

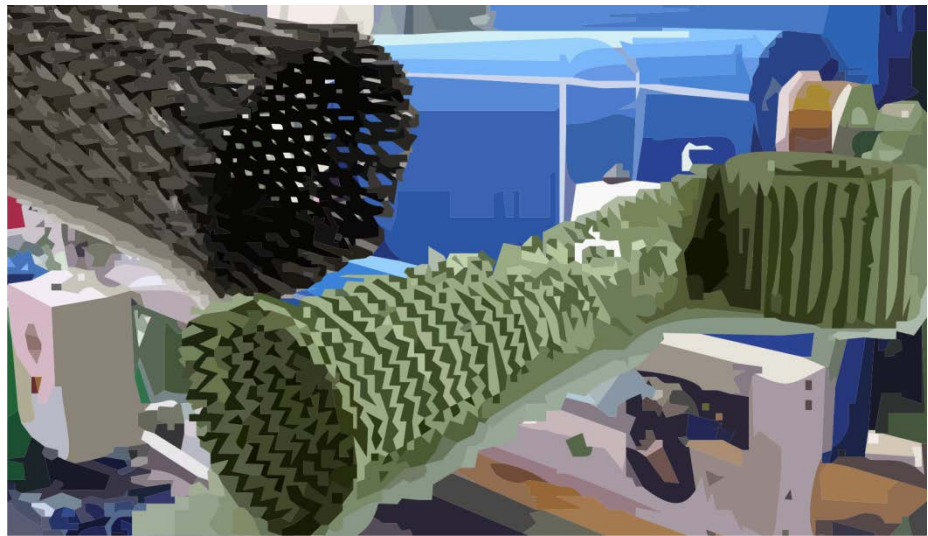
This fiche is part of the wider roadmap for cross-cutting KETs activities

'Cross-cutting KETs' activities bring together and integrate different KETs and reflect the interdisciplinary nature of technological development. They have the potential to lead to unforeseen advances and new markets, and are important contributors to new technological components or products.

The complete roadmap for cross-cutting KETs activities can be downloaded from:

<http://ec.europa.eu/growth/industry/key-enabling-technologies/eu-actions/ro-ckets>

Potential areas of industrial interest relevant for cross-cutting KETs in the Textiles domain



This innovation field is part of the wider roadmap for cross-cutting KETs activities developed within the framework of the RO-cKETs study. The roadmap for cross-cutting KETs activities identifies the potential innovation fields of industrial interest relevant for cross-cutting KETs in a broad range of industrial sectors relevant for the European economy.

The roadmap has been developed starting from actual market needs and industrial challenges in a broad range of industrial sectors relevant for the European economy. The roadmapping activity has focused on exploring potential innovation areas in terms of products, processes or services with respect to which the cross-fertilization between KETs can provide an added value, taking into account the main market drivers for each of those innovation areas as well as the societal and economic context in which they locate.

Taking the demand side as a starting point, cross-cutting KETs activities will in general include activities closer to market and applications. The study focused on identifying potential innovation areas of industrial interest implying Technology Readiness Levels of between 4 and 8.

TX.2.1: Wearable active textiles and clothing for improved human performance aimed at human safety and protection

Scope:

To develop wearable textiles and clothing capable to measure and communicate human living functions (including through integrating sensors, flexible screens, embedded energy storage or harvesting devices) and/or react autonomously to changing activities or conditions of the wearer in order to optimise the wearer's comfort and safety at every moment.

Demand-side requirements (stemming from Societal Challenges) addressed:

Depending on the application, textiles can contribute to tackle the following societal challenges:

- Health, demographic change and wellbeing
- Inclusive, innovative and secure societies
- Climate action, resource efficiency and raw materials
- Secure, clean and efficient energy

Demand-side requirements (stemming from market needs) addressed:

- Provide for personal protection and safety
- Address individual customer needs and use scenarios

Specific technical/industrial challenges (mainly resulting from gaps in technological capacities):

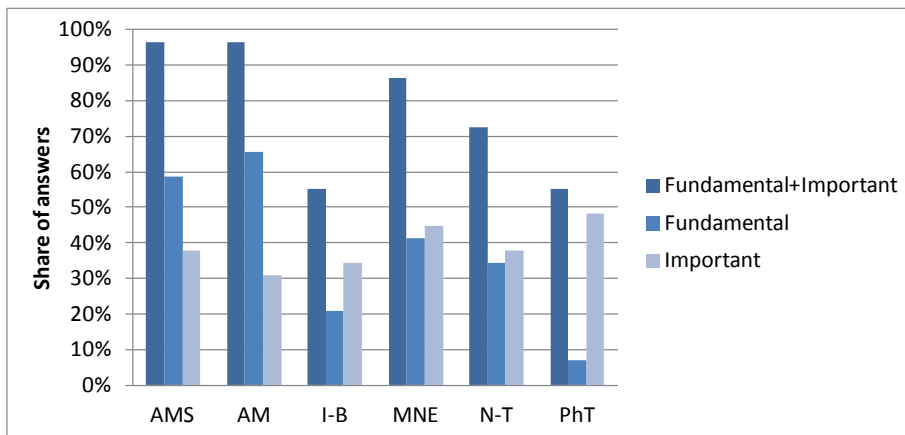
- Development of active textiles, which react autonomously or actively to the changing activities or conditions of the wearer in order to optimise comfort and safety at every moment
- Integration of smart textile materials and built in electronics (such as miniaturized embedded sensors, flexible screens, embedded energy storage or harvesting devices) in order to achieve intelligent and functional textiles and clothing capable to measure parameters and react autonomously to the changing conditions of the wearer

Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of wearable textiles and clothing capable to measure and communicate human living functions and/or react autonomously to changing activities or conditions of the wearer thanks to incorporating smart textile materials and/or built in electronics.

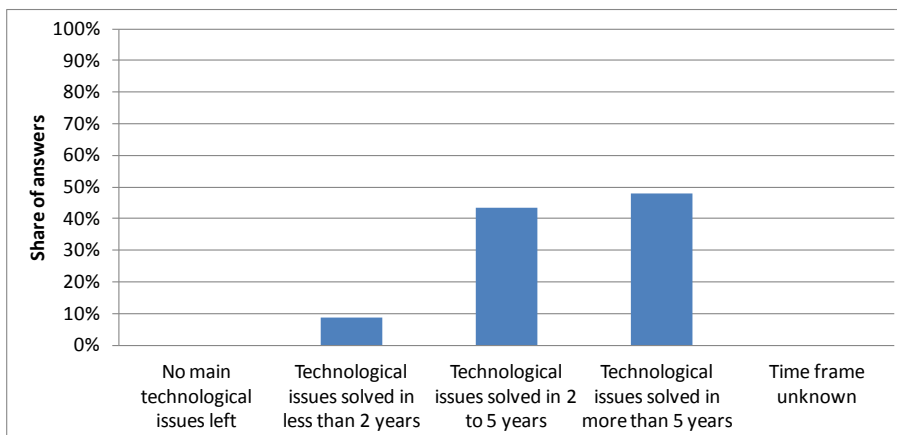
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong interaction of KETs with respect to this Innovation Field, with either fundamental or important contribution mainly by the following KETs:

- Advanced Manufacturing Systems (AMS)
- Advanced Materials (AM)
- Micro- and Nano-Electronics (MNE)
- Nanotechnologies (N-T)



Timing for implementation:

According to the majority of KETs experts' opinions (whose result is depicted in the below bar chart), desk research, and in line with the KETs-related patenting activity in this field, it is considered that the main technological issues holding back the achievement of cross-cutting KETs based products related to this Innovation Field could be solved in a time frame of more than 5 years, yet significant consensus by experts indicates also shorter periods being necessary:



Hence, depending on the specific technical and/or industrial challenges holding back the achievement of cross-cutting KETs based products related to this Innovation Field, the provision of support in the short to medium term should be taken into consideration within this framework.

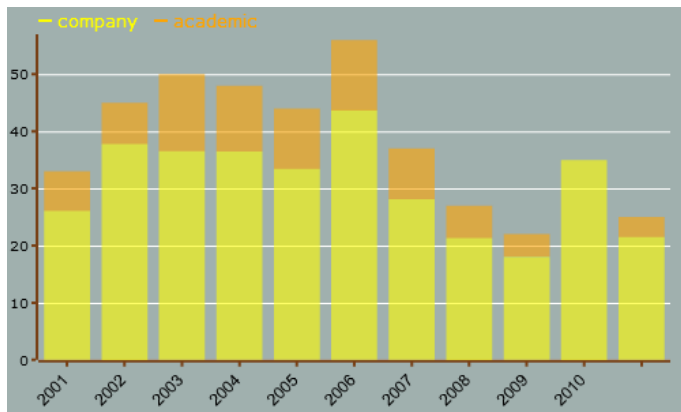
Additional information according to results of assessment:

➤ **Impact assessment:**

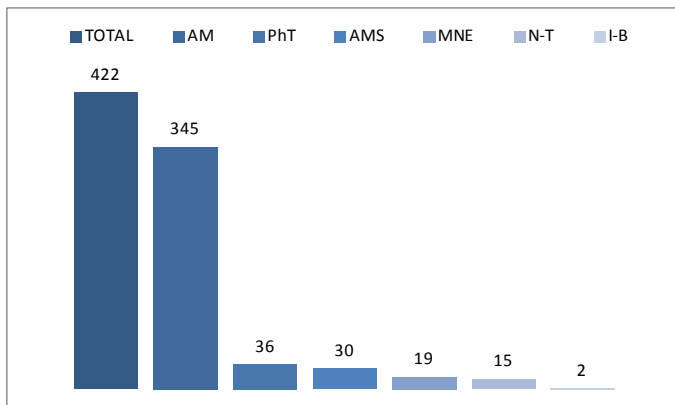
- Smart textiles represent the next generation of textiles affiliated in both research and commercial activities. There has already been an introduction of smart textiles in fashion, however the efforts of introducing smart textiles in other wearable textiles areas still dominate research activities. There is surely a difference between application of smart textiles in health care or for workwear and in their application for fashion purposes. In health care and workwear the applications are focused on monitoring the wearer's health and conditions or to facilitate communication. In fashion the applications are more focused on visual or tactile feedback from the wearer. Most of the market analyses and roadmaps on smart textiles point out potential of other areas than fashion and the funding of research projects also proves that there is a focus on technical aspects of clothing rather than fashion (Source: Berglin, Smart Textiles and Wearable Technology - A study of smart textiles in fashion and clothing, Report within the Baltic Fashion Project, published by the Swedish School of Textiles, University of Borås, November 2013).
- This Innovation Field is highly interesting also for dual use applications as some interactive wearable textiles for warrior systems already exist that may be applied to civilian applications.

➤ **Results of patents scenario analysis:**

- 422 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- Stable-decreasing trend curve (number of patents per year)
- Highest share of industrial applicants with relevant patenting activity by academic applicants especially in the early part of the period:



• Patents by KET:

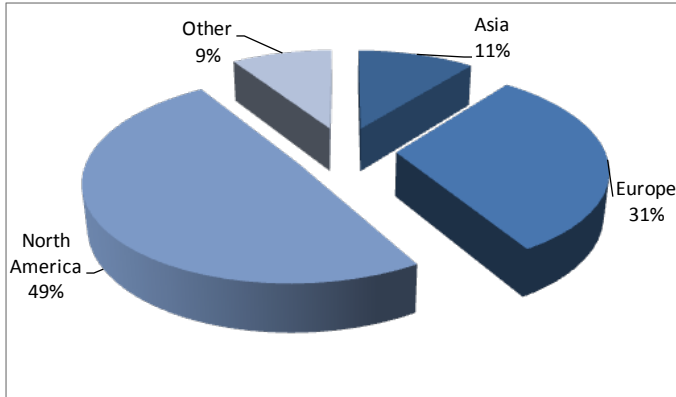


• Patents by KET(s) and relevant combinations of KETs:

KET(s)	Number of patents
AM	345
AM / MNE	4
AM / MNE / N-T	1
AM / N-T	7
AM / PhT	1
AMS	30
AMS / AM	2
AMS / MNE	1
AMS / PhT	1
IBT	2
MNE	19
MNE / N-T	2
MNE / N-T / PhT	1
MNE / PhT	8
N-T	15
N-T / PhT	1

<i>KET(s)</i>	<i>Number of patents</i>
PhT	36

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection:

