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1 Introduction

This interim report is part of Task 2 (Sectoral Innovation Foresight) of the Europe INNOVA Sectoral Innovation Watch (SIW) project. It presents interim findings on possible future developments in the sector under study. Particular emphasis is put on the one hand on future changes that are likely to significantly influence the evolution and emergence of innovation activities and associated markets, and on developments that are likely to be of cross-sectoral relevance to innovation on the other. Sectoral innovation foresight thus complements Task 1 of the SIW project, which analyzes current sectoral innovation performance.

The main objectives of Task 2 can be summarised as follows:

- Explore and identify the main drivers of change in the nine sectors. These drivers will be both internal and external to the sectors, with several of them being of a cross-cutting nature.
- Identify and assess key future developments in the nine sectors as well as in terms of cross-cutting developments. The emphasis is put on likely future innovation themes and emerging markets, more specifically also on the requirements and impacts they raise in terms of skills requirements, organisational, institutional and structural changes in the sectors concerned.
- Develop scenario sketches for the sectors under study.
- Highlight key policy issues for the future, with a view to enhancing the innovation performance and competitiveness of firms operating in these sectors.
- Stimulate debate and contribute to the creation of expert networks, based on the participatory elements of this task.

The time horizon of these foresight papers is five to ten years (2015-2020), depending on the specific characteristics and the pace of change in the respective sectors. The textiles and clothing sector has comparatively short innovation cycles. Therefore the time horizon considered for this sector tends to be shorter than in some other sectors (like e.g. Aeronautics and Space, Construction, which are characterized by rather long innovation cycles).

This Interim Report is based on a review of available foresight material on the textiles and clothing sector. Together with the corresponding report on the eight other sectors addressed by the SIW project (aeronautics and space, automotive, biotechnology, construction, food and beverage, knowledge-intensive business services, wholesale and retail trade), it serves as background material for a first expert and stakeholder workshop (June 2009). The report concentrates on drivers and innovation themes, but provides already some first findings and thoughts on emerging markets, requirements and future scenarios, i.e. as far as these issues can be derived from the review work. The first workshop aims on the one hand at reviewing the interim findings and on the other at exploring future scenarios of the sector in an interactive mode. The results of this first workshop and some further interviews with experts and stakeholders will then be incorporated in a draft final report that will serve as input to a second foresight workshop (November 2009). This second workshop will focus on the main policy issues that arise from the exploratory scenarios, both within the individual sectors and at their intersection. The final report will bring together in a consistent form the results generated in the different phases of the foresight exercise, i.e. will be based on revised and amended versions of the initial chapters of this interim report and additional chapters dealing with refined scenarios, future requirements and policy issues.
The interim results are presented in six chapters, starting with a situational analysis where the sector stands today to contextualize possible future developments (Chapter 2). Building on this context, Science & Technology (S&T) and demand drivers will be outlined (Chapter 3), as a basis for discussing emerging innovation themes (Chapter 4). These are expected developments resulting from the interaction of supply (technological advances) and demand (societal / customer needs) forces. In this chapter, implications of these innovation themes at firm level will also be addressed. Institutional and structural requirements and implications of the innovation themes for the sector will be highlighted in Chapter 5. This is complemented with first scenario sketches (Chapter 6) and some key questions to be addressed in the remainder of the Sectoral Innovation foresight task (Chapter 7).
2 Current situation

The European textiles and clothing (T/C) sector has undergone a large scale restructuring during the last 20 years. The resulting modernization has improved the quality of the products and the productivity of the sector. However, this restructuring and modernization of the T/C industry also caused a considerable reduction of the work force by more than one third. The elimination of import quotas and the EU enlargement was a main driver behind this restructuring process (Keenan, Saritas et al. 2004).

Despite the considerable job losses, textiles and clothing - with about 220,000 companies, a total turnover of almost 200 billion Euros and close to 3 million employees - is still an important industry sector in the EU. The T/C sector contains the NACE divisions 17, manufacture of textiles (including processes such as spinning, weaving and the finishing of products) and 18, clothing (including the design, development and manufacturing process of clothing). Textile companies, tend to be comparatively large and capital-intensive companies, and make use of high tech machinery, representing about 60% of the value added of the T/C sector. In contrast, the clothing industry is dominated by small and medium sized businesses employing about 60% of the T/C sector’s workforce (EUROSTAT 2008).

Textiles and clothing represent a significant sector in world trade with the EU27 being a main player. Today, the EU27 is the world’s largest exporter of textiles, the second largest exporter of clothing, but also the second largest importer of textiles and clothing (EUROSTAT 2008, p. 76). The European T/C industry is among the industries’ most open to globalization and, therefore, also strongly affected by globalization in recent years. Imports from China, Bangladesh and other developing countries surged after the removal of quotas in 2005 and put considerable pressure on producers located in the EU. But competitive pressure comes also from within the EU: almost three quarters of the total exports by the EU-27 Member States are intra-EU trade and go to another EU-27 Member State. This is a higher share than for many other products (EUROSTAT 2008, p. 76).

With 29.6% of the EU-27’s value added in the textile sector and 31.8% in the clothing sector Italy had by far the biggest share of the EU-27 value added in 2004 in both subsectors. While Germany, France, Spain and the United Kingdom, with each about 10% of the EU-27’s value added in the whole T/C sector, are the other main producers in absolute terms, only Italy is also above average specialized. Other countries with an above average specialization in the T/C sector as a whole and in each of the two subsectors in terms of value added as well as employment are Portugal, Estonia, Lithuania, Bulgaria and Romania (EUROSTAT 2008).

In particular the clothing sector is heavily affected by counterfeiting. The OECD calculated a counterfeiting factor of 8.117 for articles of apparel and clothing accessories: the ratio of seized counterfeit products to legitimate traded products is for this product group more than eight times higher than in total trade (OECD 2008).

While the labour productivity rate of the textiles sector is with EUR 20,000 already 27.5% below the average across the non-financial business economy clothing lags behind and has with EUR 15,000 the lowest labour productivity rate among all NACE division (EUROSTAT 2008).
One of the most important findings of the INNOVA Interim Sector Report (Dachs and Zahradnik 2009) is the heterogeneity of the T/C sector also in terms of innovativeness. The most obvious difference is the one between textiles and clothing:

- **Textiles** firms tend to engage in (technological) innovation frequently, pursue in-house innovation activities, and invest a higher share on turnover in innovation activity than the average firm in the business sector. Patents as a means to protect the results of innovative activity are more important than in clothing. More than one third of all innovating firms receive public support for innovation.

- **Clothing** firms, in contrast, pursue less frequently in-house innovative activities and invest far less in these activities than textiles firms and firms in the whole business sector. Trademarks are a more important means to protect innovation than for textiles firms. The probability to receive public funding for innovation is only half of that in textiles.

The often used label ‘low technology’ for the T/C sector may be misleading for the clothing industry, because it suggests also ‘low innovation’. Lower innovation expenditure in clothing has only little effect on innovative output, measured by the share of sales due to products-new-to-the-firm. Clothing firms also make frequent use of trademarks; this indicates that there has to be an innovative outcome worth to be protected. Both facts indicate the existence of other, non-technological innovation activities not measured by CIS. We suggest that non-technological innovation, which changes the appearance and aesthetics rather than the functions of products, constitutes a considerable part of the innovation activities in textiles and clothing.

A question discussed in Task 1 was the effects of outward FDI in production on the location of innovation. It is assumed that innovation at the home country and abroad is mostly complementary for some reasons. First, empirical research has shown that R&D and other innovative activities are still largely concentrated in the home country (Le Bas and Sierra 2002). Second, innovation is a typical complementary ‘headquarters activity’ located in the home country for which demand tends to rise when overall turnover of the firm increased.
3 Drivers of innovation and change

The above mentioned restructuring process of the T/C sector is still undergoing; labour intensive activities with relatively low innovation intensity are relocated to low-wage countries or replaced by advanced, less labour intensive, production methods. At the same time new technologies and changes on the demand side are the driving forces for the development of new products and markets as well as for organisational changes and firm strategies.

3.1 S&T drivers

While the basic techniques in the T/C sector did only change very slowly over time some mayor technological changes are at the moment shaping the future T/C sector. These new developments concern products, production methods and the distribution channels. The interplay of some or all of these new technologies with the demand side drivers will lead to new products and markets.

3.1.1 Intelligent textiles

Intelligent textiles integrate non-textiles technologies into textiles and clothing to add additional features. These inputs come to a large extent (but not limited to) from information and communication technologies (ICT). Intelligent textiles can conduct electric current or light, accumulate energy, store information, or receive and transfer radio wave to control, alert, inform, relax or entertain the wearer (Keenan, Saritas et al. 2004). The ongoing reduction in size and gains in power efficiency of electronic components make wearable computing possible (Murray 2004).

Existing important markets for intelligent textiles are defence and health. While it is likely that the demand in these markets will increase, intelligent textiles will play also a vital role in the customer clothing sector, for example as part of leisure and sports clothing.

3.1.2 Smart materials

Smart materials make use of new fibres, often based on findings in nanotechnology, biotechnology or chemistry. They can adapt to changes in temperature, are flame or water resistant, have protective features, provide more convenience or just more fun in day-to-day use. Smart materials may not just add new features but can also replace existing fibres because they are easier to handle or cheaper in production (EMCC 2008). These new fibres can be manmade fibres as well as specially treated natural fibres.

As intelligent textiles, smart materials are already widely used in the health sector, for example for their antibacterial features. While they will find more and more applications in almost all clothing applications the use of smart textile materials for non-clothing applications is also of growing importance.

3.1.3 E-commerce

The increasing use of online shopping enables producers to introduce new business models allowing them to sell their products directly to customers. This Business-to-customer (B2C)
e-commerce does not only reduce the influence of retail on business decisions but also allows gathering information on market trends and other developments on the consumer side. Another advantage of direct consumer contact through E-commerce is the possibility to develop a closer relationship with the costumer. A barrier to E-commerce in the B2C field is the preference of many customers to try on clothes before buying. New technologies such as 3D Body Measurement, advanced CAD, personalized avatars but also a harmonized sizing infrastructure can reduce the above mentioned barrier for the use of e-commerce (Kartsounis, Magnenat-Thalmann et al. 2002; EMCC 2008). EU sponsored projects fostering the research in these new technologies include the E-Tailor program and the e-T Cluster program.

E-commerce in T/C is not limited to the B2C market but plays also an important role in the Business-to-Business (B2B) market, allowing shorter product life cycles and quicker reactions to changes in the market for the producers as well as more efficient stock keeping for retailers.

3.1.4 New production technologies

New production technologies provide two main advantages; they improve manufacturing quality and speed but also offer more flexible production methods. New production technologies are also needed for the procession of new fibres (Keenan, Saritas et al. 2004).

Advanced production methods can also reduce the amount of energy and natural resources needed, minimize the impact on the environment and abolish substances harmful for employees and consumers. The measures that can be taken include the more efficient use or reuse of fibres, replacing artificial made fibres by natural fibres, reducing the amount of water and energy needed in the fibre production and changes colouring and bleaching procedures. One example is the production of polyester fleece from recycled PET bottles (de Brito, Carbone et al. 2008; Rewoven 2009).

3.2 Demand-side drivers

3.2.1 Demographic change

Declining birth rates and improved health leads to a stagnating, in some countries even declining, population while at the same time people are getting older. This change also means that the share of the working age population is declining relative to the total population. This is affecting the economy in general and the T/C sector in particular at least in the following ways (Lührmann 2005; EMCC 2008):

- The pool of qualified workers and engineers is declining
- The consumer base is declining and changing in age structure
- Consumption patterns differ over different age cohorts. It is estimated that the relative share of spending for clothing moderately declines while especially health related spending increases.
- Due to the dominance of SMEs in the T/C section the lack of succession for family businesses is a related problem.

The demographic change also accelerates intra-European migration. Well educated working age people tend to migrate to countries with the highest wage levels, resulting in a decline of the human capital base in the remaining countries, some CEE countries are especially affected by this trend. In a situation of a possible cross-European shortage of skilled labour the T/C in general may also experience above average problems as this sector is generally considered as a low-skills and low-pay sector and potential workers might therefore prefer to work in other sectors.

3.2.2 Health-aware society

The increasing health awareness among European citizens constitutes an emerging market for companies involved in healthcare and healthcare technologies. Products such as biomedical clothing constitute an opportunity for growth for companies in the sector (EURATEX 2004).

This trend is enhanced by the above mentioned aging society, while an aging society tends to spend a smaller share of total spending on clothing the share of health related spending significantly increases over age (Lührmann 2005). This will lead to a shift within the clothing sector; existing and new health related clothing will grow in importance compared to traditional clothing.

3.2.3 Changes in consumer behaviour

The overall clothing market is growing. While women’s clothing still accounts for the greatest share of the fashion market men’s and children’s clothing is also expanding (EMCC 2008). Also niche clothing, targeted to specific sub-cultures or sports is booming. These niches are often not just defined by a specific function but rather a lifestyle and also fashion as a mean for self expression plays an important role. This is supported by the increasing purchasing power of young people. They are not only spending above average on clothing, they also react extremely quickly to fashion trends and are also open to new products and distribution channels. While the share of young people is declining, their importance as indicator for fashion trends and as main costumers in niche markets remains high.

This growing importance of niche markets and fashion as a mean of self-expression leads to a growing fragmentation in the fashion and clothing market. Know how about the trends and changes in the specific niche are therefore of importance.

3.2.4 Sustainability-aware consumers

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987). European citizens take the environmental impact of the products they buy into consideration. There is also a growing awareness for social matters including working conditions and the use of child labour. Key issues concerning sustainability are ecology, reuse of fibres, long-lasting clothing and sustainable manufacturing. Corporate scandals, like the use of child labour in any part of the value chain can significantly harm a brand (EMCC 2008).
3.2.5 Demand for counterfeit goods

The share of counterfeit products is relatively high in the clothing sector and negatively affecting the demand for legitimate products. Changes in the demand for counterfeit products therefore influence the demand for legitimate products. The drivers of demand for counterfeit goods are summarized in Table 1.

Table 1: Drivers of demand for counterfeit goods

<table>
<thead>
<tr>
<th>Driving factor</th>
<th>Condition favouring counterfeiting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>Low price; big difference in price to genuine item</td>
</tr>
<tr>
<td>Quality and nature of product</td>
<td>High quality; small difference in quality to genuine item</td>
</tr>
<tr>
<td>Ability to conceal status</td>
<td>Easy to conceal infringing nature of the product</td>
</tr>
<tr>
<td>Health concerns</td>
<td>No or low health impact</td>
</tr>
<tr>
<td>Safety concerns</td>
<td>No or low potential safety impact</td>
</tr>
<tr>
<td>Personal income</td>
<td>High budget concerns by consumers</td>
</tr>
<tr>
<td>Personal values</td>
<td>Low regard for IPR and related laws</td>
</tr>
<tr>
<td>Risk of discovery</td>
<td>Low risk of discovery</td>
</tr>
<tr>
<td>Risk of prosecution</td>
<td>Low risk of prosecution</td>
</tr>
<tr>
<td>Penalties</td>
<td>Weak sanctions</td>
</tr>
<tr>
<td>Availability and ease of acquisition</td>
<td>Easy access and availability of products</td>
</tr>
<tr>
<td>Socio-economic factors</td>
<td>Lack of concern for IPR, etc.</td>
</tr>
</tbody>
</table>

Source: (OECD 2008)

3.3 Intersection of S&T and demand-side drivers

3.3.1 Changes in production and distribution and changes in consumer behaviour

New possibilities in the production, like mass customisation, and distribution of clothing are highly related to changes in consumer behaviour. While the fashion industry is already characterized by very short product life cycles this speed of change is likely to increase further when using these new modes of production and distribution. Producers can use the consumers’ feedback through e-commerce to adopt their products within very short time, mass customisation supports this trend. New technologies like 3D body scanners or increased safety when using only shopping will reduce the at the moment still existing barriers for e-commerce.

3.3.2 Importance of innovation

While the T/C sector is traditionally seen as a low-tech sector the above mentioned science and technology developments as well as changes on the demand side indicate a growing importance of R&D in this sector. Also inputs from other technologies are of outstanding importance. Managing this increasing importance of innovation is a key topic to stay competitive. Especially in the clothing subsector, partly because of the dominance of SMEs.
and the resulting financial and personal limitations for most companies, co-operations within the sector, with suppliers from outside the sector as well as with universities and research institutes are necessary to archive this. The growing importance of innovation is not limited to new products but also to the production and distribution of new and established products.

3.3.3 Health aware society and intelligent textiles

Intelligent textiles and smart materials can be used in the health and medicine sector in various ways. One application of intelligent clothing is sensors to monitor the user’s health integrated in clothing. Smart materials are, by using nanoparticles of silver, zinc oxide or anatase, a viable solution to stop infectious diseases due to the antimicrobial properties of these nanoparticles used (Institute of Nano Technology 2009).

At the same time, the use of nanoparticles has increasingly been seen as a potential threat to health and environment because the long run effects of these particles are in some cases uncertain.

Therefore the increasing health awareness among consumer can increase the demand for some intelligent textiles and smart materials while it might decrease the demand for others. This health and environment awareness might lead to new regulations which affect the use of new materials.

3.3.4 Internationalisation and international trade

The broad topic of internationalisation and trade liberalization is clearly not specific to the T/C and also to a certain degree already a fact and not a driver for future change (see table A in the Annex for the external trade figures of the EU-27 as of 2006). At the same time the already ongoing internationalisation interacts with the above mentioned drivers in various ways, including:

- The potential pool for suppliers, customers and other business partners is in many cases global. Managing the information on these global business opportunities is therefore a key challenge to stay competitive.

- Non European competitors are moving up the value chain and are also globally expanding. Therefore the internalisation trend is not limited to mass production but more and more the complete value chain, including traditional European strengths like design (EMCC 2008).

- S&T developments are also of a global nature. Monitoring potential useful technologies has to be done globally, the benchmark for best practise shifts from local competitors to worldwide.

- The growing demand for high skilled workers and the (partial) lack of qualified personal in the home country makes the recruitment of specialists from other EU countries and also of third country nationals in some situations necessary.

- As the enforcement of IPR is often comparable weak in newly industrialized and emerging economies, the importance of the global protection of IPR grows.
4 Emerging innovation themes and their requirements

4.1 New products, processes, technological trajectories and markets

4.1.1 Intelligent clothing

Intelligent clothing can be summarized as clothing with additional features beyond what traditional clothing can provide. This can be achieved by using new fibres or embedding the already above mentioned technologies.

One main driver in this field is nanotechnology and will offer for example the following functions and products (Institute of Nano Technology 2009):

- Nano-particles in or on the fibre can provide a textile with antimicrobial functionality or significantly increase its UV protection.

- Microcapsule or nano-capsule systems that are later applied to the finished textile are suitable for wellness and medical applications. Rubbing during wear causes the incorporated active substances to be released.

- A fresh finish is achieved using cyclodextrins. These nano-scale repository structures are capable of binding odour molecules by absorbing them and releasing these once again in the next wash.

- A sensor-shirt was developed to monitor the electrocardiogram of patients based on electrodes with a plasma coating as finish.

- An application for medical textiles is ceramic nano-coatings that are applied to a dressing. Using sol-gel processes give the dressing anti-adhesive properties so the newly formed skin remains on the wound when the dressing is changed.

Also the intersection of nanotechnology and bionics plays a main role, possible products include (Institute of Nano Technology 2009):

- A swimsuit with extremely low flow resistance for top athletes which is modelled on a shark’s skin.

- The principle of self-cleaning modelled on the leaf of a lotus plant and many types of insect has also found its way into textile applications.

- Intense textile colour effects which cannot be produced using conventional chemical dyes. This system is taken from a butterfly that achieves its ultra black colouring using nano-scale “light traps”.
• Carbon nano-tubes will play an essential role in the next few years in relation to high-strength or semi-conductor-like fibres.

HMIs (human-machine interfaces) for soldiers and first responders or wearable heating also make use of nanotechnology, additionally sensors and communication technologies are embedded. Clothing can also be used to transmit data from sensors monitoring the wearer’s health as a part of a personal area network (PAN) (Braun, Constantelou et al. 2004).

4.1.2 Protective clothing

The protective function is maybe the oldest function of clothing, clothing was always a second skin meant to protect people from harmful environmental (especially weather) and physical influence. New materials are able to perform these functions in a better and more comfortable way and also additional protective functions are possible. Techniques like vacuum plasma treatment or continuous dip coating are applied to create micro- and nanosurfaces with given properties such as water repellence, abrasion and flame residence.

Some examples include (Institute of Nano Technology 2009):

• CBRN (Chemical, Biological, Radiological, Nuclear) protective clothing - nanotechnology is the driver behind many CBRNE textile innovations and will cover several related protective and comfort enhancing technologies including phase change materials (PCMs), shear thickening fluids, ultra-hydrophobic treatments, nano-fibre membranes, shape memory polymers, next generation adsorbents and self-detoxifying fabrics.

• Carbon Nanotubes (CNTs) for helmets and hip protectors. Such body protectors have to absorb the energy of the shock during an impact and keep the reaction force under a certain critical value beyond which injuries may occur, while keeping a low weight for an optimum comfort.

4.1.3 Sustainable textiles and clothing

While avoiding scandals and producing in line with the basic concept of sustainability is of growing importance a proactive approach, voluntary setting and guarantying higher standards in all or some of these topics, seems to be a promising way to satisfy the growing consumer demand for such goods.

Generally speaking, three strategies are possible:

• Avoiding scandals and safeguarding that the complete value chain is in line with the social and ecological believes of the majority of the consumers. This strategy is already used by the majority of international brands.

• Setting voluntary higher standards than competitors and focussing on the sustainability topic in general or on some of the concerned topic. Key topics are here eco-textiles and fair-trade.

• Adding above average standards in a very competitive market to gain a unique feature or to be able to sell for a higher price.
These strategies are not limited to a single company but are also possible for regions or even the entire EU. This is a possibility to offset some of the negative cost effects of higher labour and environmental standards by guaranteeing the sustainability of the product, for example by using eco-labels. Some transnational existing eco-labels and the issues addressed are summarized in table 2, similar national labels exist in almost all industrialized countries (Global-Ecolabelling-Network 2009). With the notable exception of the Nordic Swan label most of the existing labels focus on product safety and environmental aspects of the production while social aspects are left out. The most successful of these labels, the Oeko-Tex Standard 100, was adopted by more than 53,000 companies in 2005 while the success of the European Eco-label was rather poor with 68 companies in 2007 (Biguet, Dascot et al. 2007).

<table>
<thead>
<tr>
<th>Table 2: European Eco labels</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Label</strong></td>
</tr>
<tr>
<td>Oeko-Tex Standard 100 / 1000 / 100plus</td>
</tr>
<tr>
<td>European Eco-label</td>
</tr>
<tr>
<td>Nordic Swan</td>
</tr>
</tbody>
</table>

Source: (Oeko-Tex 2009), (EC 2009), (Nordic-Ecolabelling 2009)

### 4.1.4 Smart materials for non-clothing use

Smart materials are also of importance in areas like industrial textiles, filters, transportation, home, construction, agriculture and packaging (EMCC 2008). Textiles fibres are in this context often used as reinforcement in composite materials, for example in glass, kevlar or carbon strands.

Many of these applications are highly specialized niches; firms active in these niches often compete with producers of comparable products and components made of metal, plastics or wood that technical textiles attempt to replace (EURATEX 2004). Producers therefore identify themselves rather with the application of their products and not with their common raw material (Wood, Smith et al. 2000).

### 4.2 Organisational changes and firm strategies

#### 4.2.1 Customized clothing

Advanced production methods, consumers demand for unique clothes and e-commerce are all drivers for a more frequent use for customized clothes. By using mass customization techniques customized clothes can be produced at similar prices as mass products. Customized clothes can only be produced after the order of a specific customer and are only
of use for this customer; therefore a quick production and distribution system is needed. They also have to fit so correct seizing is an issue.

3D body scanners and personal avatars in combination with automated and precise production methods can solve the seizing issue while e-commerce, proximity to the market and vertical integration help to minimize the time span between order and delivery.

4.2.2 Co-operations

The move to a knowledge intense sector increases the need to co-operate for T/C companies. These co-operations include the following options:

- Co-operations with competitors. Research is costly and the outcome often uncertain; especially SMEs often lack the needed financial and human resources. Joining forces with a competitor may help to reduce the needed resources and the risk involved.

- Co-operations with suppliers of equipment, distributors and customers.

- Co-operations with universities and contract research institutes

- Co-operations with companies operating in other technologies. As inputs from ICT, biotechnology, nanotechnology and other technologies are of growing importance and most T/C companies don’t have competencies in these fields and not enough resources to gain these competencies co-operations with firms active in these fields.
5 Institutional and structural co-developments and implications

5.1 Skills requirements and the knowledge base

5.1.1 Labour market and required skills

The required skills in the T/C sector will change significantly with the move from mass production to a more knowledge based production. With the growing importance of inputs from other technologies at least basic knowledge about these input technologies is needed. New production methods replace a big share of the traditional un- or low skilled part of the textiles and clothing sector.

Some tasks in clothing manufacturing will stay labour intense, remain difficult to automate and are at best semi-skilled. These jobs already moved to a large extent to low-wage countries (Keenan, Saritas et al. 2004). A certain part of these jobs will remain in the European Union or at least at locations close to the EU as proximity to the market plays a role. Some of the new member states and the Mediterranean countries may benefit from this development, offering proximity (for example Morocco for Spanish companies) and low labour costs.

5.2 Institutional change

5.2.1 Intellectual property rights

The move from commodities to specialities and the costly investments necessary for this move make intellectual property rights (IPR) and the possibility to enforce them are of crucial importance for the T/C sector (EMCC 2008). At the moment, trademarks and brand are the most commonly used IPR in this sector, followed by patents. The use of IPR is highly influenced by the size of the company; almost all large companies have a defined IPC. While clothing/fashion companies mostly use trademarks and brand, technical textiles and textiles processing companies rely more on patents. Again the domination of SMEs in the sector seems to be a main obstacle to an effective IPR strategy. For these companies the costs and the length of the procedure are the main reasons why they don’t have any IPR strategy, also lack of information plays a main role (NetFinTex 2006).

Besides reducing barriers for small companies to implement an IPR strategy the efficient enforcement is the second main challenge. While it is not likely that counterfeiting can be reduced to zero the reduction to an acceptable level is the target of a number of already implemented measures including international agreements but also improved costumes procedures and public awareness (NetFinTex 2006; OECD 2008).
5.3 Structural change

5.3.1 Proximity to the market and vertical integration

Over the last years moving production to east and south Asia, mainly for lower labour prices, was the overwhelming trend in the T/C sector. Especially the clothing industry is also very fragmented. As fashion cycles shorten and demand for a specific design became increasingly uncertain a quick reaction to changes in the market is of growing importance (Birtwistle, Siddiqui et al. 2003). With advanced production methods the capital needed in the clothing sector increases while the labour intensity decreases. One way to react in such a quick way is proximity to the market and vertical integration.

Box 1: Examples for vertical integrated clothing companies

One example for this approach is the Spanish clothing company Zara. They produce around 11,000 new designs a year, the average time from sketching a new piece of clothing to delivery is only 10-15 days, fresh products are delivered twice a week to the stores. This is only possible by using an integrated business model including design, just in time production, marketing and sales. By producing half its cloths in house Zara does not have to rely on slow suppliers, the whole set-up is designed to minimize fashion risks.(Keenan, Saritas et al. 2004)

Another example for such an approach is the US clothing company American Apparel. Founded in 1997 it is the biggest clothing manufacture in the US, also using a vertically integrated business model and producing 100% of their products in house. The company also voluntary pays well above the usual wage level in this sector in the US and addresses various environmental issues. The products are successful advertised as sustainable and the company is expanding worldwide.

5.3.2 Funding for the T/C sector

Funding is one of the main factors hampering innovative activities in the T/C sector. CIS data (for detailed discussion see work package 1) indicates that this is the single most important factor hampering innovation for the textiles industry as well as for the clothing industry. For the clothing industry this factor is not just the main restricting factor but also a limitation far above the average for all industries. This is partly caused by the domination of SMEs in the sector. Some progress is already made, namely the Action Plan7 and the Financial Services Action Plan 8 (EC 2004). T/C companies can also benefit from horizontal funding programmes at European level, including the structural funds, the globalization adjustment fund and the Competitiveness and Innovation Programme (CIP)(EC 2009).
6 First elements of scenarios

Two main questions arise at the starting point for building scenarios for the T/C sector:

- What are the main dimensions for scenario building?
- Is it more suitable to create integrated scenarios dealing with the textiles and clothing sector or better to build separated scenarios for each of the two subsectors?

The above mentioned developments in the T/C sector make the inclusion of the following five dimensions into scenarios useful:

- Technological change
- Consumer preferences
- Access to funds
- Global protection of IPRs
- Availability of skilled workers

The first of these dimensions, the rate of technological innovation, heavily depends on the four other dimensions. Therefore it might be useful to understand these dimensions as the rate of technological innovation in the technological fields which are important as inputs for the T/C sector and consider the rate of technological innovation within the T/C sector as part of the potential outcomes of the scenarios.

Consumer preferences are a very broad dimension, including aspects like design, health awareness, and attitudes towards sustainability. Therefore splitting up this dimension in some way might be useful.

While these first two dimensions are mainly based on the drivers of changes in chapter 2, the remaining three dimensions, access to funds, global protection of IPRs and availability of skilled workers, are equivalent to the in chapter 4 discussed necessary co-developments. All three of them are also possible fields for public involvement.

While the T/C sector is clearly not one homogenous sector and therefore splitting up scenarios into textiles and clothing seems useful it should be kept in mind that for all clothing products inputs from the textile industry are needed and that the clothing industry is the main costumer for the textiles industry. However, technical textiles and non conventional applications of textile fibres are of growing importance and need to be considered for scenario building.
Box 2: EMCC scenarios for the T/C sector as an example for T/C scenario building

The European monitoring centre on change (EMMC) developed four scenarios for the future of the T/C sector. The aim was to build scenarios which are plausible (but not necessarily the most probable), internally consistent and contain enough information to describe the functioning of a system. Each scenario also presents implications in terms of business strategies, localisation choices, innovation, employment and skills demands (EMCC 2008).

The six most important dimensions identified for building these scenarios are:

- **Development of the European economy:** This dimension was selected because of its strong influence on the consumer demand. The two possibilities are high growth and stagnating.

- **Consumer demand for products:** The variable here is not the overall level of consumer demand but the main motive for buying a specific product. This motive can be the function of the product or the desire for self expression; the variables are therefore functionality and identity.

- **Public values:** The distinction made here is between individualism and community.

- **Rate of technological innovation:** This rate can be high or low.

- **Public involvement in the sector:** Active involvement and little involvement are the two options. As active involvement includes new regulations this involvement can both enable or hinder the development of the T/C sector.

- **Global protection of IPRs:** Intellectual property rights (IPR) can be weak or strong in these scenarios.

The four scenarios, considered being the most interesting, diverse, internally consistent and plausible ones are summarized in table 3.
Table 3: EMCC scenarios for the T/C sector

<table>
<thead>
<tr>
<th>Dimension / Scenario</th>
<th>Material girl</th>
<th>Express yourself!</th>
<th>Stayin’ alive</th>
<th>We are the world</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of the European economy</td>
<td>High growth</td>
<td>High growth</td>
<td>Stagnating</td>
<td>Stagnating</td>
</tr>
<tr>
<td>Consumer demand for products</td>
<td>Functionality</td>
<td>Identity</td>
<td>Functionality</td>
<td>Identity</td>
</tr>
<tr>
<td>Public values</td>
<td>Individualism</td>
<td>Individualism</td>
<td>Community</td>
<td>Community</td>
</tr>
<tr>
<td>Rate of technological innovation</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Public involvement in the sector</td>
<td>Little involvement</td>
<td>Active involvement</td>
<td>Little involvement</td>
<td>Active involvement</td>
</tr>
<tr>
<td>Global protection of IPRs</td>
<td>Weak</td>
<td>Strong</td>
<td>Weak</td>
<td>Strong</td>
</tr>
</tbody>
</table>

Source: (EMCC 2008)
7 Key Questions

Associated to the preceding exploratory analysis, a number of issues are still subject to much uncertainty and warrant further attention:

- Emerging economies, especially in South and East Asia, are at the moment mainly seen as low wage production locations and therefore as a threat for employment in Europe. With an increasing purchasing power in these countries, can these countries develop into markets for European T/C products? What are potential new markets for European products?
- How and whether to transfer the emerging possibilities from S&T that are often being made in other areas than the T/C industry? What are potential new applications for textiles?
- The access to funds is the most important factor hampering innovative activities in the T/C sector. In light of the ongoing world financial crisis and the restructuring process of the T/C sector additionally measures are likely to be needed to make the move to knowledge intense sector possible. Which measures are needed and how they can be implemented?
- The profile of the workforce in the T/C sector is undergoing a remarkable change at the moment. While the total workforce declined and is likely to continue to decline the demand for engineers and other skilled workers will increase with the move to a more knowledge based production. How to manage this changing demand in skills and how to attract more high skilled and educated?
- As design and innovation are strong points of the European T/C industry intellectual property rights are of importance to safeguard these strong points. How to improve the global enforcement of IPRs? How to support especially SMEs to develop an appropriate IPR strategy? How to reduce consumer demand for counterfeit T/C products?
- Comparable high environmental and labour standards in Europe are at the moment often seen as a competitive disadvantage. In light of an increasing consumers’ awareness for health and sustainability issues, can this higher level of regulation be transformed into an advantage? Are mandatory regulations or voluntary labels, like the existing eco-labels, the more promising way? How can the consumer awareness for these issues be further increased?
References


## Annex

### Table A: External Trade (EU-27, 2006)

<table>
<thead>
<tr>
<th></th>
<th>Extra-EU exports (EUR million)</th>
<th>Extra-EU exports (% share of T/C)</th>
<th>Extra-EU imports (EUR million)</th>
<th>Extra-EU imports (% share of T/C)</th>
<th>Trade balance (EUR million)</th>
<th>Cover ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Textiles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Textile yarn and thread</td>
<td>1,578</td>
<td>4.7%</td>
<td>2,966</td>
<td>3.8%</td>
<td>-1,387</td>
<td>53.2</td>
</tr>
<tr>
<td>Textile fabrics</td>
<td>6,597</td>
<td>19.7%</td>
<td>5,000</td>
<td>6.5%</td>
<td>1,596</td>
<td>131.9</td>
</tr>
<tr>
<td>Made-up textile articles, except apparel</td>
<td>1,672</td>
<td>5.0%</td>
<td>6,787</td>
<td>8.8%</td>
<td>-5,115</td>
<td>24.6</td>
</tr>
<tr>
<td>Other textiles</td>
<td>5,144</td>
<td>15.3%</td>
<td>3,691</td>
<td>4.8%</td>
<td>1,453</td>
<td>139.4</td>
</tr>
<tr>
<td>Knitted and crocheted fabrics</td>
<td>1,256</td>
<td>3.7%</td>
<td>774</td>
<td>1.0%</td>
<td>481</td>
<td>162.2</td>
</tr>
<tr>
<td>Knitted and crocheted articles</td>
<td>1,812</td>
<td>5.4%</td>
<td>8,673</td>
<td>11.3%</td>
<td>-6,861</td>
<td>20.9</td>
</tr>
<tr>
<td><strong>Wearing apparel, furs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leather clothes</td>
<td>311</td>
<td>0.9%</td>
<td>1,012</td>
<td>1.3%</td>
<td>-701</td>
<td>30.7</td>
</tr>
<tr>
<td>Other wearing apparel and accessories</td>
<td>14,467</td>
<td>43.2%</td>
<td>47,663</td>
<td>61.9%</td>
<td>-33,196</td>
<td>30.4</td>
</tr>
<tr>
<td>Workwear</td>
<td>175</td>
<td>0.5%</td>
<td>923</td>
<td>1.2%</td>
<td>-749</td>
<td>18.9</td>
</tr>
<tr>
<td>Outerwear</td>
<td>6,649</td>
<td>19.8%</td>
<td>21,246</td>
<td>27.6%</td>
<td>-14,597</td>
<td>31.3</td>
</tr>
<tr>
<td>Underwear</td>
<td>2,956</td>
<td>8.8%</td>
<td>17,484</td>
<td>0.0%</td>
<td>-14,528</td>
<td>16.9</td>
</tr>
<tr>
<td>Other wearing apparel and accessories</td>
<td>4,687</td>
<td>14.0%</td>
<td>8,010</td>
<td>10.4%</td>
<td>-3,323</td>
<td>58.5</td>
</tr>
<tr>
<td>Furs, articles of fur</td>
<td>678</td>
<td>2.0%</td>
<td>475</td>
<td>0.6%</td>
<td>203</td>
<td>142.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>33,515</td>
<td>100.0%</td>
<td>77,041</td>
<td>100.0%</td>
<td>-43,527</td>
<td>43.5</td>
</tr>
</tbody>
</table>

Source: (EUROSTAT 2008)