European Commission

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 Electronics and Communication Systems 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.

E&C.1.1: High resolution integratable 3D displays

Scope:

To develop displays offering realistic and immersive three-dimensional (3D) video reproduction, supported by energy-efficient, flexible/wearable and easily integrated technologies, supported by methods of immersive sound reproduction as well as file formats and adequate video processing hardware.

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

- "Inclusive societies" need an efficient interaction between all sorts of systems and humans whatever their technical and communication abilities, including bridging the age and disability gap with regards to digital technologies
- "Innovative and reflective societies" are supported by machines and systems designed to enable human users to take best advantage of technologies' potential and leave room to individual and collective creativity
- "Health and wellbeing", "secure, clean and efficient energy", "smart, green and integrated transport", various environment and resource management and surveillance systems or advanced production chains are served with expert systems that enable trained operators to raise their overall awareness, take very reactively the good decision and make sure it is efficiently and safely implemented, which calls for expert systems' operator-friendly interfaces
- Protecting security of Europe and its citizens without hampering freedom requires that many systems in interaction with humans are able to undertake seamless identification of users and operators

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

- With many technologies becoming causes of fears, misunderstanding and exclusions, offering a more natural way to interact with and within information-rich environments is a condition for sustained societal trust in technological progress, thus a condition for "smartification" of our environment
- Many recent successful innovations as smart phones or tablets have been based on smooth, ergonomic and personalized interfacing, improving overall user experience of technology services. This is a long-term trend in all sorts of markets and "mass-customization" starts with human-machine interfaces
- The human factor remains a significant source of accidents and inefficiencies in complex systems, calling for ever-improving training of operators but also for better decision-making assistance, vigilance monitoring and various forms of personal assistance. Well-designed interfaces will deliver high value services at a low human attention cost
- New interfaces create standards that then require wide deployments and ubiquitous applications, including on specifically constrained environments as embedded in vehicles, in remote areas, on nomadic devices, etc. Advanced systems need advanced interfaces whatever their operational constraints (shock resistance, electro-magnetic aspects, weight, power management, etc.)

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

- Development of displays to offer realistic and immersive three-dimensional (3D) video reproduction, including energy-efficient and wearable displays, and new methods of immersive sound reproduction
- Development of new tools to classify metadata as well as new "modelling formats": file formats for the audio, three-dimensional (3D) video and data that are the active constituents of services, plus the metadata that describes them and allows them to be processed
- Exploration of opportunities from flexible materials, thin film glass and organic electronics, to develop flexible/wearable displays

Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of solutions such as enhanced displays offering more realistic and immersive three-dimensional (3D) video reproduction, including energy-efficient and wearable displays possibly based on flexible materials, tools for immersive sound reproduction and video processing hardware, etc.

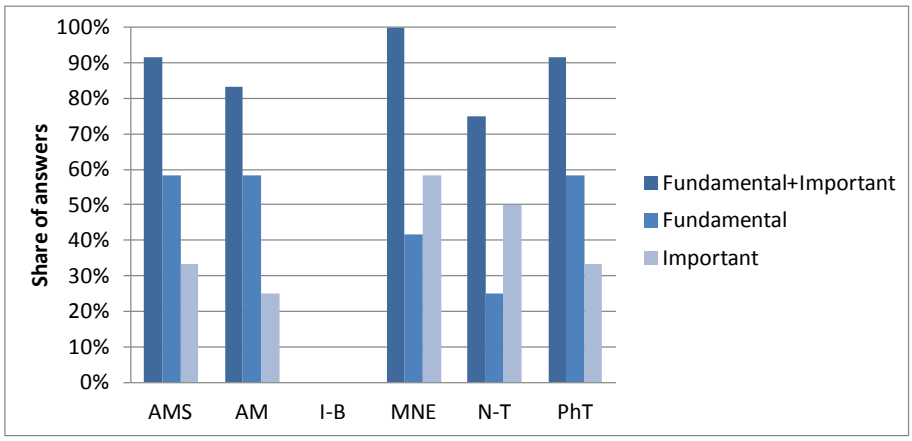
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this

Innovation Field, and desk research activities, have allowed identifying a rather strong interaction of KETs with respect to this Innovation Field, with fundamental contribution mainly by the following KETs:

- Advanced Manufacturing Systems (AMS)
- Advanced Materials (AM)
- Photonics (PhT)

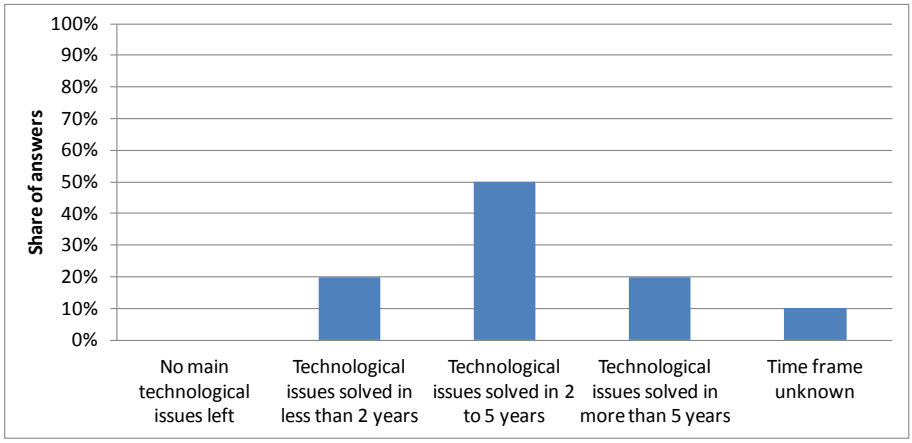
and important contribution by:

- 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 2 to 5 years:



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 term should be taken into consideration within this framework.

Additional information according to results of assessment:

➢ ***Impact assessment:***

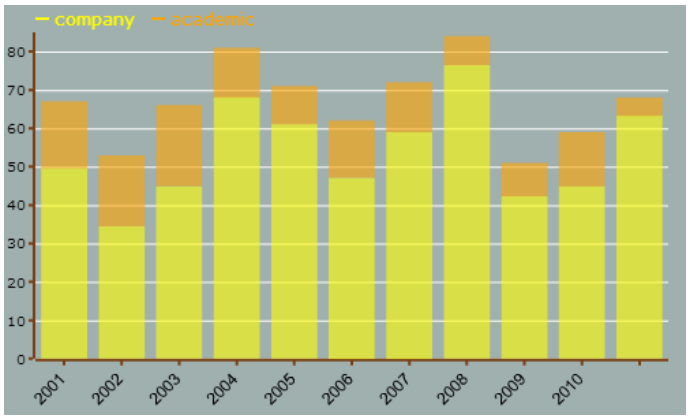
- Novel three-dimensional (3D) display technology is aimed at offering viewers a truly immersive experience, with main market impacts expected in entertainment businesses, including cinema and television, videogames, all sorts of individual or social games.
- Education and training is next market opportunity, either for "edutainment" / "serious games" – taking advantage of the attractiveness of the immersion effect to best capture the participant's attention – or

for highly demanding professional training (pilots and other vehicle operators, surgeons, sportsmen, etc.) – using high definition ultra-realistic three-dimensional (3D) visualization to offer a near-real-life professional situation simulation.

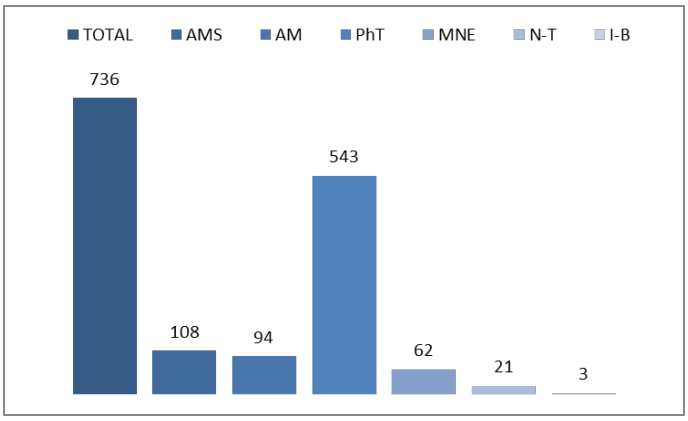
- Much other usage of such technology is expected to rise when satisfying technology is made available in the market, including mission preparation (e.g. surgical, space, military, rescue or complex building and manufacturing missions), commercial displays (typically for architects and urbanist projects), industrial design, visual arts, videoconferences, science, etc.
- Considering all these potential applications, advanced three-dimensional (3D) displays have a large potential for creating not only direct but also many indirect activities and jobs.
- Three-dimensional (3D) dimensional display technology crossed an important threshold in the past two years, with explosive growth expected in the commercial sector and, increasingly, a feature of military simulations. Such displays provide the viewer with depth perception, and thus an illusion of reality that cannot be achieved with a conventional bi-dimensional (2D) display. Such technology is already used for battleship simulations, thus the knowledge in this sector could be transferred into civilian applications with potential uses for wide ranges of markets.

➢ ***Results of patents scenario analysis:***

- 736 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- Quite stable trend curve (number of patents per year), with a decreasing share of academic applicants, highlighting progress towards industrial maturity:



- Patents by KET(s):

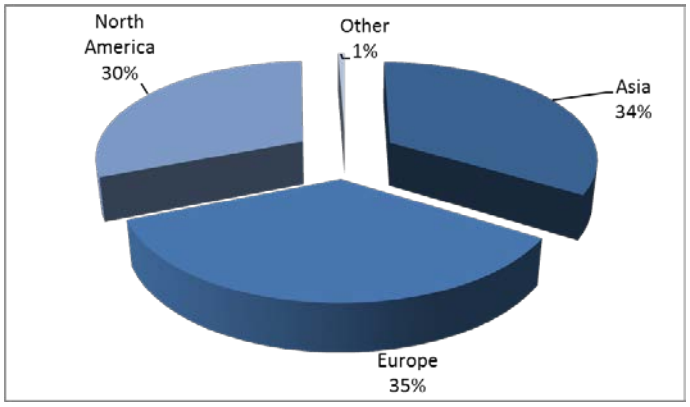


- Patents by KET(s) and relevant combinations of KETs:

KET(s)	*Number of patents*
AM	94
AM / MNE	2
AM / MNE / N-T	1
AM / MNE / PhT	1

KET(s)	*Number of patents*
AM / N-T	6
AM / N-T / PhT	3
AM / PhT	34
AMS	108
AMS / MNE	1
AMS / N-T	2
AMS / N-T / PhT	1
AMS / PhT	11
IBT	3
MNE	62
MNE / N-T	2
MNE / PhT	36
N-T	21
N-T / PhT	7
PhT	543

- Patent distribution by (Applicant) organization geographical zone:
- Japanese companies are dominating the top 30 patent applicants list, but the top patent applicants are Phillips, Bayer and a noticeable Luxemburgish SME named Seereal



- Patent distribution by geographical zone of priority protection: