

# GOING AGAISNT THE GRAIN: THE DEMATURITY OF THE EUROPEAN TEXTILE INDUSTRY

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## ABSTRACT

The paper investigates the process of transition of the European textile industry away from being a mature industry towards a more knowledge-based one. The European industry has fallen into what Abernathy (1978, 1983) termed the 'maturity trap' due to a number of different factors; firm inertia, the fragmentation of markets, increasing competition and regional and national business cultures. However, the findings also suggest that a number of companies have successfully circumvented maturity-trap and indeed shifted their capabilities from mature businesses to ferment phase. There is now a concerted effort at the EU and national level to rescue the European industry from the maturity trap based on innovation and entrepreneurial management at the level of the firm.

## INTRODUCTION

The European textile industry is at the onset of major industrial reconfiguration pioneered by the emerging developments in materials science and engineering, micro electronics and, more recently, micro and nanotechnology. We are witnessing a growing number of new textile products such as functional and smart textiles derived from the combination of textile and emerging technologies. The industry, which has been undergoing sever decline in the past five decades, remains representing around 4 percent (€70.4 billion) of the European manufacturing sector total turnover and 7.6 percent of manufacturing employment (2004).

Data on fibre usage published by the European Apparel & Textile Organisation in 2006 suggests that the industry is in the process of transition. It reveals that there is a gradual shift of fibre markets from apparel uses to technical/industrial markets<sup>1</sup>, yet at slow pace. In Europe, technical textile markets reached 7 percent of textile output in 1980's, 25.8 percent in 1998, 27.9 percent in 1999 and 26 percent in 2003 (Euratex, 2002, 2006). To speed up the transition process the European Union promoted €1 billion R&D funding (2007-2010) to conduct R&D activities in three focused areas set out in the 'European Technology Platform for the Future of Textiles and Clothing – A Vision of 2020': a) a move from

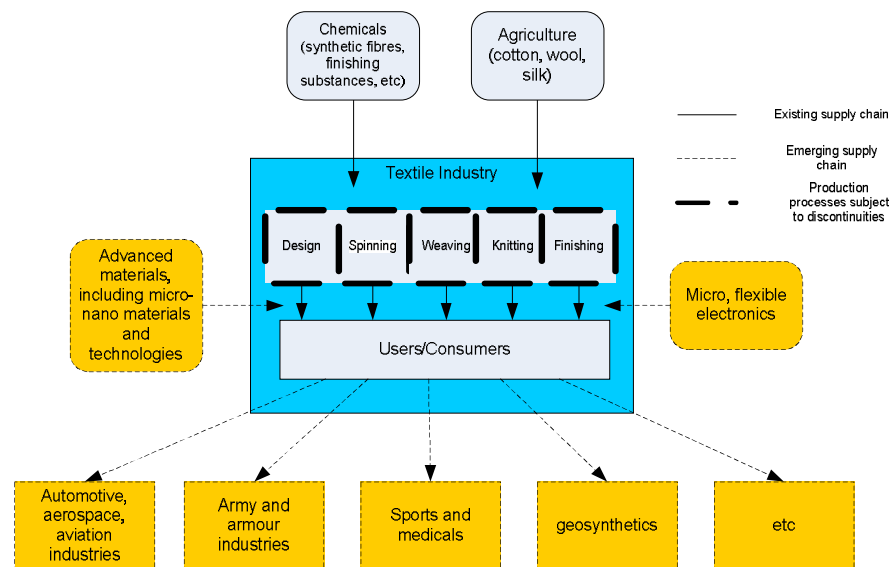
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<sup>1</sup> Technical textile is "textile materials and products intended for end-uses other than non-protective clothing, household furnishing and floorcovering, where the fabric or fibrous component is selected principally but not exclusively for its performance and properties as opposed to its aesthetic or decorative characteristics" (Textile Terms and Definition, The Textile Institute, Manchester, 10<sup>th</sup> Ed).

commodity fibres, filaments and fabrics towards speciality products from flexible high-tech processes b) the establishment and expansion of textiles as the raw materials of choice in many industrial sectors and new application fields c) ending the era of mass manufacture and moving towards a new paradigm of mass customisation, personalisation, intelligent production, logistic and distribution (Figure 1).

The technology platform will inexorably lead to fundamental changes in the industry e.g. knowledge and expertise, products and technologies, supply chain, market and marketing channels, and production processes, thereby ushering in new constraints, needs and opportunities in the industry. This is, however, potentially problematical having occurred in a mature industry which is characterised by mature technology and strong path-dependency in technology, markets and production processes. Moreover, the make up of the industry which is predominantly small and medium enterprises (95%) could be a burden for such an *industrial renewal*. Therefore, a profound study on innovation initiatives by textile companies in different European countries, the constraints and drivers, degree of innovativeness, is essential to uncover the multi-faceted nature of innovation process in textile firms. The findings are expected to contribute in driving the industrial transition forward.



**Figure 1. Reconfiguration of the textile industry**

Previous studies concerning innovation in the textile industry predominantly emphasize on the lack of innovative capability and entrepreneurship, in addition to unfavourable industrial organisation and government support, as the arguments for the downturn of the European textile industry. In strong contrast to these studies, this research is investigating in the manner in which *mature*, standardized textile firms have survived --and, moreover, thrived-- amid economic and technological changes in, e.g. the 1930's, 1950', 1970's and 2000's. Therefore, investigating the transition of strategy, technology, structure, product/market, and innovation in some textile firms, each of which has experienced transitions over a long period of time with *various degrees of success*, is expected to enhance our understanding on how certain firms manage to circumvent the "maturity trap". Thus, our programme is expected to make highly valuable contributions to industrial policy aiming for creating new industrial competition in the European textile industry as well as struggling sectors in general.

This paper is part of an ongoing PhD research project. In this paper, we present a brief theoretical framework and two case studies. This paper is organised in five sections. The next section presents the major theoretical frameworks this research is built on. Section three provides two case studies followed by discussion. The final section presents conclusions and implication of the research.

## **THEORETICAL FRAMEWORK AND METHODOLOGY**

Industrial maturity in different industries has been studied by a number economic and business historian scholars (e.g. Vatter, 1975, Owen, 1999, Abernathy et al., 1978, 1983, Lazonick, 1981, 1983). In general, the studies found that rapid industrialisation, technology standardization, new competition from lower-labour cost countries and organisational inertia contribute to industrial maturity. Standardization in a mature industry makes the productive units increasingly vulnerable to changes in technology, market preference, and relative prices. Indeed, it carries intrinsic threats of upheaval if there is a sudden or radical shift of those aspects brought in by new competitors, technologies, demand, regulations, etc. Industrial maturity is argued to be attributable to the loss of the British and US dominance in manufacturing industry, particularly for cotton and automotive industries respectively (Owen, 1999, Lazonick, 1981, 1983, Abernathy et al, 1978, 1983). Such a phenomenon is described as maturity-trap (Abernathy, et al., 1978, 1983) in which firms favour familiar technologies, organisational routines and markets in their search of improvement as a consequence of standardized technology, production system and other organisational routines. As a result, all players in the sector perceive competition in the same way, follow the same strategy to outperform each other in the area of implementation, largely in effectiveness and efficiency, which eventually has an effect on costs (Styles and Goddard, 2004). New product development is designed to improve the quality of the existing products with an improved cost-quality performance. Furthermore, such a trap is also about value and behaviour of the organisation and management. Success leads confidence which in turn creates stability. Stability often leads to the following occurrences: strategic frames become blinders; processes harden into routines; relationships become shackles; and values turn into dogmas (Sull, 2000). Moreover, profitable growth commonly leads to increased commitment of resources to the pertinent activities. The accumulation of technical system, managerial system, knowledge and skills, and values built on past success which had become the company's core capabilities at one time may be dysfunctional or inappropriate when changes are required as a response to changing environment (Leonard-Barton, 1992).

Industrial maturity is an inevitable course of industrial evolution. Efficiency is the priority in a growing market post dominant design (Abernathy and Utterback, 1978. As a result, standard operational procedures are developed to reduce all unnecessary activities. When such standards are proved to bring in success, it becomes solidified within the organisation. However, Abernathy et al., (1983) argue that maturity does not necessarily lead to decrease. Derived from a profound research in the US automobile industry, they argued that *manufacturing industry can arrest maturity and even, for some circumstances, reverse the process of maturity*. The framework which is referred to industrial de-maturity is a process in responding to significant, non-trivial environmental changes by which firms restore technologies back as

the competitive advantage. De-maturity has to be pioneered by ” *innovations that change an industry’s basis of competition at the same time that it disrupts established production competence, marketing and distribution systems, capital equipment, organisational structures and the skills of both managers and workers*” (p. 109). The search for new concepts typically works its way back up through the same design hierarchy established by the evolution toward maturity which preceded it. Consequently, the shift may require a long process because *the producers will take the less radical paths or non-core first before going to the more radical one* as changing toward the core concept is usually increasingly capital-intensive and requires new organization skills. Until they find that the less radical ones can not take them to a new competitive level, change in the core concepts is inevitable which may cause competence destruction of established firms. At this stage, the possibility increases for new entrants to introduce new concepts which renders substantial increase in the market share of small and/or peripheral firms. In brief, the logic of de-maturity is to undercut the established position of old technologies thus leading toward technological ferment and, over time, industry de-concentration.

Abernathy et al (1983) introduces the phenomenon of industrial de-maturity within which firms undergo technological transition resulting in revolutionary products for the existing markets or the creation of new industries as well as the reformation of the old ones. The study however does not investigate further the manner in which mature firms undertake technology and market transitions bringing the firms back to technological ferment phase at a new competitive landscape. Meanwhile, studies in the emerging ‘dynamic capabilities’ literature pioneered by David J. Teece (Teece, 1986, 2007, Teece et al, 1994, 1997) attempts to unveil the foundations of long-run enterprise success in rapid environmental change. Dynamic capability is defined as the firm’s ability to build, integrate and reconfigure internal and external assets to address rapidly changing environments. Dynamic capability defines the course of evolution of a firm as a consequence of chosen long-term competence development trajectory. Whereas the firm’s *asset positions determine its competitive advantage* at any point in time and its *evolutionary path constrains the types of industrial activities* in which a firm can be competitive, its *organizational processes* transform the capabilities of the firm over time.

In his latest study in the field, Teece’s view goes beyond the foundational approaches his early work was built on i.e. behavioural and evolutionary economics. He believes that economic change is not just about ‘adaptation’. More importantly, entrepreneurial ability of a firm to shape the business ecosystems through innovation and collaboration with the ecosystem stakeholders that continuously drive value creation is central to an organisation’s dynamic capabilities. Although the dynamic capabilities rooted in routinized behaviour are important, those created from entrepreneurial leadership are equally significant. The latter enables firms to sense changing markets and technological opportunities and threats, seize the opportunities and maintain competitiveness through enhancing, combining, protecting and, when necessary, reconfiguring the firm’s intangible and tangible assets.

This thesis attempts to combine maturity/de-maturity framework and dynamic capability framework in explaining the manner in which declining firms 1) are trapped in maturity and 2) de-mature themselves such that they find themselves competing in technology. A case study of the European textile

industry is selected since the industry is at the onset of major industrial reconfiguration pioneered by the development in materials science and engineering, micro electronics and, more recently, micro and nanotechnology. It is particularly interesting having occurred in a mature/traditional industry which has undergone severe decline primarily due to fierce foreign competition in the past five decades. To address the phenomenon under study, case study research method is proposed because of its dynamic nature. It examines the evolution of the textile industry in Europe, the trend in the industry which entails analysis of changing technology, market and competition, and firms' initiatives in responding environmental changes. In addition, the number of variables to be examined is large, all of which have complex mutual relationship among them. Quantitative methods do not provide the depth for researching the phenomenon closely and identifying the mechanisms by which the variables interrelate. Accordingly, four detailed case studies of four different companies in different countries in Europe with varying degrees of success in business and technological transition are presented. Different locations of the selected companies are critical to illustrate different evolutionary paths which should be addressed in the innovation strategy of the European the textile industry. Since a rigorous study require longitudinal investigation of firm abilities in responding changing environment, the selected firms have to have a long history of innovative activities and have been in business for more than a hundred years. These criteria will give us confidence that their innovative capabilities have been tested for a considerable period. Data are gathered from multiple resources including interview with relevant people in the selected companies and industry experts, business history articles and books, scientific journals, the companies' official information and statistical data.

## **CASE STUDY & DISCUSSION**

### **I. ITALY-MARZOTTO, S.p.A**

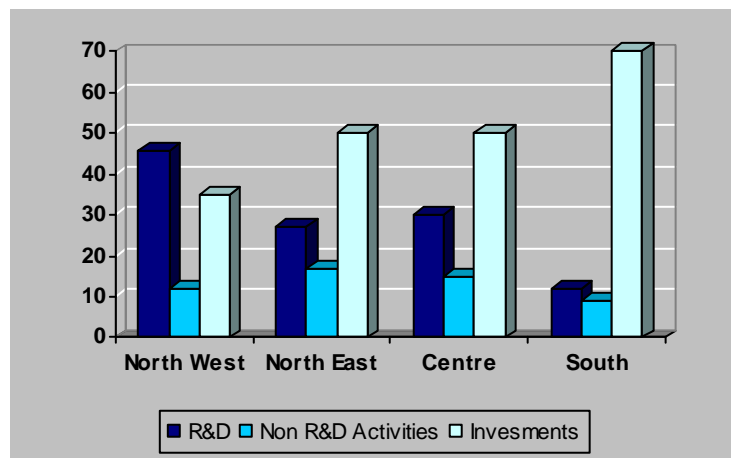
#### **Introduction**

Italy is a major textile and clothing producer in Europe. In 2006, the sector constitutes 25.5 percent of the total EU turnover and represents 37.3 percent of the total number EU textile and clothing companies. Up to now, the sector remains crucial to the country's economy representing 10 percent of the total turnover of the manufacturing sector, 7.1 percent of total manufacturing production, 11.4 percent of manufacturing employment, and contributing to no less than a quarter of commercial surplus in 2006 (Sistema Moda Italia, 2006). Despite the existence of textile making for hundreds of years, Italy is well-known for their high-end fashion brands which came later after the mid of the 20<sup>th</sup> century. The main products remain in traditional textile and clothing (82 percent in 2006), the markets of which has been eroding in the last decade. While other European countries e.g. the UK, Germany, the Netherlands have shifted their textile capabilities to greater technical contents and higher added value markets, Italy is trailing behind. Built on Abernathy's et al., (1983) framework industrial maturity, this section will examine the evolution of the Italian textile industry by focussing on the process the industry's maturity. To illustrate the framework, a longitudinal case study of one of the oldest and largest textile firm in Italy, Marzotto, S.p.A will be presented. The influence of industrial maturity, the local/regional/national

innovative culture, and the industry trend to Marzotto's strategic actions to enhance its competitiveness will be examined. The case study will demonstrate the manner in which maturity phenomenon occurs in a sector which used to be believed never reaching maturity given its distinctive characteristics. Furthermore, the study will enable us to observe the role of the nation's innovative culture and the industry trend to maturity-trap.

### **Innovative culture of the Italian textile industry**

Italy has frequently been cited as non-homogenous national innovation system (Iammarino 2005). Evangelista et al., (2002) group the country into four clusters in accordance to their innovative capacity and pattern of innovation. The north-west region of Italy is the centre of economic wealth and industrial orientation since the eleventh century. Industrial activities in this region are concentrated in three regions i.e. Piemonte, Lombardia and Liguria which also the centre of R&D-based innovative activities, and machinery and equipment industry. The second economic core of Italy is the north-east region. Clusters of manufacturing activities were established, mainly specialised in traditional-skill intensive sectors since the 1200's (Iammarino, 2005). Venetian clothing industry rose in the mid sixteenth century and reached the peak in the early seventeenth century before experiencing rapid decline due to competition with the English clothing industry. This region, particularly in Veneto, Friuli, Venezia, and Trentino shows rather strong propensity to introduce innovation yet accomplished with modest efforts of R&D. Firms in this region mainly innovate through acquisition of new vintages of fixed capital combined with activities such as design, trial production, and marketing (Evangelista, 2002). The region is also characterized by rather weak technology and R&D infrastructure, large presence of small companies with lack of technical capabilities, and technological self-references i.e. relatively sparse contacts the firms have with the rest of the country. Meanwhile, southern part of Italy is clustered as a region without innovation system, providing the grounds for their technological backwardness. Figure 2 illustrates the percentage of innovation expenditure of each region.



**Figure 2. The breakdown of innovation costs by macro-regional in Italy**  
Source: Evangelista et al., (2002)

An examination of the Italian textile industry in the 1980's and 1990's (Rolfo and Calabrese, 2003) suggest that R&D activities performed by textile and clothing firms did not play a key role in bringing about major innovations. R&D contribution to innovation in textile and clothing was well below the average figure of Italian industries. The purchase of new textile machinery was the most important aspect of the innovation process, followed by design and customer needs. At the level of the individual firm, a large number of the decisions which are likely to make or break its fortune must be taken in the areas of design and marketing

Lack of technical innovation in the industry can also be observed from the development of technical textile markets in the industry. Technical textiles are commonly associated with synthetic fibres and, more recently, composite and advanced materials. During the formation of synthetic fibre industry in Europe in the 1950's, Italy was not well-known for its scientific research tradition in this industry. However, through the 'conglomerate' Montedison, S.p.A, the result of merger between Montecatini, S.p.A and Edison, S.p.A, Italy became one of the largest producers of synthetic fibres, particularly acrylic, in Western Europe throughout 1950's until 1960's. Indeed, chemical (and synthetic fibres) was part of *Italy's economic miracle*. However, Italy's performance in this industry was, to a large extent, is influenced by the government's protectionism and heavy subsidies during the 1950's until 1965. By the late 1960's and particularly in 1970's the economic miracle became to slow down. It was mainly due to high wage settlements, increased inflationary price, and the loss of competitiveness of Italian exports. Among the European countries, Italy suffered the lowest productivity in the 1970's despite having an advantage of lower labour costs among the Western European countries. Protectionism and heavy subsidy policy ruled by the government exacerbated the condition. For instance, a number of companies built manufacturing facilities in the south region in order to receive the government's subsidies although with little commercial rationale (Fauri, 2000). In another case, the government threatened Montedison to suspend its subsidies if the company closed its obsolete plants in Piemonte or ceased cooperation in the development of a major fibre complex at Ottana in Sardinia. Consequently, the company had to operate at loss without the government aids (Shaw and Shaw, 1983).

The decline has never recovered (Fauri, 2000). It may be one of the arguments for Italy's slower growth in technical textiles compared to other Western European countries. Technical textile consumption in Italy was only 12.5 percent of the total Europe's markets in 2000 (Figure 3). The figure slightly decreased by 0.16 percent in 2005 and is predicted to remain steady until 2010 (Ciabatti, 2007). As to the production, Italy constituted 14 percent of total Europe's production in 2005, leaving the country behind Germany, France, UK, and Belgium. From the trade balance data in 2004, technical textiles constituted 19 percent in the textile sector or 9.4 percent for the total textile and clothing sector (Sistema Moda Italia, 2004). In terms of employment, in 2004 technical textile activity employed 6000 workers, constituting merely 1.1% of total employment in the textile and clothing sector, mainly located in Lombardia, Piemonte and Toscana. Majority of the workers were employed in the research, study and production of revolutionary innovations to be applied in the various sectors. Italy, however, recognises the importance of technical textiles for the future of its textile and clothing sector and has dedicated €3 billion billion in

2003 for the study of new solutions with forecasts of 20 percent growth per year. The attempts to improve their technical knowledge and skills in technical textiles are expected to enhance their capability in development new products and processes in more competitive markets. Italian current technical textiles remain limited to some traditional markets, mainly home textiles, clothing, and sports (Figure 4). The markets have been increasingly less competitive due to competition from producers in Asia (Ciabatti, 2007).

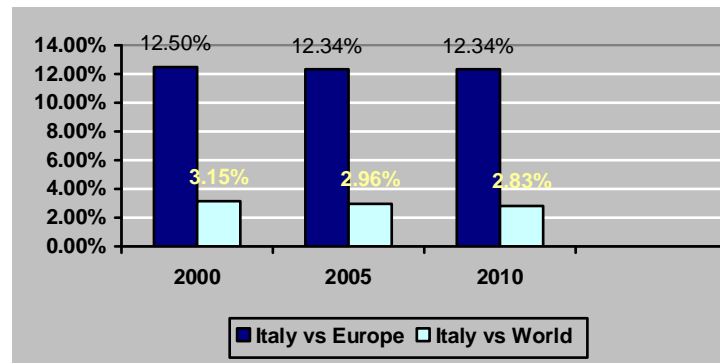


Figure 3. Technical textile consumption, Italy vs Europe and Italy vs the world  
Source: Ciabatti, 2007

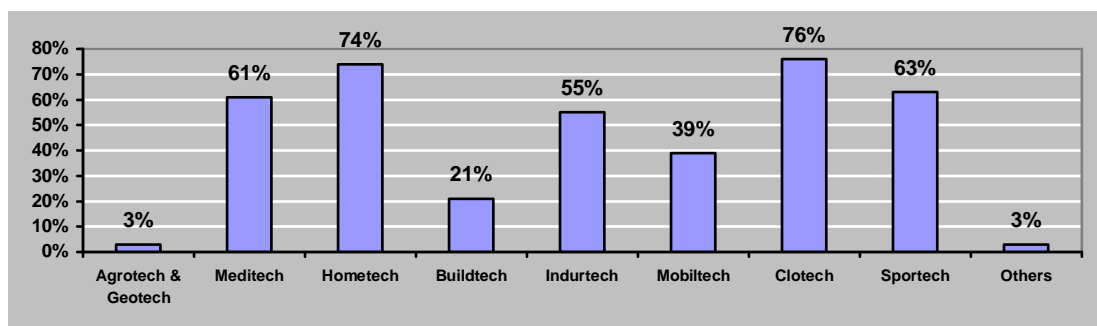


Figure 4. Technical textile production in Italy per sector of application  
Source: Ciabatti, 2007

## The Evolution of the Italian textile industry

### Prior to the 1950's – Mechanisation and integration of structure

The making of fabrics and clothing has begun since the thirteenth century in Italy but the mechanisation came by the mid of the 19<sup>th</sup> century (A'Hearn, 1998). The distinctive feature of the Italian industry, from the early formation, was its dependence on small, family-owned firms clustered together in districts which concentrated on particular segments of the market, such as Prato which specialised in wool textiles, and Florence in leather. Such an industry structure involved a high degree of co-operation among members of each network, while trade associations and other industry-wide organisations provided common services e.g. overseas marketing, research and training, in the respective areas (Owen, 1999). Such Marshallian external economies provided incentives for small firms to grow through flexible specialisation. Specialized skills, rapid exchange of information, and extensive sub-contracting enhanced locational advantages and kept transaction costs low (Belussi, 1993). Furthermore, the setting facilitated network growth and capitalized upon the commodification of Italian “style” i.e. broad product markets at

short production run. Thus, firms flourished by avoiding more price sensitive product lines, permitting them to be innovative and focus upon niche markets rather than economies of scale for efficiency (Guercini, 2004).

The structure, however, changed by the turn of the nineteenth century during which the unification of Italy was recently established and transport system between the north and south regions was built. Italian cotton firms began to integrate (backward or forward) and amalgamate resulting in increased population of integrated yet diversified firms. A large number of spinning firms, for example, produced several different yarns. Under the circumstances where demand was uncertain, such a structure was advantageous as it reduced one-firm-specific element of instability, e.g. demand shock for particular products. The structural shift was argued to be influenced by firms' strategic decisions to deal with changing technology (Lazonick, 1983). Unlike in Britain where the market for cotton was concentrated in Manchester and Liverpool, Italy, by contrast, did not have a special location for cotton-exchanges. Rather, cotton was shipped to Genoa, Venice, Naples and smaller ports. As a consequence, mills had to purchase raw cotton periodically, depending on where and when the cotton was shipped. Such condition forced them to purchase cotton at a large amount, permitting similar quality of cotton at each purchase but causing high inventory problems. In order to deal with the situation, firms imported ring frames and automatic looms (mainly from Britain), a rather modern set of equipment which worked at higher level of productivity and demanded less variety of cotton qualities. Thus, adopting ring spindles and automatic looms would solve the problems simultaneously i.e. increased productivity and lower inventory (A'Hearn, 1998). Since the optimum outcomes for using the two equipments could be achieved through an integrated system trades were encouraged to become integrated (spinning and weaving). As a result, since the nineteenth century to the 1950's, the concentration of vertically integrated firms increased (Antonelli and Marchionatti, 1998).

During the war, Italian textile manufacturers were hardly damaged. Difficulties in imports permitted local manufacturers to gain market advantages (White, 2000). As a result, textile and apparel makers grew in terms of size and numbers, mergers and acquisitions took place which may contribute to structural integration.

#### 1950's – 1980's Adoption of mass-production system, disintegration of structure

From the 1950's, Italian textile and particularly fashion industry began to embrace the "ready-to-wear" business as a result of America's influence in mass-consumption culture (White, 2000). Italy and the US had developed a close relationship in industrial organisation since after World War II during which the US provided financial support, progressive manufacturing methods and technologies as a part of Marshall Aid Programme, and, moreover, large market that were keen to adopt Italian style. Couturiers began to produce top-end ready-to wear collections by combining their famous craftsmanship with mass-production techniques. The products were exported to the US partly to repay loan given by the US government under the Marshall Plan and partly due to the relationship in between Italian craftsmen and American traders which began in the inter war period. The scale of market in the US was in fact the

primary attraction such that even couturiers were attracted to create ready-to-wear collection. As a consequence, the Italian textile and fashion industry was undergoing transition to large-scale, automated method of production (as opposed to craftsmanship for couturier collections), requiring them to import machinery and experts from the US. Such a major shift was permitted partially due to the standardization of textile machinery, pioneered by the US textile machine makers, to which the skills required to run the production system were embedded.

Large new markets and the mass-consumption culture in the US stimulated the Italian textile industry to rigorously improve their productivity. By 1964, 86 percent of Italian looms had adopted fully or semi-automatic machines compared with 37 percent in Britain and 69 percent in France. As a result, productivity increased by 350 percent and 400 percent for spinning and weaving respectively during the period (Antonelli and Marchionatti, 1998). Such aggressive technology adoption led Italy to be one of the most progressive cotton industries in Western Europe, outperformed their counterparts in Europe by 1987 i.e. nearly 60 percent higher than that of France and Britain (see Table 1). In the years of 1960-1987, total employment declined by 66 percent and the number of firms was halved. Meanwhile, the wool industry experienced similar rapid productivity growth. By 1965, Italy was spinning 90 kg wool per worsted spindle per annum compared to Britain which was only spinning 46 kg per worsted spindle per annum. Output of cloth per loom in Italy was 15,500sq.m whereas Britain was 10,000sq.m (Jenkins, 2003).

	Italy	France	Germany	UK	Austria	Switzerland
1962	55.8	74.2	65.1	n.a	68.7	64.4
1970	100.0	100.0	100.0	100.0	100.0	100.0
1980	138.1	120.0	138.1	114.6	147.6	147.5
1985	239.4	123.2	160.1	n.a.	189.2	221.7
1987	247.7	124.0	158.7	165.1	210.2	206.9
1962	100.0	152.7	143.0	-	133.7	133.7
1970	100.0	114.8	122.4	86.9	108.9	115.8
1980	100.0	99.7	122.3	72.1	115.9	123.6
1985	100.0	59.1	81.8	-	85.7	107.2
1987	100.0	57.3	78.3	57.9	91.9	96.6

**Table 1. Labour Productivity (1/HK) in cotton spinning in various European countries: indexes 1962-87**

Source: Associazione Cottoniera Italiana in Antonelli and Marchionatti (1998).

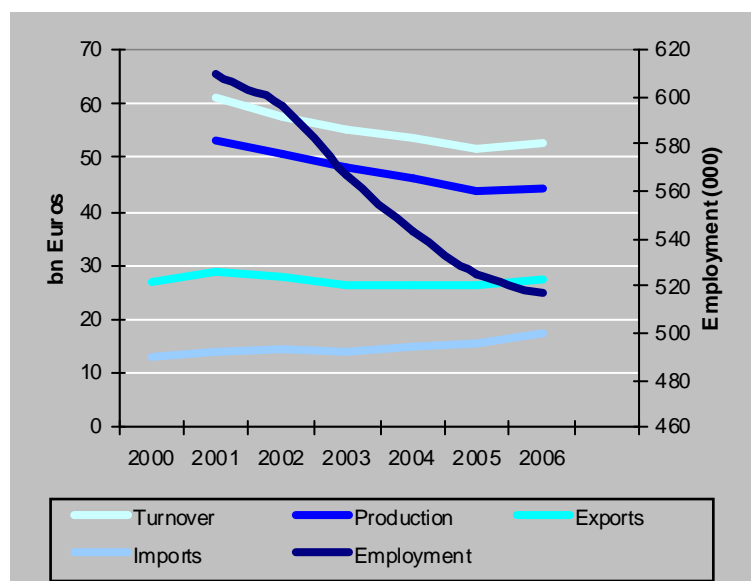
Note: 1/HK = the inverse of worker-hours (H) per kilogram (K) of product.

In contrast to that at the period of the late nineteenth century, the adoption of new technologies paralleled with radical changes in organisational structure in which specialised firms emerged together with vertical disintegration. The average vertical integration, as measured by the ratio of added total sales, declined from 42.8 percent in 1973 to 27.3 percent in 1986. Similarly, technical concentration shrank drastically (Antonelli and Marchionatti, 1998).

### 1990's-2000's – Enduring crisis

Following their triumph in the 1970's and 1980's, economic crisis hit the Italian textile industry because of greater competition in the single European market, reduction of protectionism in developed countries as a result of Multi-fibre Agreement and the Uruguay Round, and a new wave of international competition brought by new low labour-cost countries such as China and India. Since domestic markets

could not absorb the industry's total production capacity which had increased significantly as a result of mass-production system adopted in the 1950's, international markets were increasingly gaining importance over domestic markets. However, given their disintegrated structure, the majority of the companies were unable to operate efficiently in a larger, global international market and competition. Consequently, Italian firms were undergoing difficult times which have led to a decline in total production, number of firms, employment and the rate of innovation. Production underwent a steady decline between 1997 and 2006. Between 1990 and 2000, 80,000 of textile/clothing companies had disappeared, and an additional 13,594 companies between 2001 and 2006. The average employment decline between 2001 and 2006 was 3.26 percent per annum. Turnover also suffered from continuous decline between 2000 and 2005 whereas imports showed the opposite trend (Figure 5). Labour productivity grew at a much slower rate despite maintaining its leading position in the rate of modernisation over other Western European countries. Such circumstances encouraged the industry to search for innovations that allowed cost reduction and better coordination between production and marketing. The adoption of new information technology, which can be considered as a technological system, demanded a greater structural-integrated approach in order to exploit its full potential to gain significant productivity growth. Given their structure, Italian cotton industry has been experiencing organisational difficulties in introducing the new information technologies since the mid of 1980's (Antonelli and Marchionatti, 1998).



**Figure 5. The performance of Italian textile and clothing sector, 2001-2006**

Source: Sistema Moda Italia, 2006

Another argument with regard to the decline is the shift of power toward retailers. Guercini (2004) suggests that the fragmented structure remains viable as long as the majority of retailers in Italy remain independent and less concentrated. In contrast to the powerful retailers which more likely to source production overseas at large quantity by means of controlled distribution networks, independent retailers rather source their products domestically. As a result, it limits somewhat the buying power of domestic buyers in the commodity chain which, in turn, averts or, rather, delays the sector from

catastrophe suffered by the textile industries in other EU countries within a decade after World War II. However, it is becoming apparent that in Italy, following that in other European countries, the buying power of retailers/buyers has been increasing. This issue will be discussed in the following section.

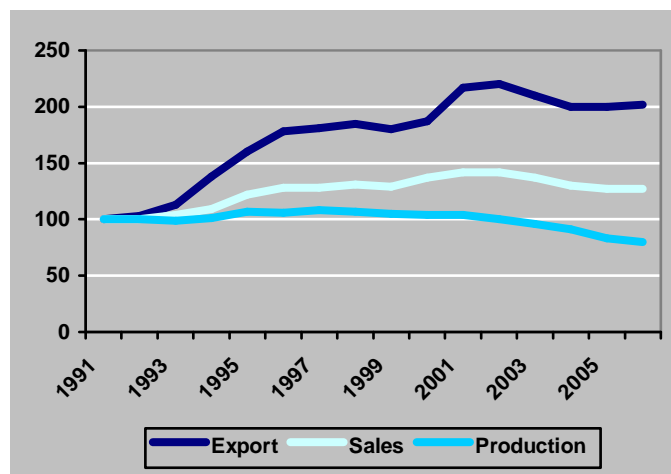
### **Italian Textile Industry – A Mature Industry**

The competitive advantage of Italian textile and fashion industry is believed to be rooted in its design flair, flexibility, and speed of response to changing customer demand as a result of its territorial networking system of trades (Owen, 1991). However, the distinct profile of the industry does not necessarily enable it to avert the economic phenomenon called “maturity” which has held back industrial growth in other western European countries. A number of events have indicated the occurrence of maturity. For instance, delocalisation of production has taken place since the 1990’s, especially in clothing sector while outward processing trade (OPT) has occurred more recently. Benetton, for example, has set up factories in Croatia, Hungary, Spain, and Portugal, Miroglio has been investing in Hungary and Bulgaria while Marzoto has established a plant in Lithuania, Tunisia and Czech Republic. The relocation decision is based upon cost, quality of labour force, and proximity factors. The latter is critical because rapid delivery constitutes flexibility, one of the industry’s main competitive factors. As an illustration, sourcing products from Eastern Europe permits 2-3 days of delivery in comparison with 45 days from Asia. Unlike their counterparts in the UK and Netherlands, Italy outsourced the more complicated tasks and high-quality products at the beginning while retained the production of simpler low value-added tasks at home. The rationale behind such an idiosyncratic strategy is that the former requires skilled labour that can be accessed at much lower costs in central or Eastern Europe whilst the latter can simply be mechanized at home (Taplin, 2006). It is expected that the delocalisation process will continue especially for mass-produced fabrics and clothing (Owen, 2001). As a consequence, the label “Made in Italy” which has been the country’s distinctive quality for decades could be deteriorated hence calling for a new competitive landscape for the industry to compete in the future. Another indication of maturity in the Italian textile and clothing industry is the increase of acquisition undertakings in the last decade. In 1999, 122 acquisitions took place which made up an increase by 107 percent from the year before. In 2000 and 2001, the number rose to 158 and 204 respectively. Consequently, the level of industry concentration increases which is a strong indication of a maturing industry (Abernathy, et al., 1983).

In an interview with the New York Times in February 2004, Moritz Mantero, the Chief Executive of Mantero, a fine silk producer in Italy, blamed the decline of the luxury good markets over the last eight years and China’s emergence as a cheap textile producer as the two factors that erode the Italy’s competitiveness. Marzotto S.p.A, one of the largest textile companies in Italy revealed that up to 1994, they operated all production functions in house; however, since 2004 50 percent of their wool is made in Lithuania or Czech Republic while 60-70 percent of their linen is made abroad. This condition has, in fact, began since the mid 1990’s when designer-driven trend became under pressure as a consequence of market change. Previously dominated by customers in Europe and the US, the markets spread farther across Japan, Russia, India, and China whose preferences were quality clothing at competitive prices. In

order to reduce price, producers had to reach the level of economic scale which entailed higher productivity and larger markets. To achieve such an objective, fashion houses began to perform market expansion aiming at market shares and produce second line collections. Consequently, two-seasonal-collection tradition had to be replaced with flowing designs all year around since the bargaining power shifted from designers to market demand. Such a shift indicates saturated markets, one of a few factors of industrial maturity (Abernathy, et al., 1983).

As demonstrated in Figure 6 the sales of the fashion industry have been undergoing a steady decline since 2001 while the production has plummeted by around 30 percent between 1997 and 2006. The figure also shows a steady increase in international markets which encourages international decentralization of retailers. Such a condition yields increased bargaining power of buyers/distributors/retailers in product sourcing and consumer preferences (Guercini, 2004). In order to ensure all supplies meet market demand, independent retailers have begun to source semi-finished textiles, clothing designs, and product branding, integrating their industrial capabilities backward. Moreover, the retailers continue to invest in point of sales tracking capabilities as do some of the more prominent manufacturers who have developed their own retail outlets (e.g. Diesel, Max Mara and Zegna). This permits greater coordination between production and sales and blurs the line between retail and manufacturing. In taking over what are essentially distribution functions, retailers are acquiring greater power over manufacturers, thus altering the symmetrical interdependences that traditionally sustained this sector (Guercini, 2004).



**Figure 6. The sales and production of the Italian fashion industry (1991-2006)**  
Index 1991=100

Source: Camera de Nazionale della Moda Italiana (Jan, 2006)

The industry in general still believes, however, that high-end apparel and accessories were safe in Italy despite increasing capability of Asian and African countries in catching up to what Europe can offer in sophistication and technology. Trade group representatives and company executives convinced that the worst of the decline may be over. By investing in new digital technology, new fabrics and other necessary requirements that will improve the speed of production and flexibility, Italian textile and fashion industry

will retain its competitive edge. As Moritz Montero said "If we are able to get at the essence of the needs of fashion designers -- luxury designers -- in a short time, this will fuel our longevity". This is Italy's secret" (Bruni, 2004). Unfortunately, this attitude reflects to the traditional school of thought of *transient economic misfortune* which was criticized by Abernathy et al (1983) as one of the causes of the decline of the US automobile industry. The Italian textile industry executives believe that by re-enforcing the current basis of competition, i.e. speed of production and flexibility, Italy's competitiveness will be restored. They do not consider that the change could be permanent as a result of shifted demand, technology and competition. Rather, they believe that the present difficulty is temporary, a result of sudden and unpredictable shifts in long-established competitive dynamics.

## **MANIFATTURA LANE GAETONO MARZOTTO AND FIGLI, S.p.A**

### **Introduction**

Marzotto S.p.A was founded in 1836 by Luigi Marzotto in the town of Valdagno (Vicenza Province, Veneto Region, North East Italy). He established a woollen mill with a capital of 2,000 Venetian Lire, the equivalent of nearly \$100,000 in the mid-1990s. In the 19<sup>th</sup> century, the company grew significantly, particularly after the unification of the Kingdom of Italy in 1861. The unification and improved transportation facilities permitted access to new markets both in north and south regions. Accordingly, expansion was necessary supported by the paced transition from an agrarian to industrial economy within the north east region. It encouraged Gaetano, the second generation of Marzotto's family to acquire a new spinning factory near Maglio in 1880. By 1866, the company had operated an integrated manufacturing facilities comprising of carding, spinning, weaving and dyeing. Towards the end of the 19<sup>th</sup> century, the wool industry had become one of Italy's largest industries, in terms of both employment and production, and enjoyed protective tariffs of up to 40 percent from 1887 to 1965. By the first three decades of the 20<sup>th</sup> century, under the fourth generation of the family, Marzotto's fabrics had reached across western and eastern Europe, Latin America and elsewhere. In addition to industrial wool, Marzotto involves with the production of linen and flax yarns and fabrics. In 1961, the company went public registered at Borsa Italiana (Milan) although the majority of the shares remain at the family possession.

In the 1970's, the textile industry in Europe began to fall into enduring crisis instigated by the mounted oil price. In 1972, Marzotto announced a loss of 6 billion lire. It encouraged the company to pursue designer clothing labels by creating their first moderately priced-menswear fashion label, Principe by Marzotto, in 1985. Henceforth, Marzotto has transformed itself from a textiles-focused company to a brand-centred stable of designer clothing labels. The course was strengthened by the acquisition of Hugo Boss in 1991 and Valentino in 2002 in addition to licensing agreement with Marlboro Classic, Gianfranco Ferre and M. Missoni. This high fashion clothing sector however was demerged from Marzotto group in 2005 after which to be managed under a wholly-owned subsidiary Valentino Fashion Group S.p.A. This demerger is said in favour of both individual sectors as they grow into two different directions hence requiring distinct management and markets.

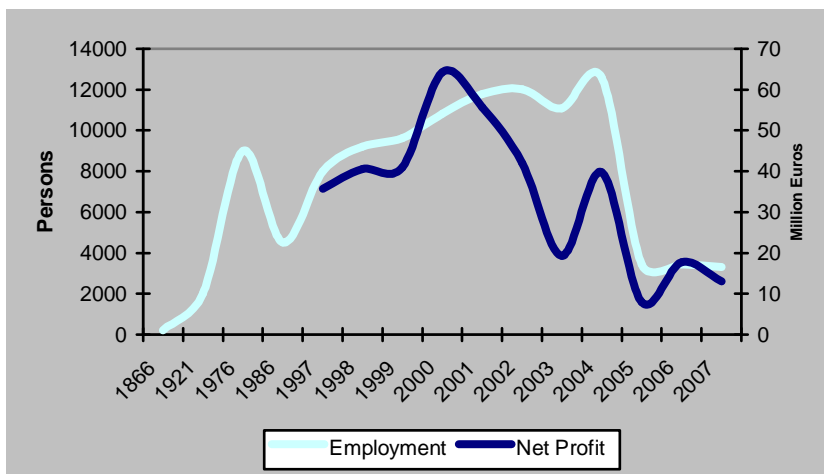
Within its 172 years of history, Marzotto has changed its appearance without betraying its original, historic direction, profiting from the culture of expansion and constantly updating its own aims despite the highs and lows of the general economic climate. It survived the lowest period of the European textile industry in the 1970's and 1980's by conducting major restructuring. During the period of 1972-1983 it improved efficiency by cutting more than half of employment and modernisation of machinery. Non-core or loss businesses were divested and aggressive approach to high-end apparel markets was launched. One of their main priorities was to be able to respond to multi-faceted markets and different needs, as well as to increase exports. During the same period, many European clothing and textile firms froze investments as they believed the crisis would irreversible. Such circumstances led the way for Italian goods, creative virtues, taste and intelligence to dominate European markets. The rise of Italian luxury fashion in the 1970's and 1980's and the emergence of Milan as one of the fashion metropolitan along with London, Paris and New York, brought in positive attitude toward the future of the industry. Such an achievement may influence the strategy of the textile firms in Italy in general. Hence, unlike Ten Cate, Marzotto did not pursue technical innovation leading to high-tech, higher added-value textile markets for their future. Rather, it is Italy's prominent image of high-quality and classy fashion was deemed to be providing unique opportunities for the company. However, globalisation of the fashion industry forced the company to gradually transfer the majority of its production overseas from 1993 onwards. The structure of the Italian textile industry, their craftsmanship, and the relatively lower labour costs may delay maturity. Indeed, when other European countries were relocating or closing down their textile businesses in the 1970's and 1980's, Italy was reaping the rewards of its investment. However, it is becoming apparent that changes in market preferences, maturity of textile technology, emerging competition from new countries, and increased domestic wages have changed the competitive position of the Italian textile industry.

### **Company size**

Marzotto has long been well-known as one of the largest textile & clothing companies in the world, and the largest in Italy. By 1866 the company employed 200 workers, the figure of which increased sharply to 2,000 and 9,000 by 1921 and 1976, respectively (Figure 7). From its early establishment, Marzotto had had carding, spinning, weaving and dyeing production facilities. Thus, unlike their counterparts in Britain and the Netherlands, Marzotto has been a rather vertically integrated firm from the early days.

Pietro Marzotto reduced employment from 9,000 in 1976 to 4,500 by 1986 as the global textile industry was hit by a sharp increase of oil price. The crisis led to the rise of the Far East's textile and clothing industry as the region became dominating the production of textiles and clothing. A series of restructuring and launching new markets was promoted by Marzotto in response to the crises. Between 1986 and 2000, the employment jumped by more than 100 percent as a result of active acquisitions and new market entries. From 2000 to 2003, however, as clearly seen from Figure 1, the company has gone to increase market shares yet at the cost of EBIT margins as the employment showed an upward trend whereas EBIT margins and net profit slumped. A temporary rescue came in 2002 when the company

purchased Valentino fashion. Nonetheless, EBIT margins could not match that of before 2000. In 2005, Marzotto's profits and employment underwent a sharp decline but, this time was caused by the demerger of high-fashion clothing sector and the subsequent restructuring and rationalisation. Some plants have been scaled down or discontinued since 2005 hence redundancies. The demerger and restructuring is expected to streamline the production and business process of the textile sector. In 2006, the company made higher profits though in 2007 it is predicted that it may suffer a slight decline.



**Figure 7. Employment (1866-2007) and net profit, (1999-2006)**

Note: Data in 2007 is provisional

## Product and Market Trajectory

### Yarns and Fabrics

Gaetano Marzotto, Jr, the fourth generation of Marzotto family in the textile business, is characterized as "an authentic founder of the family business." Under his leadership, Marzotto survived during the Great Depression which took place in between the two world wars. In fact, he was successful in modernizing and expanding the operation during the fascist-dominated government. The company was able to open another worsted woollen mill and new foreign markets e.g. Eastern Europe, Latin America, and Mediterranean regions. Italy's lower labour costs relative to other countries in continental Europe and Britain allowed the company to capitalize during this period.

In 1935, Marzotto bought 1,000 hectare of farm from Stucky family by which it supplied wool to its own textile mills. This farm acquisition allowed the company to integrate backward to secure the supplies of raw materials. The period of late 1950's to the early 1960's, during which Italy was experiencing unprecedented economic progress, witnessed the company's first attempt to enter American markets. As part of the Marshall Plan, Italian textile industry received loan to buy cotton and wool raw materials from the US in 1945. The repayment was arranged through exporting finished products to the US. Marzotto, as one of the largest textile firm gained substantial advantage from the Plan and made considerable profits during 1940's and 1950's (White, 2000). The trade to the US continued after the 1950's.

The shock of oil price in 1973 and 1979 caused high inflation. Inflation went to hyperinflation combined with slow economic growth in the 1980's. The circumstances forced the company to improve productivity by installing more advanced equipment and machinery and significantly reduce employment. The economic stagnancy rendered a large number of companies in difficulties. Under these circumstances, opportunities came for acquisitions. In 1985, Marzotto acquired the struggling FinBasetti Group, one of the most important Italian textile groups. The purchase included controlling interest in Linificio e Canapificio Nazionale, a linen yarn producer, and Mascioni, a leading textile printing and finishing company (the majority shares were sold to Zucchi Group in 1988, remaining 28.3 percent to Marzotto family). It took them two years to integrate the new operations into their existing system. In 1987, they acquired a state-owned Lanerossi Group, a woollen yarn and fabric manufacturer, which boosted its total revenue by 72 percent and became the first fully integrated wool producer, incorporating from the sheep raisings to suit making. Two years later the company purchased LeBlan&Fils, a linen yarn producer from France, and Biella-based Lanificio Guabello woollen mill in 1991.

Pressure from new foreign competition forced Marzotto to relocate production to lower labour cost countries. It opened a subsidiary linen factory, Filin in Tunisia in 1993. During summer 1994, it acquired the wool factory Nova Mosilana in Brno in the Czech Republic in order to focus on combed textiles made of pure wool and to build a bridge with Eastern markets.

After the demerger of the clothing division, Marzotto undertook major restructuring, rationalisation, as well as expansion throughout 2005-2007. It initiated a joint venture with Verzoletto S.p.A commencing from 1<sup>st</sup> July 2005 for manufacturing woollen yarns made for pure wool, acrylics blends, and carded knitwear. The promotion of market expansion to emerging markets e.g. India, China and Russia was intensified by establishing cooperation with Itochu, a Japan's textile dealer and Youngur Group, a textile manufacturer based in China.

### High-end fashion clothing

High-end fashion industry in Italy was closely related with textile manufacturers. Indeed, large textile manufacturers sponsored the designers financially to develop and design clothing made from their fabrics starting from 1952. Marzotto began its relationship with fashion designers by sponsoring some fashion houses such as Rivella and Pucci, in 1952. The close relationship with designers encouraged them to integrate forward to clothing manufacturing. By 1973, Marzotto had exported its apparel collections to the US. Later on, however, intensified competition in consumer textiles and clothing as well as the rise of Italian luxury fashion industry encouraged Marzotto to gradually shift its image from traditional –style clothing to upmarket fashion commencing in the mid 1980's. The company first penetrated the designer market in the 1986 by launching M. Missoni under licensing agreement. A major turning point in this division came in 1991, when Marzotto paid Japanese investor Akira Akagi ITL 200 billion (around €103.44 million) for a controlling interest (50.7 percent) in Hugo Boss, German's largest manufacturer of menswear. The purchase was considered as a threefold success: it extended Marzotto's global reach, further strengthened Marzotto's primary textiles business, and added a widely recognized, high-end brand

in to their brand portfolio. The company continued to expand its label through out the 1990's both through licensing (Gianfranco Ferré Studio, GFF Gianfranco Ferré, Gianfranco Ferré Forma, M. Missoni, Marlboro Classic) and its own labels (UomoLebole, UL Trendy, Borgofiori, Marzotto Lab).

Marzotto announced to relocate 40 percent of its clothing production overseas starting from 1993. Consequently, it had to cut jobs more than 600 in Italy, close one of its local clothing plants in 1993 and complete the purchase of 90 percent stakes in Czechoslovakia's Nova Mosilana in 1994. In 2000, Marzotto purchased an 84.4 percent stake in Litekas and Calw, AB, a Lithuanian woollen garment manufacturer. The acquisition permitted the company to shift part of its textiles production to the lower-cost countries. Despite the efforts, increased competition from the Far East eroded the company's profitability from all units but the highest-end of the textile markets. It encouraged the company to expand its high-end fashion business by purchasing the struggling Valentino in 2002 for € 133.5 million. The company was successful in implementing a revitalisation strategy for Valentino by launching a new label Red to capture the emerging youth market.

When Marzotto transferred Linificio e Canapificio Nazionale, its main linen subsidiary, to Zignago in 2003, the family owned company, many people concluded that Marzotto was going to concentrate on high-fashion business. Concurrently, Hugo Boss made healthy profits while Valentino showed stronger growth. However, the complexity of managing two business sectors each of which require different management, marketing, and strategy forced the company to demerge the fashion clothing business to become an independent company in July 2005. The new company emerges from the demerger is named Valentino Fashion Group, S.p.A, to which the entire Marzotto's fashion brands including Hugo Boss and other licenses are transferred. Marzotto, S.p.A itself stays focusing on the high-end textile business.

## **Strategy**

Within its extensive history, Marzotto has undergone two major transitions. The first was in the 1980's-1990's during which the company began to embrace higher-end textile and fashion markets as a response to the textile industry crisis. The transition took place in two phases. The first step was competition reduction and expansion by acquiring competitors such Basetti group, Linificio e Canapificio Nazionale, Lanerossi Group, and Guabello, four major textile groups in Italy. The second phase was the period of forward integration to control end users through acquisition and licensing of high-end fashion brands and establishment of subsidiaries in the US, France and Japan. The second transition is in fact underway initiated by the demerger of clothing sector in which Marzotto remains the major shareholders. Marzotto conducted major restructuring and rationalisation throughout 2005-2007, began with a joint venture with Verzoletto S.p.A which resulted in Europe's largest wool production by volume. Marzotto argues that the joint venture would enable optimisation of cost structure, maximum competitiveness and customer service through better use of manufacturing plants, integration of the product range, and streamlining of marketing and sales. This strategy is believed to be beneficial in an environment characterised by hyper competition due to structural overcapacity of production. A number of production facilities have to be discontinued because of low capacity utilization or being transferred to other facilities

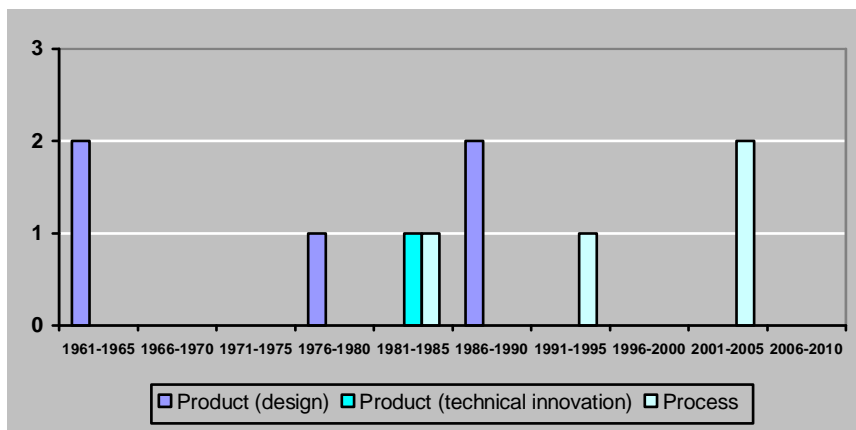
in lower-cost countries. For example, woollen combing in Mortara and finishing plants in Schiowere were closed in 2005 and 2006 respectively while parts of the operations were transferred to Nova Mosilana. Moreover, the operations at the headquarter (Valdagno) were downsized and transferred the tops spinning and dyeing operations to Czech Republic. Such undertakings cause redundancies of more than 627 jobs. In July 2007, Marzotto S.p.A withdrew their shares from Mercato Telematico Azionaria.

In an interview with Industry Europe Magazine after the demerger, Giorgio Todesco, the director of Marzotto Textile Division, emphasized the company's strong commitment in innovation and R&D in textile products, processes and procedures to support their businesses and brands. The R&D and innovation are developed to support materials sourcing (e.g. fine, high quality wool and cotton), new combination of fibre blends, (e.g. the mixture of cashmere, wool and silk), and innovative weaving and spinning processes. The entire activities are designed to maintain the luxury, elegant and opulent-feel image the company has long been renowned for. In production, they combine old and new spinning and weaving techniques to create unique products. Mr. Todesco believed that their strong presence across the globe would support their goals in dominating new markets, especially India, Russia and China, within five years.

Despite undergoing major transition, Marzotto remains in the same business as it was 172 years ago yet in a far greater scale involving high-tech machinery and various brands. The company began its business with rather vertically integrated production facilities which remain up to now yet being relocated to a few countries. The company's strategy to embrace high-fashion clothing sector in the 1980's and 1990's was proven to be exceptional decision for the company's profit. It had supported a strong growth in terms of company's size whilst creating complex organisational structure. However, in such a hyper competitive market like today, complexity is the last thing the company needs. Hence, its strategy to demerge the clothing sector to streamline the organisation may enable them to create new growth for both sectors. Prof. Enrico Beltramini, an expert in Italian fashion industry who sits on the board of Gucci Group in the 1980's presumed, however, that the demerger was rather motivated by opportunity than strategic decision. Under Marzotto's management, Valentino was able to improve its financial performance and make profits for the group. Thus, the management might consider it was the right time to sell the business especially when the shares were valued at €2.6 billion in 2007 by Permira Advisers, a financial group company based in London. Given the slump of luxury fashion business in the last five years, it may be a good decision after all.

## **Patent**

Marzotto's patent portfolio shows a modest number of new product innovation achieved by extensive technical innovations. Indeed, the only technically-enabled product innovation shown in the database is electric woollen blanket within which electrically-conductive elements are embedded. The rest of the patents are related to treatment of wool fibres and product designs.



**Figure 8. Patent portfolio**  
Source: European Patent Office

## DISCUSSION

Historical studies of the Italian textile industry illustrate the stability of the industry which had remained since the early 19<sup>th</sup> century. The stability, however, has been interrupted by increasing industrial turbulence in the last decade. The dominance of the ‘Italian style’ peculiarly characterised by a craft model of organisation and flexible-embedded network within industrial district boundaries appeared to be diminishing. Such peculiar characteristics were argued to have enabled the country to avoid competition on cost and scale in the past 50 years which were the key characters of mature industry. However, it became apparent in the last decade that the argument is contestable (Guerrieri and Pietrobelli, 2002, Whitford, 2001, Djelic and Ainamo, 1999). Ainamo and Djelic (1999) believe that the decline is a consequence of globalization, acute competition, technology revolution, and increased customer sophistication.

### Industrial maturity and local search

The case study reveals that maturity in the Italian textile industry is imminent. The case study finds that the decline of the Italian textile industry is not only a consequence of standardized production system which in turn invites new competition from lower-cost countries. Rather, it is a complex interaction among peculiar local/regional/national innovative culture, industry trend, and historical legacies, at one side, and organisational capabilities at the other. Such an interaction creates opportunities and constraints which subsequently determines an organisation’s trajectory in responding environmental disruption (Table 2). In the case of Marzotto, it appears that Marzotto is falling in to maturity-trap. We elaborate this argument as the followings.

Marzotto S.p.A was born in Vicenza province of Veneto region. As described earlier, the innovative pattern of this region shows rather weak R&D activities and infrastructure partly due to the business population which is predominantly inhibited by small firms with lack technical capabilities, and strong legacies of traditional-skills and craftsmanship. Such a traditional character remains inside Marzotto’s management approach throughout its inexistence. Mr. Todesco said that the company’s approach to innovation is rooted in “the love of art” for which creative blends of different fibres and a

Year	1900- 1920's	1930's-1940's	1950's – 1960's	1970's – 1980's	1990's – 2000's
Technological change					
Machinery/ Process innovation	Ring frame		Auto ring frame; Projectile	OE rotor spinning; Shuttle-less loom; Jet; Electronic Jaquard weaving; Information technology for flexible manufacturing system	Lean retailing model, nano-based finishing process
Product innovation	Cellulosic man-made fibres	Synthetic fibres	Technical textiles	High Performance Fibres; Functional textiles	Multifunctional textiles; Smart textiles;
Textile industry trend in Italy	<ul style="list-style-type: none"> <li>Italy adopted ring frame faster than other European countries.</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>	<ul style="list-style-type: none"> <li>The height of synthetic fibre industry. Production jumped by nearly 1800 folds.</li> <li>New technical know-how and equipment in mass-production techniques imported from the US as part of Marshall Plan</li> </ul>	<ul style="list-style-type: none"> <li>Inflation hit the whole industry due to sharp increase in oil price and labour costs.</li> <li>Extensive restructuring, greater technological flexibility.</li> </ul>	<ul style="list-style-type: none"> <li>A further increase in wages</li> </ul>
Market change	<ul style="list-style-type: none"> <li>Growing market as a result of unification of Italy (1860)</li> </ul>	<ul style="list-style-type: none"> <li>Italian couture began to gain market as French and English couture was unavailable during the war.</li> <li>Begin international market expansion</li> </ul>	<ul style="list-style-type: none"> <li>Export textiles to the US</li> <li>The beginning of Italian fashion industry sponsored by large textile manufacturers.</li> </ul>	<ul style="list-style-type: none"> <li>The rise of Italian luxury fashion</li> <li>Market expansion in ready-to wear markets in the US.</li> </ul>	<ul style="list-style-type: none"> <li>Crisis hit Italian textile due to: MFA, competition from emerging countries.</li> <li>Market expansion to emerging markets (India, China, Russia)</li> </ul>
Competition change	<ul style="list-style-type: none"> <li></li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>	<ul style="list-style-type: none"> <li>Productivity and competitive crises due to increased labour cost, sharp rise in material costs, obsolete plants and competition from the Far East</li> </ul>	<ul style="list-style-type: none"> <li>A wave of mergers and acquisitions</li> </ul>	<ul style="list-style-type: none"> <li>A wave of merger and acquisition in the luxury fashion industry.</li> <li>Relocation to North Africa and Eastern Europe.</li> </ul>
Structural change	<ul style="list-style-type: none"> <li>Increasing number of vertically integrated firms.</li> </ul>	<ul style="list-style-type: none"> <li>A few large companies emerge as a result of mergers and acquisitions</li> </ul>	<ul style="list-style-type: none"> <li>Forward integration to clothing manufacturing</li> </ul>		<ul style="list-style-type: none"> <li>Declined total production, number of firms, employment and rate of innovation.</li> <li>Increased buying power of buyers</li> </ul>
Marzotto Initiatives	<ul style="list-style-type: none"> <li>Capacity expansion by means of buying the latest technology and opening new mills.</li> <li>Invest in transportation companies to link plants to the main rail line.</li> </ul>	<ul style="list-style-type: none"> <li>Integrate backward to control wool supplies.</li> <li>International market expansion to Europe, Eastern Europe and Latin America</li> </ul>	<ul style="list-style-type: none"> <li>Adopt mass-production system imported from the US</li> <li>Installed the first “made in Italy” computer, ELFA 9003</li> <li>Sponsor some fashion designers which become the embryo of its fashion industry</li> <li>Enter the US textile markets</li> </ul>	<ul style="list-style-type: none"> <li>Integrate forward to produce moderately-priced clothing line</li> <li>Restructuring, cutting down nearly half of jobs.</li> <li>Modernisation of equipments to improve productivity.</li> <li>Reduce competition by acquiring competitors (FinBasetti group) and Lanerossi</li> <li>Acquire LeBlanc&amp;Fils, Biella.</li> <li>Starting designer label business through licensing.</li> <li>Export apparels to the US</li> </ul>	<ul style="list-style-type: none"> <li>Intensify production off-shore</li> <li>Acquire Guabello.</li> <li>Acquire menswear label Hugo Boss</li> <li>Adopt ICT to improve supply chain management.</li> <li>Improve equipment with the latest rapier and air jet weaving to improve design and production flexibility.</li> <li>Develop new products: Natural Stretch, Plasmato, Microwool.</li> <li>Open new markets for high-end sport apparels.</li> <li>Expansion to emerging markets</li> <li>Acquire Valentino</li> <li>Demerge fashion clothing sector</li> </ul>

**Table 2. Marzotto initiatives toward environmental changes**

combination of new and old spinning and weaving techniques are developed to satisfy a wide range of markets. The region is also characterised by considerable investment in the latest fixed capital, primarily from local/national suppliers, combined with activities such as design, trial production, and marketing (Evangelista, 2002). Such a pattern is noticeable in Marzotto's pattern of innovation. For instance, the company installed the first computer made in Italy, ELFA 9003, in 1960. Instead of purchasing the machines from Britain or the US which were well-known for their excellence in the field, Marzotto showed its propensity to local manufacturer. The result, however, was rather unsatisfactory as the subsequent development project of the computer was discontinued by Olivetti, the developer and manufacturer. Such an attribute demonstrates the tendency for 'local search' argued by Teece (2007) as insufficient in a rapid changing environment. Indeed, under these circumstances local search may cause maturity-trap.

Local search does not only persist in local innovative culture. A number of surveys concerning the innovativeness of the Italian textile industry performed between the 1980's and 2000's show invariable results (Rolfo and Calabrese, 2003, Guerrieri and Pietrobelli, 2002). In general, Italian textile firms show stronger propensity in incremental innovation for the existing markets than in diversification to create new markets. They consider local and national machinery and equipment producers as the main source of innovation. Such behaviour corresponds to the fact that the industry is leading in productivity (process innovation) but poor in performing product innovation which is new to the firms or to the sector (e.g. technical textiles for industrial uses). A number of scholars believe that the intensity of local linkages in each industrial district may deter participation to global innovation networks; hence calling for restructuring the industrial district system in order to catch up with fast changing global technological and business environment (Whitford, 2001, Guerrieri and Pietrobelli, 2002). Such a description of industrial innovativeness mirrors that of Marzotto. From Table 2, Marzotto has continuously improved their equipment by purchasing state of the art machinery derived from major innovation in the industry. In terms of product innovation, on the other hand, Marzotto does not involve in any major development i.e. synthetic fibres, technical textiles, functional textiles and smart textiles. The company does perform new product development activities and have produced a large numbers of different products. However, the approach is, in large part, limited in branding and creative design involving yarn and fabric construction and colouring. It is confirmed by a rather limited patent portfolio. Hayes and Abernathy (1980) suggest that merely buying equipments will not provide an edge for long-term competitiveness nor solution for long-term decline. Buying off-the-shelf technology permits imitation and replication by competitors which subsequently drives competition to efficiency and costs. Moreover, the improvement trajectory of textile technology has been concerning productivity enhancement since Industrial Revolution aiming at reduction of skilled labour. Only recently textile machinery producers focus on flexibility. From the technology point of view, textile spinning and weaving technologies have reached its maturity since the beginning of 20<sup>th</sup> century. As a consequence of relying on technology suppliers, therefore, the decline of Marzotto's business is inevitable when environmental dislocation occurs.

Furthermore, in a mature industry environment value networks are established for long period with reliability is the fundamental norm. Upsetting established value networks may cause high-risk business reconfiguration (Christensen, 1997). Marzotto's value network has been built around its traditional business for over 178 years which has been expanding along with the growth of its businesses. Marzotto's various brands require them to engage with a complex value network since different brands promote different quality proposition and involve different distribution channels (Romano and Vinelli, 2001). As a result, incremental innovation in the existing technologies and products is favourable because it is deemed to be less risky and less complicated (Christensen, 1997, Ahuja and Lampert, 2001). Such behaviour shows the phenomenon of maturity-trap (Abernathy et al., 1983, 1985).

Certainly, Marzotto possess profound knowledge in the business. Several attempts to diversify their business have been taken ranging from using different fibres, selling different brands, and different markets. The company follows the trend to embrace designer labels and luxury fashion markets. They close interaction with fashion designers in the early development of the Italian fashion industry and the trend of mergers and acquisitions among the fashion houses as the industry is maturing contribute to the decision. It proved to be a winning strategy in the early 1990's. However, when market preference changes in the 2000's, adding more brand (Valentino) did not result in equally remarkable growth. Sull (1990) argues that it is the very problem of active inertia persists in successful companies facing big changes. Leonard-Barton (1994) names it as core rigidities. Successful companies build organisational routines and values derived from their past success. The routines and values solidify to become norms and dogmas. When changes occur, the companies respond using the same routines which are frequently not suitable. As a result, after 30 years operating in high fashion business, Marzotto demerged the sector in 2005, following continuous decline in the luxury fashion markets since 2000.

The influence of external factors on the development of organisational internal capabilities and on the evolution trajectory opted as a response to environmental dislocation has been illustrated. The organisational capabilities which involve high-skilled workers in employing the latest textile technologies, state of the art technical systems, traditional management system (albeit listed in Borsa Italiana, the majority of its shares are owned by the family members), and traditional values have guided Marzotto to its current state. Their earlier success appears to become barriers for creating new competition in different markets (architectural innovation) or novel value added to the existing markets (revolutionary innovation), two types of innovation argued by Abernathy et al (1983, 1985) as the transition routes toward de-maturity. With reasonably secure financial performance and various opportunities to engage in various research projects in textile sector, Marzotto has the opportunities to engage with emerging technologies and markets. However, it is plausible to argue that up to now Marzotto has been unsuccessful in building dynamic capabilities from which dynamic competences can be developed to sustain long term competitiveness (Teece et al, 1994, 1997). From an interview, the company persists to expand their established markets, at least for the next 5 years. The trajectory they choose is argued to be the perseverance of maturity-trap influencing the Italian textile and fashion

industry. Nevertheless, having learnt that industrial trends strongly influence organisation's evolutionary paths, a lack of attractiveness of technical textile markets, particularly in Italy, may also contribute to the trajectories. Therefore, in order to de-mature the industry, there should be a direct interaction between textile producers and industrial users beyond the industry's boundaries. This interaction is the foundation to rejuvenate the industry toward higher value added textile markets. Similar interaction was indeed the fundamental step in the birth of the fashion industry in Italy (White, 2000).

## **ROYAL TEN CATE, NV**

### **Introduction**

The size of the Dutch textile industry is rather less significant in comparison with other countries such as Italy, UK, Germany, France and Belgium. The turnover accounted for 2 percent of the total EU T/C turnover in 2004 or 6.6 percent of that of Italy, the leader in Europe. In terms of employment, the industry merely represented 1.3 percent of the EU textile-clothing employment or 4.2 percent of that of Italy. However, the productivity, in terms of turnover per worker, the Netherlands is significantly higher (39 percent in 2001 and 58 percent in 2004) than Italy. We therefore can infer that the Dutch textile industry produces higher value-added textile products than the Italian textile industry. Does it suggest that the Dutch textile industry has been experiencing de-maturity? Using maturity/de-maturity framework of Abernathy's et al., (1983, 1985), and emerging dynamic capability literature promoted by Teece et al (1994, 1997) and Teece (2007), we investigate innovation processes at Royal Ten Cate, NV, a large textile company, as an attempt to address the issue.

### **Innovative culture of the Dutch textile industry**

Unlike in Italy, the significance of regional innovation system in the Netherlands is inconclusive. De Bruijn (2004) finds that innovation is not widely dispersed across the country. Rather, it is concentrated in a number of hot spot areas i.e. Rotterdam/The Hague, Amsterdam, IJmond (West), Twente and Zwolle (East) and Sittard/Gellen (South). He further indicates that Zuid-Holland region (Rotterdam, The Hague and Leiden) undertakes considerable degree of regional cooperation in innovation processes, while international partnerships are more important for Rotterdam/The Hague, IJmond, and Enschede/Hengelo. Although different characteristics are found in different cities, the importance of industrial districts in the Netherlands economy is not widely recognised. A study by Benneworth and Hospers (2007) suggests, however, the role of territorial integration of new growth nodes and stronger external linkages is significant in industrial renewal in Twente region.

According to a study by the Ministry of Economic Affairs of the Netherlands published in 2003, the economic growth of the country was lagging behind the rest of the EU members chiefly due to considerable increase in wage costs and too little innovative ability. Although the innovative ability of businesses in a broad sense is reasonable, indicated by high productivity, considerably high R&D expenditures and quality results in comparison with other EU countries, the trend is in relative decline as

other countries are catching up. An analysis of innovation climate shows that the Netherlands performs rather poorly in a number of indicators i.e. the number of graduates in science and technology, the position of the medium and high-tech industry, innovative entrepreneurship, application of scientific results, interaction between knowledge infrastructure and business sectors, and corporate R&D. The latter indicator shows a rather strong concentration in R&D expenditures to which 50 percent of the expenditures between 1998 and 2000 come from the seven largest companies i.e. Philips, AKZO-Nobel, ASML, Shell, OCE, DSM, and Unilever. Such a concentration has been observable since the 1930s in which the five largest companies (Philips, AKZO, Shell, DSM) constituted 50 percent of total industrial R&D (van Zanden, 1998). The figures increased after World War II to 70 percent.

The Dutch textile industry is relatively less significant than any other EU countries. In the taxonomy developed by Raymond et al., (2004), the textile-clothing industry falls in low-tech industry category. Indeed, it is only one in four companies in the sector that can be regarded as innovative. The figure is considerably fewer in comparison with other sectors such as chemical, machinery and equipment. Moreover, data published by the Agency for International Business and Cooperation (EVD), a bureau under the Ministry of Economic Affairs, showed that the textile and clothing industry merely contributed 0.34 percent of the total industry R&D expenditures in 2003. The table below illustrates the innovativeness of the Dutch textile-clothing industry.

% of innovators	24%
% of companies with product innovation	18%
% of companies with process innovation	16%
% of innovators that collaborate	37%
% of innovators that collaborate with universities	42%
% of innovators that collaborate with government/quasi-government institutions	71%
% of innovators that collaborate with private research institutes	25%
% of innovators that collaborate with consultants	35%

**Table 3. Data on innovation in the clothing and textiles industry, companies with 10 or more employees, 2000-2002. Source: Statistic Netherlands**

The table shows that there are only a small number of companies engage in product and process innovations. The majority of them are textile manufacturers with technical textile producers being the most innovative group. The main sources of information about innovative trends for textile specialists and their partners are suppliers in the chemical industry (fibres, textile finishing) and the machinery sector. However, only 37 percent of the innovators that claim to have collaborations with other parties, mainly with local organizations. Thus, opportunities to share knowledge, but also to share the risks and costs of innovation are simply not being taken up by smaller companies. Consequently, concentration in R&D expenditures may occur since only large companies are able to manage risky investments. Therefore, for the majority of the companies the government remains the key partner in innovation undertakings.

Despite the condition, a small number of traditional textile manufacturers have re-emerged to become high-tech textile manufacturers producing a diverse range of technical textiles for various applications e.g. military, aerospace, automotive, agricultural, shipping and fishing industries, packaging,

construction materials, and medical, since the 1960's. Manufacturers of carpets and floor coverings produce textile floor coverings such as carpets, rugs and mats, but also other products like artificial grass. The Dutch technical textile sector enjoys a strong international competitive position in Europe and other parts of the world. Ten Cate, for instance, is the world leader in geotextiles and synthetic grass both for home and sport uses. All-weather pitches for hockey, football, American football and other sports are also supplied from the Netherlands by companies such as Desso-DLW and Ten Cate. The Dutch carpet industry is the second largest in Europe after Belgium and the third in the world (behind the US).

The ability to shift their capabilities from traditional textile manufacturers to scientific-based, higher value added textile producers is, to a great extent, supported by the advancement of supplier industries and changes in demand of the user industries. Since the turn of the 20<sup>th</sup> century, chemical industry, the primary supplier of the textile industry, was the third largest industry in the Netherlands. AKZO-Nobel and DSM, two largest chemical companies in the country, were among the five largest employers between the 1920's to 1990's (van Zanden, 1998). In fact, they remain in the list up to now. The top five large multinational companies (i.e. Philips, Unilever, AKZO, DSM, Shell) pioneered corporate R&D activities of which rather inexistent before 1900 in the Netherlands. The number of scientists working in the laboratories of industrial firms grew from 350 in 1915 to about 1900 in 1939. Advances in the chemical industry opened up new opportunities for the textile industry. DSM invention of polyethylene fibre, for instance, was exploited by Ten Cate NV in Twente region for creating values in geosynthetic and sailboard markets. From the customer industries, Ten Cate's decision to initiate geotextile project made of polyethylene was encouraged by the need to improve the existing products made of polyamide which had failed to prevent flooding in 1953. Thus, opportunities to transform textile firms are closely related to advances in the supplier industry, for which it confirms the taxonomy developed by Pavitt, (1984), and changes in demand of the user industries. In addition, the existence of Technical University has a significant role in progressing innovation processes (Benneworth and Hospers 2007). The opportunity however will not be realized without a strong management capability to transfer or reconfigure their resources to engage with more competitive markets. The case study of Royal Ten Cate will provide an in-depth understanding in this issue.

### **The Evolution of the Netherlands Textile Industry**

The history of textile and cloth making in the Netherlands can be traced back to the medieval era, concentrated in Flanders and Barbant areas until the onset of Dutch Revolt in 1568. Leiden had become the largest woollen cloth making city in the United Kingdom of Netherlands in the 17<sup>th</sup> century. Other cities such as Amsterdam, Utrech, Haarlem and Delft among others were also vibrant textile areas. The importance of Leiden as a textile centre nearly disappeared by the 19<sup>th</sup> century. It was replaced by Twente region, particularly in Almelo, Borne and Enchede, in the East which emerged as the centre of cotton spinning and weaving, and Tilburg in the South as the centre of wool (van Klaveren and Tijdens, 2001). The emergence of Twente as an industrial centre was endorsed by the King Willem after the Netherlands

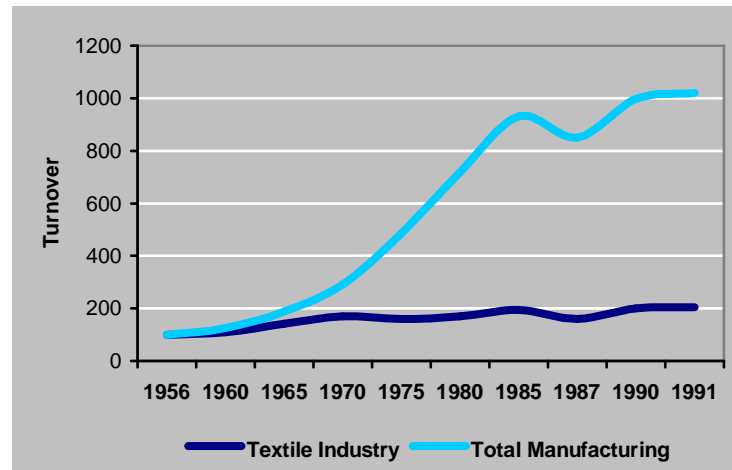
lost key textile cities, Ghent and Burges, to Belgium in 1830. During the 19<sup>th</sup> and first half of the 20<sup>th</sup> century Twente's textiles and metal manufacturing grew continually, providing not only mass products, but also specialized clothing, synthetic fibres and metal-electronic equipment (Benneworth and Hospers 2007).

The Dutch main industry in the 19<sup>th</sup> century was textiles (especially weaving) and shipbuilding. The two industries thrived during the colonial era as the main trading commodity and means of transport between the mother country and the colonies. Textile trade with the Dutch East Indies (Indonesia) particularly contributed to the country's economy significantly in the 19<sup>th</sup> century. Indonesia was the important outlet for textile products especially for cotton textile from Twente region. The trading was protected by Preferential Access up to 1874. After losing the privileges they had gained during the market protection, the Dutch textile firms remained the largest players in Indonesia textile imports reaching up to one-third of the market share through specialisation. In 1890, about 45 percent of the Dutch textile exports went to Indonesia. The figure was generally maintained at around 40 percent until the early 1930's after which it fell to a low of 12 percent as a consequence of Japan expansion to Indonesia's markets (van der Eng, 1998).

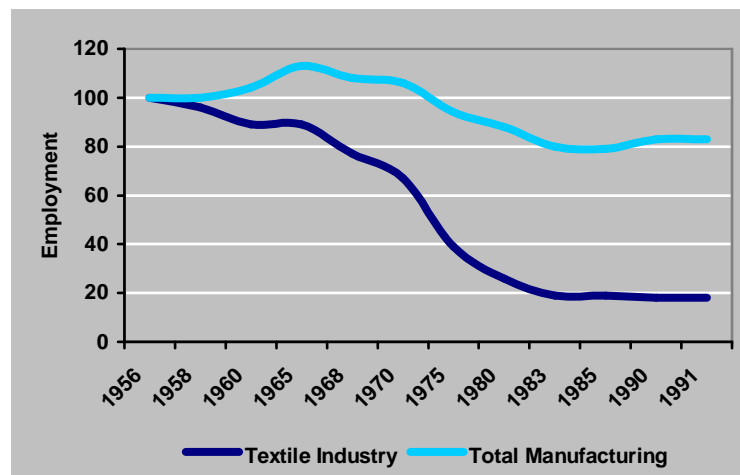
After the independence of Indonesia in 1945, the Dutch textile industry remained growing despite the loss of tie with the colonial markets. The industry shifted its primary markets, taking advantage of enormous growth in international demand and domestic markets. However, the industry failed to maintain its domestic markets and suffered from enduring decline from the 1950's mainly due to the leap of production costs, competition from lower-wage countries, increasing technological efficiency across the industry, and a lack of local entrepreneurial alertness (Lambooy, 1995 as in Benneworth and Hospers, 2007). As a response, a wave of merger and acquisition took place since the mid 1950's aiming for market expansion and consolidation in Africa and Western Europe. As a result, the Dutch textile industry became the most concentrated structure in terms of numbers of employees among the EEC countries in 1965 although by the 1980's the UK became the most concentrated textile industry whereas Italy and Germany was the least. The Netherlands stood somewhere in between the two extremes (van Geenhuizen and van der Knaap, 1994). H. Ten Cate Hzn & Co of Almelo and Koninklijke Stoomweverij N.V. of Nijverdal initiated the wave of mergers and acquisitions in 1957 and changed their name to Nijverdal Ten Cate (now Royal Ten Cate).

Despite the ominous sign of industrial decline, the Twente industrialists, analysts and policy makers remained optimistic about the future prospects for industrial revitalisation. They believed that the decline was temporary and thus recovery was imminent. The economic board ETIO believed that employment in Twente would grow by 1250 from 1960 to 1970. In reality, the result was the contrary. The industry contracted by 17,400 jobs, or around 50 percent. Such optimism might influence the Dutch government stance to not protect the industry, in contrast to other European Community nations. As a consequence, international relocation of textile manufacturing was inevitable. International production began in 1963 to Belgium because of its relatively cheap female labour costs. Later on, the production

moved further to North Africa by the 1970's and to Eastern Europe by 1980's. The offshore production began with the manufacture of products for low to mid segment markets. As domestic manufacturers increasingly less competitive even for higher quality products, after the 1980's production of medium to higher segment markets were transferred abroad. As a consequence, the industry lost 82 percent of jobs between 1956 – 1991 (van Geenhuizen and van der Knaap, 1993). It made the country to be the worst-case among the European Community. In terms of turnover, the Dutch textile industry suffered from stagnancy between 1965 and the 1980's. The enduring crises led to the demise of traditional textile and clothing production.



(a)



(b)

**Figure 9. Turnover (a) and employment (b) in the Dutch textile industry 1957-1991**

Source: van Geenhuizen & van der Knaap (1994)

Given the circumstances, however, a number of large to medium-sized companies did not particularly follow the relocation strategy because they had an advantage of high productivity machinery and benefited from vertically integrated production system (van Geenhuizen and van der Knaap, 1994). Instead, they shifted their textile capabilities to specialised, high value added textile markets by means of

major technological and organisational change, and high capital intensive leading to high-tech textile facilities. They focus on niche markets, new products and materials, and with a new role in production chain. Innovative firms in Twente region were particularly thriving in transforming the Dutch textile industry. Royal Ten Cate was the first large textile firm that shifted to technical textiles as early as late 1959. The company was involved in the first geotextiles produced in the Netherlands in 1956 for Delta Works Scheme (Horrocks and Anand, 2000). Nicolon, NV, the one of the inventors of the polyethylene geotextiles, was taken over by Ten Cate in 1974. In other region, Gamma Holdings entered the technical textile markets later in 1990 as they first tried to sustain their position in traditional textiles/interior textiles before eventually divested the pertinent business in 2001.

### **Recent Development – A further decline**

The evolution of the Dutch textile-clothing industry experienced bipolarity of structure i.e. larger companies are concentrated in the textile sub-sector and smaller companies inhabit the clothing and leather sub-sectors. The former group is characterised by high-capital, high-tech production facilities, competing in high-performance textile markets whereas the latter largely employs low technologies and competes in design, marketing, organisation of production and logistics.

In the past decade, the industry continues to contract. During the period of 1993 and 2002, eight hundreds companies in the textile, clothing and leather industry have disappeared (**Figure 10** right-hand scale). The share of the sector in overall manufacturing has fallen by roughly 30 percent. In 2004, the industry was populated by 782 textile companies, 378 clothing companies and 146 leather and leather goods companies. The share of textile-clothing production in total manufacturing decreased by 1 percent between 1993 and 2002 with textile production alone shows somewhat steady during the period of 1995-2007 (**Figure 10**). The general performance of textile sub-sector, while undergoing a decline since 2001 after showing an upward trend between 1998-2001, was somewhat stable (Figure 11). In terms of turnover, leather and clothing sector underwent a sharp decrease between 1995 and 2003 being fallen by 15 percent between 2001 and 2003 alone (Figure 12). The turnover of the entire sector in 2007 was €3,643.24 million, declining from €4503.12 million in 2000. The employment contracted by 80 percent between 1970 and 2002 leaving around 28,800 jobs in 2002 (Figure 14).

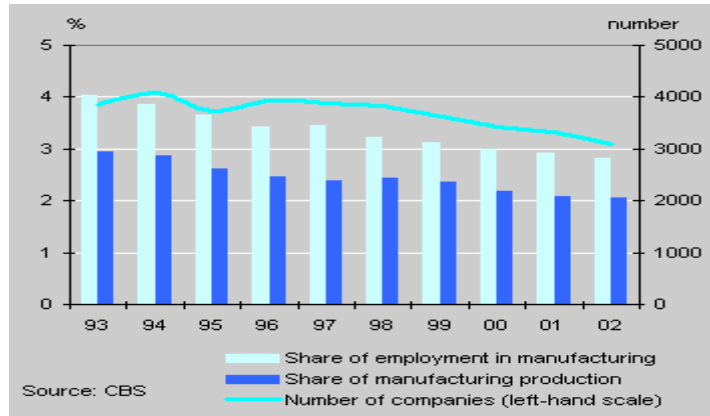


Figure 10. Share of production, labour volume and number of companies  
Source: Statistics Netherlands

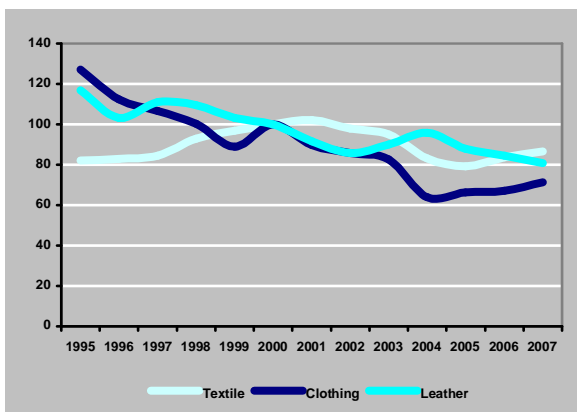


Figure 11. Index of production 1995-2007  
Index 2000=100. Source: Statistic Netherlands

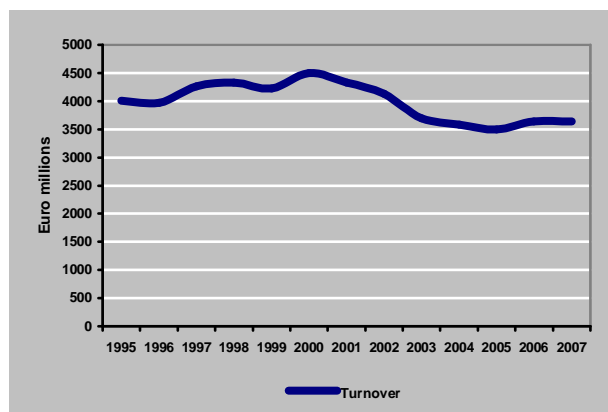


Figure 12. Total turnover 1995-2007 in Euro millions  
Source: Statistics Netherlands

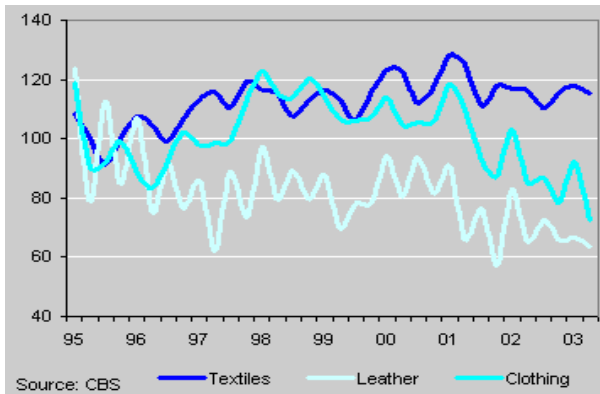


Figure 13 Quarterly turnover (current prices) 1995-2003  
Index 1995=100 Source: Statistics Netherlands

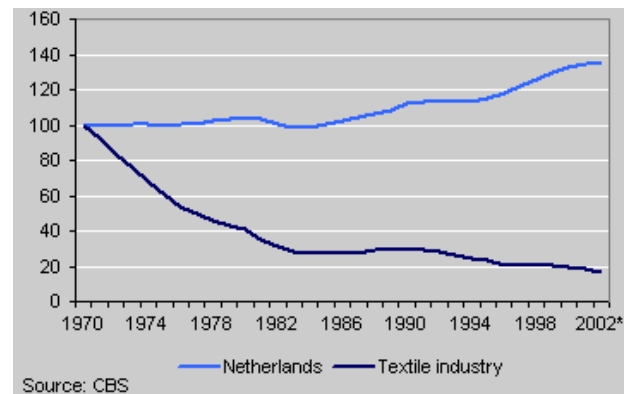


Figure 14 Employment in the textile industry 1970-2002  
Index 1970=100 Source: Statistics Netherlands

The Dutch textile and clothing industry has been in a long decline for the past 50 years. The industry is now dominated by textile sub-sector which accounts for three-quarters of turnover and 70 percent of employment. The two largest sub-sectors are technical textiles and interior textiles which include floor covering and carpets. Within the textile sub-sector, technical textiles largely avoided the malaise since these products are sold mainly to business customers. It indeed one of the faster growing

markets in the global textile sector. However, even the companies in this sector have lost ground in recent years, as investment has fallen off and equipment replacements have been postponed which, as a consequence, caused the downward trend since 2000. Although the sector has not yet reversed the trend investments has increased in since 2004, which could be a sign of better times to come (Statistic Netherlands).

## **A CASE STUDY: ROYAL TEN CATE, N.V**

### **Introduction**

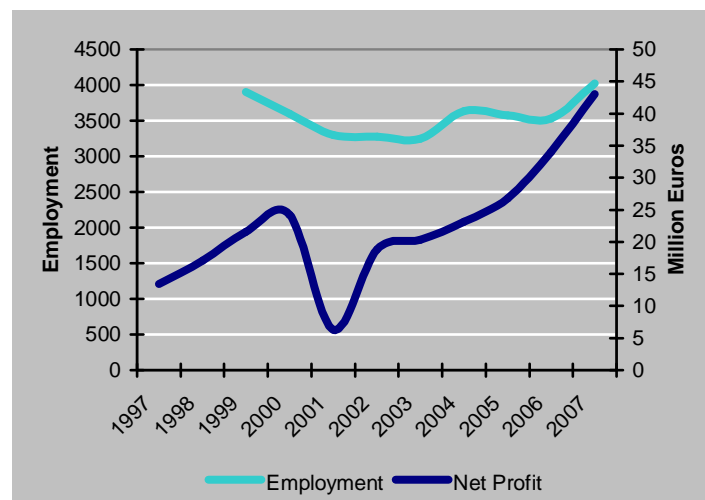
Royal (Koninklijke, in Dutch) Ten Cate N.V. is one of the world's leading producers of technical textiles. The Almelo-based company in Twente region is also the Netherlands' oldest industrial firm that remains exist, tracing its history back to 1704. The company is the result of merger of two textile merchants, H. Ten Cate Hzn & Co of Almelo and Koninklijke Stoomweverij N.V. (KSW) of Nijverdal, in 1957. Throughout its 300 years of history, Ten Cate has transformed its business, undergoing three periods of transition which involved changes in technology, product, and market. From manufacturing cotton fabrics for traditional textile markets, Ten Cate has emerged as one of key companies in technical textiles, supplying a diverse range of high performance textile for global niche markets. They now focus on five strategic growth cores: protective fabrics, aerospace composites, antiballistic materials, artificial grass and geosynthetics.

Ten Cate is aware that China and India's ability to catch up with the latest technology put pressure on shorter product life cycle. In other words, high-technology products could be mass-produced hence, mature, in relatively shorter time than decades ago. Indeed, the production of its consumer products such as interlinings and Ten Cate Enbi's technical rollers and components for printers has been moved to China. Moreover, a geotextile plant in Zhuhai, China, is planned to operate in 2008. The decision to move the production is because the market in the US, the largest market for Ten Cate geotextile, has been under pressure while the market in Asia is growing. Consequently, smaller margin is applied to be competitive and market expansion to Asia is crucial. As a result, Ten Cate is dealing with maturing and ferment markets simultaneously. The company believe that rapid change and concentrating on product-market-technology combinations which offer growth potential will enable them to circumvent maturity and maintain their lead. Buy-and-built strategy which focuses on strengthening their strategic base by acquiring companies which synergistically promote their core strategic growth was developed for this purpose. Concurrently the company promotes fix it-exit strategy for units that are fit less to their cores over time.

### **Company size**

Detailed data concerning the size of the company from the year at which merger took place can not be found up to now. However, from family archive in Global Anabaptist Mennonite Encyclopedia Online, it was said that Ten Cate owned 4,000 looms and 157,000 spinning spindles in the mid-1950s.

The annual consumption of cotton amounted to some 6 million kilograms while the production capacity reached three quarters of a million yards of cloth every week. The company served wide geographical markets reportedly to reach 30 countries all over the world. The number of employees at that time was more than 5,000, whereas before the acquisition, in the 1920's, Ten Cate employed around 2000-3000 people. Furthermore, van Geenhuizen and van Der Knaap (1994) reported that employment at Ten Cate in 1991 was 4185. Therefore, it is plausible to argue that Ten Cate has been categorized as a large company. Figure 15 below shows a significant decline during 2001-2003. It was mainly caused by a decline in technical component business, the consumer product division of Ten Cate. In this period, the Netherlands underwent economic slow down in which consumer spending on both clothing and household textiles collapsed. These circumstances forced the company to divest their consumer product division in 2005 and 2006. The year of 2004 remarked a fundamental change in the company. Loss making businesses were discontinued while a number of new products derived from profound scientific research and development were introduced. As a result, EBITA margins increased significantly after 2004. The year of 2007 shows the strongest growth in 5 years both in profit and employment as a result of exceptional strong growth in advanced textile and composite group. Several acquisitions of composite and artificial grass companies in 2006-2007 contribute to an increase in employment. The company is to target 10 percent EBITA margins in 2008.



**Figure 15. Number of employment and net profit 1997-2006**

### Product and Market Trajectory

The earliest involvement of Ten Cate family in the Netherlands textile trade is recorded in 1704. There is no sufficient information, however, regarding the business. Later in 1766, when Hendrick ten Cate began to run the family business, it was described that he was operating as a commercial agent, buying cotton yarn and then distributing them among peasants who made the yarn into fabrics. Ten Cate afterwards sold the fabrics to some merchants at home and abroad. Despite such a static activity, H. ten Cate Hzn & Co grew into a prominent regional linen supplier.

During the Dutch colonial era, Dutch possession over Indonesia allowed significant markets for cotton textiles. Likewise other textile companies, H. ten Cate Hz en Co tried to expand their market to the Dutch colony. However, since the Dutch Trading Company did not give them permission to enter Indonesia, in 1841 the company bought up an existing weaving mill, J.P. Lorey, situated in Almelo, which had been a fabric supplier to Indonesia. The acquisition marked Ten Cate's first shift toward industrial production techniques. Thereafter, for over the next one and a quarter century, H. ten Cate's strategy was capacity expansion in their existing traditional textiles through installing modern machinery and integrating backward by buying spinning mills in 1924 and 1929 and bleaching machinery.

Meanwhile, about 15 kilometers away in Nijverdal, Gottfried and Heimann Salomonson founded a textile trading company, G&H Salomonson, importing and selling cotton yarn from England, in 1816. After around 40 years of trading, Salomonson brothers decided to enter textile manufacturing business. They bought a site located in Nijverdal in 1851 which was named Stoomweverij et Nijverdal (later became Koninklijke Stoomweverij (KSW)). From the beginning, the company focused on international market, especially the Dutch colonies.

Both companies had experienced growth until the late 1940's. The independence of the Dutch colony of Indonesia rose concerns among the stakeholders that the threat of market loss becoming inevitable. Companies began to seek partnerships to consolidate and strengthen their businesses as a response to the changing market. Ten Cate and KSW developed cooperation in 1949 followed by merger in 1957. The merger resulted in a large capacity of vertically integrated textile manufacturing facilities. For around a decade after the merger, the company, which was then called Nijverdal ten Cate, remained focused on their existing traditional textile market. However, the industry suffered from rapid decline starting from 1960 and enduring turnover stagnancy from 1970. In such an economic decline, the size of the textile industry shrank dramatically. The company tried to enter more specialised markets of consumer textile by establishing a joint venture with Blijdenstijn Willink N.V of Twente (later on to become Permess), an interlining maker for ladies and men's fashion, in 1964, carpet backing in 1959 and denim markets in 1974. The interlinings made of woven and non-woven fabrics using a number of fibres such as polyamide, polyester, cotton, viscose, or a blend of fibres. The acquisition marked the first stage of the company's transition to technical textiles. On one hand, it enhanced the company's technical capability in dealing with materials (synthetic fibres) and production process (non-woven) that were new for the company; on the other hand, the acquisition minimized risk of learning as the markets remained within their traditional market i.e. clothing.

Economic depression followed by stagnation in the 1980's led the end of the traditional textile industry in the Netherlands. Nijverdal Ten Cate quickly responded to the situation by preparing themselves to shift to emerging markets in technical textiles. Their experience in synthetic fibre processing for interlinings business provided the foundation to shift their capability to technical and industrial textiles. A number of new business units were established in the 1980's and 1990's; medical textiles in 1986 yet divested in 1997, armour business unit in 1990, a geotextile subsidiary in the US in

1991, polymer for building insulation in 1994, and protective clothing in the US in 1996. Hereafter, Ten Cate has been in transition process culminated in a high-tech, research-intensive, global organisation. As far as their consumer textile business is concerned, the operation was gradually reduced and dismantled in the 1990's as a consequence of severe price competition and global overcapacity. The company, however, had kept their consumer denim businesses until 1999 where Atlantic Mills was closed and Hellenic SA was sold. The year of 2005 marked Ten Cate's last association with consumer textiles when they sold Permess to the Management.

In the early transition period, (1970's -1980's), the company need to build their capability in synthetic fibres processing technology as it is the core of the technical textile industry. They might have gained modest knowledge in synthetic fibres processing through their interlining business. The organisation quickly learned synthetic fibre processing technology by establishing cooperation with the first supplier in the world, DuPont, for protective fabric market. At the same time, in order to speed up the learning process, Ten Cate looked for acquisition opportunities of innovative companies in technical textile markets. The transition period which took place for over 37 years (1970-2007) had witnessed the company's market entering and withdrawing along with changing economic conditions. Indeed, the transition is still underway as restructuring remains in progress.

### Geosynthetics

Coastlines protection was critical for the Netherlands given their position being below sea level. Disastrous flood which hit the Netherlands in 1953 had boosted the market for coastline protection. One of the companies which was successful in conducting research in this market was Nicolon B.V. The company dedicated their research to create stronger, more advanced industrial textiles, particularly advanced line of tough industrial textiles used to reinforce and retain the dike soils. They developed geotextile tubes using thermoplastic polymer and polyester as the replacement of previous products using polyamide. Geotextile tubes were initially identified to be used in Egyptian times when they provided protection against flooding from the Nile River. These were only temporary and were constantly replaced or repaired. It was not until the 1960's, though, when these structures were used in permanent coastal projects, one being the Delta project in the Netherlands. Ten Cate commenced their geotextile project as early as 1959 and foresaw a significant market of this product worldwide. It encouraged them to acquire Nicolon in 1974 and later on established Nicolon Corporation, a division of Royal Ten Cate, Inc (USA) in 1980. In 1986, Nicolon Corporation acquired Florida-Based Bradley Materials which boosted their presence in the US geotextiles for civil engineering projects.

Meanwhile, in the late 1960's in North Carolina, a series of experiment was undertaken which culminated in the development of Miracle Fiber (Mirafi), polypropylene-based materials used in roadbeds and drainage system. In 1980, Nicolon Corporation was interested to supply global demand for Mirafi, Inc. Satisfied with market acceptance and opportunity for growth, Nicolon Corporation acquired Mirafi, Inc in 1991 in order to strengthen their market position in the US. Nicolon/Mirafi continued to dedicate

their research, development, manufacturing and marketing expertise to designing products that provide soil reinforcement, sedimentation control, erosion control, filtration, and drainage. The company had successfully introduced several new products under trade name Mirafi, Miradri, Miramesh and Miragrid. In 2003, Miradri business, bituminous-backed rubber sheet membranes for waterproofing solutions, was sold off as a consequence of technology alignment strategy taken by the company. Miradri was made of bitumen hence outside the company's core technology i.e. advanced polymer.

In order to expand its product portfolio, geographic market and technological basis in geosynthetics, Ten Cate acquired Polyfelt, GmbH of Austria in 2005. Polyfelt produces, distributes and researches natural geo-textiles and geo-synthetics, for example, tarpaulins and foils to stabilise supports for roads, railways and dams. They are the market leader in the field. Its headquarters, largest production unit, and research unit are all based in Linz, Austria with other production sites are located in France, Malaysia and Australia. As a result of this takeover, Ten Cate will achieve a leading global position in the market for geotextile materials.

### Protective Clothing

Nijverdal ten Cate's first effort to enter technical textile markets commenced in 1970 when the company began to dye and sell Nomex® (of Dupont) to protective clothing market. Through 1982 it began supplying Nomex fabric for U.S Forest Service garments and subsequently took a step forward to introduce its own PBI/Kevlar® outer shell called KOMBAT™ in 1985. In the same year, they developed, for the first time, quilted aramid thermal barrier for the fire service before entering airline seat block market the following year. Throughout the 1990's, Ten Cate introduced a series of new products for protective clothing, particularly heat resistant and fireproof fabrics. In 1992, they introduced ADVANCE™, the first NOMEX®/Kevlar® outer shell and COMFORTBLEND™, first Nomex®/Lenzing FR™ fabric in 1997. In 1999 they introduced MILLENIA™, Zylon® blend outer shell in. In order to strengthen their technological position, in 1996 Ten Cate developed collaboration with Southern Mills, the leading supplier of heat resistant and fireproof fabrics in USA, which, in 2004, was acquired by the company.

### Advanced Composite

In 1973, Ten Cate took a license from Windsurfing International (USA) to produce and sale windsurfer made of polyethylene filled with PVC foam in Holland through its subsidiary, Ten Cate Sport BV. The company procured windsurfing components from a few manufacturers, being one of which was Kolbus Kunststoffwerke GmbH (Germany), to supply hulls, masts, mast heels and curved booms. Ten Cate filed five patents related to windsurfer assembling method and, later on, materials during the period of 1970's and 1980's. By 1981, windsurfing board sales in Europe outnumbered that of the US of which 1 million boards had been sold. Learning from the experience dealing with synthetic materials, especially polyethylene, in the late 1970's the company decided to move into advanced materials to produce

composites containing carbon, aramid, high-density polyethylene or glass fibres in a matrix of polyphenyl sulphide (PPS), polyethersulphane (PES), polyetherimide (PEI), epoxy or polyethylene (PE), a process that was patented in 1981. This enhanced capability permitted them to develop the basic technology for Cetex, continuous fiber-reinforced thermoplastic laminates in the 1980s, in cooperation with Delft University (Delft, The Netherlands). Standard Cetex products feature PEI or PPS matrices with glass, carbon or aramid fabric reinforcement. There are roughly 1,500 different part numbers made of Cetex PEI or PPS composite on an Airbus aircraft. This number is expected to grow significantly as aircraft companies demand more thermoplastic composite parts on the new Boeing 787 and Airbus A350. Ten Cate also supplies the material for A380 engine air intakes made by Airbus France. Thermoplastic materials used by Ten Cate makes it possible to manufacture single barrel acoustic liner, versus the traditional two to three panels, which is able to eliminate acoustic disturbance caused by the spliced joints, giving the A380 a very low noise profile.

In 1990, Ten Cate established a new division, Ten Cate Armour, aiming for producing body armour made of thermoplastic materials. In the late 1990's and early 2000's, the business became the company's central attention as the market grew substantially following political turmoil in Asia, and, moreover, global war in terror promoted by the US after terrorist attack on September 11, 2001. In 1998, Ten Cate acquired 68 percent of Ares Protection of France, a producer of antiballistic composite. Ares manufactures personnel and armoured vehicle protection and holds the manufacturing rights of Liba patent, a new generation of antiballistic materials made of ceramic polyurethane materials. Furthermore, to secure its operation in the US, Ten Cate acquired 100 percent of Bryte Technology, Inc, an advanced composite maker for aerospace, communication and electronic industries, in 1999. The company manufactures prepregs, cyanate ester, epoxy resin systems, syntactic foams and thermal management materials. This acquisition was deemed as an alternative of green field operation. The two companies were research-led organisations whose sizes are relative small (€10M in sales each). The acquisition, therefore, is not for expansion of Ten Cate's customer base. Rather, it was to strengthen the company's technology portfolio in armour market for personal, vehicle, aircraft and watercraft protection.

To accelerate the growth in this sector, Ten Cate aggressively implements its buy-and-build strategy in 2007 and 2008. In 2007, the company acquired Roshield of Denmark, a leading provider of tailor-made antiballistic vehicle protection and personal armour for the European market. Roshield specializes in design and management of armour upgrading programmes. Military vehicle markets become attractive because it is currently widely implemented especially by countries actively involved in peace keeping operations. Furthermore, the acquisition will give an important contribution to knowledge and capacity enhancement as well as profit development because Roshield has recently been awarded important orders for an amount of approximately €20 million. Another company acquired by Ten Cate in 2007 was Phoenixx TPC, a technology leader in unidirectional thermoplastic composites (UD) for aerospace, oil and gas exploration. In addition, Phoenixx UD technology will strengthen TenCate CETEX® thermoplastic composite product lines worldwide.

Following its strategy to reinforce their technology portfolio in armour business, Ten Cate wishes to expand its position within this market, especially in the field of vehicle armour products for which future major modernization and expansion programs are planned. To fulfil its wish, in early 2008 Ten Cate acquired Composix, a producer of advanced armour solutions (fiber-reinforced composites and ceramics), for the protection of vehicles (Mine Resistant Ambush Protected Vehicles – MRAP), armoured personnel carriers, trucks, tactical vehicles such as HMMWV aircraft, ships/watercraft and military personnel. The company has an excellent reputation as a developer of revolutionary concepts and as an engineering partner in prototyping and designing of production processes. Partly as a result of this, Composix has become an important partner for the US Government and its associated vehicle manufacturers and contractors. Its current annual sales which are approximately US \$100 million (€63.1 million) will strongly promote Ten Cate's market base as well as technologies and products in the US market.

Growing importance of composite activities for Ten Cate's product portfolio is shown in their late acquisition of YLA, Inc and CCS Composite, Inc in February 2008. YLA primarily focuses on supplying composites for satellite communications, aircrafts, military, and energy markets while CCS Composites is a manufacturer of aerospace-grade compression-moulded-composite components used in commercial and military aircrafts, satellites, oil & gas and other industrial applications. The acquisition re-enforces Ten Cate's growing market position within the aerospace market and further establishes the company as the world leader in advanced composite materials.

#### Plastics-based technical components

The 1980's marked the beginning of plastic packaging boom affected by progress in logistic system, global trades, supermarket culture and consumerism. In 1983, Ten Cate acquired Plasticum BV, the manufacturer of aerosol packaging, caps and closures. The company's core capability is in plastic injection moulding. From the 1990's to 2005, Ten Cate's plastic packaging division had taken aggressive expansion strategy in customer base, technology and market. Plasticum expanded its aerosol caps market to the UK by setting up Ten Cate Plasticum UK (1990) and added product line for food and nutrition packaging markets by acquiring Bandringa Plastics (1991) and Combi Plastics (1992) respectively. In 1999, Plasticum entered German market, by acquiring Ilkenhans, the market leader in aerosol caps, and subsequently set up Ten Cate Plasticum US in 1999. A range of product development and process improvement initiatives had been taken during the period, particularly in the early 2000's. Throughout the first half decade of 2000's. Plasticum entered into the new wet wipe tissue box market and launched a series of new products mainly made of polypropylene and thermoplastic elastomers. In addition to packaging, Ten Cate plastic division established business in wholesale pipe system under Mega Valves group (previously Bosta BV) in the 1980's and in expanded polystyrene and specialty forms for packaging and building insulation, among others (Synbra group). The latter was owned together with Shell, under a joint venture agreement.

By 1994, plastics represented 80 percent of the group's sales. However, the wave of production relocation to the Far East and China for consumer products which began in the 1980's coupled by economic crisis in the early 2000's and lingering recession in Europe forced Royal Ten Cate to scale down their operation in consumer products. The company shifted its plastics production to more specialized areas such as the production of specialized rollers for printers and photo-copiers (Ten Cate Enbi), and self adhesive and heat seal base materials for labels and label materials (Multistiq). Nevertheless, it was not sufficient to keep the production in Europe and the US, particularly after the terrorist attack in September 2001 which affected the economy significantly. Ten Cate transferred production facilities of Ten Cate Enbi to Mexico, Hungary and Far East in 2000 followed by closing down their operation in the Netherlands, USA, UK, Switzerland and France. Furthermore, Ten Cate dismantled their plastic business began with selling TC Moulding UK and NL in 1998 and 1999 respectively and subsequently Plasticum US and France in 2001 before finalising divestment of Ten Cate Plasticum group as a whole in 2006 for €20 M. The company divested Mega Valves group in 2005 (net sales €60 M) followed by Synbra in 2006. Ten Cate Enbi is the only business remaining in the technical component business.

#### Artificial Grass

Ten Cate's first interest in artificial grass business began in the 1980's when they filed a patent application in the pertinent field in 1987. The capability in this field was derived from their established carpet backing business and complemented with Thiolon's skills and technology. However, artificial grass had never been Ten Cate's core business until the 2000's when several acquisitions were taken. In 2000 Ten Cate Thiolon BV acquired Nymplex, an extrusion company with expertise in co-extrusion bi-polymer, and Polyloom Corp (USA), the pioneer of the use of polypropylene fibrillated yarn for synthetic turf and indoor-outdoor carpeting for the US market, in 2001. Polyloom has extensive knowledge and experience in the field since its establishment in 1968. The acquisition enables Ten Cate to acquire necessary technologies to compete in this market, particularly in the US, since the technology was shifting from polyamide to polyethylene-based. The shift permits broader application of synthetic turf, including for football markets. It is understood that the company's advanced capability in thermoplastic polymer built for different markets contributes this particular business. Hence, co-specialisation suggested by Teece (1986, 2005, 2006, 2007) as a root of a firm's dynamic capability is indeed demonstrated.

Artificial grass markets continue to grow. European Football Association's (UEFA) new regulation which permits football matches being played on artificial grass for the first time in 2005 season gives a boost to Ten Cate grass business. Ten Cate, as the first mover in the business, undertook several actions to expand their market and technological capability in order to keep their leading position in this growing market. In addition to R&D, Ten Cate continues to apply their buy and build strategy in order to speed up the expansion process of technology, product and market. The company acquired Mattex Leisure Industry of Dubai for €120M in 2007. This acquisition allows market expansion since it permits

low cost, large volume of artificial grass production to take place in the new facilities in Dubai. It complements their existing customized artificial grass markets which are served by production from Europe and USA.

In order to provide a comprehensive solution to its customers, Ten Cate operates a systems approach which further guarantees the safety and desired playing properties of the pitch over a period of at least 12 years. System approach is crucial because various building blocks of an artificial grass pitch should be optimally geared to each other in order to optimise the designed properties of the fibres. In 2007, Ten Cate signed a letter of intent with GreenFields in order to develop close cooperation in a new artificial grass system (4th generation of synthetic turf). The new development, aiming at lowering the cost of a total system and shortening the time to market, is based on a new concept of integrated (as opposed of individual components i.e. fibre, backing, infill, sub-base) synthetic turf system. To enforce its present patent position, Ten Cate acquired relevant patents of GreenFields. Another global strategic alliance was developed with FieldTurf Tarkett, the leading marketing company in worldwide synthetic turf system for sport applications. The alliance is expected to increase market access and to have an immediate positive impact on market share. To further re-enforce their patent position and lead in the market, in 2008 Ten Cate acquired Edel Grass Synthetic Turf System (NL), a company it met during an EU Framework 5+6 project in artificial turf (Multiturf) in 2005.

#### Functional digital printing

Ten Cate has a great interest in functional/multi-functional textiles attainable through exploitation of nanotechnology on surface treatment. The company began their research in the 1990's culminated in a patent filed in 2004. Unlike the majority of textile companies that employ chemical processes to attach nanomaterials onto textiles, Ten Cate takes digital printing as a route to exploit nanotechnology. The technology enables functional particles to be applied on a nano scale. Several functionalities can be simultaneously applied in one production run, thus making it possible to produce intelligent and/or interactive fabrics efficiently. Some examples of new technical possibilities include fabrics that will emit colour and other signals to warn the wearers from overexposure to heat or chemical substances, or fabrics with solar cells.

In addition to these functional properties, the new technology will provide great efficiency and environmental benefits. This technology will enable more evenly and in much more precise quantity of application of chemical substances, compared with the traditional methods. As a result, considerable timesaving can be achieved, coupled with a major reduction in waste material and exceptional flexibility. In the future, savings in energy and water can be attained in the order of 70 to 90 percent while savings on the use of chemicals will amount to approximately 60 percent. Hence, this technology could be the future platform of technology for the company as it is able to deliver different functionalities required by Ten Cate's core products complemented by high-level of efficiency, flexibility, and environmental benefits.

In 2004, Ten Cate coordinated an EU Framework subsidized project called Digitex. The project, which involves 26 partners across the EU countries and requires €12.7 M for a period of four years, develops the respective patented technology further. One of the partners, Xenia Technology, Ltd of Cambridge (UK), is the leading specialist in the area of inkjet technology for the development of inks / coating fluids and related steering technology (software). This company was acquired (75 percent of the issued share capital) by Ten Cate in 2008 since it owned a strong intellectual property portfolio and a number of key technology platforms for both inks/coating fluids and hardware (co-specialised assets). The other industrial shareholder in Xenia is Xaar, plc, a leading specialist in inkjet printheads (nozzles). For Ten Cate, this technology driven acquisition is important to own and jointly develop key knowledge for the application of coatings and related chemicals on textile materials and other substrates, enabled by a (digital) technology that works on nano scale. The purpose of this development is to produce functional textile materials (smart textiles, innovative technical textiles) with functionalities and qualities that could not be produced in the traditional ways.

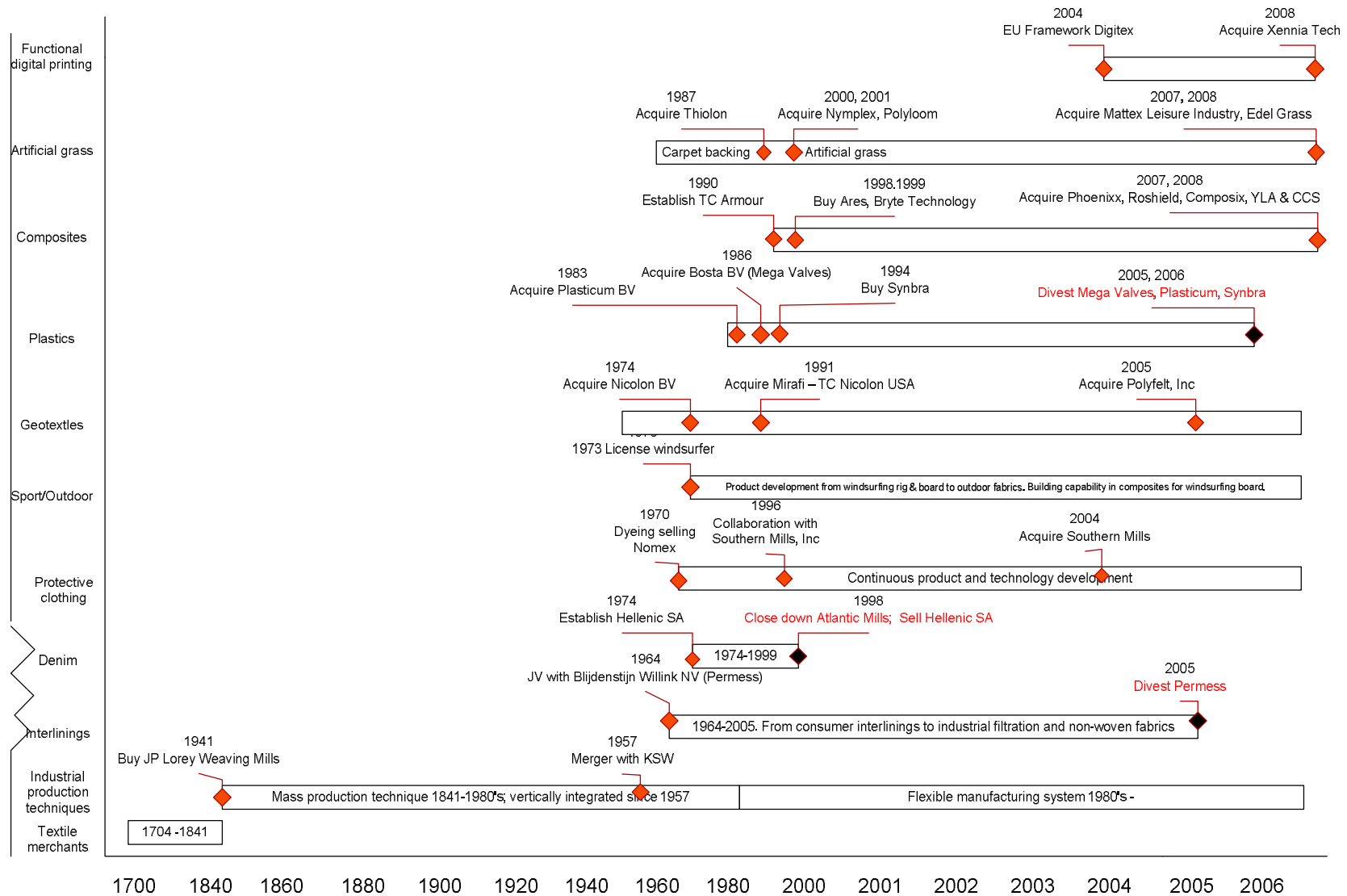


Figure 16. Transition timeline-major events

Year	Number of takeovers	Number of divestments	Products Involved	Regions/countries
1957	1		Cloth for apparel (including birth merger)	Region
1959	3		Various cloth; household textiles	Region
1960	1		Household textiles	Region
1961	1		Household textiles	Region
1965	1		Technical textiles	Elsewhere in NL
1970	1		Cloth for apparel	Region
1974	1		Technical textiles	Region
1977	1		Synthetic cloth and yarn	Region
1979	1		Synthetic materials (packaging)	Region
1980	1		Technical textiles	Region
1983	1		Synthetic materials	Elsewhere NL
1985	2		Non-woven cloth; technical textiles	Region; USA
1986	2		Technical yarn; technical textles	Region; USA
1987	1		Synthetic products	Region
1988	4		Working cloth; wholesale (synthetic product); non-woven cloth; technical textiles	Region; elsewhere NL; UK; USA
1989	4		Wholesale (synthetic product); technical textiles, advanced materials	Mostly USA, also elsewhere in NL
1991	1		Mirafi® Inc. industrial (geosynthetics)	USA
1994	1	1	Polystyrene-based packaging product Sell Technical Fabric division	FR
1998	1		Antiballistic advanced composite	FR
1999	1	2	Advanced composite Denim	USA GR, Ir
2000	1		Extrusion	
2001	1	1	Artificial grass Plastics packaging	USA USA
2002		1	Geotextiles	USA
2004	1	1	Synthetic technical textiles Non-woven textiles	USA DE
2005	1	3	Geosynthetics Pipe system wholesale, interlinings, label	Austria NL
2006		2	Plastic packaging, insulation	NL, FR
2007	3		Advanced composites, artificial grass	USA, DK, UAE
2008	3		Advanced composite, artificial grass, digital functional printing	USA, NL, UK

Table 4. Takeovers and divestments, 1957-2008

Source: van Geenhuizen and van der Knaap, 1994, updated by the author

## Patent

Patent searching and grouping of Ten Cate's patent portfolio is performed in this study. Patent grouping is useful for trend and transition analysis. Data is gathered from European Patent Database and United State Patent Database and subsequently grouped in accordance with year of application (Figure 4). The data however does not include patent portfolio belongs to companies before they are acquired by Ten Cate. For example, Nicolon NV had had nine patent applications while Plasticum had applied ten patents prior to the acquisitions. In the majority of cases, acquisitions of high-tech companies are technology driven. In other words, the acquisition is motivated to transfer the patent position of the acquired company to that of the buyer to be used in conjunction with the buyer's patent portfolio.

Patent position of Ten Cate is shown in figure 4. From the figure, it is noticeable that patent applications were carried out in three periods; hence, we can divide the patent data in three groups. The first group is before 1974; the second is between 1974 and 1992; the last group is between 1996 and

2007. The division marks the periods in which transition is taking place. Each group demonstrates the importance of particular technology within the relevant period. The second group reveals the importance of advanced textiles, particularly geotextiles, for the company's technology portfolio. The third group does not clearly show the dominance of one particular technology until 2006. Nevertheless, it exhibits the growing importance of artificial grass. In 2007 one particular technology appears to be the next platform for the company i.e. textile processing/treatment. As we have discussed before, digital textile finishing technology may revolutionize the whole paradigm of textile processing methodology. It involves the adoption of the latest nanotechnology for creating functional/multifunctional textiles.

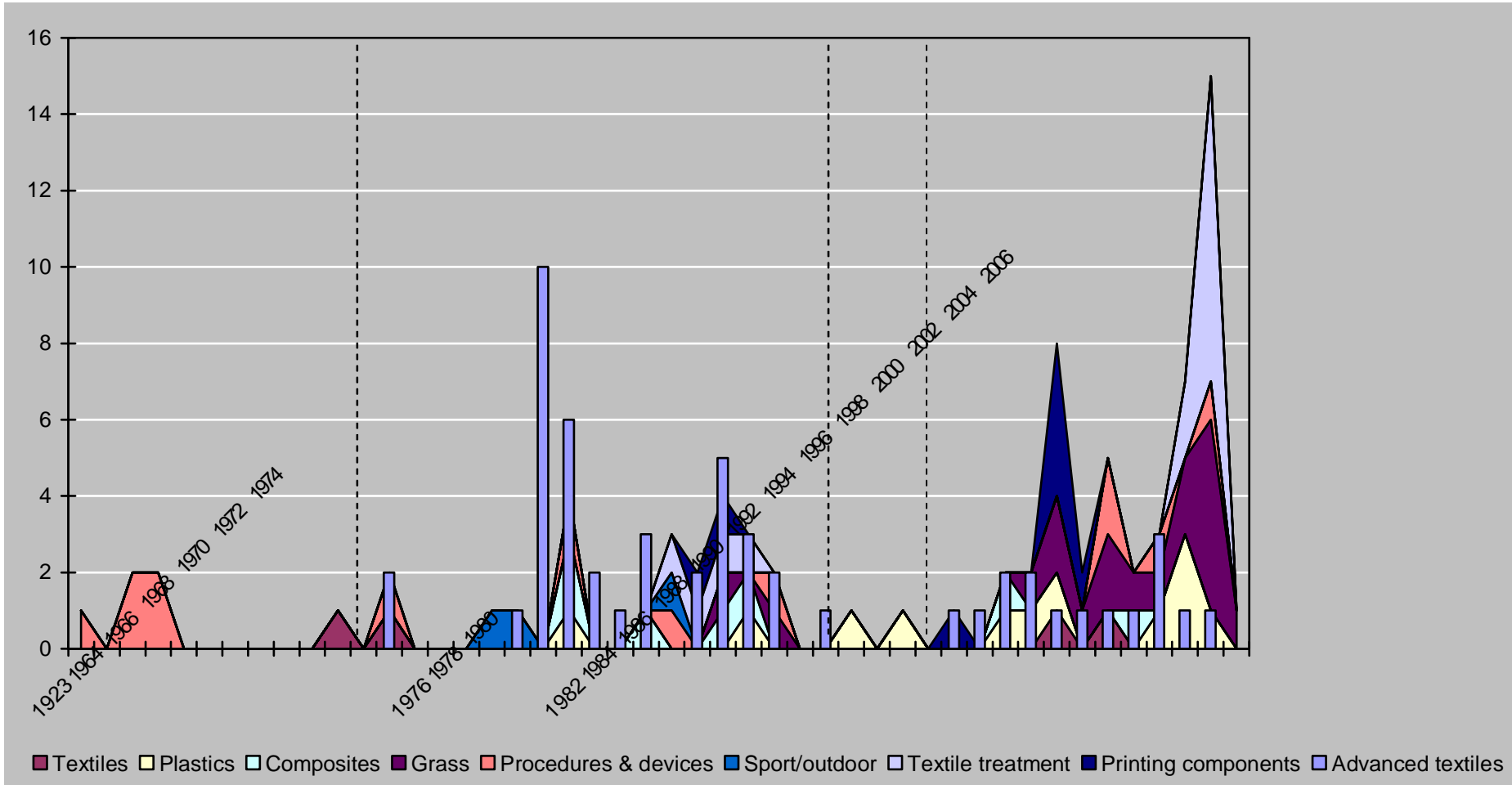


Figure 17. Patent database

## **DISCUSSION**

This section is intended to discuss the manner in which Ten Cate has successfully managed its competitiveness amid persisting decline affecting the industry in the past 50 years. We argue that the process of de-maturity is underway within Ten Cate organisation as a result of entrepreneurial management's ability to develop dynamic capabilities. The summary of Ten Cate's initiatives as a response to changing environment leading to de-maturity is depicted in Table 5. Evidences and factors that contribute to this process will be discussed.

### Industrial Maturity

The case study reveals that industrial maturity of the Dutch textile industry came earlier than its counterpart in Italy. Indeed, while the industry was in a rapid decline until the 1980's, the Italian textile industry was in its peak of success. The Dutch clothing industry declined faster across market segments than the textile industry. Majority of those which survived were medium-large textile companies that benefitted from high productivity machinery and vertical integrated production system. As a consequence, in addition to bipolarity of structure as we have discussed earlier, the textile companies lost their markets in the clothing industry. Unlike in Italy, the Dutch clothing industry did not pursue high-fashion markets as a response to industrial decline. The long history of the textile industry in providing cheap cotton textiles to their colonies may less sufficient to support clothing manufacturers in creating high-fashion brands. Or rather, somewhat distant relationship between the clothing and textile industries may contribute to this fact. As discussed before, the textile industry predominantly produced bleached cotton fabrics for Indonesia's batik sarong markets. Thus, clothing was not the primary market for textiles when the industry reached its peak. Consequently, business models and supplier/customer networks were built around the relevant business activities leaving the relationship with the clothing industry remained peripheral. We have learned from the case study of Italy that intense relationship between textile manufacturers and fashion designers greatly contributed to the birth of the Italian high-fashion industry.

### De-maturity and dynamic capabilities

Severe market contraction which began in the 1950's forced textile firms to consolidate their markets. Ten Cate, together with KSW, initiated cooperation and later on merged into one company. In order to reduce competition, the company took over a number of declining firms in Twente region. The initiative did not solve the company's decline,

Year	1900- 1920's	1930's-1940's	1950's – 1960's	1970's – 1980's	1990's – 2000's
Technological change					
Machinery / process	Ring frame		Auto ring frame; Projectile	OE rotor spinning; Shuttle-less loom; Jet; Electronic Jaquard Machine; Information technology for flexible manufacturing system	Lean retailing model; nano-based finishing process
Product	Cellulosic man-made fibres	Synthetic fibres	Technical textiles	High Performance Fibres; Functional textiles	Multifunctional textiles; Smart textiles
<b>Textile industry trend</b>	• Preferential market agreement was terminated		• Increased labour costs • Early rapid decline	• Rapid decline continues	• Economic slow-down 2001-2003
Market change	• Losing market protectionism in the Dutch colony of East Indies	• Severe decline in market shares in Indonesia due to intensified competition with Japan • Growing international and domestic markets	• Losing colonial markets • A number of companies begin to shift to interior textiles and consumer technical textiles.	• Growing production in technical textiles	• Exploitation of high added value textiles
Competition change	• Begin to compete with Japan over markets in Indonesia	• Intensified competition with Japan and Britain in Indonesian markets.	• Begin a rapid decline due to increased labour costs • Production relocation to Belgium for low to mid segment markets • A wave of mergers and acquisition	• Production relocation to North Africa and Eastern Europe • Production relocation for high segment markets.	• Clothing production largely disappears from the Netherlands
Structural change	•	•	• Increased concentration		• Textile companies dominate the industry (60%) • Bipolarity of industrial structure • Agglomeration of retailers
Ten Cate Initiatives	• Capacity expansion by means of buying the latest technology and opening new mills. • Integrate backward by buying spinning mills and bleaching facilities.	• Develop cooperation with KSW for market consolidation • Remain producing traditional textiles	• Merge with KSW • Market expansion/reduce competition by acquiring local clothing textile manufacturers • Diversify to carpet backing • Diversify to interlinings by acquiring Permess (local) • Commence R&D project in geotextiles	• Adopt information technology to implement flexible manufacturing system • Enter protective clothing markets using Nomex/Kevlar® • Enter denim markets, set up Hellenic SA (Gr) and buy Atlantic Mills (Ir) • Receive license to supply wind surfboard • Acquire Nicolon, BV (local) • Enter plastic packaging market by acquiring Plasticum (other NL) • Enter piping system by acquiring Mega Valves (other NL) • Enter medical textiles by acquiring Kemex BV (local)	• Major capacity reduction in consumer products (denim) • Enter composite armour markets • Market expansion to the US, establish US subsidiaries for geotextiles and cooperation with Southern Mills for protective clothing • Enter building insulation markets; establish JV with Shell (Synbra) • Technology capability enhancement in armour markets by acquiring Ares and Bryte Technology • Technology capability enhancement & market expansion in artificial grass by acquiring Nymplex and Polyloom • Divestment of consumer products (denim, plastics) • R&D project in functional digital printing & acquire Xenxia Tech.

Table 5. Ten Cate initiatives toward environmental changes

however, because their existing markets continued to contract as a consequence of increased labour costs and competition from lower-labour cost countries. Since losing its major market in the colonies and in the clothing industry, textile firms needed to look for opportunities beyond its traditional markets which offered new basis of competition to replace severe cost-based competition in their traditional markets. Firms such as Gamma Holding, N.V opted to enter interior textile markets in 1969 while Ten Cate NV decided on interlinings, sailboard and geotextiles in 1964, 1973 and 1974 respectively. The latter market, although R&D project began as early as 1959, they did not supply the markets until the acquisition of Nicolon, N.V. It is evident that Ten Cate was the first mover and trend setter in the industry. They initiated the trend of mergers and acquisition in the late 1950's and, moreover, pioneered to seek and seize opportunities in technical textiles. Their initiatives were followed by other large textile firms more than three decades later. For example, its competitor, Gamma Holding, diversified to conveyor belts in 1990 and mattress ticking in 1992 after realizing that interior textile business could not retain their competitiveness leading to the sector divestment in 2001. Similar to Ten Cate, Gamma Holding acquired a number of companies to enter to new markets.

In this case study, it appears that it is Ten Cate's entrepreneurial alertness and innovative organisation and management that driving the transition. Ten Cate created the trend in the textile industry whilst following the trend and seizing opportunities in different industries while its competitor, Gamma Holding, followed the trend within its respective industry. The role of regional network appeared to be less critical, unlike in Italy, at least at the onset. The entire industrial businesses in the region were in unfavourable conditions and the official industry's foresight was a fatal error. Local university had not established until 1964; hence it is difficult to illustrate the university's role in driving the early transition. Only in recent years the link with local businesses and the university has been intensified, particularly after Ten Cate announced their association with advanced materials businesses as their core in 2004. The company launched Materials Valley with the university in 2004 in order to drive inventions and innovations in the field. Moreover, government's liberal stance in industrial protection was perceived by the majority as a threat leading to acute decline. Such unfavourable circumstances forced the company to perform 'distant search'. Had the government introduced industrial protection, Ten Cate might have remained in traditional textile business. Some kind of local dependency, nonetheless, was found in the early transition when the company developed joint ventures and acquisitions with local companies such as Blijdenstijn Willink, BV, Nicolon, BV and Kemex BV. However, since the 1980's local search has become less important as the company spread their business all over the Netherlands, Europe and, primarily, the US. Ten Cate's business in the US has developed from solely geotextiles in 1980 to a diverse range of markets including body and vehicle armour and protective clothing for the US Army and synthetic grass for football pitches. The US has become the major location of production and market (43 percent and 38 percent respectively in 2007).

Ten Cate's decision to enter particular markets at the onset corresponding with the description of de-maturity process and dynamic capabilities framework. While the innovative decision contributed to a

change in the company's basis of competition, disruption of established production competence, marketing and distribution system, and a shift in skills, it also took the less radical paths to begin (local search). Their existing resources combined with knowledge, skills and experience belong to by Blijdenstijn Willink N.V permitted competitive product diversification in their traditional markets i.e. clothing interlinings. In this manner, the company took less risky path because the business remained in the market they were familiar with whilst learning new production processes and raw materials. Likewise, licensing sailboard from Windsurfing, Inc permitted learning processes to experience with new materials (thermoplastic polymer and composite) and technologies. Since Ten Cate did not have experience in sailboard, at the outset they established new supply chains from which the company obtained supplies for the whole components. From this exercise, Ten Cate filed two patents in 1978 and 1979 for sailboard assembling. It is not until 1984 the company filed a patent concerning processes to make sailboard and small boat, and the materials used. It was the company's first patent involving thermoplastic materials and composite, two materials that make up their core business today.

Learning is fundamental in managing transition. For markets that require new resources and R&D such as geotextiles, protective clothing, armour, artificial grass, and functional digital printing, there is a gap between their first engagement with each market and the related acquisitions. In protective clothing, for example, the company began with dyeing and selling Nomex® for the relevant markets. Technically, they made necessary adjustment to their existing equipment. Greater importance in the learning process though is to engage with relevant stakeholders in the market such as suppliers, distribution channels, customers and end users. Parallel learning process occurred while developing competence in functional digital printing technology. The company began their R&D in the 1990's before finally filed a patent in 2004. They joined a research consortium of EU Framework 6 which enabled them to meet the key co-specialised technology holder, Xenia, Ltd, a company they later acquired, and other relevant stakeholders. After entering a new market, Ten Cate continues internal R&D and acquisition programmes to re-enforce their position in the associated markets. Their constant changing through active R&D programme, acquisition and divestment, market entering and withdrawing demonstrate their capacity to maintain leadership in the existing businesses whilst building fundamental basis to pursue new competitiveness. Figure 16 illustrates several parallel activities in different markets the company engages with encompassing market expansion of the existing businesses, R&D in different markets and acquisitions to obtain new routines/resources.

Their success in managing transition is fundamentally supported by their dynamic capabilities to re-deploy internal existing resources and combine them with external co-specialised assets (Teece, 2007), and to design rapid learning processes. An ability to seek competitive co-specialised assets, either tangible or intangible, for value creation or enhancement is a crucial factor in dynamic capabilities. Internal capabilities however have to be assimilated with profound understanding of external environment (beyond the company's boundaries and industry) from which the company develop a strategy to seize opportunities. For instance, advances in chemicals and, later on, materials pioneered by successful Dutch

multinational companies AKZO-Nobel and DSM opened up new opportunities in technical, high performance textiles and composites. Increasing demand in global niche markets was also conducive for the transition. The role of dynamic capabilities is to internalise external opportunities with internal capabilities such that new value creation and enhancement can be executed.

Dynamic capabilities and evolutionary trajectory of firm

Ten Cate’s recent re-alignment of core business to functional materials is a result of such exercises. It implies that evolutionary trajectory of a firm to a great extent is defined by the firm itself. The strategic decision is derived from historical trajectory it has passed and opportunities and key competitive factor the company foresees in the future. The historical trajectory can be illustrated as dynamic competences (Figure 18). Since functional materials is an emerging field, in which technical competence is the competitive factor, as a result, Ten Cate has driven itself from maturity to technical ferment phases. In its evolution process, Ten Cate does not only adapt to business ecosystems. Moreover, it shapes them through continuous innovation and collaboration with other enterprises i.e. competitors and suppliers, customers, end users, and institutions, internal and external to the industry. In promoting its protective clothing for the US army – Ten Cate Defender M – for example, Ten Cate has convinced the US Congress to lift the country’s restriction over FR-rayon fibre importation, the key component of the product. The amendment, which is asserted in the Department of Defence Authorization Act for Fiscal Year 2008, ensures the longer term legality of Defender M product for American military use. It also demonstrates Ten Cate’s entrepreneurial acts in shaping its business ecosystem, creating competitiveness in a market, which in turn defining its evolutionary path.

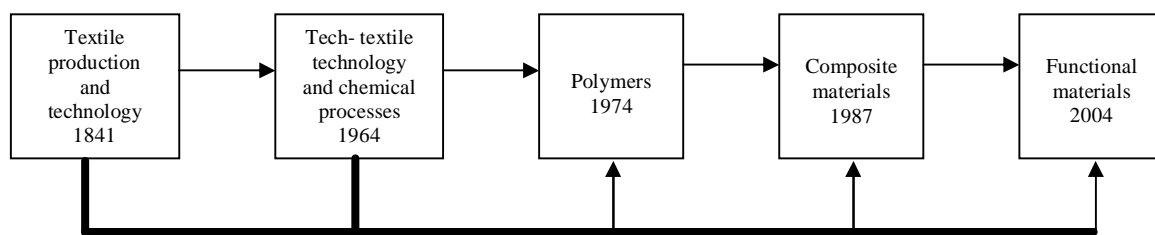


Figure 18. Ten Cate competence dynamics

The case study also demonstrates the implication of dynamic capabilities in market dynamics (Eisenhardt and Martin, 2000). Timely response and adding, recombining, and dropping resources to create a series of *temporary advantages* faster than competitors have been demonstrated in this case study. For instance, when mass consumerism emerged in the late 1970’s and early 1980’s which encouraged the omnipresent of supermarket and hypermarket and, accordingly, logistic system, Ten Cate entered plastic packaging business and undertook a series of acquisition. The sales of plastic unit made up 80 percent of the company’s turnover in 1994. However, as plastic technology matured the company found that it was increasingly difficult to compete with new competitors from emerging economy. Ten Cate had divested

the business unit in 2005-2006 but the core knowledge, skills and capabilities in polymer remain in the organisation and have been used to advance the organisation's competence in composite materials and functional materials prior to the divestment.

#### Path dependent and path breaking changes

The case study also demonstrates path-breaking changes and its implication in business reconfiguration. Path-breaking change is undertaken through a combination of internal development and external acquisition (Narula, 2000) and business unit reconfiguration (Karim and Mitchell, 2004). In the case of protective clothing and digital printing, for instance, alliances have been established in 1996 with Southern Mills, Inc and in 2004 with Xenia, Ltd, respectively. Those companies were Ten Cate's competitors in their respective fields. Acquisition did not occur until 2004 for Southern Mills and 2008 for Xenia. Hence, path-breaking changes require entrepreneurial management which has the capability to decide the time to start internal development, establish alliances and undertake acquisitions. However, Colpan (2004) and Karim and Mitchell (2004) find that some degrees of path dependence remain as a function of resources, capabilities and deeply-embedded routines. As illustrated in Figure 18, although Ten Cate operates various business sectors. The core technology remains in textile technology combined with an in-depth knowledge in related chemical processes. The core technology which links the entire business sectors permits synergies among business sectors.

Ten Cate is indeed in the process of de-maturity as a result of their dynamic capabilities. The company continuously engages with the latest development in fibres and fibre products and actively create new opportunities in various different industries. They continuously sharpen their business through transition process of technology, market, product, and business to maintain long term competitiveness. The company has laid the foundation to change the basis of competition in the Dutch textile industry and disrupted their existing production competence, marketing and distribution channels, capital equipment, skills and knowledge. Whether the entire Dutch textile industry is in the process of de-maturity, further study should be taken to examine the performance of relevant companies and whether they drive the entire industry to ferment phase. Ten Cate's geographic sales breakdown in 2003-2007, however, shows that the market in the Netherlands has been decreasing whereas the US market is showing the opposite trend. Consequently, the Netherlands has become less important as a production site and market. The majority of products manufactured in the Netherlands are for export, mainly for European markets. Such circumstances do not appear to be conducive for industrial de-maturity process.

## **CONCLUSION & IMPLICATION**

The phenomenon of maturity-trap in a company has been examined in the case study of Marzotto, S.p.A. It is argued here that the phenomenon is not solely a consequence of technological evolution. Rather, it is a phenomenon orchestrated together by several factors external and internal to the company i.e. regional and national innovative culture, industry trends, opportunities and constraints occur within the industry, historical legacies, competitor behaviour (external) and firm capabilities derived from the evolution trajectory it selects and firm inertia (internal). The consequences of local search have also been examined in this study.

On the contrary, de-maturity phenomenon is found in the case study of Ten Cate. The company has been successful in transforming itself from maturity to technological ferment phases. It is argued that de-maturity is a process involving the company's dynamic capabilities. In contrast to Marzotto, Ten Cate performed innovation strategy against unfavourable culture, historical legacies, industrial trends and constraints. The company responded to adverse circumstances by performing distant and local search to create new value creation and enhancement and to shape business ecosystems. Thus, it is entrepreneurial management embedded in dynamic capabilities that drives the innovations. The company senses opportunities in emerging markets, seizes the opportunities by assimilating their existing competence with co-specialised competences and reconfiguring business units. As a result, the company builds dynamic competences over time which defines its evolutionary path.

The case studies are not intended to generalise the condition of the entire textile industry in Italy or in the Netherlands. As we have discussed before a number of Italian textile companies have engaged with the production of technical, higher value-added textiles. Indeed, the government provides significant funding for R&D in the field. We however would like to emphasise that maturity-trap persists in the industry. Revolutionary technology alone is not sufficient to rejuvenate the industry. Indeed, such a technology may be denied by the industry. As suggested by Abernathy, et al (1983), it is crucial to explore the forces that drive evolution toward industrial maturity in order to understand de-maturity phenomenon. Therefore, comprehensive measures which involve not only technology but, more importantly, rejuvenation of local innovative culture and creating linkages with stakeholders beyond the industry boundaries need to be in place in promoting industrial renewal.

The implication of the research is expected to illuminate our understanding in innovation process in textile companies in Europe. The findings show diversity and complex relationship among variables that contribute to innovation process. Given the diversity, industrial policy devised to revitalise the industry should address relevant issues which not only involves technology but also social and historical factors which are idiosyncratic to firms and countries.

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