful human capital: It will be one of the biggest challenges for the paper industry to attract young talents for which purpose many paper industry firms are working hard.

3.2 The evolving printing papers range

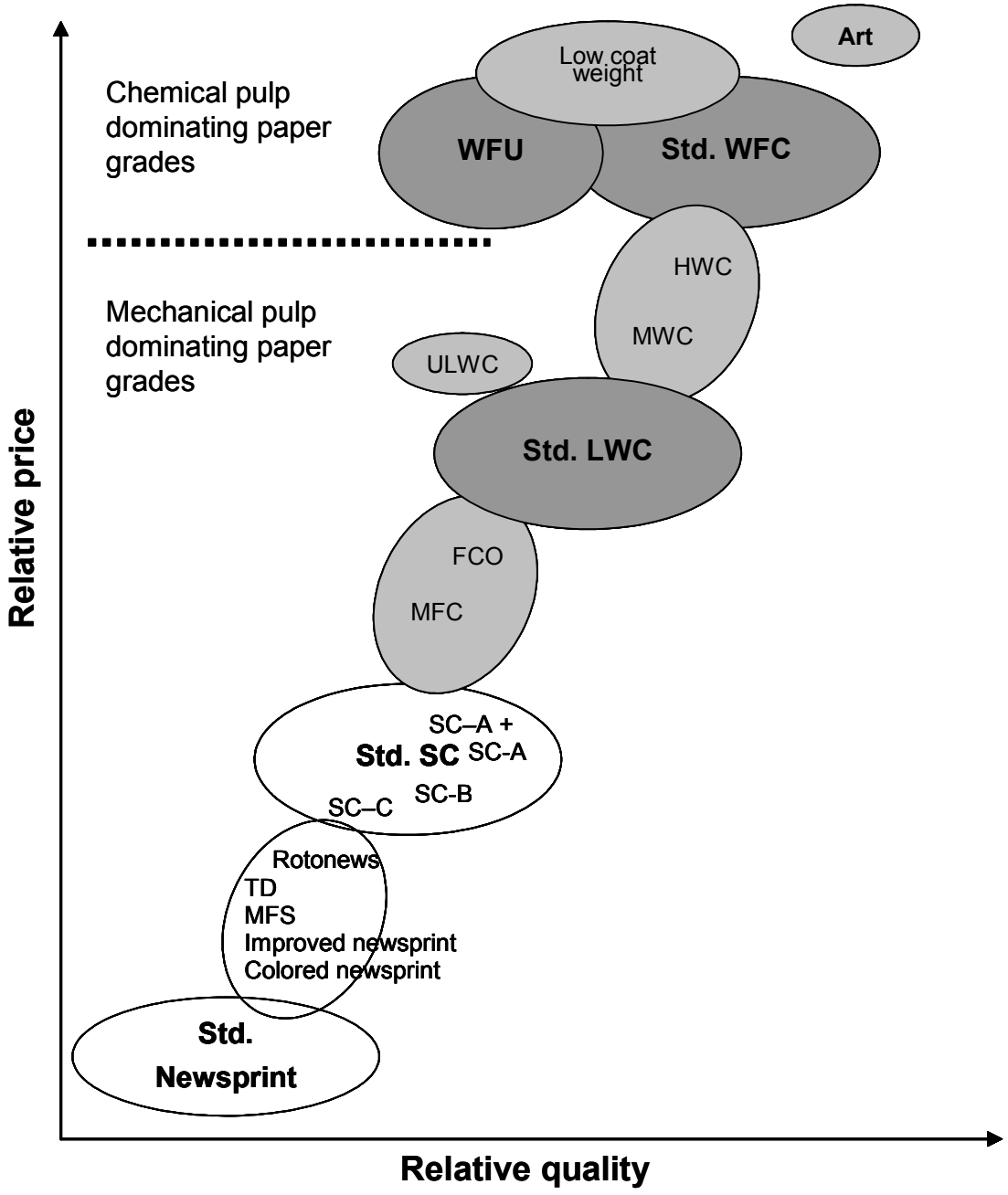
"Paper is after all one of the pillars of Western civilization, and is very likely to continue to play a key role in communications for a long time to come."

Dr Pirkko Oittinen, Professor of Media Technology, HUT (1999)

Printing papers are paper grades, which are used for newspapers, magazines, catalogues, books, commercial printing, business forms, and stationaries. Their current functional use is to collect, distribute and store information. Printing papers account for about one third of the world's paper and board markets. They can be divided into two groups, **mechanical pulp dominating grades** and **chemical pulp dominating printing paper grades** on the bases of the nature of the main raw material, pulp (Haarla, 2000b). Figure 3.5 depicts the position of the main printing paper grades according to relative quality – value added to fibre - and relative price. The end-use of a paper defines, how much a buyer can pay for paper. This stems from the paper's importance in the customer's earning mechanism.

Another, more precise way to position various printing paper grades from an end-use perspective is to use pairs of important properties such us opacity and brightness, roughness and gloss or caliper and smoothness for example.

Important general paper technical properties of printing papers are brightness, opacity, gloss, roughness/smoothness, absorbency, surface strength and stiffness (Jernström, 2000). However, important properties overlap as Figure 3.6 indicates (Haarla, E. 2001). This makes product differentiation through only paper technical attributes difficult if not impossible. Jernström (2000) has stated that the value of a printing paper depends on an end-product or product group and also "…the use of purely technical testing to classify printed products according to the customers' expectations proved to be only indicative at its best".



Source: Haarla (2000 b).

Figure 3.5: Evolvolving printing papers range

Main properties of different printing papers

Grade	basis weight range (g/m2)	Brightness range (ISO %)	Opacity range (ISO %)	Gloss %	Print method
Newsprint	40 – 48,8	~ 58 (Y-value 63,5 %)	91 – 95	-	CSWO, flexo and letterpress
MFS brite	42 – 70	63 – 80	90 - 94	-	CSWO, flexo and letterpress
MFS book papers	45 – 80	63 - 76	85 - 96	-	CSWO, flexo and letterpress
SC papers	45 – 60	67 - 72	88 - 91	42 - 51	Gravure and HSWO
SC A +	48 – 60	70 - 75	89 - 91	46 - 50	Gravure and HSWO
MFC (Satin)	48 – 80	76 - 78	88 - 94	30 - 40	HSWO
LWCO	45 – 80	69 - 80,5	89 - 96	40 - 68	HSWO
LWCR	35 – 70	67 - 76	86 - 95	38 - 65	Gravure
HB LWCO	57 – 80	82 - 88	89 - 93	60 - 70	HSWO
HB LWCR	57 – 80	82 - 86	89 - 93	60 - 70	Gravure
MWC Matt	80 – 120	92 - 93	95 - 97	15	HSWO
MWC Gloss	65 – 120	88 - 93	90 - 96	70 - 75	HSWO
WFU	60 – 250	93,5 -95	83 - 99	-	HSWO
WFC Matt	90 – 150	91 - 93	90 - 98	< 35	HSWO
WFC Silk	90 – 170	91 - 93	90 - 98	30 - 35	HSWO
WFC Gloss	90 – 170	91 - 93	90 - 98	70 - 80	HSWO

CSWO Cold Set Web Offset
HSWO Heat Set Web Offset

Source: Haarla, E. (2001).

Figure 3.6: Overlapping paper technical properties of various printing papers

Typical end-uses and the most common competing printing papers by printing paper grade are described in Appendix 1 (Haarla, 2000b).

There is no generally accepted or standardised paper grade classification system, but many types exist in the global paper trade. Different bases have been used in classification: for example, raw material compositions, end-uses, basis weights, brightness and manufacturing technologies. There are also geographical differences in the classification of paper grades between Western Europe, North America and Japan. In the worst cases the same grade names are used but with different property specifications. This forces a global supplier to develop and maintain separate grades for each market.

Different classifications and lack of internationally recognised standards causes serious problems when studying differentiated printing papers in the

global trade: differentiated papers are accidentally grouped with standard printing papers. This restricts the use of public quantitative data and analyses. Within one company one and the same classification principles are normally followed, but inter-company or inter-industry comparisons are difficult, if not impossible. This creates a challenge and a need in current research for precise identification of the terms used. Technological advancements in production, new raw materials and their combinations as well as customers' specific requirements are reasons for the blurring of boundaries between the paper grades.

A majority part of printing papers can be classified as traditional commodities, which have typical standardised quality and the same product price, a standard newsprint as a typical example. Niche products make up another section of printing papers. Typical niche products are a high brightness book paper and a catalogue paper with certain bulk, stiffness and optical properties combination. Typical to niche products is a producer specific attribute profile, a more limited supply compared with commodities, and highly specialised end-uses, where paper grade, as such, often is a message. For both a commodity and a niche product there must be a back-up supply to secure customer interest. In the case of a niche product, another subsidiary often comes from within the company or from an alliance partner.

Commodities and niche products behave in different ways and require suppliers to take a different sales and marketing approaches. For commodities, a large market share is key whereas for niche products solid understanding of the customer’s business drivers is vital.

The printing method – whether it is letterpress, offset, rotogravure or one of the digital printing methods – together with the end use and its colour content determine the set of attributes which are required from a printing paper. Important end-use dependent attributes can be, for example, a matt finish for high quality senior magazines, stiffness for copies sold at kiosks or

bulk for book papers. It is important to note that functional properties of paper grades are important and they vary according to an end-use.

Where offset printing requires a good strength from a paper surface, rotogravure printing requires good sheet compressibility and smoothness of the surface. In digital printing no single technology is involved, instead many are used. In electro photography, for example, the runnability of the paper is critical. The electrical conductivity of a paper should be sufficient and it should have electrical resistivity. Moisture content and appropriate friction are also important properties as well as good dimensional stability and good surface strength and smoothness. Ink jet-printing papers must match with the inks used and with the drop volumes: primarily, ink jet papers must be smooth. They must have sufficient and even porosity. Dimensional stability is also important. Cockling and curling tendencies should be minimal.

Paper technical properties are, however, approximates of how a printing paper is expected to behave in the printing process which follows. Evenness of quality is important within one order and between the consecutive orders.

Customer roll size and roll width in particular, are on the increase. This is driven by printers' pressures and their desire to improve their competitiveness. A rotogravure printer has ordered a printing machine, which will use 4.2 m wide reels. This development puts high demands on the dimensional stability and profiles of a paper web and reel winding as well as the handling and transportation of such customer reels.

At least four generic groups of drivers for the development of printing paper quality and printing paper grade can be found:

- diversified customer demands stemming from more targeted end-user sectors (Haarla, 1997)
- technology, especially in the area of coating and calendering but also in sheet formation

- new raw material combinations resulting in new attribute combinations
- intensified competition from an electronic media
  (Stade, 2001; Haarla, 2000b)

Diesen (1998) mentions the following reasons for the emergence of new paper grades:

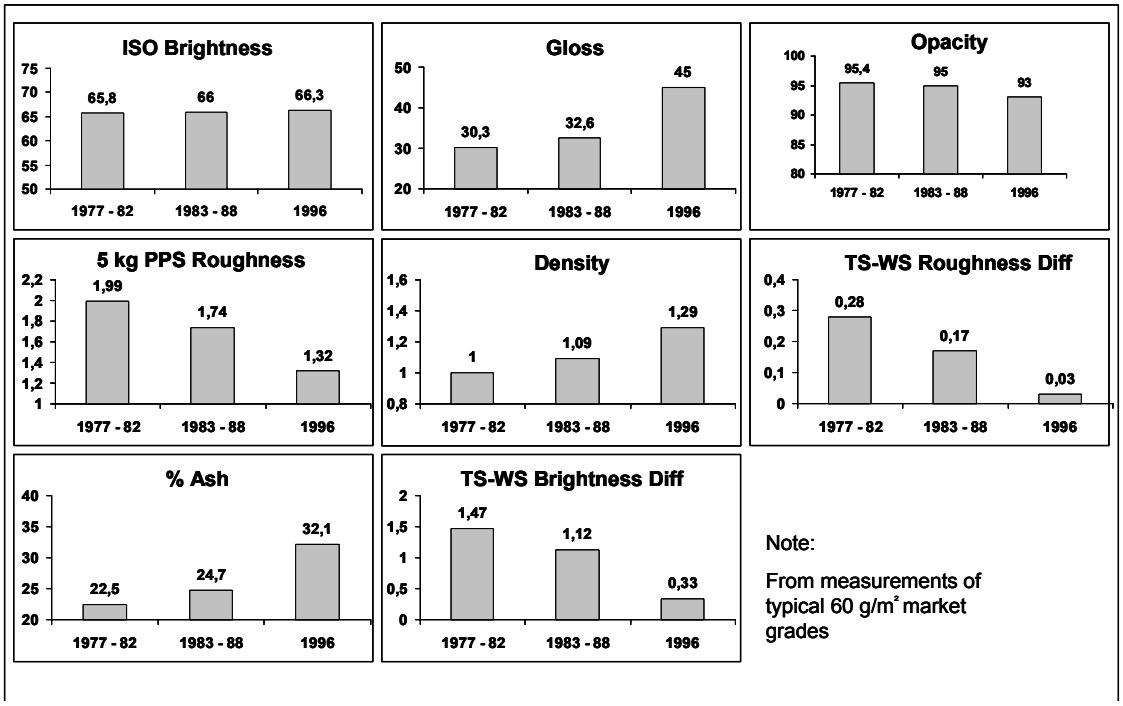
- customers' diversifying needs boosted by increased target marketing
- advances in printing technology such as digital printing which create new end-uses
- advances in paper manufacturing technology, especially in the areas of multi-layering, coating and finishing
- producers who upgrade older machinery due to profit erosion
- increasing utilization of recycled fibre, especially in newsprint and SC B grades
- increasing utilisation of different minerals and mineral combinations.

Haarla (2000) pinpoints following general development trends for printing and writing papers: There will be new end-uses and new paper grades. Paper characteristics will change; brightness will increase, basis weight will decrease, and the polarisation of properties such as matt versus gloss will take place. Changes in the use of raw materials will occur such as the increased use of recycled fibre and expanding use of various minerals. These changes can be either customer's customer driven, advertiser, driven in the case of demand for higher brightness or consumer driven – illustrated by increasing use of recycled fibre as a raw material.

Rapidly changing printing technology puts pressures on paper manufacturers to collaborate closely with the printing industry. Given the in-built rigidity of the paper industry and lengthy time spans of the development work, it is crucial for future success to initiate the co-operation with printing machine manufacturers and printing ink suppliers as early as possible.

SC papers are a good example of what developing technology, increasing customer demands and alternative use of raw materials have resulted in. Figure 3.7 shows the changes in some characteristics of standard European SC papers between 1977 and 1996 (Veness and Williams, 1999).

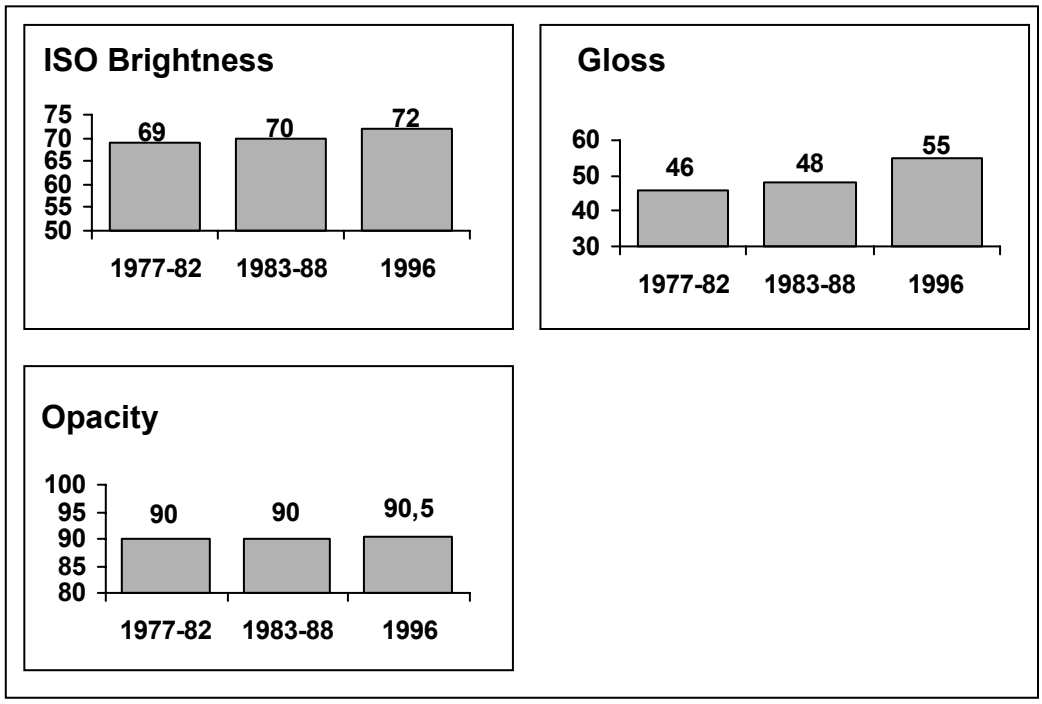
Gloss level has further improved to the level of 48-50 and PPS 5 roughness decreased to the level of 1.1.



Source: Veness and Williams (1999).

Figure 3.7 Changes in the characteristics of European SC papers in 1977-1996

Figure 3.8 depicts the changes in characteristics of European LWC papers during the same period (Veness and Williams, 1999).

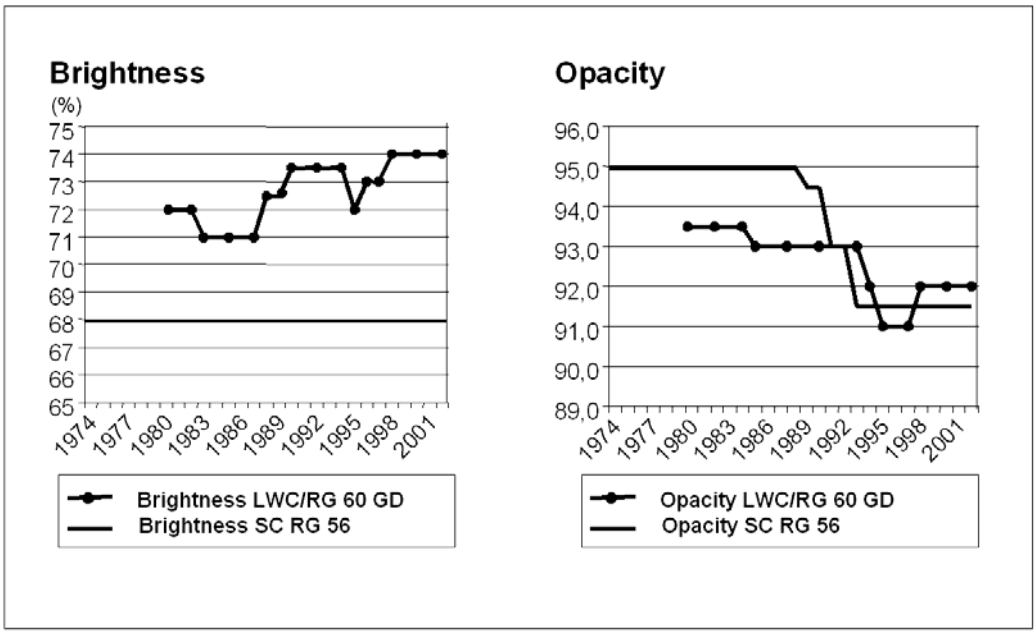


Source: Veness and Williams (1999).

Figure 3.8 Changes in characteristics of European LWC papers in 1977 – 1996

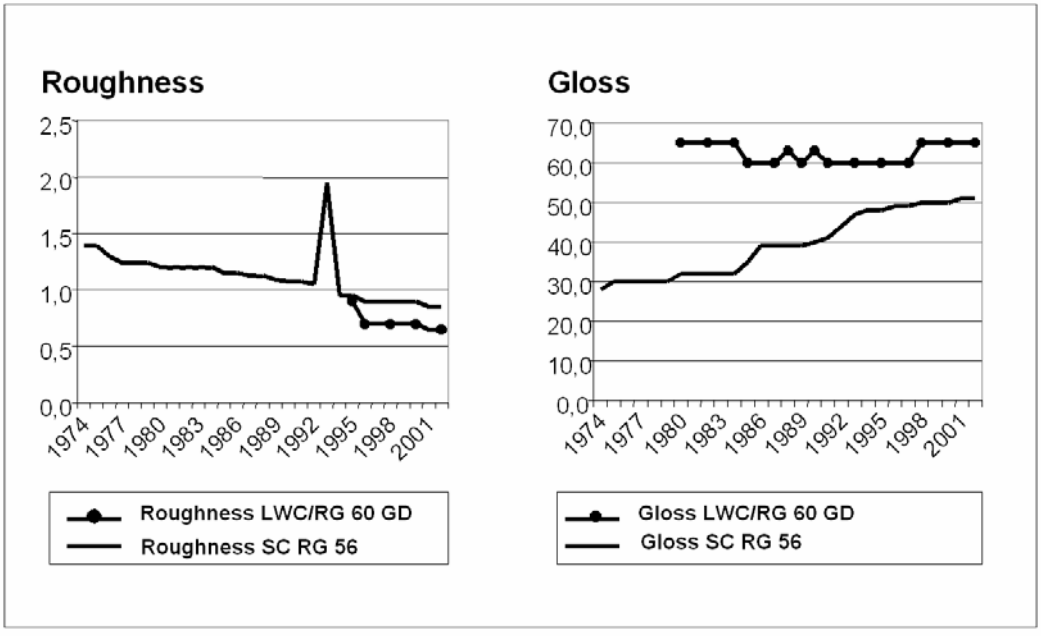
The gloss of LWC paper has only somewhat improved to the current level of 56-58.

Figures 3.9 and 3.10 point out clearly how a quality gap between standard LWC paper for rotogravure printing and standard SC paper for rotogravure printing has deminished over the years in critical paper technical properties. The new technologies such as gap former and the use of the 4th press started to impact on the quality level of SC papers in the early 1990's.



Source: industry statistics (2002)

Figure 3.9: Development of opacity and brightness in SCR 56 and LWCR 60



Source: industry statistics (2002)

Figure 3.10: Development of roughness and gloss in SCR 56 and LWCR 60

Veness and Williams (1999) describe, how improved SC papers can target LWC papers' markets. The quality gap between SC and LWC papers has decreased and so SC papers have been able to move in on LWC paper's traditional markets such as catalogues. Lorusso and Phipps (1999) show how the fillers in SC papers can make a difference. Numerous studies exist on how developing paper manufacturing technology has affected printing papers. For example one study investigates how a new gap former technology applied in early 1990's in SC papers production decreased the two-sidedness of a printing paper with 30% filler content (Paulapuro, 1993). Carter (1999) describes the ways in which bleaching technology can improve brightness and print quality. Klass (1998) describes, how new production techniques enable low cost, high quality grades, and simultaneously create the potential to save older, less competitive paper machines. Beivi et al. (2001) discuss improved surface properties for value-added newsprint.

The gradual development of printing papers range since 1960's is described in Appendix 2.

3.3 Changing customers' demands

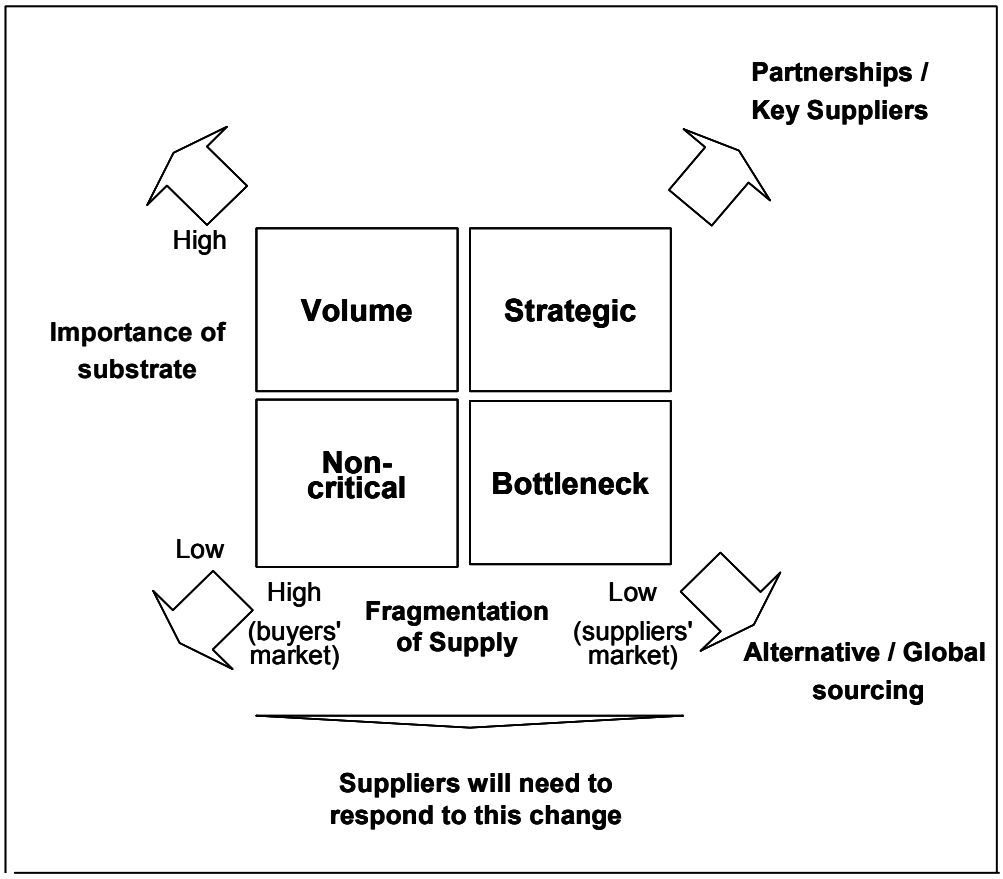
Publishers, printers and merchants are the customers of printing paper companies. Digitalisation of information is the most powerful change agent for publishers and printers.

"The future success of various media will be based on the quality of the contents, regardless of whether it is printed or electronic communication."

Jaakko Rauramo, President and CEO, Sanoma-WSOY Oyj (1999)

Globalisation and restructuring continuously drive **publishers** towards larger, multinational groups. This development has affected on publishers' buying behaviour. According to Malinen (2001) we can observe in the paper

industry four different types of development – global sourcing, partnerships, volume buyers and price seekers as Figure 3.11 depicts.



Source: Malinen (2001).

Figure 3.11: Four types of buyers grouped according to their purchasing behaviour

Publishers are outsourcing printing and concentrating on publishing or related activities such as developing data banks. Developed information technology and digitalization of information offer a way to short-cut the value chain and to create new business models and also, to create new markets. This development offers opportunities for new printing paper grades, in the near future. However, new opportunities will open rather for niche products than standard products due to the volumes involved. Book-on-demand or newsprint-on-demand are recent examples of this development. The cult of the individual, the enabling ability of IT and the modifying effect of environmental concerns are the key themes of the future which will influence

the direction and development basis for publishing - and also for printing (Pira, 2000).

New technology changes the act of publishing. The trend is towards the distribute-and-print model - a move away from the traditional print-and-distribute model. Traditionally, the role of a publisher was to compile a product and arrange for it to appear in bookshop shelves or promote it in other ways. With new technology, the act of publishing becomes the creation of a database of information available from which a customer may extract the information content required. The price will be a function of the volume or value of the information selected. Consequently the copyright, licensing, ordering and accounting procedures will all acquire additional dimensions to cope with this new arrangement.

The contents will remain king (Rauramo, 1999; Brown Anderson, 2003); the most important asset to a publisher. Publishers have multiple channels through which to distribute products, either in printed or in electronic form. The consumers' point of usage, together with the time available dictates the delivery method. Many publishers are actively using both print and electronic media and creating new products to satisfy "a new consumer".

The European content market is worth more than £100 billion and is predicted to grow between 5 and 10 % per annum up to 2004 (Birkenshaw et al., 1999). It is for example significantly larger than European telecommunication or IT sector.

Parallel publishing - the re-use of content for different media - has forced publishers to adopt standard document structures and to invest in database systems. Also wider skills for multiple media usage are required.

There are several drivers of change that are likely to have an impact on the various publishing value chains (Birkenshaw et al., 1999). Typical effects are

- Vertical integration or disintegration of the core value chain
- The development of alternative value chains which may compete with or replace the existing value chain and
- The incorporation of digital printing technology into the value chain (and the implications of this).

Conventional publishing will, however, not suddenly change as value chains develop.

Printing is one of the biggest manufacturing businesses world-wide, print being worth 440 billion euros, of which global communication print is worth 375 billion euros (KBA, 2000). In absolute terms print media will grow by 3 to 5% per annum, but its relative market share compared with electronic media is declining. Consolidation and globalisation of the printing industry is also taking place, a similar development is occurring in the publishing industry. New mega-printers such as RR Donnelley and Quebecor have emerged.

"Print media is fundamental to any and every economy as is the telephone. Print is as essential to the transacting of business, whether it be business-to-business or business-to-consumer, it does not matter. Print is not going away."

Charles G. Cavell, President and CEO
Quebecor World
(2001)

At the same time there is another type of development that can be observed: the birth of small/medium–sized printing companies, offering high quality services and utilising digital and on-demand printing technologies. The European printing industry is for the main part, local and small in character. The fragmentation of the industry is partly a result of language requirements. Regional consolidation has been faster than a global consolidation.

In terms of printing papers, the following printing methods are used: offset, lithography, gravure, letterpress, flexo and digital printing. Waterless offset is emerging. It may offer new opportunities for differentiated products. Although this process is more difficult to control than traditional offset, it offers many benefits such as lower investment cost, simplicity and a more efficient asset utilization (KBA, 2000).

The characteristics of the end-use determine the choice of printing method and paper grade used. So does the available paper budget also. A customer type (a magazine publisher for example) drives purchasing behaviour. However, an end-use (a telephone directory) drives a paper choice. One customer segment can have a number of various end-uses. The absolute importance of paper price varies widely depending on the end-use and on the customer. For catalogues for example paper represents about 30% of the direct costs. In newspapers it represents from 15 to 25% of total costs, but in books only 3 to 5% of total costs. In terms of printers' costs, paper typically represents 50 to 65% of total costs and for merchants about 85% (Baker, 1999, interview, Appendix 4).

Offset lithography dominates in magazines, catalogues, books, newspapers and in direct mail. Gravure has a strong presence in catalogues and magazines as well as where print runs are long. It offers excellent quality with the lowest cost per copy. Digital printing has good prospects in books, direct mail, envelopes and labels, business forms and legal documents. Here, there is a lot of personalization and print runs are short. In reel offset newspaper printing no competition from digital printing is expected before 2030 at least. (EDSF, 2001)

Although reel offset printing dominates in Europe and North America, and is increasing its share, the highest growth is expected to come from digital printing.

Even 60 % of the newspaper sales revenue is generated through advertising, mainly through classified advertisement. In 2003 close to 10 % of the classified advertising in Europe and Japan is expected to be distributed on-line while the corresponding figure in North America is expected to be as high as 15 %.

Newspapers are unlikely to be printed in a central location in the medium-term, but printed regionally with specific population groups being targeted.

Following changes are expected to take place according to EDSF (2001): telephone directories, reference books and so on will in the future be sold more widely in CD Rom format or on-line. Because of high printing quality economic efficiency, readability, modularity and other advantages reel offset job printing has no course for concern about its future.

At the moment the majority of advertising – 70 % - is done through printing (Zenith Media, 2002). In 2010 this figure is expected to fall to about 50 % with oral growth (radio and TV) in advertising generally of nearly 10 %. In the long term, sheet offset printing will lose market share to digital printing. The applications in the print-on-demand sector (book-on-demand and advertising material-on- demand) offer advantages as regards warehousing costs and a high level of flexibility so that any changes the customer have to make in a last minute, can be carried out more quickly.

A break-down of European printing output in 2000 shows that books dominate: they represent 19%, magazines represent 13%, newsprint 12%, catalogues 5%, commercial printing 17%, other promotional material 19% and other end-uses make up the rest, 15%, of total printing output (KBA, 2001).

Digital printing can be defined as the direct transfer of digital information to a substrate without a transfer medium. The main drivers behind the increase of digital printing are economical manufacturing of short print runs, the

speeding up of the process and high quality. This printing method is still practically in its infancy but is growing rapidly. This entails more fragmented printing and more demands regarding logistics and increasing complexity for a paper producer as each digital printing method requires somewhat different paper properties. The development of digital printing machines could lead to a scenario where different printing machines can use one and the same printing substrate. The importance of branding is increasing – users' knowledge of different paper grades and their performance is currently limited.

The key question regarding printing is as follows: How is the Internet and other electronic means for transferring information likely to change the traditional printing business in the next few years? At the core of this question lies the convergence of conventional printing: words and images transferred onto paper and other materials; and the era of the Internet where the transfer of information to the printing system is done via high speed computer networks. Due to the availability of new media choices, traditional areas of the printing industry face already changes as advertisers and other print buyers go for an alternative channels. Printers have to restructure in order to increase profitability, to attract a skilled work force and fight off the competition by reducing the prices. Some big printers have gone for electronic media.

There is no fear that printing will be superseded within the next 20 to 30 years. Today the printing industry can offer more than just printing. In the future the industry will move from being a mono-media service provider to a cross media systems suppliers.

Paper **merchants** have a role in the chemical pulp dominating paper grades such as WFU and WFC, because of they have stricter service requirements than those of mechanical pulp dominating printing papers such as SC papers. Consolidation has also taken place among European merchants: the five biggest merchants in Europe holding over a 50% stake in the pulp

dominating paper markets. Merchants have a role to play in service an increasing number of different customer groups with very different demands for services and products. The merchant's role therefore has to concentrate on the deeper segmentation of these groups to be able to better adapt organisations to the different customer groupings. Merchants have to adapt their businesses to the new electronic commerce concept. Along with increased customer focus requirements merchants have to establish brands and branding. With brands will eventually come differentiation in the customer's minds. This will then bring the driver for repeat-purchase loyalty and the willingness to pay a price premium.

3.4 Electronic vs. print media

"Forecasting of the media is conventionally conducted only through technological and market issues without considering human factors. Since the receiver of media is a human being, human factors like the cognitive nature of the media have to be taken into consideration in developing a model for forecasting the future of paper media in competition with electronic media."

Professor Fumihiko Onabe
Paper Science Laboratory
Graduate School of Agriculture and Life Sciences
The University of Tokyo

For 550 years paper-based communication has dominated our society and our culture. The newest electronic challenger is the Internet. The Internet competes more with other electronic media than directly with print media because of its basic character: it is good for mass-communication. The development of electronic media will force publishers, printers and merchants to re-evaluate and develop their product offerings, their supply chain structures and to take more consideration of the demands of personalized end products. Print connects like no other medium: it engages both the mind and the senses.

Despite the emergence of new information technology and methods for mass-communication, print has been able to maintain its position, even to strengthen it. In terms of media spending, print has remained the dominant medium, the cornerstone for communication. Figure 3.12 shows the development of advertisement expenditure between different media.

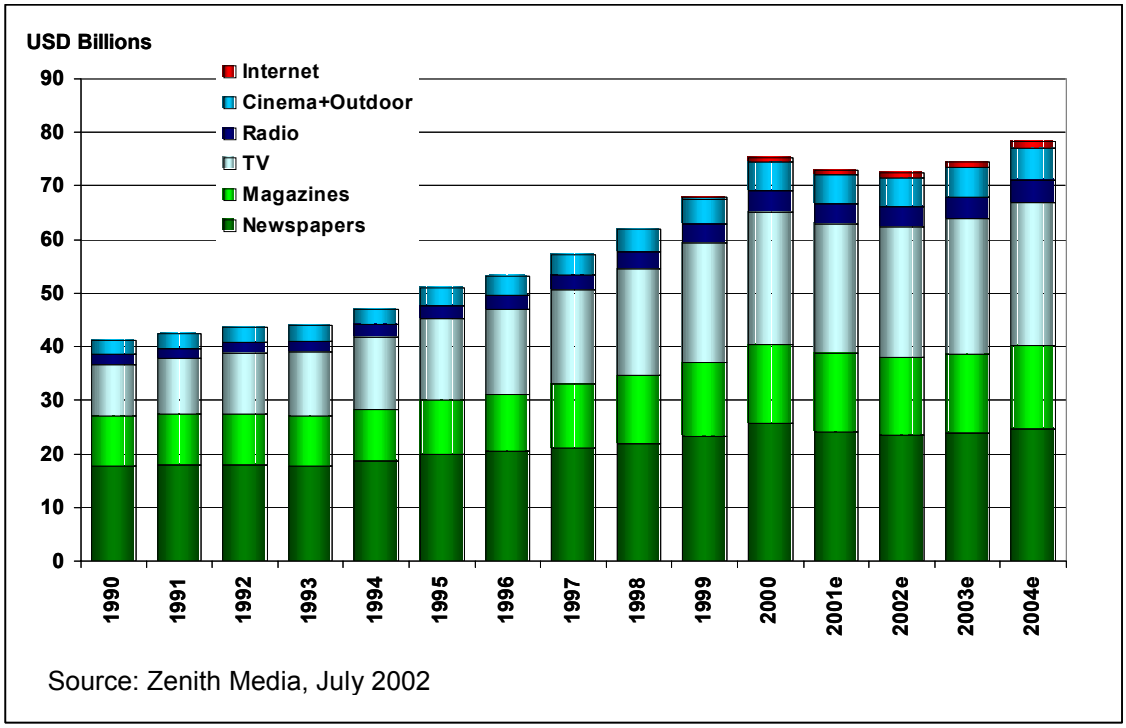


Figure 3.12: Print has remained a dominant medium for media spending

Helbling and Page (2001) have identified three main drivers for media selection, factual needs, personal motivation and the convenience factor. Table 3.1 shows these drivers in more detail.

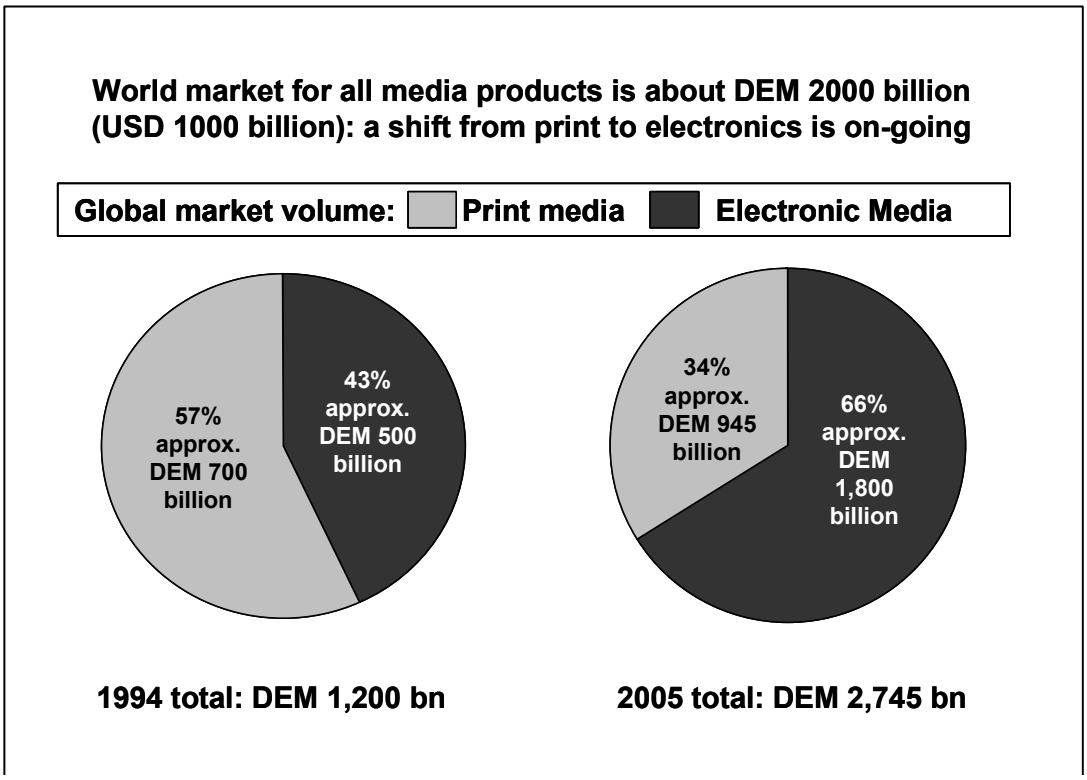
Table 3.1: Drivers for media selection

Factual needs	Personal motivation	Convenience factor
News	Quick-to-know	Mobility
Data	Need-to-know	Flexibility
Commercial info	Nice-to-know	Readiness
Personal interaction		Efficiently
Entertainment		

Source: Helbling and Page (2001).

Earning concept with electronic media has not yet been clarified. For example, Rauramo (1999) states: "For instance, advertisers are interested in the opportunity to see. For newspapers and periodicals it is much easier to attract viewers than for the Internet… To attract viewers they (web sites and portals in the Internet) have to advertise heavily in traditional media."

Figure 3.13 shows one projection of the future development between print and electronic media from 1995 to 2005.



Source: KBA (2000).

Figure 3.13: Development of print and electronic media up to 2005

There are three key elements, which will shape the future: rapidly developing digital technology, consumer choices and the publisher's ability to make money with a new concept using electronic alternatives (Pira, 2001).

Rapidly developing computer technology will help both publishers and printers to expand their businesses and to make them more competitive. Developments in computer technology will continue to double processing power every 18 months. This will also have a big impact on the systems used in print production. There are two important laws to remember when considering competing digital media technologies: Moore's law – silicon chip density doubles every four years – and Metcalf's law – that is the value

network increases exponentially with the number of users connected to that network (Haarla, 2000a).

Digital printing technology will be the most obvious beneficiary of computer technology development. Integration of print and electronic media will have the most positive impacts on printing paper demand, whereas the rapid development of IT, (the economy, effectiveness and versatility to store and to transfer information) will have the most negative impact on printing paper consumption. The transfer of classified advertising from to print to electronic media is gradually eroding the economic basis of traditional print products such as newspaper.

Electronic media will change print media, the use of printing papers in particular. Electronic media also creates new needs. Hetemäki (2000) mentions economical aspects, consumers' preferences, environmental aspects and institutional changes as factors which affect the relative competitiveness of each media.

Electronic media will affect print media in the long term in different ways depending on the end-use (Pira, 2000; EDSF 2001).

Newspapers will most likely face severe competition from on-line services available via the Internet especially the traditional daily, weekly and regional formats, but there will be growth in free and commuter papers. Classified advertising will transfer to the Internet, eroding an important revenue source for newsprint. According to EDSF (EDSF, 2001) the web is already an important channel for classified ads. To increase revenue, newspapers are installing colour printing presses to produce more value added colour advertising and provide a more consumer oriented product. This development offers the paper manufacturer opportunities for product differentiation. Pira (2000) estimates the net effects being the following: for traditional newspapers slightly negative outcome, for renewed products such as commuter papers, a positive outcome. Recent developments,

however, show that newspaper as a product is renewing and developing towards more colours, segments and smaller formats.

Magazine publishers will develop e-commerce activity which will more than compensate advertising lost to the Internet. Special-interest magazines are expected to boom, satisfying individual consumers. Shorter print runs favour offset printing thus increasing the need for offset-printable printing papers. In the future, periodicals in particular will work synergistically with the Internet as new revenue models evolve. EDSF (2001) predicts that periodicals will be printed closer to consumers following print-on-demand. The net effect is expected to be as follows: for special interest magazines very positive, for general interest magazines slightly negative, for new products such as magalogs, positive. Magalogs are products which have features of both, magazines and catalogues.

Catalogues and directories: As regards catalogues, a drop in pages will occur but there will be an increase in the number of catalogue titles. Targeted recipients will be directed to web – "push media (= consumer catalogue) will work with pull media" according to EDSF (2001). Directories will see a substantial drop in page accounts. The search and retrieval capabilities of digital media will make reference information the most likely candidate for electronic applications. Telephone books will continue to be printed until portable electronic appliances access phone databases. Printed directories will see a drop in volume through 2020. Yellow page directories will probably continue even though material will be web-accessible. They are an effective local advertisement media.

Books are expected to experience continued growth in the number of titles with fewer sales of each. This, however, depends on the use of the book: reference and academic material will increasingly transfer to electronic media. Virtual warehouses, other distributed print modules, e-books and Internet retailing books are all challenging the structure of the supply chain. The switch from print and distribute to distribute and print is on-going. The

major trend is on-demand printing. Many different printing methods create opportunities for differentiated products. EDSF (2001) predicts that self-publishing will gain popularity. The net effect is expected to be very positive, however, and the potential for e-books is great. After 2020 E-books are the real challenge according to ESDF (2001).

Promotional print is expected to show strong growth until the latter part of the decade. No major electronic replacement is projected for advertising. Direct mail has been perceived as a successful tool and will be used more for smaller catalogues which will be distributed in this fashion more frequently. However, it is expected that most brochures and other small promotional materials will be produced – instead of offset - by desktop devices such as high colour inkjet and toner and printed where they are needed. The net effect is expected to be very positive for paper.

Stationary and transactional print will experience a substantial decline as e-mail and other forms of electronic transaction/communication become more common place. However some will be transferred to desktop printing thus leading to a projected growth of cut sheet paper by 3, 5 % per annum. The Internet has stimulated printing paper demand and is believed to continue to do so. In the longer term e-products are expected to replace printed stationeries and transactional print.

Critique: Both PIRA and the Electronic Document Society see clear changes in print media due to the emergence of electronic alternatives. The speed of this change, however, depends on the development of profits in electronic media and on an individual consumer's future behaviour. (technology push vs. consumer preference)

Printed products, which give experiences and challenge a reader's intelligence, and which are difficult to replace, will maintain their strong position also in the future. The next 20 years will, however, contain dramatic changes for readers, publishers, printers, technology and change the

definition of information itself. EDSF (2001) predicts that "…as soon as digital delivery and display systems begin to match the **quality** of mechanical technologies for producing and distributing publications and do it at a **relatively low cost**, most publishers will make the transition. Co-existence and co-evolution of typographic documents printed on paper and digital documents on electronic displays will continue. The key question may be whether information is typographic as opposed to audio and video.

For the first time in history the dominance of print media has been challenged by technology, infrastructure and attitude. In the long term, from 20 to 50 years a foundation will be in place to disseminate information in non-paper formats for mass audiences. The Internet has succeeded because its text-based orientation provided the most definable characteristic of print. (=starting point) It then added colour, sound, static and moving imaginary. It is now adding contents. The pieces are on the way to challenge print. Changes will probably take place gradually. Traditionally, information has taken many forms. Print and electronic media will co-exist in an uneasy harmony over the next century as new generational and technological forces take effect. According to RIT's (Richmond Institute of Technology) analysis, a share of all printed information will gradually drop from its current share of 60 to 48% in 2020 and to 35% by 2020 and information in electronic form consequently grow. Print is expected to have a smaller role in the future. Print's role is also expected to different from now. One must also take account the fact that human knowledge and information will grow dramatically. Print will see some overall growth – although at a slower rate than in the past. Some end-uses will do well and others not so well. Researchers expect a nominal increase of 1 - 2% per annum in paper usage – over next two decades. Print will have a dwindling share of the total body of public information.

The above described development indicates that there is potential and even need for new printing paper grades. Digital printing technologies require different surface properties of paper. The rapid development, however,

necessitates, that a paper manufacturer closely follows the technological development and consumer behaviour, preferably in close cooperation with its customers, printers and publishers. There is a limited amount of scientific research on the impacts of information technology on print media.

3.5 Consolidating suppliers

Consolidation has also continued to occur among paper machine manufacturers. There remain two main suppliers of printing paper machinery: Metso Paper from Finland and Voith Paper Machines GmbH from Germany. Metso Paper (Valmet Oyj) acquired Beloit Corporation in 2000. The market share of Metso Paper in printing machines and in Europe was 55% and that of Voith 45% in 2001. Consolidation has also proceeded among mineral and paper chemicals suppliers.

4 Product differentiation in the printing paper industry

The main aim of this chapter is to give an extended empirical picture of the product differentiation as a phenomenon in the printing paper industry. The research strategy and methodology are described in detail already in Chapter 1 but data collection is here explained. The Finnish paper industry with its co-operation partners has been used as a single case to gather empirical material.

To test motives and drivers for product differentiation 22 propositions are formulated and their validity tested through personal in-depth interviews with 37 carefully chosen interviewees. Propositions (Table 4.1) were developed on the basis of the literature analysis and the author's personal experience in product differentiation projects. Propositions were first tested by five interviewees and an interview protocol thereafter finalised (Appendix 3).

Interviewees represent all four major Finnish paper industry firms and seven functions within them, three international customer groups of the Finnish

paper industry firms – publishers, printers and merchants – the Finnish Technology Agency, the supply industry (three companies, both domestic and international) and also a paper industry analyst and advisors such as consultants (three companies).

The chapter provides answers to the following questions: In general, 1) what is the product differentiation of printing papers as a phenomenon and what are its positive and negative consequences, 2) what are the motives and drivers, their relative importance and how those motives and drivers vary by actor group and by function in the printing paper industry, 3) what are the preconditions, enablers and barriers to product differentiation in the studied context and 4) what are the roles of key actors in the studied phenomenon. Time factors and branding as regards product differentiation are also commented in this chapter. This chapter briefly presents successful product differentiation cases which were identified on the basis of in-depth interviews with the summary of key success factors. One failure is also described with its failure factors. Validity and reliability of this thesis are assessed after the presentation of the research findings. Finally the author compares the research findings with her own experiences in the printing paper and related industries.

4.1 Data collection

4.1.1 Methods

Data collection was carried out between March 1999 and September 2000. The following data collection methods were used: 1) participant observation, 2) literature survey, 3) examination of various documents, 4) preliminary personal interviews and 5) final in-depth personal interviews.

Two main tools to acquire empirical data were used: 1) in-depth interviews and 2) participant observation. The main part of empirical data was collected through personal in-depth interviews by the help of an interview protocol. This study follows Taylor's and Bogdan's (1984) approach to in-depth

interview (Taylor and Bogdan, 1984). Taylor defines an in-depth interview as follows: "By in-depth qualitative interviewing we mean repeated face-to-face encounters between the researcher and informants directed toward understanding informants' perspectives on their lives, experiences and situations as expressed in their own words". Deep interview requires careful preparation (Siekkinen, 1996, p. 49). The author constructed the interview protocol on the basis of literature analyses and the author's own long practical experience in the paper and related industries. The interviewing process contained the following sub-processes:

- decision on population selection criteria
- mapping out the group of potential interviewees
- selection of appropriate interviewees
- designing and preparing an interview protocol
- testing an interview protocol
- producing a final interview protocol
- interviewing
- documenting and arranging the interview data for systematic analysis
- classifying interview material using concept map technique
- producing interview reports.

The final interview protocol (Appendix 3) was prepared after 5 preliminary interviews with industry experts. It contains nine main themes with open-ended questions. The author had pre-existing practical experience - both personal and together with her team - on making qualitative in-depth interviews and also carrying out quantitative surveys while working as a Business Intelligence Director for a paper company.

The interview protocol was sent to interviewees one week in advance of a personal interview. It was not possible to organise face-to-face meetings with all interviewees because of practical, time-dependent reasons. Seven respondents returned written documents. A personal phone call preceded mail interviews to explain the target of the research and this was followed by

another phone call in most of the cases to check that the content was understood in the intended manner.

Notes were made during each interview. Each interview was documented immediately after completion. This amounts to 233 written pages. Interviews could not be tape-recorded because of reasons of confidentiality. No risks were taken which may have compromised the open discussion environment (Patton, 1990, pp. 295 – 298). Recent research has indicated that written notes may be as reliable as taped transcripts (Zuboff, 1998).

Participant observation forms another important method to obtain information for the empirical section. It is an attempt to study reality from "the inside". It is also characterised by the fact that the researcher is in a situation where she or he also has other interests than those of research. Only later is she or he interested in sorting and analysing the information for the purpose of the study (Taylor and Bogdan, 1984). Taylor and Bogdan (1984) define participant observation in the following manner: "Participant observation is the research that involves social interaction between the researcher and informants in the milieu of the latter during which data are systematically and unobtrusively collected".

4.1.2 Propositions to reveal the motives and drivers for product differentiation

Alternative propositions - to shed more light to motives and drivers behind product differentiation in the printing papers industry - were developed on the basis of the literature analysis and on the basis of the author’s personal experience in the research field. Table 4.1 shows the propositions tested in this thesis.

Table 4.1: Propositions for motives and drivers of product differentiation in the printing paper industry

Customer need based motives and drivers	
P1	A new end use application of a customer functions as a driver for product differentiation.
P2	Desired change of the image of the printed end product is a driver for product differentiation.
P3	Decreased customer spending and a customer's need for a more economical printing substrate are drivers for product differentiation.
P4	A new end product feature such as a changed format and consequent changed requirements of paper functional properties function as a driver for product differentiation.
P5	Increasing mailing costs of printed products act as a driver for product differentiation.
P6	Changed environmental demands are drivers for product differentiation.
P7	Changed legislation functions as a driver for product differentiation.
P8	A printer's need to use invested capital more efficiently functions as a driver for product differentiation.
P9	New printing technology is a driver for product differentiation.
Producer need based drivers	
P10	Erosion of a printing paper manufacturer's profits at the manufacturing line is a driver for product differentiation.
P11	An uncompetitive standard of quality or too large quality variations are drivers for product differentiation.
P12	A printing paper producer's existing skills and capabilities act as drivers for product differentiation.
P13	Availability of a raw material is a driver for product differentiation.
P14	The price of a raw material is a driver for product differentiation.
P15	A producer's need to level off changes in demand for standard printing papers in order to better manage cycles is a driver for product differentiation.
P16	A producer's need to increase customer share and strengthen market position through expanding its product range is a driver for product differentiation.
Other drivers	
P17	Competing products act as drivers for product differentiation.
P18	New technologies - those of a producer - function as drivers for product differentiation.
P19	New minerals and chemicals are drivers for product differentiation.
P20	Environmental pressures exerted through various organisations, pressure groups and through environmental legislation function as drivers for product differentiation.
P21	Ideas from universities and the research institutes lead to differentiated products.
P22	Chance always has a role to play in the process industry.

Empirical testing of propositions was carried out through personal, in- depth interviews with carefully selected experts working in or with the Finnish forest industry cluster. In addition to testing the validity of the propositions, the relative importance of various motives and drivers was also measured by asking the interviewees to prioritise drivers using the scale from 1 to 10.

4.1.3 Population and sample of interviews

Appropriate informants were carefully chosen. In the first phase, 45 potential candidates for interviews were identified. Candidates had to meet the following criteria:

- First, an interviewee must have or have had a working relation with the Finnish printing paper industry cluster.
- He or she had to have a sound understanding of the phenomenon researched and personal experience of one or more product differentiation project, or on product upgrading, downgrading, re-orientation or similar projects to be able to have deep insight into the problems studied (Stake, 1995, p. 67).
-

In addition:

- A respondent had to be a representative of one of the main actor groups of the forest industry value chain, either a supplier, a papermanufacturer, a customer, an employee of the paper industry association, research organisation or industry advisors' group such as a consultant.
- Paper industry representatives also had to represent different functions within the paper company's organisation such as management, m marketing, sales, production, technology, R&D, business development and purchasing to shed light on the roles of different functions and to help to conceptualize product differentiation for a paper company in the printing papers context.

The above mentioned requirements restricted the total sample to 37. Five respondents participated in preliminary interviews and 32 in final interviews. Interviewees represent

- four Finnish paper industry companies
  (UPM-Kymmene, Stora Enso, Metsä-Serla – currently known as M-real- and Ahlström)
- all three main customer groups
  (publisher, printer and merchant)
- three supplier companies
  (one paper machine and systems manufacturer, two chemical companies)
- three paper industry advisors groups
  (two paper industry consultancy companies, one bank analyst responsible for forest industry follow up)
- National Technology Agency (Tekes).

The representatives of the following functions of the Finnish paper industry companies were interviewed: four marketing and sales specialists, one production specialist, three technology specialists, five R&D specialists, one purchasing specialist, three business development specialists and three representatives of top management. Technology function in this context refers to investment planning, and technology and process development. R&D primarily focuses on basic and applied product research and development and also process development.

Interviewees represent the following nationalities: Finns (28 interviewees), Englishmen (7), German (1) and Swiss (1).

Total working experience of the respondents amounts to 537 years. Time spent on personal interviews was 61 hours. In addition seven interview protocols were mailed. Preceding and follow-up phone calls supported the mailed interview protocols.

Table 4.2 describes the population and sample of the interview.

Table 4.2: Population and sample of the interviews

Interwiewee group / Function	Paper Industry	Customer	Supplier	Paper Industry Association	Paper Industry Research Organization	Paper Industry Consultancy And Financing	All
Marketing and sales [1])	4		3			1	**8**
Production	1						**1**
Technology	3	1	1				**5**
R & D	5		3		1		**9**
Purchasing	1	1					**2**
Business Development [2])	3	1		1		2	**7**
Management	3	1				1	**5**
All	**20**	**4**	**7**	**1**	**1**	**4**	**37**

[1]) Includes technical marketing
[2]) Includes Business intelligence, market research and external industry analysts

The chosen research approach also necessitates sound and versatile understanding of the research area by the researcher. The researcher has more than 24 years experience in the forest cluster, mainly with the paper industry but also in the supply industry in the following areas: product and process research & development, technical customer service, marketing (both from the paper and supply industry), sales and business development for the major part from managerial, director and at vice president level. The researcher participated in one product reorientation project – in which a raw material and a clientele base changed totally - from idea generation phase through to product development and finally to market launch. In addition, she was also responsible for the technical marketing of a differentiated printing paper – specifically at the new brownfield printing paper machine. A brownfield paper machine refers to a new paper machine at an existing mill site.

4.1.4 Testing of an interview protocol

Stake, for example, has emphasised a good preparation of case study interviews by stating that 'trying out the questions in pilot form at least in mental rehearsal should be a routine' (Stake, 1995, p. 65). The six-page interview protocol was pre-tested by five informants representing different areas within a paper company as well as within the Finnish Forest Industry Association. Some modifications were made to the wording and format of the questionnaire for final interviews, and some examples added to clarify statements. Testing of interview protocol and following refinements and additions improved the quality of research. Special attention was paid to the definition of terms due to the complexity of the researched issue and its novel approach (Siekkinen, 1996, p. 54). Also, some clarifying examples were given in conjunction with the questions for the final interviews as a result of a testing phase. One and the same interview protocol in English was used in all interviews (see Appendix 3). Pre-testing showed that the language of the interview protocol was clear and understandable.

In general, feedback on the interview protocol was positive. **It was stated at the end of several interviews that in-depth interviewing was a learning experience for the interviewees, too.** This supported the fact that the chosen research method was suitable for the present research. The testing of the interview protocol also proved that at a minimum of two hours should be reserved for one final interview.

The research process of this study is described in Figure 4.1.

One problem of case studies can be massive and versatile data (for example: Yin, 1989). This problem was approached by using concept maps technique (Novak, 1998).

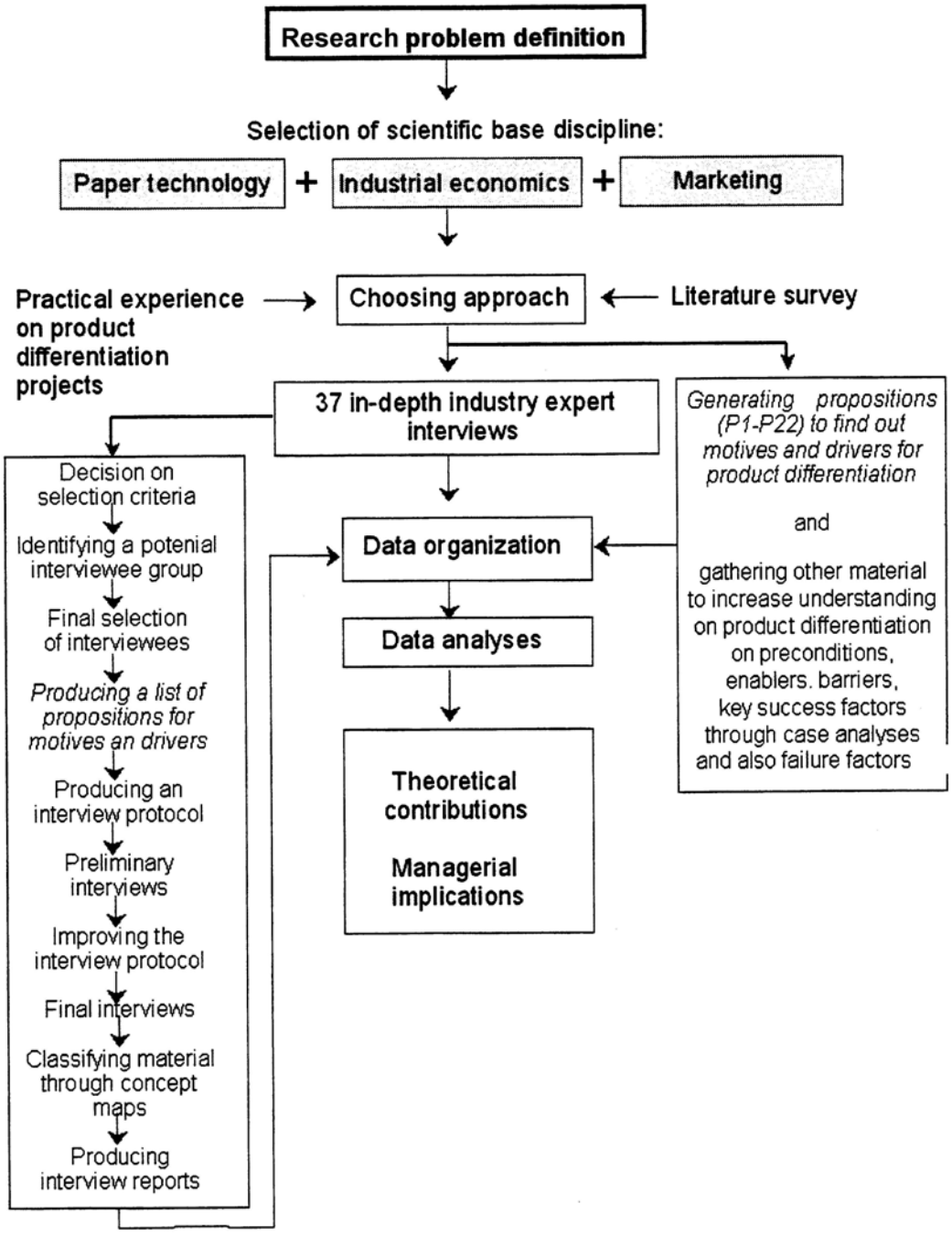


Figure 4.1: The research process of this study

Concept maps were developed by each interview question to help to organise and classify the abundant and versatile data. Concept maps as a research method in qualitative studies were first developed in Cornell University in early 1980's (Novak and Gowin, 1984; Novak 1998). Åhlberg et al. (1997) have developed concept maps further. In this study data was first categorised before drawing the concept maps. *Concept mapping techniques were found to function well as the first step to organise and classify non-homogenous data* although it proved to be another time consuming phase of this study. Classification of data is a typical procedure for qualitative research. One example on concept maps is included in this report as Appendix 5: internal and external barriers for product differentiation.

Data analyses contain interviewee quotations. Their meaning is illustrative: they do not represent an average view of interviewees, but rather reflect thinking in the forest industry cluster and among the interviewee's reference group. Quotations are to be treated as parts of the whole in the same way that an engineer examining the physical properties of a substance might also investigate the interaction of atoms. The inclusion of quotations is an attempt to increase the reader's interest and understanding of product differentiation as a complex phenomenon. On the other hand, they also verify the conclusions of the study.

One important group of informants comes from four Finnish paper industry companies. For reasons of confidentiality the results are not reported by company. Another reason for not reporting results by company is that a number of interviewees varied by company. Generally it can be stated that there are differences between companies which stem from basic strategies, but the views of specialists working in the same function such as sales and marketing, R&D and business development appear rather uniform on product differentiation in this research.

4.2 Results

4.2.1 General observations

Differentiation of the printing papers began with the most value added paper grades, that is chemical pulp dominating coated papers (also known as wood free coated papers, WFC papers). Value based pricing was used more at the top end of the paper grade range, with WFC papers for example, than less value added grades such as newsprint, in which cost based pricing is commonplace. **Value based pricing offered better opportunities for price differentiation.** Also, according to the present research, **more broadly used branding in these grades has supported product differentiation.** Product differentiation is gradually being adapted towards newsprint through coated mechanical pulp dominating papers (such as LWC papers) and uncoated mechanical pulp dominating papers (such as SC papers).

Product differentiation is a business cycle dependent phenomenon. The development of differentiated grades, takes place during a downturn, when the operating rates at the mills are low and thus enables trials without disturbing the normal process too much. This refers to the operational nature of R&D work. Technology-push products in particular have been subject to experimentation during the periods of recession. Market-pull products are developed both during periods of recession and upturn. This depends on the urgency to meet a customer's need and also on the producer's existing resources. During recession more economical paper grades are sold because of decreasing purchasing budgets of the customers. During an upturn the situation is often different: Customers are planning to launch new titles and more differentiated products are available to meet the customers' needs. An informant, who has been involved in the Finnish paper industry more than 30 years observed that

> *"new grades are the children of downturn".*

According to the present study **differentiated paper grades are the first to be hit by recession** especially in cases, where the price level of standard grades. Differentiated papers seem to function as a sort of a buffer between standard grades: When a better “upper” grade is available – for example low weight coated offset paper (LWCO) at a lower price – film coated offset paper (FCO) is replaced. In a case of the fixed paper purchasing budget a customer can get better quality. There are hardly any visible differences in a printed product.

There are national differences when adopting differentiated products. Barriers to change from one grade to another were reported to be less prevalent in the UK than in Germany, for example. This stems from the national differences in consumer behaviour.

Product differentiation can also take place at the point of the usage as a customer's initiative, but in all identified cases it was done in co-operation with a supplier. This, however, requires that the printer fully knows the potential of a printing substrate and how the inks perform on it.

Differentiated paper grades are not only produced on old machines. Good examples of this are the Jämsänkoski PM6 (in 1991) and the Kirkniemi PM 3 from the year 1996. Jämsänkoski PM 6 started to produce the new generation of SC paper for a new demanding end-use, rotogravure printed catalogues. The manufacturing concept was based on a new gap forming technology, broad, in-depth skills in SC paper manufacturing, on some local competencies, market knowledge, and also on the well developed quality of the TMP based furnish. Kirkniemi PM 3 utilised aspen mechanical pulp as means to lower the substance of base paper significantly (18%) without a loss in a sheet bulk and rigidity.

A lot of a preliminary and supportive work is done in conjunction with the suppliers such as pigment, chemical and machine suppliers. In Finland there is a long tradition of local co-operation within an existing broad

forest cluster. In the past, the role of local suppliers in product differentiation has been more important than that of customers who are mainly located abroad. The fact that the Finnish paper industry has traditionally integrated more upstream (the raw materials such as forests, pigments and chemicals) than downstream (the customers) has supported this tradition.

Buying a couple more years of paper machine lifetime with a economical, limited rebuild in order to manufacture differentiated products can be an important element in the survival strategy of a printing paper firm and especially one of its mills. This measure has been more often taken by Canadian paper companies than the Finnish one in the recent years, where many old newsprint machines have been rebuilt to produce more value added papers.

Is an increasing number of differentiated products a direct or indirect outcome of increasing customer focus among producers? (Question 9 in the interview protocol, Appendix 3) On the basis of this research, **product differentiation does not seem to be a result of increasing customer focus of paper industry companies' current strategies. Rather, differentiating products reflects the competitive pressures exerted by both, the producer and the customer. Indirectly increasing customer focus can help to identify market gaps and reveal new market opportunities:** A paper producer is more sensitive to signals coming from customers. Customer focus forces producers to learn customers' business logic and thus helps to identify potential for differentiated products.

Is increased product differentiation in the printing paper industry a reaction to emerging electronic media? (Question 8 in the interview protocol, Appendix 3) On the basis of the present research **an increasing number of differentiated products and the emergence of electronic media are separate phenomenon, but coincide. The key drivers behind product differentiation and emerging electronic media are different.** Print and electronic media are not competing to satisfy the same needs. Interfaces

have different properties. Increasing electronic media alternatives are more a reaction to satisfy the final consumers' diversified and new requirements of information usage. Experimenting with electronic media is more a publisher than a consumer driven phenomena. As a consultant stated in an interview:

> *"A primary driver for a publisher searching for new alternatives to electronic media is an attempt to increase their profitability."*

The wider paper range, however, provides a publisher and a printer with more means to prepare the final product and thus improve the competitiveness of the printed product.

Product differentiation can offer a means for a publisher to strengthen the position of the print media through improved cost structure. Specifically a publisher can choose an economically sound alternative from a broader selection of paper grades. One interviewed customer stated that electronic media has directly had an effect only in a few cases of product differentiation. Some of those are paper grades developed for digital presses.

The role of 'tacit' knowledge proved to be important for product differentiation. This is natural because of the researched phenomenon's complex nature, the product differentiation process is unknown, paper industry is a multidisclipnary industry, and in addition, the value chain is long.

The change in a final consumer's media behaviour in the long term will impact on the opportunity window for product differentiation. Rapidly developing electronic media offers new alternatives to a consumer in order to satisfy various needs. *Nine informants were of the opinion that this will definitely be the most important long-term driver affecting the paper industry. Whether the opportunity window will expand or shrink, it is too early to say.*

Table 4.3 sums up general observations.

Table 4.3: General observations on product differentiation of the printing papers

- Product differentiated began with the most value added printing papers supported by value based pricing and branding.
- Product differentiation is a business-cycle –dependent phenomenon.
- Differentiated paper grades are the first to be hit by recession.
- National differences exist in adapting differentiated products.
- Product differentiation is not always carried out by producers, it is also performed in co-operation with users.
- Differentiated paper grades are not always produced by the old machines, but can also be produced on new paper machines.
- Preliminary and supportive work performed together with supplier plays an important role in product differentiation.
- The manufacture of differentiated products after a limited rebuild of an old production line can be an important short/medium term survival strategy for a paper mill.
- Increasingly customer-focused strategies do not have a direct effect on the emergence of differentiated products but they can indirectly help through revealing market gaps.
- The emergence of differentiated products and the emergence of electronic media are separate phenomena they coincide.
- Product differentiation can offer a publisher a means to strengthen the position of print media through improved cost structure.
- The role of 'tacit' knowledge is important for product differentiation.
- A change in a final consumer's media behaviour will impact on the opportunity window for product differentiation in the long term.

4.2.1.1 Positive consequences of product differentiation

A number of **positive consequences of product differentiation** regarding printing papers were identified (Question 7 in the interview protocol, Appendix 3). Table 4.4 gives a summary of positive consequences extracted from interviews.

Table 4.4: Positive consequences of product differentiation

Product differentiation

- Supports print media competitiveness against an electronic challenger.
- Supports customers' – publishers', printers' and merchants' – end product differentiation needs.
- Increases the competitive edge of printing paper companies by offering a broader product portfolio for global markets and by decreasing market transparency.
- Offers a producer an opportunity to new type of product pricing.
- Offers a testing opportunity for a machine, mineral or chemical supplier.
- Accelerates branding of printing papers.
- Creates pressure to improve the quality level of an "upper level" standard grade; this is positive from a customer's perspective but can be negative, i.e. costly from a producer's perspective (Table 4.5).

4.2.1.2 Negative consequences of product differentiation

Product differentiation of printing papers has also some negative consequences according to the present research (Question 7 in the interview protocol, Appendix 3). Table 4.5 illustrates these.

Table 4.5: Negative consequences of product differentiation

- Complexity in many points of the value chain increases;
  -- from a customer's point of view, more precisely from a printer's point of view, an increased need for product and usage training, also extra work to control reel stocks
  -- from a paper supplier's point of view a difficulty to position a new product .
- Misleading statistics and false conclusion and recommendations for example as regards investments.
- Pricing may get more complex from a paper producer's point of view if there is a "fixed" notion of commodity.
- Decreased profitability, if product differentiation leads to too many grade switches on the production line especially when a price premium does not cover extra costs.
- More dedicated staff needed to educate customers; this can also be an opportunity and offer value added to the customer.
- Increased pressures to improve the quality level of standard products which may prove to be a costly exercise to a producer.

4.2.2 Motives and drivers

The purpose of this chapter is to present the empirical results of this study and discuss research findings in detail.

Motives and drivers of all the respondents are divided into five main groups on the basis of their importance, more precisely on the basis of average score by proposition. A scale from 1 - the most important driver – to 10 - the least important driver - was used. Chapter 4.2.2.1 presents the classification of motives and drivers used in this study before presenting research results in detail. Chapter 4.2.2.2 thereafter discusses empirical results in detail.

4.2.2.1 Classification

The research findings as regards motives and drivers for product differentiation are grouped into five categories: *supported propositions, strategic means, issues to be systematically followed, unsupported propositions* and *additional propositions* which are new propositions for motives and drivers emerged in the interviews.

4.2.2.1.1 Supported propositions

GROUP I: Supported propositions with 3 sub-categories are the following:

1. On the basis of the present research **very strongly supported propositions (+++)** in ascending importance are the following:

P10 erosion of a producer's profits
P1 new end-use applications by a customer

Criteria: average ranking position between 1 and 2.

2. **Strongly supported propositions (++)** in ascending importance are;

P3 reduced purchasing budget of a customer and a need for a more economical printing substrate
P9 a customer's new printing technology
P16 producers' need to strengthen its competitive position via broadened product offering
P12 a producer's existing skills and capabilities
P13 availability of a paper producer's raw material
P14 price of a paper producer's raw material

Criteria: average ranking position between 2 and 4

3. **Supported propositions (+)** in an order of importance are;

P2 a customer's desire to change an image of the printed end product

P4 a customer's need to have a new feature in the end product

P5 a need to decrease a customer's printed products mailing costs

P8 a customer's need to improve the use of invested capital through expanding printed product portfolio

P17 competing products

P22 chance (by a producer)

Criteria: average ranking more than 4.

There are several motives and drivers in this category and it is difficult to put some of them in order of importance due to a wide distribution of ranking positions. The ranking order is therefore to be regarded as indicative only.

4.2.2.1.2 Strategic means

GROUP 2: Not motives & drivers for product differentiation but <u>strategic means</u> are the following:

The following propositions were **not supported as motives & drivers for product differentiation but supported more as strategic means:**

P18 new technologies <u>of a producer</u>

P19 new minerals for filling or coating and chemicals

Criteria: no ranking but qualitative comments

4.2.2.1.3 Issues to be systematically followed

GROUP 3: Not currently motives & drivers for product differentiation but issues to <u>be systematically followed</u> are the following:

The following propositions were **not supported as current drivers but more as issues for continuous follow-up:**

P6 the environmental demands of customers

P7 national or regional legislation

P20 environmental pressures extended by various organisations and pressure groups

Criteria: no ranking but qualitative comments

4.2.2.1.4 Unsupported propositions

GROUP 4: Unsupported propositions for motives & drivers for product differentiation of the printing papers are the following:

The following propositions **did not gain support as real motives and drivers for product differentiation:**

P11 uncompetitive quality of a printing paper

P21 ideas from universities and research institutes

P15 a producer's need to level off changes in demand for standard printing papers in order to better manage cycles is a driver for product differentiation.

Criteria: no ranking but qualitative comments

20 interviewees were able to give rank to proposed reasons for product differentiation. Due to the complex nature of the research issue this figure can be regarded as satisfactory. Those, who could not give a ranking order provided the interviewer – the author of this thesis – with qualitative information about the alternative drivers, and also presented three new possible reasons for product differentiation as listed below.

The informants regarded the pre-grouping of propositions into customer need based possible drivers and motives (P1-P9), a producer need based

possible drivers and motives (P10-P16) and other possible drivers and motives (P17-P22) applicable and clear for gathering information on product differentiation in the printing paper firm.

4.2.2.1.5 Additional propositions

GROUP 5: Additional alternative motives and drivers gained from in-depth interviews are as follows:

P.add.1: Changes in a general economy produce changes in advertising which results in reduced revenues and paper purchasing budgets and finally a search for more economical printing substrates.
(an additional alternative propositions to the group 'customer need based reasons')

P.add.2: A scarce resource concept drives producers for developing differentiated products.
(an additional alternative propositions to the group 'producer need-based reasons')

P.add.3: A change in a final consumer's behaviour and in their consumption patterns.
(an alternative proposition)

The above three potential new drivers were not tested in this research due to reasons of consistency and reliability.

4.2.2.2 Empirical results

Supported propositions for motives and drivers in product differentiation according to all informants and in the order of importance are as follows:

According to this research, **erosion of profits** (P10) **is the most important driver for product differentiation in a printing paper firm.** 14 out of 20

respondents, who explicitly gave a ranking order, ranked profit erosion as the number one reason for product differentiation in printing papers. The average ranking was 1.35 and standard deviation 0.59. For example, one paper industry R&D manager states:

> *"Profit erosion was absolutely the number one driver for product differentiation on our production line X, but the availability of new tested technology affected timing."*

The erosion of the profits means that the earnings of the production line with current products have started to deteriorate due to more efficient, more modern paper machines producing the same products on a larger scale and with the latest technology in a more efficient manner. Cost competitiveness has been lost. Profits are typically below the target or accepted level over the cycle. Production lines with eroded profits are typically to be found among old, narrow newsprint and SC papers machines. One of the following actions typically taken in these cases is to 1) shut down the machine, 2) run it only during periods of high demand, or 3) modernise it to produce a higher value added differentiated grade, where the price of the new paper grade is so much higher that the pay back period for a reinvestment is acceptable. The printing paper machine is built to last around 15 years. Technology life cycles for the main parts of the paper machines are much shorter, usually between 5 and 7 years. The paper industry is still very cyclical and cycle times have become shorter. This has to be taken into consideration when evaluating the timing for modernisation as well as when evaluating future profits. Typically new greenfield or brownfield investment decisions are made during periods of high demand. Capacity often becomes available during the next downturn. Reinvestments are, instead, smaller, less time consuming and can be timed more optimally.

Based on this thesis, **the profit erosion alone, although being the most important driver, is not in itself a driver strong enough to cause product differentiation**. One paper industry business development director summarises this idea:

> *"If the motives for product differentiation stem from a producer's profitability needs, there must simultaneously exist an identified real customer need, a supportive risk-taking company culture and multi-skilled executives, who have a good understanding of the whole value chain."*

To be prepared to act quickly when profits are eroding to an unacceptable level an interviewee proposed a system with a pool of developed and tested products. When a need in a market appears, a paper producer can quickly offer a paper to be tried and tested. This is a recommendable activity because of the long development cycle and a cyclical nature of the industry.

New end-use applications (P1) **came second in the ranking**. The average ranking was 1.85 and standard deviation 1.28. Eight respondents out of 20 ranked it as a number one driver for product differentiation, and six respondents ranked it number two. The distribution of opinion was rather large. This may rise out of the fact that the interviewees understood 'new end-use application' in different ways, although the following examples were given in the interviews*:* "it can for example be a new printing method such as one of digital printing methods", or "a new end-product, a new magazine title for example". By defining more clearly 'new end-use application' at the beginning of each interview this problem could probably have been overcome. There was also one comment that a new end-use is not really a driver for product differentiation. This interviewee was of the opinion that a product differentiation is entirely a producer driven issue.

A paper industry business developer describes the importance of this driver*:*

> *"Co-operation with an office equipment manufacturer is a necessity because of the short life cycle of the office printing machine. Technological development is the fastest of all in this segment".*

Another senior paper industry business developer highlights the importance of a new end-use:

> *"The emergence of special offset printed TV-magazines and catalogues were important drivers for the birth of WSOP in the early 70's. They (new end-uses) are essential drivers still."*

The importance of a new end-use as a driver for product differentiation is expected to increase and to gradually take a leading role. This development would support the customers' increasing segmenting efforts as regards their own product portfolio.

Due to more customer focused paper company strategies and increased understanding of customers' earning logic paper producers are expected to more efficiently identify potential gaps in the markets and to create potential differentiated products to meet the needs and requirements of the customers.

One respondent from paper firm marketing pointed out a new end-use as an important driver behind product differentiation but warned that no single customer can justify differentiated printing paper because of the high risk of availability. There must be a bigger market, a group of customers, who require the same product. This is one of the key dilemma in printing papers differentiation.

Lower price (P3) as a driver for product differentiation in printing papers received nine number one ranking positions despite the fact that the total number of customer informants was smaller than that of producer informants. Lower price in this context means that a customer wants and needs a more economical printing substrate for the end-use. This may also refer to the fact that there are already more economical printing substrates available in the markets. The customers' ability to pay for paper varies during the business cycle. A publisher underlines the importance of price and its dependency on the time of the business cycle by saying:

> *"During periods of strong demand, it is easier to get a differentiated paper grade accepted because of the shortage of paper. On the other hand, when a downturn starts and advertisements drop, one starts to look at more economical papers. Quality differences in printed work are negligible, if you have good paper and a good printer. "*

In the most referred success case of product differentiation, WSOP, (Chapter 4.2.7) the price of a differentiated paper proved to be one of the key factors for success. In the words of a current paper industry business development director, previously in charge of R&D in WSOP development:

> *"A good example of a customer need-based driver is WSOP: It was qualitywise a good enough and economical option compared to standard LWCO for a publisher in emerging supplements and TV magazines business."*

There was, however, also another reason, an existing problem: to decrease offset picking in SC paper.

The price of the printing paper plays an important role in an end product as a single cost component. Its importance, however, varies according to end-use: in top-end sales catalogues the cost of paper can be 3-5% of the total manufacturing costs. In newspapers this figure rises to 60-70 %. In up-market magazines this figure is close to 20 %. For women's weeklies the number is almost 30 % and for TV-magazines close to 40 % (according to the publisher interviewed for this research).

The prices of standard printing papers follow the decreasing trend of the total manufacturing costs. Price differences between various printing papers vary according to the point in the cycle. A difference between substitutable papers can be in the region of 5 to 25% in extreme cases. Price differences are typically at their minimum when demand peaks, during high operating rates. They are at their greatest during periods of low demand. The pricing of standard printing papers has been rather transparent. This is typical for

commodities. It is, however, becoming less transparent due to developed and more versatile services and combined product services pricing.

The importance of price as a trigger for product differentiation decreased during the 1990's according to the present research. The focus has moved from price drivers towards value adding issues such as to new end-use applications and end-product features.

The average ranking position was 2.2 and standard deviation exceptionally high, 2.14 reflecting the complexity of the research issue. This suggests that the pricing mechanism is not so familiar to all the interviewees.

Paper price alone is not a strong enough driver in itself to make product differentiation happen according to the present research.

New printing technology (P9) is the fourth important driver behind product differentiation in the printing papers. Average ranking position is 2.8 and standard deviation 1.59. This is reflected in the words of both a printer and a paper industry marketing executive:

> *"This is an important driver: developed printing technology allows an acceptable printed quality for a lower or medium quality paper."*

The senior paper industry business developer argues:

> *"In the case of fine papers, office papers in particular, developing printing technology is the main driver. Continuous co-operation with manufacturers of office equipments is a necessity."*

As a recent example we can be mentioned mechanical pulp dominating printing papers for digital printing. For office papers, new printing technology is of particular importance because printing technology typically gives an optimal result for purpose-optimised paper. In order to exploit the real potential of new printing technologies, the co-operation between a paper

producer, a printing machine manufacturer, a printing ink manufacturer and a printer must be seamless. “New optical pleasure” is seldom only a result of a new attribute combination of paper properties or a new or developed printing method, but usually the result of good interaction between the two. The development of printing technology has smoothened over some differences in end products stemming from paper properties and made it possible to use a larger variety of papers with different attributes. Also, a development in the post-press area has created the possibility of using a larger variety of different paper grades. Whenever the runnability requirement is fulfilled, there are lower barriers to use new grades.

According to the findings of this thesis, new printing technology is only one driver and in itself not strong enough to allow product differentiation to take place. Printing technology is more important driver for product differentiation as regards new printing technologies such as digital printing than in the case of traditional printing technologies.

A producer’s need to strengthen its competitive position by offering a broad product range (P16, average ranking position 3.1, standard deviation 0.99). *One interviewee from the paper industry ranked this as the number one driver for product differentiation*: the possibility of expanding the range of potential products increases customer share and strengthens one's position. On the other hand the customers of printing paper firms such as publishers and printers are consolidating leading to the diversification of their product portfolio and consequently resulting in more versatile paper grade needs. Product differentiation supports this development.

There are also, in addition to customer need-based reasons, other internal reasons to expanding a product range. A producer may want to increase the operating rate of a machine through a differentiated paper grade as long as a market demand exists. This, however, requires a rapid grade change and it must be performed in an economic manner. This strategy of high versatility

is followed by old paper machine lines whereas modern paper machine lines are optimised for a narrow product range.

The importance of an expanded product range has changed. A senior manager in the paper industry points out:

> *"This was one of the key motivations in the past but not anymore: requirements regarding profitability are now stricter. Unprofitable products are no longer offered so easily, even to key customers, not even to merchants."*

On the other hand the paper merchant's concern over the breadth of supply is reflected in his words:

> "*The main trend in the paper merchanting business is a narrowing of the supplier base. The few suppliers left must have a broad product range."*

The importance of a broad paper selection was also highlighted in the following publisher's comment:

> *"We cannot cope any more with multi-purpose grades. You have to make compromises, which the current high quality demands do not allow." (summer 1999)*

The findings of this research refer to the fact that the importance of the broadness of the product offering is a cycle dependent issue: it has more value in upturn when publishers diversify their products than in downturn.

Available skills and capabilities of the paper producer (P12, average ranking 3.4, standard deviation 1.5) were found to have driving power behind product differentiation of printing papers, but their impact was more indirect: available skills and capabilities function rather as preconditions than means for product differentiation according to this research. A paper industry consultant argues:

> *"They (available skills and capabilities) are like the availability of the raw materials: they must be in place before product differentiation can take place".*

The following comment by a paper industry R&D director supports the view that available skills and capabilities were seen more as drivers behind drivers:

> *"This (available skills and capabilities of a paper producer) is not a starting point, a driver, but a previous step. It answers the question how are drivers themselves driven. Rather these are a kind of preconditions which allow a product differentiation to happen. They answer rather the 'how' question than 'why' question."*

Research findings refers to two facts: firstly, a process for product differentiation as well as the system of linking skills and capabilities in order to create product differentiation is missing; secondly, the nature and the broadness of resources which product differentiation requires is not well known. Based on this study product differentiation needs a process, versatile skills, and broad and in-depth knowledge of the customers' business. **There are relatively few variables (inputs) in the paper industry, which a producer can influence. Skills, capabilities and knowledge make the three most important of them.**

Some skills and capabilities were regarded as being especially important for product differentiation. Table 4.6 lists these.

Table 4.6: Important skills and capabilities of a paper producer regarding product differentiation

- A profound knowledge of and understanding of customers' business and earning logic including an advertiser's role.
- Knowledge and understanding of the customer's specific needs.
- Good understanding and effective utilization of raw materials such as fibres, minerals, chemicals; properties and performance of those are also important.
- Experience of changing a product range at the production line.
- Expert use of available technologies.
- Ability to identify and utilise of "tacit" knowledge in the entire value chain.

Surprisingly, skills to identify a market gap or to translate a market signal into practical actions were not mentioned, although knowledge of the customer interface was emphasised on the general level. According to the author's experience, neglecting or underestimating the importance of this issue has resulted in failures in the past. This indicates that there are severe shortcomings in the entire concept of product differentiation. A paper industry consultant refers to a point even further in the value chain by stating:

> *"The most important is to start from our customers' customers needs such as advertisers. Continuous co-operation with carefully chosen partners guarantees unbreakable information flow. You must have dedicated resources for this work. Next come excellent skills to use the newest technology and new raw material cocktails."*

A paper industry business developer summarises the importance of skills and capabilities in the product differentiation process of the printing papers in the following manner:

> *"There are skills and capabilities in each organisation. I wonder if a paper company has finally identified its core capabilities and if it is exploiting them to their full extent. Those who have worked long enough in the paper industry – which is often the case – tend to think in a traditional way despite of changes and increasing dynamism in the business environment. It is important to organise natural meeting points, forums, where experts from different functions and areas from the whole value chain can meet."*

In five interviews there were references to existing "tacit" knowledge in the demand chain. Neither capabilities to use "tacit" knowledge in a systematic manner nor practices to convert it into explicit knowledge were identified. Nonaka and Takeuchi (1995, p.64-67) refer to externalizing of knowledge.

Ng (1991) has concluded in her dissertation 'Creating and sustaining competitive advantage: competing through a skill base approach' that the skills determine a firm's ability to compete and a successful firm strategically utilizes them.

Availability (P13, average ranking 3.5, standard deviation 0.53) **and price** (P14, average ranking 3.6 and standard deviation 0.53) **of a raw material.** These are mentioned as important drivers in many interviews, but with some concern. This relatively high ranking position contains some ambivalence. The question arises, whether these are true drivers or rather preconditions (such as available skills and capabilities), and whether these reflect general concerns about the availability and price of the key raw materials. A senior manager in the paper industry describes the importance of availability and price of a raw material:

> "*Manufacturing preconditions such as availability of the suitable raw material must be in place first, and then other elements will follow."*

Another informant from paper industry R&D states:

> *"The sustained availability of key raw materials is the starting point of all paper manufacturing. Supply of raw materials is number 1, and then come the other issues."*

Instead, local availability and price of raw materials determine in any eventuality which type of printing papers are produced and in which locations.

The availability of economical, recycled fibre has helped some paper industry companies to produce for example a differentiated SC paper grade, SC B, for less demanding end-uses such as TV-listings for example, where there is relatively much text and pictures are not so complex. Recycled fibre (RCF) can offer one way of differentiating products when fibre is available in close proximity and when customers are close. However, RCF provides different paper technical and functional properties compared to a virgin fibre, for example lower bulk and high density. Unless this develops to an industry standard, it can cause some usability problems to a printer. Some other examples of the impact of the availability of raw materials include film-coated offset, where aspen is used as one of the raw material components; WSOP, which is based on fresh virgin wood; and also Gallery Fine, where the properties of aspen are also utilised.

The price of raw materials has an indirect impact on product differentiation as the example of RCF containing SC B paper shows. In the words of a paper industry business developer:

> *"A lower product price through lower raw material prices can be a driver behind product differentiation. Gallerie Fine is a good example of this development containing CTMP from aspen and economical PCC as filler."*

A paper industry consultant ranked the yield of a raw material in the manufacturing process higher than a price:

> *"Maximising the yield of the main raw material is important, especially in parts of the world such as the Nordic countries, where the relative price of virgin fibre is currently high." (spring 1999)*

Desired change of the image of the printed end product (P2, average ranking 4.1, standard deviation 0.57) received some support as a driver behind product differentiation in printing papers. This typically happens when a customer wants to change the image of an existing printed product and while it wishes to continue operating with the existing suppliers (who do not have a suitable paper grade in their product portfolio), or where no suitable paper grade exists in the market. The primary driver is in many cases the publisher's target to expand the life cycle of an existing product. **A publisher emphasizes the importance of which paper grade is used** in following words:

> ***"One of the main differentiation factors between publications comes from the paper grade used. The trend is twofold; towards more readable products, matt grades, and simultaneously towards glossy grades for high advertisement retention".***

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Examples of choosing a paper grade to support the message of a publication include the use of paper containing RCF for a garden tool catalogue or a matt, bright surface for a design furniture catalogue. The publisher may also want to target a product such as a special interest magazine for a new, more specific reader group and to change a paper grade to support this.

Overall performance of a paper grade in an end-use and fulfilment of a customer's expectations (Jernström, 2000) are, however, more important factors than an image. The findings of this research support Jernström's finding. So when considering a paper grade for a purpose the priority is: functionality – satisfactory printability and runnability as well as processability in the printing house – only thereafter comes the image. Although not presently a very important driver, the importance of the image

of the printed product as a driver behind product differentiation seems to be increasing according to this study.

New end product feature (that is a paper technical property; P4, average ranking 4.1, standard deviation 0.90) was found to be closely linked to a desire to change the image of a printed end product. Typical features through which publishers differentiate their products with the help of a paper grade are basis weight, brightness, opacity, paper shade, stiffness and bulk.

Increasing mailing costs of printed end products (P5, average ranking 5.0, standard deviation 0.93) got some support as a driver behind the printing papers' differentiation in the form of a increased number of lower basis weight papers. **In fact, a change in the basis weight is one of the most commonly used differentiating factor. It was, however, left outside the scope of this research because of the aim of going beyond the obvious, to find out less known causes for product differentiation.**

More efficient use of printing machine capacity (P8, average ranking 5.2, standard deviation 0.67) also received some support as a driver behind printing paper's differentiation. A good example of this is a printer of a daily newspaper: low daily operating rates of printing machines have until recently been a problem. Competition is tight among printers and they aim to use invested capital at maximal efficiency. Increasing number of newspaper printers and publishers have installed cold set printing units to increase the capacity usage rate. The need to use printing capacity in a more efficient manner was a trigger to the recent emergence of coated mechanical printing paper grades for cold set web offset printing.

Competing Products (P17, average ranking 5.5, standard deviation 3.3)
Competing products have only marginal importance as a motive for product differentiation if any. Few opposite comments were also presented but no supportive examples given. Two different types of competition were identified: competition between substituting paper grades within the same

end-use – LWC or SC paper used for a sales catalogues as an example - and competition from emerging electronic media.

This thesis identified some cases, where competing products can function as stimulus for product differentiation: Firstly, success stories in particular encourage some paper producers to follow suit. Japanese Bitokoshi grades were mentioned as examples of such grades. Secondly, customers must have supply security at least for regular business and they cannot cope with only one supplier.

According to present research **the importance of competing products as motive for product differentiation has changed. Although competing products are more systematically reviewed than previously, it is a printing paper firm's strategy which determines 'an operational window'. Differentiated products in the past were more likely to be one-off solutions and separate actions rather than an integrated element of the firm's total product portfolio.** This finding also refers to a more disciplined behaviour of the printing paper companies.

Chance (P22, average ranking 8.0, standard deviation 0.71)
The paper manufacturing process is complicated. For example a flaw in a raw material – either natural fibre or mineral for example - which was not eliminated before the process, can cause unexpected process variations. This can lead to unintended product attributes such as a different colour of the paper. Based on years of experience, a chemical supplier states:

"Never underestimate a possibility of chance in the process industry".

Following two propositions were regarded <u>rather as strategic means for product differentiation than motives and drivers:</u>

1) new manufacturing technologies and (P18) and 2) new minerals and chemicals (P19). These two strategic means are commented next.

New paper manufacturing technologies (P18): Informants identified technology drivers not only in the area of 1) **new paper manufacturing technologies** but also in 2) **customers' own technologies** (P9) such as printing technology, as well as in 3) **infrastructure development** such as information technology.

1) New paper manufacturing technologies do not function as real drivers and motives for the emergence of differentiated products according to the findings of current research. Rather, they **are strategic means,** fundamental ones, **to reach the business objectives of a printing paper company.** They rather answer the question "how" (to make product differentiation) than "why" (to differentiate). One paper industry senior business developer argues:

> "*Drivers for product differentiation come from customers' technologies such as printing technologies rather than from paper manufacturing technologies. The development of paper manufacturing technologies is slow and it has only long term impact at best."*

A technology expert stated:

> *"New paper machine technologies in web forming, coating and calendering for example have functioned more as facilitators than drivers for product differentiation in printing papers."*

When considering the change of product range at the paper machine, the existing technology defines an operational window. Each case is different. To find a suitable technology requires continuous co-operation between a paper manufacturer and a machine supplier. This cooperation should start from the customer's needs and expectations to secure an optimal result.

The development of paper manufacturing technologies is relatively slow and will have a long term effect on the paper industry at the most. The development of sub-processes such as coating and calendering - as the use

of synthetic pigments - were mentioned as offering a lot of potential for implementing product differentiation. The three layer head box was seen to offer excellent potential for SC development in particular. Developed on-line super calendering (such as OptiLoad from Metso and Janus from Voith) have been very significant in the emergence of SC B grades.

The paper industry is typically a manufacturing technology driven capital intensive business and that is why it is rather slow to change due to long pay-back periods. In the present dynamic global market environment either more flexible concepts in paper manufacturing are needed or a great number of paper machines per paper firm so that each machine can concentrate on narrow segment in an economically sound manner. Processes must be easily manageable and easily changeable.

2) According to the findings of this research, the impact of **customers' own developing technologies** as a driver for product differentiation is regarded as more important than that of paper manufacturing technology. A typical example of this is an office paper, which is developed together with the equipment manufacturer. A senior marketing director of a paper machine manufacturer states:

> "*The development of paper manufacturing technologies aims in the first place to improve the productivity and secondly the quality. Excellent paper machine runnability is the number one target.*"

A consultant goes even further by saying:

> *"New technological (paper technology) innovations have not brought along new products. The need for an idea behind product differentiation lies somewhere else: i.e. at a producer because of uncompetitive production and profits or in the changed need of a customer."*

Examples to support this statement are WSOP and FCO paper grades (see Chapter 4.2.7).

The emergence of ESA paper (uncoated mechanical pulp dominating paper developed for rotogravure presses with electrostatic assistance) is an example of printing papers born from the development of printing technology.

There are indications that the importance of technology as a facilitator behind differentiated products has changed in Finnish paper firms. From a paper manufacturer's perspective technology used to be a more important driver during the era of Finnpap in Finland (when marketing and sales was outsourced). Later, marketing & sales became the paper company's own responsibility and more customer focused strategies were put into use. Increasing competition has now led to more focus on customers' needs.

New minerals and chemicals (P19) are not seen as drivers for product differentiation but also rather as strategic means of carrying out product differentiation. New minerals and chemicals have a similar role in product differentiation to that of a new paper manufacturing technology.

According to the findings of this research, it is very much a question of mineral and chemical suppliers' profound understanding of paper grades and the demands set to those paper grades by printing houses, what they can offer for current and future needs. The real value of each mineral and chemical is very much case-dependent, dependent on the specific manufacturing process and local conditions. So, in-depth, continuous co-operation with a paper manufacturer is a precondition. Increasing use of minerals and that of new mineral combinations have brought along additional problems to the control and management of wet end chemistry. According to the findings of this research the importance of minerals and chemicals is expected to increase in the future because there will be restrictions to product modifications (differentiation) through expensive investments into new technologies (sub-processes) while surface modifications for example can be accomplished with skilful use of chemicals without a need for major investments.

There were two propositions which were <u>neither motives and drivers for product differentiation nor strategic means but issues to systematically be explored:</u> 1) customers' environmental demands (P6), and 2) legislation (P7). These are reviewed next.

Environmental demands from customers (P6) **were not drivers for product differentiation at the time of the interviews but nevertheless are perceived as issues to be followed up continuously on local or regional level.** One example is the use of recycled fibre and the cluster rule in the USA. Environmental demands from the customers have varied in different times and have been typically driven by changes in legislation. A paper industry R&D manager points out the priorities:

> "*The local environmental requirements set the operational limits and may force changes to be made."*

Legislation (P7) is **another issue to be followed locally. It sets operational limits also for product differentiation.** No case could be identified where legislation would have functioned as a motive or driver for product differentiation. For example the moisture content of WSOP, the most preferred success case of product differentiation in this study, had to be changed by Californian law. One area which was mentioned by many respondents in this context was RCF.

There were three propositions among 22 which were <u>not supported at all as motives and drivers for product differentiation:</u> 1) uncompetitive quality level and too large quality variations of the products of a manufacturing line (P11), 2) ideas from universities and research institutes (P21) and 3) a paper manufacturer's need to level off changes in paper demand by filling a machine with intermediary products (P15). These propositions can neither be classified as strategic

means nor issues to continuously be explored and are separately commented next.

An uncompetitive level of quality (P11) and too large quality variations do not have importance as motives and drivers for product differentiation according to the research findings. **Uncompetitive quality is rather a driver for a paper manufacturer to take corrective actions with existing products.** In the words of a paper firm R&D manager:

> "*It is difficult to see a direct link between uncompetitive quality and the emergence of differentiated paper grades. It (product differentiation) is a more complicated question. It is more likely a kick to start quality improvement than anything else. The ground reasons for product differentiation lie elsewhere."*

Uniform product quality, as such, is, however, increasingly important to a customer: A printer points out*:*

> *"Growing printing machine speed and increasing automation require excellent runnability, uniform and faultless paper."*

Publishers and printers typically share the risk of bad quality by using typically two to even five suppliers' paper simultaneously. It is typical for printing paper customers to control quality regularly and organise cross-comparisons between suppliers on a regular basis. All test results are typically sent together with comments to all suppliers involved. Technical restrictions of the production line and the quality of raw materials affect receivable quality.

Ideas from universities and research institutes (P21): no product differentiation projects directly initiated by ideas originating in universities and research institutes were identified. **Their role as a performer of basic research is different: the work done in universities and research**

institutes forms a necessary scientific foundation – the first part of the chain of activities for applied work carried out by paper companies.

A paper manufacturer's need to level off changes in paper demand by filling a machine with intermediary products (P15) was not supported as a driver, on the contrary. Customers regard it as a temporary, producer's own activity and are not interested.

Table 4.7 shows the ranking of motives and drivers for product differentiation as supplied by all respondents.

4.2.2.3 Comparative analyses of motives and drivers between actor groups in the value chain

Customers (publisher, printer, merchant) saw drivers and motives based on their own needs as the most important group of motives/drivers for product differentiation. Reasons stemming from their own technological development were the most highly ranked. Competing products came on the second place and producer need-based drivers came in the third place. Customers could not recognise any importance stemming from producers' new technologies or minerals and chemicals because they were not so well known. Environmental pressures, ideas from universities and research institutes or chance did not have any importance as a driver for product differentiation.

Table 4.7: Motives and drivers for product differentiation: all respondents

Proposition	Number of answers [1]	Mean	Standard deviation	Number of No.1 ranking positions /all answers [2]
Customer need based motives and drivers				
P1	13	1.85	1.28	8/13
P2	10	4.1	0.57	
P3	16	2.2	2.14	9/16
P4	7	4.1	0.90	
P5	8	5.0	0.93	
P6				
P7				
P8	9	5.2	0.67	
P9	12	2.8	1.59	1/12
Producer need based drivers				
P10	20	1.35	0.59	14/20
P11 [3]				
P12	13	3.4	1.50	1/13
P13	8	3.5	0.53	
P14	9	3.6	0.53	
P15				
P16	10	3.1	0.99	1/10
Other drivers				
P17	8	5.5	3.30	
P18 [4]	(17	3.4	)	
P19 [4]	(8	5.0	)	
P20 [3][5]				
P21 [3]				
P22	5	8.0	0.71	

Sample: all the respondents, number of respondents 37.

Notes: P1-P22 tested propositions
1) total number of answers from the whole research population
2) 1 = the most important motive/driver, 10 = the least important motive/driver
3) only qualitative information available
4) rather a strategic means than a real motive/driver
5) rather an issue for a systematic follow-up than a real driver

Paper industry representatives saw drivers stemming from their own environment as the most important. In second place came customer need based drivers. In the third place were new paper manufacturing technologies for their own processes and then new minerals and chemicals

- both, however, functioning more as strategic means than as real drivers. Then came competing products. Environmental pressures were regarded as having some importance but ideas from the universities and research institutes as well as chance were found to have no importance. In addition to presented propositions, the timing of the business cycle was mentioned to be crucial for product differentiation. Not only time-to-market but especially when-to-market matters.

Suppliers regarded both producer need-based drivers and competing product related drivers as the most important drivers for product differentiation. In second place were the producer's new technologies and in third place customer need-based drivers as well as new minerals and chemicals. Environmental pressures, chance, long term consumer behaviour, new fibres and fibre combinations and increasing use of recycled fibre were found to have some importance. Suppliers were of the opinion that no ideas from universities or research institutes have led to a differentiated paper grade although those instances have an important role in basic research.

Paper industry observers (consultants, analyst) ranked producer need-based drivers as the most important for product differentiation. In second place came customer need-based drivers. Third place came the paper producer's new technologies followed by competing products. New minerals and chemicals were found to be the fifth most important reason. Industry observers strongly questioned whether paper producers' new technologies and new minerals and chemicals are real drivers but rather strategic means to achieve product differentiation. Industry observers found the following drivers to have some importance: environmental pressures, chance, the paper manufacturer's desire to upgrade, better understanding and interpretation of the market needs.

Customer need based reasons, P1 to P9, were post-grouped to one and producer need based reasons, P10 to P16, to another group. The number

of respondents in each actor group along the value chain significantly varies and thus conclusions can only be indicative at their best. **The answers clearly point to 'silo' thinking: what is closest to you is considered to be the most important. This indicates that there are inadequate or disconnected links and a lack of systematic forums to exchange information and knowledge.** This was a somewhat unexpected result bearing in mind the long product development cycles and the clear need and target for improvement.

Table 4.8 summarises how various actor groups in the printing papers' value chain rank the motives and drivers for product differentiation.

Actor groups in this research are customers (4 interviewees), paper industry experts (20), suppliers (7) and paper industry observers (6).

4.2.2.4 Comparative analyses of motives and drivers between different functions within the paper industry

Paper industry management saw **the erosion of profits at the paper manufacturing line** – as all the other functional experts except those representing marketing and sales - as the most important driver for product differentiation. In second place came **new end-use applications** for a customer **and a change of image of the printed product** followed by the new end product feature and new paper manufacturing technology. The following issues were found to also have some importance: a new printing technology, the lower price of new differentiated paper as well as new minerals and chemicals.

Business developers regarded **the erosion of profits at the paper machine line** as the most important reason for product differentiation. In the second place came **the new printing technologies** and **paper manufacturing technologies.** In the third place came the right timing of a marketing entry. The following issues received some support: new end-use

Table 4.8: Drivers for product differentiation by value chain actor group

		Custom-ers	Paper Industry	Suppliers	Paper Industry Observers	All
Propositions	Number of respondents	4	20	7	6	37
P1 – P9	Customer need-based reasons	+++	++	+	++	++
P10 – P16	Producer need-based reasons	+	+++	+++	+++	++
P17	Competing products	++	+	+++	+	+
P18	Producer's new technology	NK	++, rather SM	++, rather SM	++, rather SM	SM
P19	New minerals & chemicals	NK	+, rather SM	+, rather SM	+, rather SM	SM
P20	Environment-al pressures	-	(+), rather F	(+), rather F	(+), rather F	F
P21	Ideas from universities and research institutes	-	-	-	-	-
P22	Chance	-	-	(+)	(+)	(+)

Sample: value chain by actor group and by combined reason groups, number of all respondents 37

Notes 1: P1 – P22 tested propositions; SM = strategic means, F = follow systematically
+++ very strongly supported propositions (average ranking <2, where 1 the most important reason and 10 the least important reason)
++ strongly supported propositions (average ranking position 2-4)
+ supported propositions (average ranking >4)
(+) limited support (average ranking >7)
- not supported propositions
NK not known

applications of a customer, desired change of image of the printed product, lower price, decreased mailing costs and a printer's need to use its capacity more effectively.

The marketing and sales executives within the paper industry regarded customer need-based drivers as the most important for product differentiation in the printing paper industry. The most important reasons among them were **a desired change of image**, **a new end-use application** and **lower price. Then came the erosion of profits** at the paper manufacturing line and competing products. The following drivers were seen to have an effect on the decision to introduce differentiated product: new printing technology, availability and price of raw materials, new paper manufacturing technologies, new minerals and chemicals as well as environmental pressures.

Technology experts within the paper industry regarded **erosion of the profits** and **available skills and capabilities** together with the **ability to offer new end product features** as clearly the most important drivers for product differentiation. **New technologies came thereafter.** New end-use application and availability of raw materials also received some support.

Production experts in the paper industry regarded **the erosion of profits** as the most important driver for product differentiation followed by **new printing technology** and **new end-use applications** for a customer. Also, new paper manufacturing technologies and environmental pressures received some support.

R&D experts within the paper industry regarded **the erosion of profits** as the most important driver for product differentiation, followed by a desired change of image of the printed product, new printing technology and a producer's need to increase customer share. The following drivers also received some support: a new end use application, increasing mailing costs, a printer's need to use invested capital more effectively, availability and price of raw materials, environmental pressures and chance.

The erosion of profits was ranked as the number one motive for product differentiation by all functions except sales and marketing. This may reflect

low profitability consciousness within sales and marketing which ranked a desired change of image as the number one reason. The technology function raised skills and capabilities as being as important a motive as profit erosion. The importance of having the right skills and capabilities is decisive when making an expensive investment profitable. Given the author's experience it was a surprise that business developers in the paper industry who were interviewed were so technology oriented. These results also indicate that there is potential for improving intra-industry exchange of information and knowledge.

Table 4.9 summarises the importance of alternative motives and drivers for product differentiation by function within the paper industry. The functions studied were management (3 interviewees), business development (3), marketing and sales (4), R&D (5), production (1) and technology (3).

Table 4.9: Drivers for product differentiation by function in the printing paper industry

Propositions	Mgmt (3)	BD (3)	M&S (4)	R&D (5)	Prod. (1)	Tech. (3)	All (37)
Customer need based motives and drivers							
P1	++	+	++	+	++	+	+++
P2	++	+	+++	++			+
P3	+	+	++				++
P4	++					+++	+
P5		+	++	+			+
P6							F
P7							F
P8		+		+			+
P9	+	++	+	++	++		++
Producer need based drivers							
P10	+++	+++	++	+++	+++	+++	+++
P11	-	-	-	-	-	-	-
P12						+++	+
P13			+	+		+	++
P14	-	-	+	+	-	-	++
P15	-	-	-	-	-	-	-
P16				++			++
Other drivers							
P17			++				
P18	++	++	+		+	++	SM
P19	+		+				SM
P20			+	+	+		F
P21	-	-	-	-	-	-	-
P22	-	-	-	+	-	-	+
Additional:	timing of the market entry						

Sample: paper industry by function; number of respondents 20

Note1: P1 – P22 tested propositions (Chapter 4);
SM = strategic means
F = follow systematically
+++ very strongly supported proposition (average ranking position <2, where 1 is most important reason and 10 the least important reason)
++ strongly supported proposition (average ranking position 2-4)
+ supported proposition (average ranking position >4)
- not supported proposition

Note2:
P18, P19 were supported propositions but rather as strategic means than real drivers or motives. P20 was supported rather as an issue to be more closely followed than as an actual driver.

4.2.3 Preconditions, enablers and barriers

Preconditions

Preconditions in this research refer to the basic requirements which must be in place before product differentiation can be realised. (Question 2 in the interview protocol, Appendix 3)

First of all, **there must exist a simultaneous business need of both a printing paper producer and a customer**. In most of the cases in this study, this is the paper manufacturer's deteriorating profit status due to their use of old, inefficient technology. It can also stem from the use of the less economical raw materials than those used by a competitor for the same product. Simultaneously, and, with at least the same importance, comes a customer's business need. This can be a need to differentiate oneself from the competition through paper grade, or to find a more economical printing substrate. A technology push and a market pull must occur simultaneously. **The differentiated product should improve both a producer's and customer's competitive edge to be on the sustainable basis.**

Having **the skills to identify a market gap** is an important starting point. A market gap is seldom the same as a gap in a producer's own product portfolio. **Skills to understand customer's business logic and to identify a customer's real needs** are other important preconditions. It is not enough to identify the customer's current need, it is even more important to have **a vision on customer's future needs and also emerging needs.**

There must be **supportive management** and **company culture** both by a producer and a customer. The most important attributes in terms of supportive management are according to the findings of this study as follows:

- a broad understanding of the whole value chain from final customers and their dynamics to raw materials
- visionary leadership

- personal risk taking ability
- understanding the importance of both business and technology intelligence
- international working experience.

There must be a strategic fit between intended product differentiation and the overall business strategy. Product differentiation must be an intended action, not the result of targetless actions in the form of one-off solutions. Product differentiation must add value to both a customer and a producer. As a result, the competitiveness of both must be strengthened.

Product differentiation to succeed requires **multiple skills** such as skills in management, marketing, technology, innovation and product development. Also, the personal characteristics of an individual are also important: those individuals must be broad-minded team players with good communication skills and able to manage complex issues. A paper industry R&D director states:

> *"You must have a good understanding of how the whole value chain functions as well as the skills to co-operate with various value chain partners. It is not enough to understand only your own part of the business."*

Necessary technology must be ready to use and tested in practice.

The correct positioning of a new product must thoroughly be investigated before actions are taken: this will have a fundamental effect on price.

There are also a number of other facts, which are important as preconditions:

- A production unit or production line where a differentiated product will be launched, must be trouble free.

- There must be a clear difference in an end product, perceived by the customer for example through trials, between differentiated and standard products.
- A producer must have the readiness to offer support services such as recommendations for a suitable printing ink or printing process conditions.

In this process **the establishment of contacts with chosen partners are of great benefit.** A selection of co-operation partners is important. In the words of a paper industry marketing executive:

> "*You have to know your markets and go where the mentality is to try a new solution."*

Not essentially a precondition but an important factor for success is the timing of the market launch of a differentiated product.

> ***"It is all about timing",***

as one Senior Business Developer argues. The timing of a market launch is crucial, especially in this cyclical industry, where both business and annual cycles must be taken into the consideration. Success factors of product differentiation are discussed in Chapter 4.2.7.

Table 4.10 summarises general preconditions.

Table 4.10: Preconditions for product differentiation of the printing papers

There must exist:

- A simultaneous business need by a paper manufacturer and a customer.
- Skills to identify a market gap.
- A supportive management and company culture by both a paper manufacturer and a customer.
- A strategic fit with the business strategy.
- Multiple skills in management, marketing, manufacturing and R&D.
- Necessary technology ready for use and tested in practice.
- A clearly defined position for an intended product.

Enablers

An enabler is here defined as a factor which makes product differentiation possible. Compared with a precondition, an enabler is not so concrete to define as a precondition, which lists the factors, which must be in place before product differentiation can be realised. (Question 3 in the interview protocol, Appendix 3)

Interviewees were asked to comment on both internal and external enablers. Some interviewees find it difficult to distinguish enablers from preconditions. However, the difference between an enabler and a precondition was made clear at the beginning of each interview. In this context, enablers are regarded more supporters of product differentiation than necessarities.

Internal enablers, which refer to those intra-company factors which support product differentiation, are discussed below:

Because of paper company strategies have became more customer focused, market gaps are more easily and faster recognised. Finnish paper companies gave up the joint market organisation Finnpap in 1996. As a result, now the companies' own market control and direct communication with customers support product differentiation. **Company controlled, well-established marketing channels** and **product positioning know-how** were mentioned to be of great importance as internal enablers for product differentiation.

The broad skill base of a paper industry company can support product differentiation. A high standard of education through the whole organisation – as is the case in Finland – is a powerful supporter of product differentiation. **Knowledge pools** covering the whole corporation could be one method of supporting product differentiation. Especially important are **the skills to combine this cross-functional know-how in the area of technology in a new way.** One important marketing skill required for product differentiation to succeed was said to be the skill of maintaining the existing business during periods of specialisation and many simultaneous changes.

One supporter and also amplifier of product differentiation is **a new, tested technology.** It has a dual role: it is also a precondition.

Management and company culture were mentioned as important supporters of product differentiation. Key features in company culture which enable product differentiation include the following: entrepreneurial spirit and innovativeness, openness to change and a novelty-searching atmosphere. Strong - but not too strong - and dominating personalities within organisation, spokespersons - are important champions of the process.

Research findings of this study refer to the following important features of appropriate management: It must contain risk-taking visionaries with decision-making ability and the ability to communicate shared meanings.

Management should also have enough financial room to manoeuvre and to support product differentiation. An established process for product differentiation would also help. There was no mention of existing systematic innovation work.

The broad R&D project portfolio supports product differentiation: when a trigger appears, a necessary action can quickly be taken. The better and the broader R&D skills are, the better the possibilities for a product differentiation exist. Furthermore, **a continuous system where ”sensors are out all the time”** searching for new products helps to identify the market gaps.

The system and resources to gather information from various sources and analyse it for decision making is of importance to product differentiation as an enabler. All the Finnish paper industry firms have systems to gather this information (market, business, and technology intelligence), analyse it and translate it to the product differentiation opportunities.

Not only willingness to change but also **the ability to change** – on the company and personal level - was found to be another important enabler for product differentiation.

External enablers are found to be according to the findings of this study those factors outside the paper industry company which support product differentiation are discussed below:

The most important external enablers stem from customers. The existing market gap, preferably already identified by a customer but still unidentified by a competitor, is the most important single supporter. Other customer based enablers include the following:

- the customer's (the printer) unused production capacity; this is typically the case when newspapers are printed for only a couple of hours each night
- new printing technology, for example various emerging digital printing methods
- customers' need to differentiate their end-products from the mass of products available. Customers are obliged to move towards more tailored paper grades.
- customers may want to prolong the lifetime of their products with a new type of printing substrate (paper)
- customers see an opportunity to strengthen print media's competitiveness against electronic media
- customers have smaller budgets during a downturn and they are forced to find more economical printing papers solutions.

Other group of external enablers come from suppliers.

Table 4.11 summarises both the internal and external enablers for product differentiation of the printing papers.

Table 4.11: Internal and external enablers for product differentiation of the printing papers

Internal enablers

- Customer focused strategies resulting in a faster market gap identification
- Company controlled, well-established marketing channels
- Product positioning know-how
- Broad skill base of a paper industry company
- Knowledge pools within the corporation
- Supportive management and company culture
- The broad R&D project portfolio
- The system and resources to gather business, market and technology information
- The ability to change
- Project team practice

External enablers

Mainly stem from features associated with customers:

- Unused printing capacity
- A new printing technology (digital printing)
- Customers' need to differentiate printed products
- Customer's wish to prolong the lifetime of the product by the help of a new paper grade

But also from features associated with suppliers:

- A new technology
- A new raw material.

Barriers

Barriers are facts or actions, which can prevent product differentiation from becoming a reality. (Question 4 in the interview protocol, Appendix 3.) They are divided into internal and external barriers.

According to the findings of the current study **barriers as regards product differentiation in the printing paper industry are more marketing than technology driven.** These barriers are also different for small and mega paper industry companies. There also seems to be a time dependent factor: barriers for product differentiation seem to be lower now than some years ago - from the Finnish producer's point of view – due to companies' own marketing and sales organisations, and increased understanding of customers' businesses and their business logic.

Internal barriers

The most important internal barrier according to this study is **the inadequate fit with the existing product portfolio**. In the words of a paper industry consultant:

> *"How often do we see how restricted portfolio thinking leads to missed market opportunities when the main task is to avoid eating from your own basket."*

The lack of a clear mission and strategy for intermediary grades - the fit with overall strategy - **can prevent product differentiation from happening**. In this kind of situation, other departments within the company jealously protect their own current products and markets. **There is a fear of "eating from one's own basket"** if no common and well-communicated rules exist. Because the product differences regarding measurable product attributes are already relatively small, the positioning of a new product can cause internal conflict. Clear internal rules are needed to guide the product differentiation process - a focus on short-term issues can prevent product

differentiation from happening. The positioning of a differentiated product is of utmost importance.

A shortage of the required skills to carry out product differentiation projects may also prevent the occurrence of product differentiation according to the findings of this research.

The third factor which may prevent the realisation of product differentiation is **competition for the same internal resources:** according to this study this can be money for investments, skilful people committed to other projects, R&D staff's time or competition on management's time and attention. These facts can prevent product differentiation or prolong the projects. As a result, the optimal time to launch a product is missed or possibly the window of opportunity may be missed completely.

Mental barriers can also form internal barriers. In the present context, mental barriers mean conventional thinking and behaviour, non-use of the cross-industry networks. This can result in missed opportunities. In a company culture, where mental barriers exist, old traditional concepts are followed and new potential technological advancements in other areas of technology are not exploited. One chemical supplier argues:

> *"The paper industry has, in certain cases, completely misunderstood product differentiation: it is not operational problem solving but a strategic means of adding value to both, to a producer and a customer. And in the most optimal case, also to a supplier."*

An innovative culture may be missing and risk taking may not be encouraged. Especially in paper companies, where the cost competitiveness strategy is followed this kind of thinking is ingrained. The innovation chain may also be incomplete. Pulp dying was one example mentioned: it is almost without cost, it is not easy to manage but is one way to differentiate a product on the basis of paper shade.

Incomplete technology can also prevent successful product differentiation.

There might be **a missing system of capturing weak signals.** Even if the system existed, **the process to translate signals to applicable actions may be missing instead.**

One of the internal reasons for present barriers is due to **the increasing number or mergers and acquisitions in the paper industry, at the least this will prolong the process** according to the research findings**:** a product portfolio must be redesigned for a new corporation and many activities may have to be put "on hold" temporarily so that a new operating mode can first be defined.

An internal barrier can also develop from the fact that **a paper company is unwilling to be the first user of the newest technology.**

Paper branding can also form an internal barrier to product differentiation: a suitable position may not be available for a differentiated product. Other reasons why branding was mentioned as possible barrier were non-skilled branding and unclear, misapplied and inflexible branding philosophy. Branding has a dual role in product differentiation: it can be also a powerful tool to support product differentiation.

External barriers

The main external barrier identified in this study to product differentiation is **the missing gap in the market, an unidentified customer need.** However, an informant from paper industry management stated that

> ***"customers do not set barriers: it is a question of a producer's ability to identify the right customers as co-operation partners"***.

Choosing the correct development partner is crucial. The attributes of the ideal development partner according to the findings of this study are as follows:

- an ideal development partner must have risk taking ability (readiness to take and manage both the runnability and quality risks)
- an ideal development partner must be willing to grow together
- an ideal development partner must have an innovative and thus supportive company culture
- the right personalities should work together: neither of the partners should be too dominating
- both partners must be committed to long-term co-operation - not only for a price hunt.

One general comment was that **customers' knowledge of paper and different paper grades and their functionality in various end-uses is deteriorating.** This may be caused by an increasing number of similar paper grades and inadequate product training. This means that the producer must take a more active role in educating customers and also highlights the possibility of differentiating through services offered.

Missing value added from the customer's perspective is a strong barrier to product differentiation. This means that a customer perceives such small differences between different grades that he or she does not bother to change. Product change in any case causes extra work and costs.

The second most important external barrier to product differentiation is **mis-timing of the market launch.** It is easier to introduce a new product into the market during an upturn, because in many cases there is a lack of a preferred paper grade. So **a window is open to establish a position during the upturn but it is open for only a limited period.** One industry leader mentioned:

> **"*There are no barriers if the timing is right*".**

The third most important external barrier is the **wrong positioning of a product and consequently wrong pricing.** At the beginning of the product differentiation planning process, product positioning may have been incorrect and the product, when completed, proves to be too expensive to manufacture compared to the achievable price. This indicates that market research has probably not been done professionally.

The uniqueness of printing paper grade can also prevent it from being put into use, because a printer or publisher wants to share risks. The lack of a back-up supply is the problem.

The printers' stock management practices can also create a barrier: a printer wants to minimise the number of different paper grades in stock to be able to effectively manage stocks and decrease capital employed**. A printer** customer may also want to streamline its processes to be competitive and is **not willing to run too many different paper grades.** Pressure in these cases may come from a publisher who buys the paper and for whom printability properties such as gloss, brightness, opacity and perhaps stiffness are important.

An external barrier can also be **the lack of a shared, common understanding between value chain partners.**

Another external barrier may stem from the **printers' own actions regarding product differentiation: printers innovate all the time using standard papers.** This increases their own understanding of paper's behaviour. This indicates that a supplier does not know a printer customer's business well enough.

Table 4.12 sums up both internal and external barriers.

Table 4.12: Internal and external barriers for product differentiation of the printing papers

Internal barriers

- A lack of strategy for differentiated papers
- An inadequate fit with the existing product portfolio
- A shortage of required skills
- Competition for the same internal resources
- Mental barriers
- Incomplete technology
- A system to capture weak signals from the markets is missing
- A process to translate the signals to applicable actions is missing
- An increasing number of M&A
- Unwillingness to be No 1 with new technology
- Branding

External barriers

- An unidentified gap in the market
- Missing value added from a customer's perspective
- Mistiming of the market launch
- Mispositioning of differentiated product resulting in mispricing
- Uniqueness of a product
- More effort needed in a printer's stock management
- A printer's target of rationalising and reducing a number of paper grades
- A lack of shared common understanding between the value chain partners
- A printer's own actions to differentiate end products.

4.2.4 The roles of the key actors in product differentiation of printing papers

The actors in the product differentiation process of printing papers are

- consumers at the starting point of the long demand chain
- paper industry customers: publishers, printers and merchants
- paper industry
- the supplying industry such as chemical, mineral and machine suppliers
- industry observers such as consultants and analysts

According to the findings of this study **the paper industry and its customers, publishers, printers and merchants, are the key actors in product differentiation of printing papers.** The paper industry is the initiator, but it needs its customers, publishers and printers to make product differentiation happen. Publishers and printers must have a need – identified or unidentified - for a differentiated product. The differentiated product should add value to a customer's chosen end-use. The supplier must also have the ability to meet these demands. The research findings, however, indicate that **the initiator's role in product differentiation of printing papers is in the shifting from the paper manufacturers' end of the value chain towards customers, advertisers and final consumers.**

According to the author's experience an advertiser also has a role in printing papers differentiation, but this was not clearly reflected in the interviews. In the following studies on product differentiation of printing papers, advertisers should be more involved.

There are basically two alternatives in terms of how publishers choose a differentiated paper: it either has to be a good enough, cost competitive solution for a certain title, or it must help to differentiate a printed product. The image of the paper has to support the printed product and its image.

The important attributes in this respect are often brightness, stiffness and matt surface.

Other actors are also needed in their specific roles: universities and research institutes to provided basic research from where paper industry firms can continue with their applied research; consulting companies to bring in global intelligence, to carry out feasibility studies and competitiveness analysis and to function as a sparring partner; the paper machine suppliers to continue the development of paper manufacturing technologies in order to improve the competitiveness of paper; mineral and chemical suppliers to offer new raw materials to realize product differentiation.

The research findings indicate that the actor groups referred to above have their special roles to play in product differentiation. They all are needed. In addition, advertisers should be added to the chain. All actors should be linked with each other to form a knowledge value chain to benefit all the knowledge which various actor groups posses and to improve the competitiveness of a printed product.

4.2.5 Time factors

The time factor is two-fold: on the one hand the drivers for product differentiation have not remained the same over the years. On the other hand they also vary according to the timing of a business cycle.

Time dependent drivers: According to the findings of this study **former drivers** for product differentiation were typically producer-driven, such as extending the life time of a paper machine instead of closing it down. **Future drivers** are expected to be more customer-driven supporting both print media's competitiveness and diversified customer needs such as intended image, a new product feature or a new end use. An example of this trend is the use of stiff, matt paper for a design furniture catalogue.

Business cycle dependent drivers have remained steadier from decade to decade despite cycles, whose amplitude and length, however, have varied. This means that differentiated products are developed mostly during a downturn when there is time to make machine scale trials which are necessary in any product related development. Paper producers try to launch them during upturns when there might be a lack of a used standard paper grade or customers want to differentiate from the mass products available on the market. Customers, however, may be also willing to try differentiated products during a downturn when searching for a more economical printing substrate.

4.2.6 What about branding?

The role of branding in product differentiation has been only supportive, not in a strong role, as the two following notions arising from the interviews indicate: 1) only a few successful differentiated products were referred to by brand name, and 2) branding of printing papers was not mentioned as a precondition for differentiation. Instead, branding was mentioned as a possible internal barrier to product differentiation. To quote a paper company marketing executive:

> *"Is there space enough and is branding overall created to be so flexible that new products (outside traditional categories) can be included?"*

When investigating the failures in product differentiation, no case was mentioned where poor branding would even have been a partial reason for a failure.

Ongoing consolidation development in the global paper industry sets new demands as well as creates new possibilities for branding.

The research findings indicate that there exists unused potential in branding of differentiated papers in strengthening the bond between a customer and

a producer. This is needed to avoid the present situation in which differentiated products are first hit by recession and easily eliminated from a customer's printing papers' portfolio. The technical properties of traditional paper are also becoming so similar to each other that in order to differentiate between them we will need a story and a guarantee to support the product.

4.2.7 Successful product differentiation cases and key success factors

Informants were asked to mention and describe successful product differentiation cases with reasoning to find out key success factors for product differentiation in printing papers and increase overall understanding of the phenomena. (Question 5 in the interview protocol, Appendix 3.) *The criteria for a successful case were as follows: a differentiated product added value both to a customer and gave better profitability to a paper manufacturer than previous products on the same production line, or in a case of a new paper machine it increased overall profitability of the production unit.*

Six (6) successful cases were identified in the Finnish printing paper firms in years 1980 to 2000. They are described below.

Success stories

1. Web sized offset paper (WSOP, also used as a brand name)

WSOP, a Finnish printing paper from early 1980's, **was the most preferred success case with 9 mentions.** The paper grade was a furnish sized printing paper for web offset printing and was designed specifically for mail order catalogues and for the US market, for increasing number of supplements in the UK, and for TV- and Radio Times listing magazines. There existed a gap in the market between coated mechanical paper

(LWCO) and uncoated mechanical offset paper (SCO) so that low-end market needs could be satisfied in an economical manner. WSOP was the first mover to fill the identified market gap.

Key success factors in this case were as follows:

- a clear, identified gap in a market
- a successfully carried out joint development project with a publisher customer
- good timing of a market launch
- a professional market launch with a product branding
- appropriate pricing: next lower grade used for same end-uses + x % ('plus' pricing)
- good quality
- a manageable economic risk to the owner.

The number of supporting issues, which boosted the success of WSOP, were also identified:

- systematic and long term development work in which key customers were involved from the start
- innovative company culture; an approach and the system of searching continuously for new ideas, a willingness to take risks and the ability to maximise the fibre value in the manufacturing process
- strong visionary personalities
- the courage to take technology risk and to invest in new technology
- the broad globally acting marketing network Finnpap, with expertise required to meet printers' demands and publishers' demands achieved through a print technician, whose role in translating the printer's language into a paper manufacturer's language and actions was of great importance.

2. A product family of galerie products , such as Galerie Bright, Galerie Fine, Galerie Light, Galerie Art, was also an often-sited success story. Those grades refer to mechanical coated printing papers made for high-end magazines and advertisement brochures. They are positioned between coated mechanical LWC papers and woodfree coated papers.

According to the present research **key success factors** were as follows:

- knowledge and understanding of markets and customers' businesses and their future needs, correct interpretation of those needs, and the courage to take necessary actions
- new combinations of product properties, knowledge of raw materials and their behaviour results in value added products for the customer
- seamless co-operation between various partners in the entire value chain; starting from raw materials and machine suppliers through universities and research institutes to paper producer to customers
- clear positioning of each product in the entire product range
- successful brand building.

3. Machine finished, coated, mechanical pulp dominating paper (MFC)

MFC paper is a coated machine finished printing paper. It is bright, stiff and matt or semimatt. It was developed for special interest magazines, special catalogues and for advertisements, where product differentiation via paper is important. MFC is also used in books. MFC paper is often used for purposes, where the paper grade supports the content and image of the end product.

Key success factors in this case from mid-1980's were following:

- the identification of gaps in the developing end-use markets; the increasing number of titles especially made for the ageing population, green demands, and overall diversification of end product markets towards special interest magazines
- economic value added to customers
- economic value added to advertisers in the form of good print contrast

- many different attribute combinations, for example that of bulk and brightness
- clear positioning within printing papers
- an advantageous local partner in the development phase and as user.

4. Non-standard SC papers (SC Cat, SC B, SC A ++)

SC papers are an intermediary group of papers between improved newsprint and coated mechanical papers. They are made of mechanical pulp and fillers for various end-uses such as magazines, advertisement brochures and TV listings. Above classification follows one used in the Finnish printing paper companies.

Key success factors for SC Cat, for catalogue end use developed paper grade, were as follows (early 1990's):

- A market gap especially in the US, where there was limited own production of that grade, and simultaneously, a rapidly developing, catalogue end-use market
- A new gap former technology together with good furnish, TMP, allowed a good structure of the base sheet for rotogravure printing where 30-35 % of filler content was concentrated close to both surfaces from inside
- Joint development work with a machine manufacturer played an important role
- A willingness to take a risk with the newest technologies
- The availability of the optimal fibre in the region for the top quality SC paper and simultaneous knowledge to process it
- Established business with standard SC papers and knowledge of end-use markets and their behaviour, as well as demands
- Support from the joint global Finnish paper industry marketing network Finnpap
- Proven quality advantage over standard SC and from a customer's perspective, a more economical choice when competing with LWC.

Key success factors for SC B are the following:

- existence of economical raw material near manufacturing site
- the identification of an end-use market where paper quality is good enough (printability)

SC B paper is used for low-end magazines and TV listings.

SC A ++ papers are a group of high-end SC papers, which differ from standard SC in brightness and in some cases also in stiffness. In SC 'plus' grades the main differentiator is the brightness which is higher than in standard grades.

Key success factors for SC A ++ papers (late 1990's) are following:

- it allows a publisher to differentiate its own products according to brightness, stiffness and so on
- a manufacturer's ability to make SC papers: to manufacture SC papers is the most difficult of all, because one cannot hide any mistakes in the base sheet

5. Machine finished specialities (MFS)

MFS papers are a group of various uncoated mechanical pulp dominating papers, which are uncoated and made of mechanical fibres and also at least partly of recycled fibres. We can observe three sub-groups within this product group:

1. The 'Scandinavian league': which has high bulk, high brightness, high stiffness and which are made for CSWO printing
2. The 'Central European league', for which a high level of smoothness, good printing surface and no mottling tendency is typical

3. The ‘Specialist league’, where recycled fibre may dominate as a raw material. These papers are mostly applied by small mills, where some years extension in a paper machine's life cycle is required.

Key success factors are as follows:

- The management’s vision and sensitivity regarding forthcoming changes in the development of end products (close to special papers)
- The simultaneous development of both paper manufacturing technology and printing technology
- It is a cost competitive option for the publisher.

6. Film coated offset (FCO) was also mentioned as a possible future success story. Its industrial manufacturing was started in Finland in 1993. **Key success factors** mentioned in this case were the ability to use more economical raw materials, such as recycled fibre and on-machine coating technology.

Key success factors

According to the findings of this research, success factors of product differentiation in the printing papers industry are summarized in Table 4.13.

Table 4.13: Key success factors for product differentiation of the printing papers

- A market gap must exist and a paper manufacturer must be able to identify it.
- A differentiated product must have a clear position among other printing papers and the position must be communicated clearly to both paper manufacturers and to salesmen (internally)
- The timing of a market entrance is critical
- The pricing tactics is important: In the most successful cases, the pricing has been (+) pricing to the nearest lower grade, which can be used for the same end-use
- The company culture must allow and support product differentiation; There must be a willingness to take risks and a capability to do it (+innovative and novelty searching company culture as well as the commitment of the top management)
- An understanding of the customer's business and earning logic including the customers cost structure
- Long-term joint product development, partnership projects with both raw material and machine suppliers as well as with customers
- Value added to a customer at least in terms of cost effectiveness
- First to market
- The exploitation of a company's own core capabilities.

Continuous search for innovation was not mentioned as a success factor.

4.2.8 Reasons for failure

Question 6 in the interview protocol (Appendix 3) refers to failure cases and reasons for failures as regards product differentiation in the context of the Finnish printing paper industry. Respondents clearly mentioned less failures than success cases. In most cases it was the exact same failure, which was called a catastrophe. There may be a few reasons behind such an outcome:

All those, who gave answers to this question, came from the paper industry, or had several year's background in the paper industry during the time of the joint marketing organisation. The others simply did not know about the failures. Another aspect is human behaviour, people tend to forget unpleasant events, especially when that is a personal failure. More answers could probably have been received, if the question had been about taboos in the paper industry.

Only one case was mentioned in reference to failures. That was surface sized supercalendered paper for offset printing (SCO).

Surface sized supercalendered paper for offset printing (SCO)

Surface sized supercalendered paper is a mechanical printing paper made for offset printing as an alternative to a coated mechanical grade. The year was 1987 and the development took place at two mills.

The key failure factors were as follows:

- Despite an identified market gap, a required technology was not yet finalised resulting in a difficult and costly manufacturing concept. There existed even technology gaps in the process (the coating technology in use was a film transfer, although Japanese papermills were surface sizing DIP containing newsprint with speeds around 1000m/min).

- The real market proved to be too limited, raising the question of whether market research had been professionally done. A customer segment, where the product could have offered a real competitive edge, was not found. Intended end-uses were mid-season catalogues, brochures and retail catalogues

- Cost savings in the total investment

- Inefficient production caused higher manufacturing costs than the possible,

reachable price would have allowed (costs were not recoverable from the markets ->cost structure was wrong)

- One of the producing mills licensed the manufacturing technology: know how was, however, not properly utilised

- Overall control of the project was poor.

Manufacturing of surface sized SCO paper was stopped after an internal launch.

The original target was to make a corresponding grade to Japanese Bitokoshi.

This manufacturer was a follower, the **key reasons for failure were** the facts that **technology had been insufficiently developed** and **there was a later-than-promised market entrance.**

General reasons for failures in product differentiation are summarized in Table 4.14**.**

After the interviews also one failure was identified, in which too little human resources and a shortage of investment money were the main reasons for the failure in a produvt differentiation project.

Table 4.14: Failure factors in product differentiation of the printing papers

- Undeveloped technology at the time of the market launch resulting in unclear, real production costs and an unclear, reachable quality level
- Overly expensive manufacturing costs in relation to the position of the paper grade and available price window
- Inadequate or poor market research or false conclusions
- Absent project management skills
- Poor timing of the market launch
- The market launch for the first mover should be different from the follower's: publishers need a back up to manage their risk
- Uncontrolled internal competition due to missing rules
- In the case of swing machines, paper grade change costs were underestimated.

4.3 Validity and reliability of the study

In order to contribute to the theoretical development of a researched field, a study must demonstrate sufficient validity, reliability and generalissability (Uusitalo, 1990). Validity of the research is evaluated on the basis of the extent to which a researcher is able to use the chosen method to study what he or she sought to study rather than studying something else. (Gummesson, 2000, p. 91). In a qualitative study which uses one case to gather empirical material and which employs different types of data it is necessary to evaluate validity and reliability from different angles. The criteria of validity and reliability commonly used in the positivist paradigm are 1) construct validity, 2) internal validity, 3) external validity and 4) reliability and objectivity (e.g. Mitchell 1985, Yin 1989 and Marshall and Rossman 1989). These are not, however, totally applicable to case studies using qualitative data when. Lincoln and Cuba (1985, pp. 290 – 298) argue for the replacement of these criteria in social sciences with four questions which

establish the "truth value" of the study. Those four questions are outlined below together with a description of how these questions have been treated in this study.

1. Construct validity and internal validity: how truthful are the particular findings of the study are and how do we judge them?

Operationalisations of the key concepts have been made in Chapter 2.1. Inspite of the measures taken the matter is somewhat problematic because neither the broadly used definitions nor unambiguous foundations for operationalisation exist.

Construct validity is particularly problematic in case study research in particular (Yin, 1989, p. 41). Attempts to improve construct validity and internal validity were made firstly by using multiple sources of evidence in data collection such as preliminary and final interviews, participant observations and various documents. Secondly, data received from in-depth personal interviews was continuously cross-compared. Thirdly, a draft of the case study section of the dissertation was also given to key informants for reviewing.

2. External validity: how applicable are the research findings in another research setting?

External validity deals with the problem of whether the findings of the study are general sable beyond the immediate case study (Lukka and Kasanen, 1993). Case studies have often been criticised because of inability to achieve generalissability of the results. This is because survey research relies on statistical generalisation whereas case studies rely on analytical generalization. In the current study, this problem was tackled by using multiple sources of data, triangulation (see for example Gummesson, 2000, p. 142). (Chapter 4.1.1)

One important aspect of validity in a study which uses interviews for collecting historical data is the problem of recall (e.g. Reuband 1980, pp. 159 – 163): how easily and accurately are past events recalled in retrospective interviews? This problem was tackled in following ways: first, interview protocol was sent to interviewees in advance so they had time to recall cases of product differentiation failure or success; secondly the findings were cross-checked with those of other industry experts.

3. Reliability: how can we be reasonably sure of the replicability of the research results in a similar research context?

When data is gathered through interviews, reliability is seldom assessed by actually repeating the measurements. Instead, it can be evaluated qualitatively and quantitatively (Salvendy and Carayon, 1997). The research setting and the choice of the case and reasoning behind it are described in Chapter 1.4. Case sampling is described in detail, data collection methods and processes is made explicit and data analysis methods is made public in Chapter 4.1.

The case study protocol and case study database were maintained to improve the reliability of this current research. All the aforementioned measures referred to above were taken with great care. That is why the reliability of this study can be as reasonably good.

Problems of validity and reliability were initially considered at the planning phase of this research.

Reliability is very important in empirical research in particular, but good research results are not only reached through high reliability. Kerlinger (1973, p. 455) has stated: "… reliability is necessary, but not sufficient condition of the value of research results and their interpretation".

4. Objectivity: how can we be sure that the research findings reflect the inquiry itself and not the researcher's biases?

The quality of the qualitative data has been assured through the clear and explicit formulation of research questions, careful sampling of interviewees – they had to have personal experience of one or more product differentiation cases. This level of quality was also achieved through interviewing key informants more than once, cross-checking interview data with documentary data, cross-checking interview data between informants, careful documentation and interpretation of interview results and through the substance of the results themselves (Chapter 4.1).

The author had a role in the studied phenomena. To decrease the risk of subjectivity notes were made during each interview and the results were typed, organised, documented and classified immediately after each interview.

There was another problem which the author encountered, that is the confidentiality of information. Confidentiality was the reason why the interviews were not permitted to be tape-recorded. Products are essential in the implementation of a printing paper company strategy; they form the core of the business. For reasons of confidentiality and also to improve the readability of this report, interview reports have not been included. An effort, however, was made to report the research in such a manner that it can be repeated with sufficient accuracy and so that auditing is also possible.

The final verification of research results will occur when the managers of a printing paper firm put the recommendations of this thesis into practice.

Product differentiation as a phenomenon is complex. It can occur, for example, through tangible or intangible product attributes, services or branding. Ultimately, it is the customer's perception and a that-time perceived difference to the reference product which determines, whether a product, service or total offering will be differentiated or not. This study contributes to the understanding of product differentiation as a phenomenon in the printing papers context and, more precisely, from a paper manufacturer's perspective.

On the basis of validity and reliability analyses it can be stated that this research fulfils the criteria set for doctoral level scientific research.

4.4 Main differences between the research findings and the author's experience

Product differentiation in the context of printing papers is an even more complex phenomenon than it appeared when starting this study. There are no standards or practices and the starting point always varies. The potential which product differentiation offers is largely wasted because customers will give up on differentiated papers if better qualities are available at reduced prices. The main differences of the research findings compared to the author's experience - rather surprises - are the following:

There are separate islands of knowledge: the established networks and forums where knowledge can be exchanged seem to be missing or they are weak. This is perhaps due to the fact that these forums are often paper firm-led and therefore restricted by the need for confidentiality. The situation in Finland has changed since the demise of Finnpap. Firms have grown bigger and begun to act independently.

The customers' unintegrated, unclear and unemphasised role in product differentiation.

The lack of strategy and internal rules for product differentiation amongst paper manufacturers was a surprise. Product differentiation will become more important due to the growing number of differently-aged machines and increasing segmentation of the printed end products. However, no plans to create a separate product differentiation strategy were reported – despite the fact it was expressed that the current situation is unsatisfactory. In conclusion it can be stated that **there is a lot potential for improvement.**

No defined system to detect very early signs of technological change could be identified among paper producers despite the considerable length of product development cycles.

Paper manufacturer's new technologies, and minerals and chemicals, act only as preconditions and strategic means for product differentiation, not as motives and drivers as such which seems to be one of the basic beliefs among suppliers.

5 Conclusions and recommendations

Chapter five first summarises the key findings of the work, then gives a new meaning for product differentiation in the context of printing papers. It continues by answering the question 'Can product differentiation be used to improve the competitiveness of a printing paper firm?' and finally discusses contributions of this research, both theoretical contributions and managerial implications.

5.1 Key findings

Product differentiation in the printing paper industry is a paper firm driven phenomenon; more specifically it is a phenomenon driven by a paper machine line with eroded profits. In this study, competing products available in the markets, for example, were found to have a very limited role

as a motive for product differentiation. **Customer demand is a concurrently occurring driver.** In this thesis, a new end-use application such as a new magazine title appeared to be the most important customer need-based driver. It must be possible to identify a customer need and this need must be interpreted in terms of a producer's value offer. The existence of a customer need alone is insufficient. On the basis of this study, **there must be many simultaneous drivers. No single driver is strong enough to cause product differentiation.**

A printing paper producer and its customer have clear, important roles of their own in product differentiation. This study found that **other value chain partners are also needed to make product differentiation possible. Specifically, these are machine suppliers, and mineral and chemical suppliers.** According to this study, the suppliers' role is supportive. To excel in this role suppliers must have a profound understanding of their customers' business and earning logic. Taking into account the length of a product development cycle, it would be advantageous to also observe their customers' customers' business including advertisers and anticipate their future demands. Paper machine suppliers are in a different position to chemical suppliers with their specified, narrower customer industry scope (although it is possible that chemical suppliers have dedicated resources for the paper industry). Suppliers use between 5 and 8 times more R&D resources as a proportion of their turnover than the paper industry. To better benefit from investments, suppliers should improve their knowledge of their customer's business logic, drivers and future needs. The biggest suppliers, however, act globally. Different regional R&D resource strategies may be seen to depend on a company's own resources in the future.

According to this study's findings **universities and research institutes** do not have an initiating role in product differentiation. Their role is different. Universities provide basic, broad scientific education, wherein lie the seeds for product differentiation. They also operate as 'scientific advisors' in company specific projects. Research institutes carry out basic research – in

contrast to applied research which the paper firms pursue - on which differentiated products can rely. Thus, the role of universities and research institutes has been generally vital, but they have had an indirect impact on product differentiation.

The role of the **investor** has become more important within the Finnish paper industry companies. One of the major changes in the nature of investment has been the increase in foreign ownership of the Finnish forest industry companies. This change has forced companies to pay attention to profitability and to investments in particular. The Finnish paper industry benefited in the past from the many devaluations of the Finnish 'markka'. Since Finland joined the European Monetary Union (EMU), this tool has not been available.

Neither an existing process nor a system to support product differentiation was found. Sub-systems such as one used to identify weak signals in the markets were not identified either. Instead, the investigated cases were one-off solutions. This study found that paper firms react more to unacceptable profit levels than take proactive measures to avoid them. This indicates that there is untapped potential in their designed, strategy-linked process, their supporting system and management skills. In one of the companies investigated, product differentiation was, however, successfully applied in order to increase or secure a market and customer share. Nevertheless, a formal, identifiable process for product differentiation was also missing in this case. That said, the company in question differs from its competitors in the following respects: management is prepared to take higher risks with long term development projects and support and commit to such projects; there is comprehensive utilisation of available skills and close co-operation with universities giving a solid scientific grounding.

Product differentiation is neither a result of a systematic search for innovations nor R&D work. Rather this work helps to develop products

into a 'pool' of products from which they can be activated when the time of the business cycle is right.

Available skills and capabilities are not systematically exploited because a process is missing. The understanding of customers' business and earning logic and which type of added value they are ready to pay a premium for are of great importance. **High level strategic marketing skills appeared to be crucial for the success in product differentiation but simultaneously the most important area for development** according to the findings of this research. Acting at the proper time is particularly important. The best time for a market launch is during an up cycle when there is a shortage of paper and when customers are struggling with their paper budgets. Downgrading – customers' actions to move to lower value added grades, from LWC paper to SC for example - is typically taking place at this time. Barriers to product switches have lowered because the printing paper range is so broad. The constant development of printing technology means that the giant steps needed to be taken previously (in order to switch products) are no longer necessary.

Differentiated products function as a sort of flexible 'buffer' for a customer. The role of differentiated products is not so stable as standard products: customers change to higher quality standard products when a downturn begins and a price difference diminishes. This research finding refers to the fact that **in product differentiation in the context of printing papers, it has rather been a question of a product proliferation, a wasted action, than a real value adding product differentiation.** Functioning as a 'buffer' product naturally entails more insecurity than is the case with standard products. **To be sustainable a differentiated product should be an element in a customer's strategy.**

This study **could not identify any driver strong enough in itself to cause product differentiation.** The existence of eroded paper production profits (the number one driver for product differentiation in printing papers) and simultaneously an existing, identified – in paper manufacturer's terms – customer need (number two in the ranking of drivers' and motives'), as well as suppliers readiness to supply either proper machinery or equipment or suitable minerals and chemicals are the minimum conditions that are needed for product differentiation to take place.

According to this thesis **product differentiation in the Finnish paper industry has not been the direct result of the increasing customer focus of paper company strategies in the past. Increased customer focus has, however, helped companies to identify differentiation opportunities by market and by customer earlier than before.**

Product differentiation is not the result of emerging electronic media. However, with the help of differentiated printing paper grades, print media can strengthen its position against electronic media by offering added value to special, targeted end-products such as matt, stiff paper for a design furniture catalogue.

Some success stories could be identified in this study. Common to these cases were **an identified market gap, a clear position compared to existing products, a market launch during an upturn, 'plus' pricing, a supportive company culture with the propensity to take risks, deep understanding of a customer's business in order to offer the correct added value components, and long term joint or partnership projects.**

One real failure was also identified. **The main points to note** from this failure were that one should **use professional/independent market research (external to the project organisation), position a new differentiated product 'honestly', pay special attention to project**

management skills and the timing of a market launch, and avoid a start-up with incomplete new technology.

New paper manufacturing technologies do not function as drivers for product differentiation but rather as strategic means for enabling and implementing it. Minerals and chemicals also have the same supportive role.

Branding has a dual role in product differentiation: on the one hand **brand building could be used more effectively to support product differentiation** because the potential to differentiate on the basis of technical properties is reducing. On the other hand, branding can also become an internal barrier to product differentiation if it creates inflexibility and does not allow clear positioning of differentiated products.

Drivers for product differentiation have not remained the same over the years but instead has changed significantly. In the past the need to increase customer share and to strengthen one's position at any cost used to be important driver. Now product-related profitability targets are stricter (as reported by three out of four the companies interviewed) and unprofitable products are not tolerated for long. Following the diversification of the end-use markets, the importance of the 'desired change of image of printed product' (P2) and 'a new end product feature' (P4) is increasing. This reflects the fact that the pendulum is swinging from producer need-based motives for product differentiation towards customer need-based motives. This is reflected in a change in paper company strategies from product led to more customer oriented strategies.

The time factor is especially important when launching differentiated products in the markets. In product differentiation it is more a question of 'when-to-market' than 'time-to-market'. During an up cycle when paper demand is high there are better opportunities to introduce a new product. Publishers are also experimenting with new products at this time.

This study generated the list of management actions about what to take into consideration, avoid and strengthen when planning a product differentiation project. No single detailed list of management actions is good for all product differentiation cases. A paper industry manager will tailor a solution to a purpose. Product differentiation is a complex issue on many levels: the starting point varies (each case is different), the target for a differentiated product varies (the reference product does not remain untouched but is continuously developed) and it is the joint effort of many parties. Each party has a role of its own. One of the most important phases of a product differentiation process is the beginning, the definition of the status. One senior paper industry manager concludes:

> *"In my experience very seldom is there one single driver which could be a strong enough trigger. It is a question of many simultaneous drivers leading to differentiated products when the time is right. Furthermore, drivers for product differentiation also depend on the producer and the customer".*

The importance of product differentiation of printing papers will grow in the future: product differentiation can offer a competitive advantage to both a customer and a producer and is expected to remain on focal point for both parties. There are a number of change forces which will have an impact on the importance of product differentiation in the future.

Publishers and printers are increasingly segmenting and targeting consumer markets and developing new products accordingly. This is expected to increase the need for differentiated products. A differentiated paper with its specific property combinations supports the desired image of a differentiated printed product. For the most part, printing paper consumption is advertisement driven and thus remains cyclical. As a result customers' purchasing power varies and differentiated products offer the required flexibility over the cycle. Consolidating, expanding and global publishers and printers also need partners with broad product portfolios.

Paper firms are expanding through the continuing consolidation of the paper industry. **There will be more paper machines of different technical capabilities and efficiencies per firm and more practical possibilities to differentiate. Paper firms pursuing current customer focused strategies may also be better able to identify gaps in the markets than before.** Changed ownership of the paper industry in the form of more institutional investors (which is especially the case in Finland) has led to a focus on achieving sales and profit growth using existing (intangible) assets rather than return-on-investment – particularly at a time of emerging disruptive technologies. Paper manufacturing technologies already offer many alternative means to differentiate products through different forming, coating and calendaring technologies.

Product differentiation can function as one economic means for value creation within a printing paper firm when it is based on coordinated use of knowledge, skills and capabilities. Product differentiation is not achievable only through differentiating paper technical properties – that road is approaching its end – **but** instead **through establishing a process for product differentiation starting with the customers' customers and proceeding to raw materials**. In this process, each party has its own specific role. This is not primarily a question of technological skills – at least in Finland – but more a question of strategic sales and marketing skills and business process management skills.

Based on this research, cost leadership will continue to remain the main strategy for a printing paper company. Differentiation strategy will function as a supporting but important role in value creation: it can offer a competitive advantage when carried out properly. It can be a strategy for both ageing paper machines with old technology and for new machines with the newest technology and non-traditional raw material mixes. The application of a differentiation strategy is a case specific issue where a starting point varies.

5.2 Product differentiation: What is it on the basis of this thesis research?

On the basis of the results of this study, product differentiation in the printing paper business can be defined in the following manner:

Product differentiation is typically a strategic choice made by a paper firm when the profits of the paper machine line are starting to erode. On these occasions the product differentiation may provide an alternative action to a paper machine shutdown. Product differentiation is simultaneously driven by ever larger multinational customers and their more diversified needs for a broader product range. In only a few cases product differentiation has the direct result of routine R&D work carried out by paper firms. Rather, the timing of the market launch of a differentiated paper depends on the phase of a business cycle: when the up cycle starts, a differentiated product may be activated from a pool of closely-related products. Product differentiation is, however, not only restricted to old paper machines but it can also occur at a new paper machine where a broad knowledge base and skills are available.

In the majority of cases investigated, product differentiation has been initiated by a paper producer based on measurable paper technical properties; in some successful cases this has been supported by branding. The potential to differentiate on the basis of important paper technical properties such as smoothness, brightness, opacity and gloss between the grades has, however, become negligible as a result of the growing number of printing paper grades - a new approach to product differentiation is a necessity. Rather than paper manufacturing technical skills, it is a question of understanding the customers' earning logic and future demands and creating, organising and managing a total product differentiation process from - customers' customers needs to paper manufacturing and raw materials. In the

future more drivers for product differentiation are expected to originate from customers.

It is the customer who defines whether product differentiation is justifiable or not.
Product differentiation complements the main strategic line. In the case of printing papers this is most often a cost leadership strategy. Product differentiation needs a specific strategy which is integrated within business strategy and well communicated in order to be a well organised and well managed process – not a series of ad hoc actions with ad-hoc teams as has been the case according to this study. It must utilize all existing knowledge in the value chain.

Product differentiation is a complex process where the starting point always varies and where knowledge of the entire value chain is needed. In addition to invisible assets and tacit knowledge, technology – paper manufacturing technology in particular – also has an important role in product differentiation. Out-of-date, inefficient manufacturing technology is the reason why profits are eroded. However, it is the new technologies such as multi-layering, new forming, coating and calendering which have made product differentiation possible. New technologies offer alternative methods of making a differentiated product with different attribute combinations. However, a differentiated product is a subjective issue. A reference product does not remain the same but is continually developed. Large customers may see paper grade developments carried out by various producers, but not necessarily by one, single producer. Paper technical properties of printing papers are so similar that they alone can not create product differentiation. Product branding can support differentiation, but is not enough in itself to cause product differentiation in business-to-business market.

In this study, it was found that incomplete technology also caused the most severe, reported failure of product differentiation.

5.3 Can product differentiation be used to improve the competitiveness of a printing paper firm?

Product differentiation can offer a competitive advantage for a printing paper firm because its successful realisation is largely based on invisible assets: knowledge not only of a product and its manufacture, but rather the understanding of advertisers' and customers' future needs and also tacit knowledge of an increasingly complex and rapidly changing environment. Product differentiation requires strategic investment in order to realise it. Having the requisite skills to use these new technologies creates a key difference which is difficult for others to copy.

However, **no single driver alone is strong enough to cause product differentiation.** A strong driver at producer level, a strong driver at customer level and adequate support from suppliers are also needed. In addition, we need a trigger to launch this development, and a supportive process to make product differentiation a reality.

No one product differentiation project or process is alike. Product differentiation projects are one-off solutions which increase the importance of invisible assets, knowledge and skills. The starting point for a product differentiation project varies according to whether it is a new green or brownfield project or a result of the rebuild of an old paper machine. However, current research has shown that there are common issues which must be taken into consideration - strengthened, eliminated or maintained - in the product differentiation process.

On the basis of the research findings strategic sales and marketing skills within Finnish paper industry companies are the most critical ones for the success of the product differentiation project. Product

differentiation is not a sustainable competitive advantage for a printing paper industry company unless differentiated products are not an integrated part of a customers' strategy. On the basis of the findings of this doctoral thesis, **product differentiation in the Finnish printing paper industry, over the past twenty years, has rather been a product proliferation than a real product differentiation.**

Table 5.1: The main claim

Product differentiation – as defined in this thesis - can provide the competitive advantage for a printing paper company if it is based on the coordinated use of various knowledge, skills and capabilities within the firm. Product differentiation should start with an understanding of customers' earning logic and future needs. If based on intangible assets, product differentiation is not a sustainable competitive advantage unless it is an integrated element of a customer's strategy. Brand building could be more effectively used to support product differentiation.

5.4 Contributions of the study

5.4.1 Theoretical contributions

The main contribution of this thesis is identified in increasing knowledge and understanding of product differentiation as a phenomenon in general and in printing papers' context in particular. Porter (1985) has stated that "the sources for differentiation are not well understood". Scheuing (1974) has stated that "the connections between the intentions or needs of the supplier and perceptions of the customer is not well explained". Within the literature of strategy, economics and marketing literature, research has focused on a limited part of this complex phenomenon. This thesis gives a multi-level, holistic picture of a complex subject - product differentiation in the context of the printing paper industry (Chapter 5.1) – thus establishing the foundation for further research.

The existing research on product differentiation (e.g. Chamberlin 1965; Kotler 1985; Porter 1985) predominantly refers to higher premiums as one of the main reasons to carry out product differentiation. In the case of printing papers where differentiated papers are often priced +/- compared to the closest standard grade (thus not reflecting the real value of the product at an end-use), the premium may be partly lost. Calori and Ardission (1988) define differentiation in the following manner: "it is a position in which the offer of a given competitor has some valuable, distinctive characteristics for the customers. Those characteristics must fulfil the following criteria: they must be perceived by customers, defensible from imitation by competitors and valuable for the supplier either through higher market share and/or higher margin". In the case of printing papers it has rather been a question of increasing market and customer share than margins directly.

Another important contribution of this thesis is the identification of what makes product differentiation a sustainable competitive advantage in the printing papers' context: a differentiated product should be a deeply integrated element in a customer's strategy. The fact that differentiated products are first thrown out when the downturn starts indicates the opposite practice.

This doctoral thesis also contributes the theory of resource based view of a firm. Although the intangible internal strategic resources of a firm (knowledge and also tacit knowledge) and their integrated and broad use are vital for product differentiation to be successful, they are not enough to carry out product differentiation successfully (either in terms of market/customer share or margins. Equally important is the continuous monitoring of the external environment, customers' changing needs and their varying influence, competitors and their product portfolios, paper manufacturing technologies developed by paper machine manufacturers and also emerging new technologies especially in the area of electronic media.

In a successful product differentiation, knowledge, skills and capabilities form the core. This means that only external environment –oriented strategies, that is the Industrial Organisation Model – are not sufficient. Paper companies do differ as regards their resources, even more so when going beyond the researched geographical region, Finland. Instead, the Resource-Based Model is better applicable. The differences in resources form the basis of competitive advantage. However, ouside forces shaping the industry should not be forgotten. There is a need to find a balance in between the two approaches.

This study also confirms Porter's notions of possible problems in differentiation (Porter, 1985): underestimated costs of differentiation, lack of awareness of customers' real needs and customer paying ability for that specific product due to poorly carried out market research.

Schneider (1993) has stated in his doctoral dissertation that product differentiation is a strategy that can be used successfully by all firms and should therefore be regarded as a mobile weapon rather than a strategic barrier. Although paper industry was not one of thirty investigated industries, the present study supports this notion in the context of printing papers: product differentiation can be an effective mobile weapon to improve the competitiveness of a printing paper company.

5.4.2 Managerial implications

Product differentiation in the printing papers' context is not a one, but a multi-dimensional issue. In Table 5.2 actions are suggested – what to take into consideration, avoid or strengthen – on the basis of the research findings. Recommended actions are only indicative because each product differentiation project is different from the starting point onwards.

Table 5.2: Product differentiation project: recommendations for management actions

IMPROVE	MAKE SURE that
• understanding of customers' earning logic • skills to identify a market gap • skills to position a new differentiated product into the market • skills to price a differentiated product • understanding of full potential of raw materials • utilisation of 'tacit' knowledge of demand chain • exploitation of a paper company's own core capabilities • agility of the organization • cross-functional learning opportunities	• the timing of market launch is right • product differentiation does not commence with incomplete technology • there is a system which enables signals to be captured and linked with business strategy • internal project experts are available • there will be a clear fit between a differentiated product and existing products • a capable project organisation is appointed before the product differentiation project starts • the support of top management exists • an effective cost control exists
MAINTAIN	**MAKE CLEAR that**
• customer focused strategies • knowledge pools • pools for products that are developed but not yet launched • expert use of available technologies • the system and resources to gather business, market and technology information • strong network with value chain partners	• pricing policy for differentiated papers exists • internal product policy exists • the price window available for a differentiated product can endure extra manufacturing costs • the rules as regards the use of internal expert resources exist

Successful product differentiation requires a broad skills and knowledge base, both internally within the corporation but also externally along the value chain. There must be many links and continuous co-operation between customers and suppliers, special help from consultants and also provocative comments from industry analysts.

Listed below are the factors which have been found in this study to have special importance in organising and managing aproduct differentiation project:

First, **we need a process for product differentiation** – starting from assessment of customers' needs and continuing throughout the value chain to raw material choices – with clear roles for each value chain partner.

We also need **a collaborative arrangement**, e.g. round table discussions to ensure all relevant value chain partners work together effectively.

Internally we need:

A specific strategy for product differentiation which should be marketing function led, in order to avoid shopping from one's own basket. This should be well **integrated within the overall business strategy**, well communicated and in line with the firm's product strategy and pricing policy. The marketer's important task is to identify those customers who are willing to pay a premium for a differentiated product. Schneider (1993) states in his doctoral dissertation (p. 74) that "organization which engages in product differentiation requires decentralization with considerable authority delegated to the people close to the customers."

The establishment of a core team of product differentiation experts led by an experienced 'senior champion' to open doors and to connect people, to promote the matter and to inform top level management of progress, and to pay attention to the cultural, social, psychological influences within the

collaborative process. A cross-functional 'product differentiation team' should contain the best experts for that purpose. It should also have an internal license to go wherever product differentiation is planned in the firm.

The nomination of a 'communication officer' for internal and external communication. This is important because of the broad internal and external network. To create value through product differentiation the customer must be made aware of the existence of these important and worthwhile differences.

Key measures of progress and success must be defined, targets set and clearly communicated and followed at senior level.

Continuously updated information on changes in the business environment, customers and competitors, and the area of paper machine and customer technologies – 'when-to-market' is key to the success of product differentiation.

Organisational agility and flexibility. While 'time-to-market' is important and each product differentiation case is different, flexibility and the mentality to search for new solutions and the capacity for continuous learning are also needed.

Differentiation strategy must be combined with strong cost control.

To summarise: It can be stated that the targets of this thesis have been achieved (Chapter 1.2): product differentiation in the context of printing papers has been described and a meaning for it given; product differentiation as a competitive advantage for a printing paper firm has been assessed; and recommendations on how to manage and organise a production differentiation process delivered. This all has been done in a manner which meets reliability and validity criteria required for a doctoral level thesis (Chapter 4.3).

6 Limitations of the study and directions for further research

Despite the holistic approach to the research topic, the study has some limitations.

First, although many actor groups within the printing paper industry value chain were represented in the study one actor group was missing: advertisers. They have a special role in a printing paper manufacturer's earning logic: they make a media choice. For researchers carrying out further research in this field, the inclusion of advertisers is strongly recommended. Further research could even begin with the investigation of potential consumers' media behaviour and their influence on the range and scope of product differentiation.

Another limitation is the Finnish approach. The results as such may not be applicable to areas where the skills base in the paper industry or the customer markets are very different. However, if a broader approach had been taken, the representativeness of the sample would have suffered as a result.

A lack of profitability data – due to confidentiality of information - on the differentiated product businesses is one of the main limitations of this study. The financial success of differentiated printing papers such as the development of profit margin by paper machine line could not be assessed. **The findings of this research, however, refer rather to gratuitous product proliferation than real value adding, long lasting product differentiation.**

Recommendations for further studies:

- What differences in paper technical properties justify the classification 'differentiated paper product'?

- The pricing of differentiated printing papers

- Knowledge management and knowledge transfer in the product differentiation process

- A printing paper classification system for global markets

- The substitution dynamics of printing papers

- Co-operation agreements between value chain partners: How should this co-operation be organised in a global company in order to be profitable and well manageable?

- The media behaviour of a future consumer.

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Appendix 1

The main printing and writing paper grades and their typical end-uses

	Paper grade	Typical end uses	The most common competing paper grades
MECHANICAL PULP DOMINATING PAPER GRADES			
Newsprint			
	Standard newsprint	newspapers newspaper supplements inserts and flyers	special newsprint papers (MFS product group)
Special newsprint grades	Improved newsprint	newspapers newspaper supplements inserts and flyers	SC-C rotonews
	TD papers	telephone directories other directories timetables	standard lightweight newsprint
	Colored newsprint	same as for standard newsprint	--
	Rotonews (mainly in North America)	newspaper supplements commercial printing low-end catalog	SC-C MFS papers
	MFS-papers (a wide range of uncoated mechanical pulp dominating papers)	newsprint supplements newspapers freesheets inserts magazines direct mail bulky grades for pocket and comic books	competing paper grades depend on end use
SC papers			
	SC-A+, SC-A, standard SC	rotogravure papers for magazines, catalogs, commercial printing offset papers for TV-listings, magazines, direct mail, supplements	ULWC FCO
	SC-B	low-end magazines newspaper supplements low-end catalogs	standard SC special newsprint papers
	SC-C	same as for standard newsprint and SC-B	improved newsprint rotonews SC-B
	Standard LWC	magazines catalogs inserts commercial printing	WFC FCO SC-A+ depending on an end use
Coated mechanical papers			
	ULWC	rotogravure printed catalogs in Europe, offset printed magazines in the U.S.	SC-A
	MWC	high-end special interest magazines catalogs direct mail other advertising	WFC
	HWC	high-end special interest magazines catalogs magazine covers direct advertising	WFC
	MFC	special interest magazines catalogs commercial printing books	LWCO SCO MFS
	FCO	special interest magazines catalogs	LWCO

CHEMICAL PULP DOMINATING PAPER GRADES			
Uncoated fine papers			
	Standard WFU	cut-size business forms envelopes direct mail books and manuals	competing paper grades depend on an end use
	Offset papers (a large variety of machine finished papers)	commercial printing books magazines catalogs	--
	Lightweight papers (low-weight offset papers)	direct marketing bibles dictionaries	--
Coated fine papers			
	Standard WFC (a large variety of coated chemical pulp dominating papers)	magazines (dominant in Europe) catalogs (dominant in the U.S.) direct mail books and manuals labels	high-bright LWC-, MWC- and HWC-papers art papers
	Low coat weight papers	books directories timetables brochures	--
	Art papers	THE MOST DEMANDING END USES such as illustrated books, calendars, brochures	--
Special fine papers			
	Copy papers	copying non-impact printing	--
	Digital printing papers (expanding variety of uncoated and coated fine papers)	manuals price lists direct mail low-volume paperbacks and hard-cover books	competing paper grades depend on end use
	Continuous stationary	listings custom-made forms	--

3. Different regional paper grade classifications

3.1 European paper grade classification

The paper grade classification of printing and writing papers detailed throughout this chapter follows the European system. The key classification criterion is the pulping method of the main fiber component. In this presentation, this means the distribution of mechanical pulp dominating paper grades and chemical pulp dominating paper grades. Alternative terms in use are "mechanical printing papers" and "woodfree printing and writing papers" for the same purpose. The present European classification is very production-driven and reflects more precisely, for example, the coat weight such as ULWC, LWC, MWC, and HWC papers. This is also true of coating methods as in the case of FCO and finishing technology such as in SC, MFC, and MFS papers. It can also happen that when a new paper grade is first given a name, for instance, the finishing method used at the time, it can later be manufactured according to a different method, but still reach the same quality standards. It is seldom that the actual grade name indicates its ultimate end-use such as a telephone directory (TD paper), for example. Additional determinants such as R in the case of SCR and O in the case of LWCO are used to indicate the printing method. (R indicates rotogravure, and O indicates offset. SC Cat describes the end-use application --- a sales catalog.) The main problem with the current classification system is that it does not show how well a product meets a customer's specific need. In practice, this is overcome through a close co-operation between suppliers and publishers and printers as well as merchants.

3.2 American paper grade classification

In the United States, coated printing papers are defined in a different manner. This classification is based upon the brightness of a paper and is numerical. Coated papers are classified according to the American Forest Products Association (AFPA)/15/:

Coated paper grade	Brightness (G.E.)
Premium	88 and above
Number 1	85.0 to 87.9 (inclusive)
Number 2	83.0 to 84.9 (inclusive)
Number 3	79.0 to 82.9 (inclusive)
Number 4	73.0 to 78.9 (inclusive)
Number 5	72.9 or less

Between Premium and Number 2 above, there are chemical pulp dominating grades. From Number 3 onward the amount of mechanical pulp increases. Dull, matt, and glossy grades are all classified according to brightness. The classification does not make any distinction between different finishing methods.

Coated paper meets the following criteria:

-- Papers that have a surface coating to improve the appearance and printing surface

-- Papers less than 50 lb in basis weight, with coat weights per ream (25 in. x 38 in. - 500) of not less than 2.5 lb per side with 50% or more of the added coat weight consisting of pigment

-- Papers 50 lb or heavier in basis weight with coat weights per ream (25 in. x 38 in. - 500) of not less than 4 lb per side with 50% or more or of the coat weight added consisting of pigment

-- Papers that are manufactured in basis weights up to 110 lb or to 120 lb if the weight(s) higher than 110 lb represents a continuation of the range of basis weights in which the grade is manufactured (25 in. x 38 in. -500).

3.3 Japanese paper grade classification

The Japanese printing paper classification follows another logic. It is based on dominating pulp grade (groups A and B) and the amount of coating (1, 2, and 3 after a letter) followed by brightness. "A" means chemical pulp dominating grades, and "B" mechanical pulp dominating paper grades. Numbers 1, 2, and 3 reflect the amount of coating followed by brightness/16/.

<Table 4.>

Coating	Japanese classification	European classification
Uncoated	Printing A	WF uncoated papers, 100% bleached chemical pulp,
	Printing B	Semimechanical printing papers, >70% bleached chemical pulp, brightness about 70%
	Printing C	Mechanical printing papers, 40%--70% bleached chemical pulp, brightness about 65%
	Printing D	Mechanical printing papers (standard)
	Printing E	Newsprint based on deinked pulp, even 100% DIP, used for comic magazines, often tinted

	Printing G	Supercalendered gravure paper coated
Coated	Coated A1	Art coated papers (triple coated), 84.9--157 g/m^2, mainly for sheet-fed offset, 20 g/m^2 coat weigh/side
	Coated A2	WF coated (double coated), 73.3--157 g/m^2, mainly for sheet-fed offset, 10 g/m^2 coat weight/side
	Coated A3	WF light coated (single coated), 58.7--157 g/m^2 (the main substance 64.0--81.4 g/m^2), mainly for heat set web offset, use in posters, catalogs and magazines, coat weight 5 g/m^2/side (WF "LWC")
	Coated B2	Mechanical coated papers (standard and improved), 60.2--81.4 g/m^2 (the main area up to 72.3 g/m^2), for both offset and rotogravure printed magazines, coat weight 10 g/m^2/side
	Coated B3	Mechanical coated papers (below standard), 60.2--81.4 g/m^2 the main area being 60.2--72.3 g/m^2, for offset and rotogravure, 5 g/m^2 coat weight per side
Slightly coated	Bitoko WF	Light WF coated, base paper: Printing paper A brightness; not less than 79%, supercalendered or machine finished, used for catalogs and magazines, coat weight below 6 g/m^2/side
	Bitoko 1	Light semimechanical, base paper: Printing paper B brightness; 74%--78% supercalendered or machine finished, used for catalogs and magazines coat weight below 6 g/m^2/side
	Bitoko 2	Light LWC, base paper: Printing paper B; brightness 68%--73%, supercalendered or machine finished, use in magazines and catalogs coat weight below 6 g/m^2/side, used for catalogs and magazines
	Bitoko 3	Light surface treated mechanical paper, base paper: Printing paper C; brightness 62%--67%, supercalendered or machine finished coat weight below 6 g/m^2/side, use in catalogs and magazines

Notes:

1. Uncoated paper grades from Printing A to Printing E all contain RCF to a varying degree, Printing E uses 100% RCF. In addition, real newsprint, which is sold to newspaper publishers, is not included in this classification but sold as a tailor-made, often surface-sized, product to a publisher.

2. Uncoated Printing G is locally produced only to the limited extent.

3. Coated A2, known also as "full WF coated paper," is the main WFC grade for printing and writing.

4. Coated A3 is the main HSWO grade for commercial printing.

5. Coated B2 also known as "premium LWC."

6. Bitoko WF is for the main part high-bright matt paper for publishing, better quality than in traditional MFC paper.

7. Bitoko 1 and bitoko 2 are known as "Japanese LWC papers."

8. Bitoko 3 comparable to standard SC offset paper regarding printed quality.

3.4 Printing and writing paper grade classification according to FAO

FAO classifications follow those contained in *Classification and definitions of forest products, FAO, Rome, 1982.* Two main categories are *newsprint* and *other printing and writing paper.* FAO classification for printing and writing papers is as follows/17/:

- Newsprint
- Other printing and writing paper
  - Coated printing and writing paper
    - Coated wood containing printing and writing paper
    - Coated woodfree printing and writing paper
  - Uncoated printing and writing paper
    - Uncoated wood containing printing and writing paper
    - Uncoated woodfree printing and writing paper.

The group "newsprint" is defined more precisely in the following manner:

641.1 NEWSPRINT: "Uncoated paper, unsized (or only slightly sized) containing at least 60% mechanical wood pulp (% of fibrous content), usually weighing not less than 40 g/m^2 and generally not more than 60 g/m^2, used mainly for printing newspapers".

The other main group "printing and writing paper" is defined as follows:

641.2/3 PRINTING AND WRITING PAPER: "*Other printing and writing paper.* Paper, except newsprint, suitable for printing and business purposes, writing, sketching, drawing, etc., made from a variety of pulp blends and with various finishes. Included in this group are such papers as those used for books and magazines, wallpaper base stock, box lining and covering, calculator paper, rotonews, duplicating, tablet or block, label, lithograph, banknote, tabulating card stock, bible or imitation bible, stationery, manifold, onionskin, typewriter, poster etc."

FAO's printing and writing paper classification differs from other known classifications in the respect that it also includes some special paper grades that, for example, have been assigned to special papers in this book.

3.5 Printing and writing paper classifications according to CEPI

Confederation of European Paper Industry (CEPI) classifies printing and writing papers and refers to them as graphic papers as follows/18/:

Newsprint: Paper mainly used for printing newspapers. It is made largely from mechanical pulp and/or recovered paper, with or without a small amount of filler. Weights usually range from 40 g/m^2 to 52 g/m^2 but can be as high as 65 g/m^2. Newsprint is machine finished or slightly calendered, white or slightly colored, and is used in reels for letterpress, offset, or flexo printing.

Uncoated Mechanical: Paper suitable for printing or other graphic purposes where less than 90% of the fiber furnish consists of chemical pulp fibers. This grade is also known as groundwood or wood-containing paper and magazine paper, such as heavily filled supercalendered paper for consumer magazines printed by the rotogravure and offset methods.

Uncoated Woodfree: Paper suitable for printing or other graphic purposes, where at least 90% of the fiber furnish consists of chemical pulp fibers. Uncoated woodfree paper can be made from a variety of furnishes, with variable levels of mineral filler and a range of finishing processes such as sizing, calendering, machine glazing and watermarking. This grade includes most office papers, such as business forms, copier, computer, stationery, and book papers. Pigmented and size press "coated" papers (coating less than 5 g per side) are covered by this heading.

Coated Papers: All paper suitable for printing or other graphic purposes and coated on one or both sides with minerals such as china clay (kaolin), calcium carbonate, etc. Coating may be by

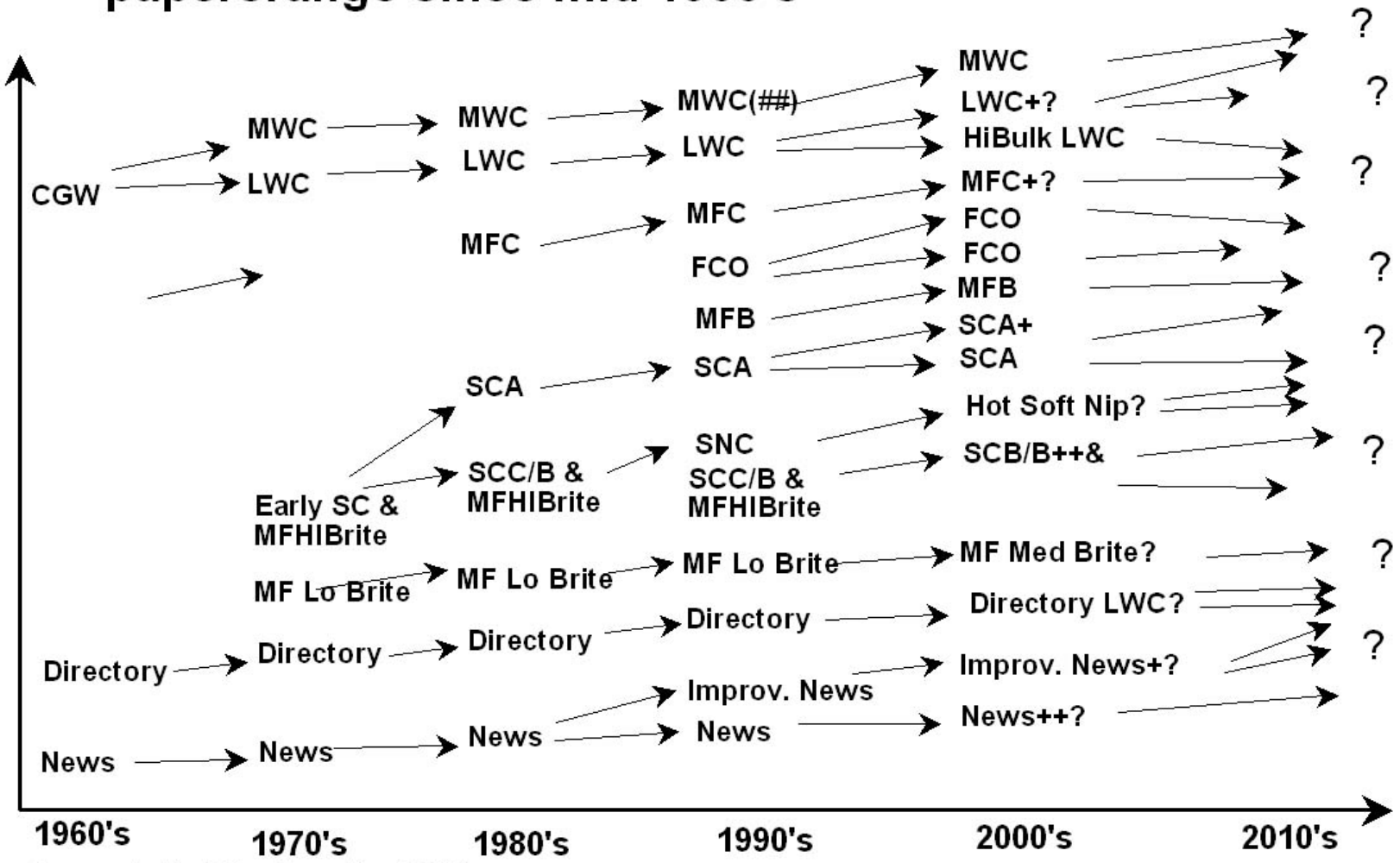
a variety of methods, both on-machine and off-machine, and may be supplemented by supercalendering.

3.6 Some comments on different classification systems

Different classifications cause problems and often confusion regarding the use of statistics. Regional classification systems are based on a local grade supply. Industry statistics are available such as those from official organizations, consultancy companies, industry analysts, and of course paper industry companies themselves following different classification criteria. One has to be very careful when comparing different statistics to avoid bad decision-making at its worst. Now that the number of paper grades is increasing, with classification being practiced on different grounds and with paper trade still globalizing, the situation is becoming even more difficult to monitor. Reference 10 provides additional information on different classification systems.

Source: Haarla (2000b)

Evolution of mechanical pulp dominating printing papersrange since mid 1960's



Source. Jaakko Pöyry Consulting (2001)

Appendix 2

Appendix 3

Ainomaija Haarla

Interview protocol
1.4.1999

Product differentiation as a competitive advantage in the printing paper industry

Background: Printing paper industry has traditionally followed 'cost leadership' – strategy, when producing mass products, that is standard paper grades. The recent increasing appearance of intermediary paper grades, however, indicates that at least some paper companies, also mass products producers – large companies in particular – simultaneously follow differentiation strategy. Does it reflect real changes in customers' demands and producers' active reactions to those demands? Are publishers and printers increasingly ready to contribute to the development of their own future paper range?

Capital intensive and – for the time being – increasingly cyclical paper industry has been advised by investors (and lenders) rather to buy than to build in order to increase shareholder value. So has it done and continues most likely to do so resulting in further consolidation and globalisation of the industry. But is there another, less capital intensive way to increase a company's value: to change – with the limited capital investment – incompatible production capacity to make more value added paper grades to meet diversifying customers' needs. Will the latter be a more often taken step in the future when increasing shareholder value in the printing papers industry? Is the appearance of an increasing number of differentiated printing paper grades an outcome of expanded knowledge pool, which the bigger companies have today?

The purpose of this study is to find out

- what are the primary driving forces and final motives for the emergence of differentiated paper grades
- what have been the success or failure factors of differentiated printing papers so far.

Definition:

Differentiated printing papers are all the other printing papers except std newsprint, std SCR and SCO, std LWCO and LWCR, std WFC and std WFU. Differentiated printing papers are for example improved newsprint grades, SC A+, SC Cat, SC A ++, SC B, SC C, MFC, FCO, WSOP, Gallerie Light and also printing equipment specific papers for digital printing. Standard grammage variations of printing papers are not included into this survey. The final end-use of a differentiated product is the main differentiation factor in this context.

1. Why an increasing number of differentiated paper grades is being born?

Beneath are listed some examples on alternative reasons for the emergence of differentiated products since 1985.They have been collected mainly from various publications, but also the writer's experience has been used:

1. customer need-based reasons:
1.1. new end-use applications (digi papers as recent example)
1.2. desired change of image of the printed end product
1.3. lower price
1.4. new end product feature
1.5. increasing mailing costs
1.6. environmental demands
1.7. legislation
1.8. more efficient use of printing machine investment (more effective use of invested capital, cold set grades for example)
1.9. new printing technology
1.10. other:

_____

_____

_____

_____

Comments:

2. producer-based reasons:
2.1. erosion of profits
2.2. uncompetitive quality;
level
too a large variation
2.3. available skills and capabilities;
2.3.1. - profound knowledge on customers' needs
2.3.2. - knowledge on various fibres and their behaviour
2.3.3. - knowledge and experience in changing product range
2.3.4. - other; _____
2.4. availability of raw material

2.5. price of a raw material
2.6. a need to level off changes in demand (in order to manage cycles)
2.7. a need to increase customer share and strengthen position through expanding product range
2.8. other:_____

Comments:

3. competitive products

Comments:

4. new technologies

Comments:

5. new minerals, new chemicals

Comments:

6. environmental pressures; organisations, pressure groups, legislation

Comments:

7. ideas from universities or research institutes

Comments:

8. chance

Comments:

9. other

What have been the primary driving forces and final motives?
Please, indicate the order of importance from 1 to 10 (1 = the most important, 10 = the least important) to the corresponding point on the list.
Give reasons and examples on differentiated grades, if possible.

2. What have been the preconditions for the emergence of differentiated grades? (for example simultaneous market pull and technology push)

3. What are the internal and external enablers?
(for example right personalities and supporting company culture/internal and value added to a customer/external)

4. What are the major internal and external barriers for the emergence of differentiated grades? (for example internal competition/internal and a 'laziness' of a customer = willingness to stick to a traditional way/external)

5. Give some examples on success stories

What have been the key success factors in these cases?

How can you best measure a success (or a failure), both financial and operational, in a case of an intermediary product? (for example ROI/financial and sold tonnes in five years/operational)

6. Give some examples on failures

What did go wrong?

7. What are the positive and negative implications of the expanding printing paper range? (for example differentiated products for differentiated customers' needs/positive and misleading statistics/negative)

8. Is an increasing number of differentiated products a direct or indirect answer to a challenge from the electronic media? Why?

9. Is an increasing number of differentiated products a direct or indirect reflection of increasing customer focus among producers?

Time	Person	Nationality	Industry	Function	Company	Remarks
5.3.1999	Kari Aarnio	Finnish	Association	Marketing	FFIA	P
	Representative					
10.3.1999	Kari Paavonen	Finnish	PI	IT	UPM-Kymmene	P
	Manager					
11.3.1999	Jyrki Ovaska	Finnish	PI	Production	UPM-Kymmene	P
	VP, LWC Product Group					
12.3.1999	Jouni Malmivaara	Finnish	PI	Purchasing	UPM-Kymmene	P
	VP, Materials Management					
20.3.1999	Markku Tuderman	Finnish	PI	RDTI	UPM-Kymmene	P
	VP, Research, Development,					
	Technology & Investments					
12.3.1999	Markku Tynkkynen	Finnish	PI	Production	UPM-Kymmene	
	VP, SC Product Group					
17.3.1999	Folke Lassenius	Finnish	PI	Marketing	UPM-Kymmene	
	Manager, Technical Marketing					
	(interviewed as the former manager					
	of a Finnish printing house)					
19.3.1999	Kari Aarnio (2nd interview)					
20.3.1999	Eero Haarla	Finnish	PI	Technology	UPM-Kymmene	
	Technology Manager					

Appendix 4

Time	Person	Nationality	Industry	Function	Company	Remarks
30.3.1999	Matti Haukijärvi	Finnish	PI	Technology	UPM-Kymmene	
	Director, Technology & Investments					
1.4.1999	Hans Sohlström	Finnish	PI	Marketing	UPM-Kymmene	
	VP, Printers & Brokers Customer Segment					
12.4.1999	Pehr-Eric Pått	Finnish	PI	Bussiness	UPM-Kymmene	
	Director, Bussiness Development			Development		
13.4.1999	Erik Ohls	Finnish	PI	Printing	UPM-Kymmene	
	Director,			Technology		
	Printing Technology & Customer Service					
14.4.1999	Eeva Jernström	Finnish	PI	R&D	UPM-Kymmene	
	Manager, Product Development					
20.4.1999	Pauli Hänninen	Finnish	PI	Mill Manager	UPM-Kymmene	
	VP & General Manager, Kajaani Mills					
20.4.1999	Markku Korpivaara	Finnish	Consulting	Market	Jaakko Pöyry	
	Consultant			Research		
20.4.1999	John Lindahl	Finnish	PI	Technology	UPM-Kymmene	
	Manager, Technology					
18.5.1999	Jussi Toikka	Finnish	PI	Business	UPM-Kymmene	
	VP, Marketing & Business Development			and Marketing		
				Development		

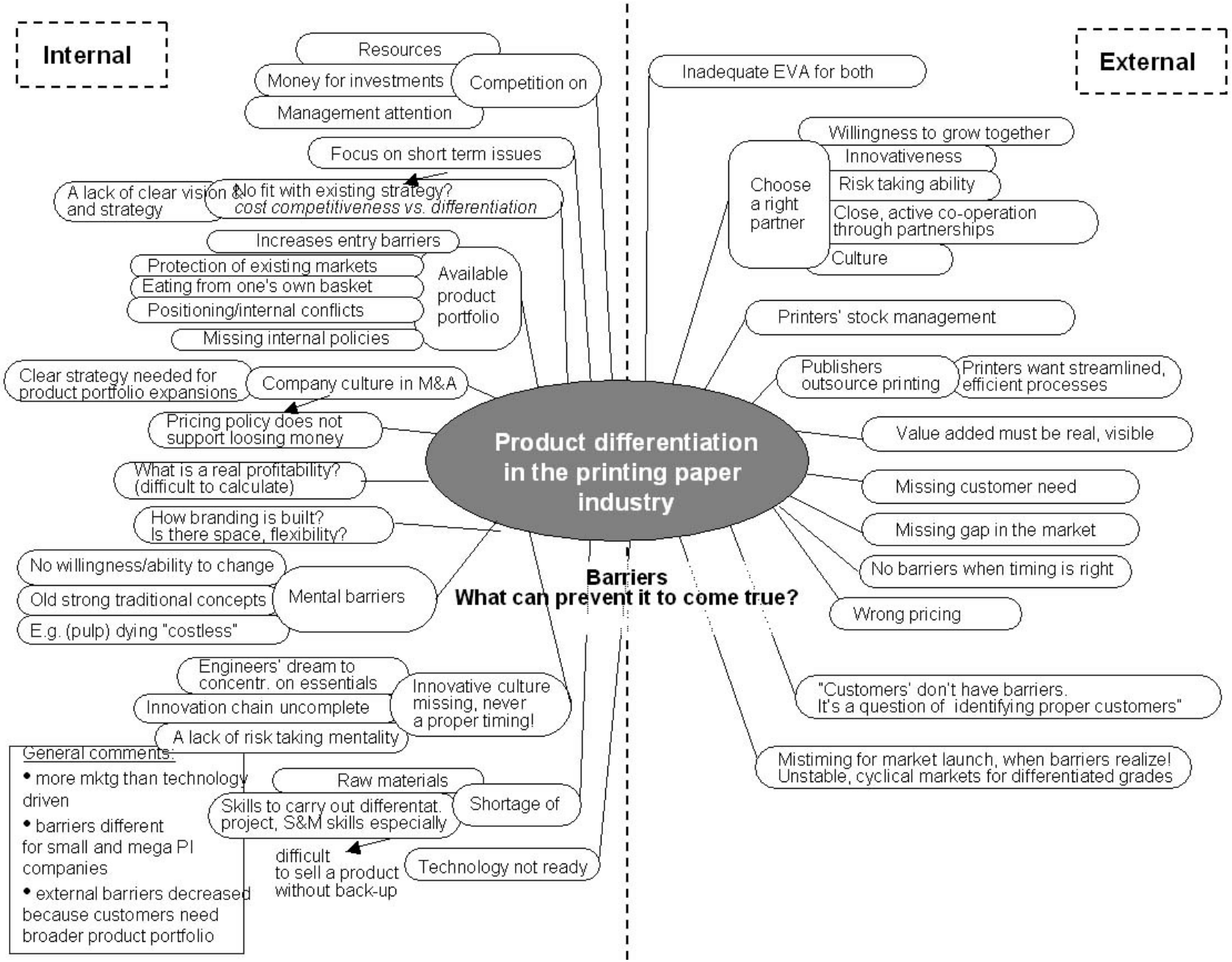
Time	Person	Nationality	Industry	Function	Company	Remarks
18.5.1999	Jussi Toikka (2nd interview)					
24.5.1999	Mikko Jokio	English	PI	R&D and	Stora Enso	
	VP, R&D and Environmental Affairs			Environment		
26.5.1999	John Taylor	English	PI	Marketing	UPM-Kymmene	WR
	Director, Technical Service					
26.5.1999	Robert Ashley	English	PI	Marketing	UPM-Kymmene	WR
	Manager, Technical Service					
14.6.1999	Martin Glass	English	Consulting	Consultant	EMGE	
	Partner					
23.6.1999	Dr Andre Helbling	Swiss	Supplier	Tech.Marketing	Dow Chemicals	WR
11.6.1999	Dr Stephen Wehlte	German	PI	Sales	UPM-Kymmene	
	Director, Newsprint Sales					
28.6.1999	Eero Turunen	Finnish	Supplier	Sales	Valmet	
	Senior VP, Sales					
27.7.1999	Malcolm Cooper	English	Merchant	Business	AWM	
	Director, Business Development			Development		
28.7.1999	Peter Miller	English	Publisher	Controlling	IPC Magazines	
	Divisional Paper Controller					

Time	Person	Nationality	Industry	Function	Company	Remarks
28.7.1999	Maurice Baker	English	Printer	Technical	Wiggins Teape	
	Technical Service Executive			Service		
5.10.1999	Osmo Kyttälä	Finnish	PI	R&D	Stora Enso	
	Director, R&D					
13.10.1999	Dr Heikki Hassi	Finnish	PI	R&D	Ahlström	
	Senior VP, R & D					
25.10.1999	Seppo Suuronen	Finnish	PI	Business	Stora Enso	
	Director, Business Intelligence			Intelligence		
26.10.1999	Rainer Häggblom	Finnish	Consultant	Management	Jaakko Pöyry	
	CEO					
28.1.2000	Dr Markku A Karlsson	Finnish	Supplier	Technology	Metso	
	Senior VP, Technology					
10.2.2000	Jyrki Mustaniemi	Finnish	Supplier	Marketing	Metso	
	Senior VP, Marketing					
4.9.2000	Jyrki Kettunen	Finnish	PI	Management	Metsä-Serla	
	VP, Company Futurist					
8.9.2000	Pertti K Aaltonen	Finnish	Banking	Research	Merita	
	Analyst					

Time	Person	Nationality	Industry	Function	Company	Remarks
20.9.2000	Päivi Miettinen	Finnish	Supplier	Business	Raisio	WR
	Business Development Director			Development		
20.9.2000	Jan-Erik Teirfolk	Finnish	Supplier	Product	Raisio	WR
	Product Development Director			Development		
20.9.2000	Dr Andrew Williams	English	Supplier	Business	Raisio	WR
	Business Development Director			Development		
26.9.2000	Christine Hagström-Näsi	Finnish	Research	R&D	Tekes	
	Research Manager		organisation			

P = preliminary interview (to prepare an interview protocol for final interviews)
W R= written response (and follow-up call by the researcher)
All other interviews were personal in-depth interviews by the researcher, duration of each from 1.5 to 3.0 hours.

PI = paper industry
FFIA=Finnish Forest Industry Association
AWM=Arjo Wiggins Merchanting


Internal
External
Product differentiation in the printing paper industry
Barriers
What can prevent it to come true?
Resources
Money for investments
Management attention
Competition on
Focus on short term issues
A lack of clear vision & and strategy
No fit with existing strategy?
cost competitiveness vs. differentiation
Increases entry barriers
Protection of existing markets
Eating from one's own basket
Positioning/internal conflicts
Missing internal policies
Available product portfolio
Clear strategy needed for product portfolio expansions
Company culture in M&A
Pricing policy does not support loosing money
What is a real profitability? (difficult to calculate)
How branding is built? Is there space, flexibility?
No willingness/ability to change
Old strong traditional concepts
E.g. (pulp) dying "costless"
Mental barriers
Engineers' dream to concentr. on essentials
Innovation chain uncomplete
A lack of risk taking mentality
Innovative culture missing, never a proper timing!
General comments:
• more mktg than technology driven
• barriers different for small and mega PI companies
• external barriers decreased because customers need broader product portfolio
Raw materials
Skills to carry out differentat. project, S&M skills especially
Shortage of
difficult to sell a product without back-up
Technology not ready
Inadequate EVA for both
Willingness to grow together
Innovativeness
Risk taking ability
Close, active co-operation through partnerships
Culture
Choose a right partner
Printers' stock management
Publishers outsource printing
Printers want streamlined, efficient processes
Value added must be real, visible
Missing customer need
Missing gap in the market
No barriers when timing is right
Wrong pricing
"Customers' don't have barriers. It's a question of identifying proper customers"
Mistiming for market launch, when barriers realize! Unstable, cyclical markets for differentiated grades

Appendix 5