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Leapfrog CA aims to establish a permanent **European Expert Network and Knowledge Platform for Intelligent Apparel Manufacturing Concepts and Technologies**.

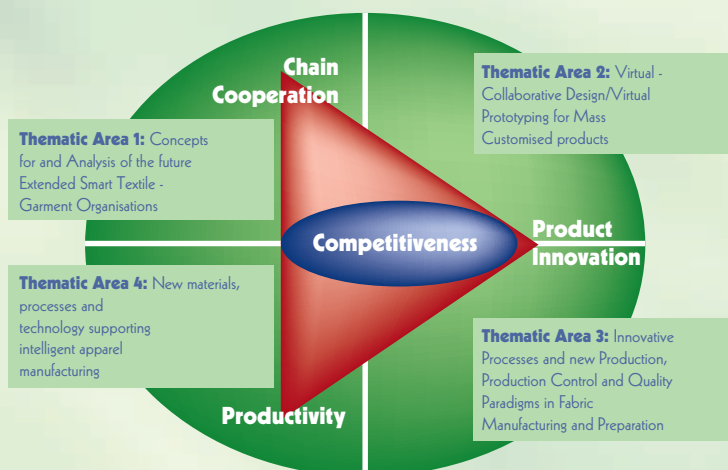
Through the **analysis of results and coordination of ongoing activities of over 70 relevant research projects** in Europe, LEAPFROG CA will create a vast and well-structured pool of knowledge available to researchers, technology developers and industrial users working towards a **technologically optimised and fully integrated clothing design and production system**. This should help speeding up the necessary strategic move to finally realise truly flexible, rapid, customised manufacturing of apparel and other fashion products in Europe through the concept of the **Extended Smart Textile/Garment Organisation**.

The project's networking and knowledge structuring exercise will **secure added value by providing the necessary, but so far missing multidisciplinary and cross-sectorial European forum** to share common problems and solution-oriented approaches, to channel efforts efficiently, to exchange and complement experience, to effectively transfer technology, to disseminate research results to recommend best practice to the sector and to develop **an integrated roadmap for future**

**research**.

The work of the expert network will focus on the collection and structuring of knowledge related to 3 following main objectives: (1) to significantly raise **productivity** in apparel production, (2) to step up the pace and efficiency of **product development and innovation** and (3) to improve speed and effectiveness of **value chain cooperation**.

### 3 Objectives - 4 Thematic Areas



The collected and structured knowledge will be provided in the form of a virtual platform that will serve:

- as a powerful search tool for scientists and developers
- a screening instrument for identification of state-of-the-art technologies and solutions
- an e-learning platform for companies interested in discovering basic innovation concepts
- In addition the project will undertake a large-scale

**expert survey** on industrial needs and current and expected future scientific-technological developments as a basis for a detailed **research roadmap** towards the preservation and further development of a **competitive integrated clothing/fashion design, manufacturing and retail network in the Pan-European-Mediterranean Area**.



# The Thematic Areas of LEAPFROG CA

## Thematic Area 1: Concepts for and Analysis of the future Extended Smart Textile-Garment Organisations

The idea of the future Extended Smart Garment Organisation (xSGO) is to enable the European garment industry to use and to integrate (1) new product conceptions, (2) new production technologies and materials, and (3) new organisational conceptions and ICT possibilities, and thus to become highly flexible and self-adaptive towards new challenges and opportunities. This will be achieved by a consequent application of three basic conceptions: (1) organisational networking, (2) knowledge networking and (3) ICT networking.

To enable all members of the textile and clothing supply net in *The World of Textiles and Garments* to follow this conception a clear structure of the existing knowledge in each of the three areas, as well as roadmap how to overcome potential gaps are required. Therefore the expert group of Thematic Area TA1 will identify, collect and analyse in a first step the State-of-the-Art in:

1. Organisational Networking, in terms of business process networking and personal collaboration, regarding permanent and dynamic collaboration. This includes for example the description of cooperation strategies and forms, or of production models. Special attention will be put to industrial districts / clusters and their support by virtual (enterprise) structures, to the dynamically extended enterprise, and to virtual organisations.
2. Knowledge Networking deals with the acquisition and maintenance of knowledge related to organisations, to processing and to garments and textile materials, with communication and distribution of knowledge including standards for modelling and information exchange, as well as with knowledge representation in distributed networks.
3. ICT Networking covers all issues of support of collaboration for the xSGO. This includes for example methods and systems for electronic communication or for inter-organisational order processing, the use of web (service) technologies for marker making or structures for network-wide planning and control of production.
4. Individual Garment Enterprising covers the areas of enterprise management and strategies, new product innovation and development, purchasing, production management, sales and distribution, and logistics for the garment industry; including common, sector-independent knowledge.

A comprehensive knowledge map of the xSGO, together with that of the other Thematic Areas will provide to the community an integrated view of and navigation tool within the knowledge and research activities for the European garment industry.

## Thematic Area 2: Virtual - Collaborative Design/Virtual Prototyping for Mass Customised products

Work in this Thematic Area will:

1. review **innovative garment design and prototyping tools** (combining 2D design and 3D prototyping),
2. analyse **new design methodologies** (associated to the change of design culture from 2D to Virtual 3D),
3. define the state of the art of **morphological analysis** (laying the basis for processing both linear or 1D and 3D body data) and
4. explore new production models related to the concepts of **mass customisation** and other **service-oriented new retail concepts**.

A collection of structured information on current research in these fields will feed the LEAPFROG CA Shared Knowledge Infrastructure and will allow the identification of gaps in research for developing an Integrated Research Roadmap in this Thematic Area.



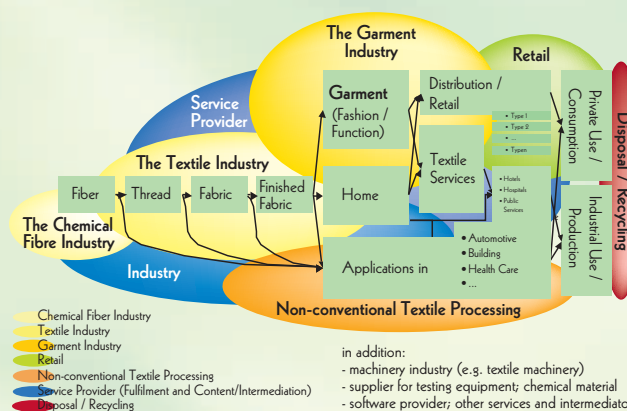
3-D virtual garment design

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The results of this work will help to define how future research projects can lead to further innovation in the area, such as **improved real-time cloth simulation** allowing better **virtual fit and comfort evaluation**,

solutions to the **3D to 2D mapping** problem in the garment design, **intelligent pattern making** approaches based on **human body "morpho-types"**, saving of costs and competitive advantages development through new production models and infrastructures.

## The World of Textiles and Garments



Structure of the textile-clothing-retail network

© ITV-Denkendorf, Tex-Map Project

# The Thematic Areas of LEAPFROG CA

## Thematic Area 3: Innovative Processes and new Production, Production Control and Quality Paradigms in Fabric Manufacturing and Preparation

Fabric manufacturing is an essential component in the value chain of apparel manufacturing. In many cases apparel functionality is achieved by functionalizing fabrics. The production of fabrics is a complicated process which encompasses various steps such as fibre and yarn production, fabric formation and finishing.

Thematic area 3 working group focuses on those aspects of fabric manufacturing processes that can solve garment manufacturing problems and enhance garment manufacturing productivity and the products themselves. The focus of the group is on the following technological fields:

1. **Distributed on-line process and quality control:** Producing fabrics requires many process steps depending on the required fabric properties. Versatile technologies which guarantee or enabling zero defects production would mean a serious step beyond present day technology which relies mostly on optical techniques and image analysis technology.
2. **Dry fabric finishing techniques:** Traditional finishing of fabrics uses large amounts of water and effluents. The textile industry is making an enormous effort in designing processes which consume less water. In recent years the industry has invested considerable time and resources in research to develop new dry finishing technology such as: vacuum and atmospheric plasma, laser finishing, digital printing...
3. **Nano-technology based processes for fabric functionalisation:** Nano-technology offer new and tremendous new opportunities for fabric functionalisation. Nano-additives in fibres and coatings can create unseen added value. Further, nanofiber webs are beginning to show there potential. Although a number of applications are already present on the market a number of problems need to be solved.



## Thematic Area 4: New materials, processes and technologies supporting intelligent apparel manufacturing

Clothing production in Europe suffers from the high labour cost component involved in garment manufacture which makes this activity largely uncompetitive in high-labour cost countries. The heavy quality-critical human intervention in garment made-up operations and many inter-process handling and storing tasks leads to inefficiencies and unusually high levels of faulty products - up to 20% even in well-run factories with qualified operators - unimaginable in most other industrial production processes.

In order to enable the industry and its technology suppliers to tackle these problems, the Thematic Area 4 expert group will:

1. Review recent advances in **automated fabric handling concepts** and innovative fast and highly re-configurable robotic devices with high dexterity and efficiency for the handling of limp materials, including modelling techniques to enable the realistic simulation of the interaction between robotic grippers and fabric, during various handling operations
2. Identify major requirements for **automatic joining**, comparison of current achievements on alternative fabric joining technologies like laser seaming, robotic sewing, ultrasonic welding and heat sealing, benchmarking towards consolidated sewing;
3. Undertake a scientific review of progress in the area of shape memory and stimuli sensitive materials, focusing on modelling of the peculiar thermodynamics and chemical-physical transformations to predict fabric functional response, definition of a research strategy for the **use of multifunctional materials for joints reduction and joint-free 3D shaping of complex textile parts.**



automated fabric handling prototype

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# Consortium of Partners

**EURATEX - European Apparel and Textile Organisation, Brussels, Belgium**  
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