Joint Research Centre

PRIORITY AREAS FOR THE NEXT WAVES OF KNOWLEDGE AND INNOVATION COMMUNITIES

EXPLORATION OF CRITICAL SUCCESS FACTORS, ALTERNATIVE OPTIONS AND CHARACTERISTICS FOR DESIGN

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Priority areas for the next waves of knowledge and innovation communities

Exploration of critical success factors, alternative options and characteristics for design

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Summary: *In support of the Strategic Innovation Agenda of the EIT this brief proposes potential priority areas for future waves of Knowledge and Innovation Communities (KICs), using a two level approach. Two general potential priority areas (level 1) are proposed: sustainability through integrated design, production and consumption; and services through ICT. These general proposals are then more closely aligned with possible areas of application (level 2), leading to seven more specific proposals for priority areas. The proposals are based on a Web 2.0 consultation of the research communities in Europe and beyond, the results of which were refined in an expert workshop. This brief also sets out the critical success factors that were applied for the formulation of the priority areas proposed, as well as some characteristics for their design.*

Keywords: *innovation, knowledge triangle, priority areas for KICs, critical success factors, design characteristics*

1. Introduction

The objective of this policy brief is to contribute to the formulation of priority areas for new Knowledge and Innovation Communities (KICs). It does so by outlining potential priority areas stemming from a foresight project carried out by JRC-IPTS for the EIT. The results described here could also serve as inputs to EIT's first Strategic Innovation Agenda. Finally, this brief also outlines ways in which KICs can be formulated, looking at the specificities of a KIC as an instrument and EIT as an institute.

The KICs are the operational base of the EIT. They are highly integrated, creative and excellence-driven partnerships which bring together the fields of education, research and business in order to produce innovations and new models that inspire others to emulate them. Their objectives are to *increase competitiveness* in Europe and to *tackle societal challenges* through improvements in curricula and learning and teaching methods in higher education, entrepreneurial education delivering top entrepreneurial people, and exploiting entrepreneurship towards new business creation. Typical characteristics

of a KIC are the use of distinctive co-location centres, effective management and governance structures, and a specific KIC IPR policy for the creation of an entrepreneurship friendly environment.

The findings set out in this brief are based on views from the R&D communities in Europe and beyond. As part of a co-operation agreement with EIT and DG EAC, JRC-IPTS has carried out an online survey among those communities to collect and assess ideas for "*world-leading innovation, integrating education, business and research with a focus on specific thematic areas*". The views have been gathered through an online interactive tool (http://eit.europa.spigit.com) using a web 2.0 social networking platform (hereafter called the EIT-IPTS platform). The findings have also been discussed in a workshop[1] with experts from higher education, business and research.

2. Better understanding KICs and KIC priority areas

2.1 Categorisation of ideas

The EIT-IPTS platform collected ideas for world-leading innovation, integrating education, business and research with a focus on specific thematic areas. Potential priority areas for KICs have been identified by looking at combinations of such ideas. An interesting initial perspective in combining the ideas collected is to group them by category, as shown in graph 1. This overview is however quite general and reflects many of the current challenges society is facing. Furthermore, the survey should not be seen as a representative sample of all members of the research communities[2]. Rather, it provides a more qualitative view on a set of opinions stemming from these communities. New KICs that are only based on these challenges risk not entailing much novelty compared to existing initiatives that already address these challenges, nor taking advantage of the added value that EIT could make through Knowledge and Innovation Communities. Exploring potential priority areas for future KICs thus lays down a question on what are the critical success factors for such areas.

2.2 Critical success factors (CSFs) for new priority areas

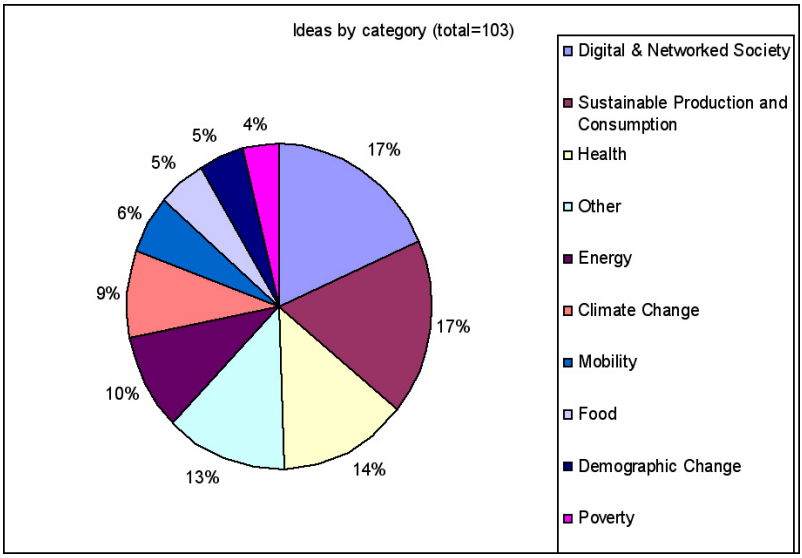
From the objectives of a KIC it is already clear that the following two elements are of key importance:

- address societal challenges
- increase competitiveness in Europe
  In the context of the Europe 2020 strategy, this can be understood as contributing to smart, sustainable and inclusive growth. Those elements are

1 EIT and JRC-IPTS would like to thank all participants in the online platform, and in particular all experts attending the workshop: Stuart Andersen, Michael Balthasar, Ip-Shing Fan, Elisabeth Jaskulké, Lars-Eric Larsson, Roberto Saracco, Fairouz Farah Sarkis, Josh Siepel, Keith Simons, John Smith, Karl Stroetmann. The authors would also like to thank for their valuable inputs and comments: from EIT: the Governing Board members, Ronald De Bruin, Mathea Fammels and Sylvia Jahn; from DG EAC: Lucia Recalde and Georgi Dimitrov; from JRC-IPTS: Xabier Goenaga, Mark Boden and Fernando Hervas.

2 The survey included participants from research-intensive universities, public research organisations and private research organisations.

Graph 1: Distribution of ideas collected from the EIT-IPTS platform by category.



however not exclusive features of a KIC as an instrument, and therefore are not sufficient to serve as critical success factors for the selection of new priority areas. From discussions with EIT staff, members of the EIT Governing Board and participants in the workshop there seems to be a rather strong consensus that it is important to look at the way these objectives are achieved in order to define tailored critical success factors[3]. More specifically, priority areas for future KICs would need to find a good balance on the following dimensions:

- Balance between novelty and relation to existing initiatives[4]. More concretely, this refers to a balance between priority areas in which existing initiatives are very fragmented and those where existing initiatives are very well coordinated. Novel areas but with very fragmented existing initiatives may not have enough potential, whereas well

3 In general the CSFs mentioned below relate to the general concern to use the KIC instrument in an efficient and effective way, but try to make this more concrete and measurable in the context of KICs.

4 During the discussions also the wider element of ´EU added value´ was mentioned. This is closely related to the concept of ´added value of community involvement´, a well-known concept in the context of the ex-ante impact assessment of the Community Support Framework, and which relates to complementarity and synergies, subsidiarity and proportionality. This concept is however less specific to KIC priority areas and therefore more difficult to apply as a distinctive success factor.

coordinated initiatives may not need extra support.

- Balance between a narrow focus and a broad focus. From the experiences with the current KICs it seems that the focus also relates to the balance between competition and complementarity. A KIC that is very broad seems to lose opportunities to benefit from complementarities. In contrast, very narrow KICs seem to limit competition amongst KIC members. The focus of a priority area has been highly debated in all the discussions. For this reason, this brief proposes alternative options for wider or narrower priority areas. It should also be noted that the focus of a priority area does not necessarily need to be the same as the focus of a KIC within a priority area.

- Balance in the knowledge triangle: a KIC aims at creating world-leading innovation that integrates education, business and research. In the discussions the following aspects were identified as important for the selection of priority areas in each of the three vertices of the knowledge triangle:

  – Education: especially interesting priority areas are those that require behavioural changes. Apart from specific areas, workshop participants pointed to the importance of a substantial degree of freedom to create new educational programmes and the need to include in curricula some elements that are relevant for any priority area (such as training on entrepreneurial skills, systemic thinking, etc.)[5].
  – Business: the need for high business potential; to cover different stages of the innovation chain; a balance between short term, mid term and longer term business opportunities; a balance between the interests of SME´s and of bigger companies; and interest of venture capital investors.
  – Research: the need to focus mainly on applied research rather than on basic[6] research, and for the priority area to be appealing for both public and private research. Graph 2, below, shows selectivity indices by category for ideas included by both public and private sector participants in the EIT-IPTS platform. This suggests that public sector research has relatively more interest in topics related to health, demography and poverty, while the private sector has relatively more interest in topics related to energy, mobility and sustainable production and consumption.

From the discussions, what seems to be critical and discriminating for KICs in comparison to other EU instruments, is the way in which they combine business potential, the integration of the knowledge triangle (in particular education, especially the need for behavioural change), the integration of the innovation chain, and its societal relevance.

5 See also Section 4 on charachteristics for the design of KICs.

6 The inclusion of some basic research could however potentially extend the KIC lifetime and increase the possibility of disruptive innovation.

2.3 Remarks regarding the use of CSFs

- The critical success factors described above have only been used as guiding principles for the formulation of potential priority areas. The proposals for priority areas described in this brief give more subjective indications of how they address each of the critical factors.

- Additional elements specific to KICs are excellence and co-location. The proposals in this brief do not address the element of excellence, as this appeared from the discussions with EIT to have more relevance in assessing concrete proposals based on a call for proposals[7]. The element of co-location is not addressed in a systematic way, but some suggestions are included in some of the proposals.

- In the workshop it was considered important that KICs, irrespective of the selected priority area, are also supported by a public private partnership (PPP) in order to increase its probability to become successful. In what follows PPPs are not considered as a criterion for identifying potential areas but for each proposal for a KIC priority area some suggestions are made of what kind of topics could be covered by such PPPs.

- The currently established KICs have a different focus in the way they are labelled: challenge driven (Climate KIC), technology driven (KIC ICTLabs) or sector driven (KIC InnoEnergy). The tendency in the workshop was to focus mainly on challenges. Hence, the proposals in this brief combine these foci, but starting from a challenges point-of-view. Purely technological or sector driven proposals were not considered optimal if not linked to a specific challenge and to social aspects. As an example, the area of smart materials[8] was identified in the workshop as a topic with high potential for a KIC priority area. This is however not included in the proposals below as a single KIC priority area, but it is embedded in other proposals as one building block to address a specific challenge.

- Support to KICs is meant to serve as seed investment. The EIT funds a maximum of 25% of the KIC budget, with the aim that the KIC should be self-sustaining within a few years. Co-funding can come from other EU instruments, national instruments, business, and other sources of funds. KICs therefore aim at leveraging existing funds. Appendix 1 provides an overview of existing R&I funding instruments at EU level and their target groups (research, business and/or education). From the overview one can conclude that KICs are the only instrument addressing all three target groups, and that the number of existing instruments especially targeting education is limited. This seems to indicate a strong potential for KICs that focus on educational aspects, such as the need for behavioural change or the existence of a market demand for skill sets that is not covered by existing educational provision.

7 The presence of some excellence in the priority areas is however important for a call to be successful, but the priority areas proposed in this brief are not necessary the ones with the most excellence.

8 Smart Materials are materials that have one or more properties that can be changed by the application of any external stimuli such as temperature, magnetic fields, etc,...

3. From challenges to priority areas

3.1 Main societal challenge arising from the EIT-IPTS platform and the workshop

As can be concluded from both the EIT-IPTS platform and the workshop discussions, most of the ideas proposed relate to two main priority areas:

- Sustainability through integrated design, production and consumption
- The provision of services through ICTs

These areas are quite wide. In the following two sections they are further elaborated, and applied to different and more specific areas, based on the ideas from the EIT-IPTS platform and the workshop. The wide areas themselves could serve as potential priority areas for KIC, but they could also serve as "umbrellas" for more specific priority areas. If considered as umbrellas, they can be used, for instance, as different waves of related priority areas.

All proposals are described using the critical success factors described in section 2.2. In addition some specific framework conditions are mentioned that are suspected to impact on the probability of success of each proposal. Where relevant, the role of new business models is also mentioned. Finally, the potential added value for the EIT in launching a KIC in each proposed area is summarised.

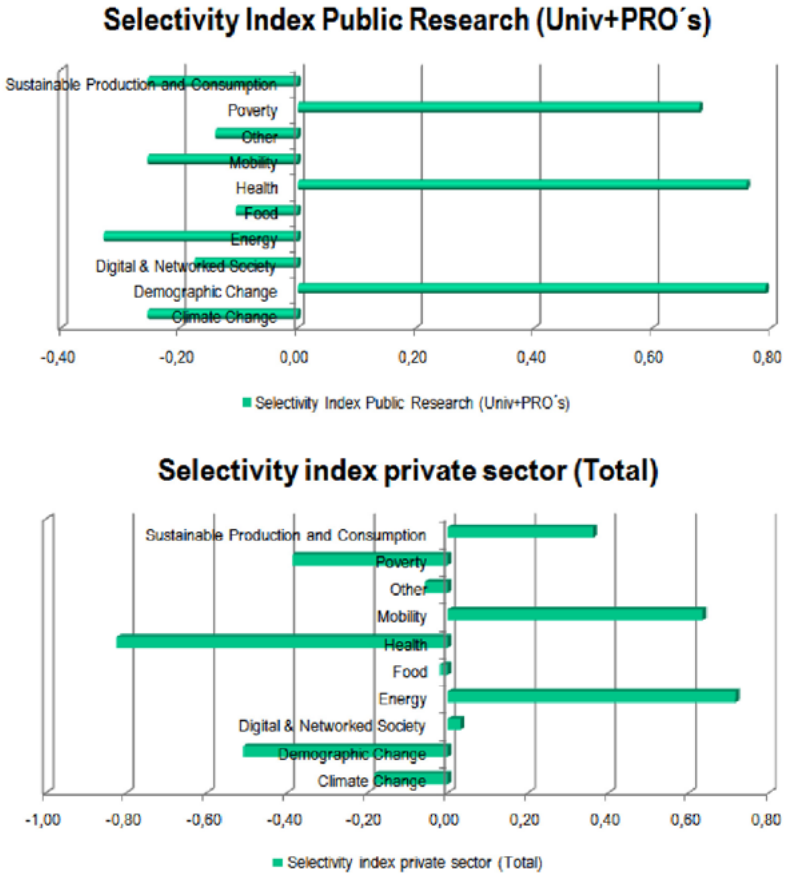
3.2 Proposal 1 for a KIC priority area: *Sustainability through integrated design, production and consumption*

The idea behind this proposal is to address the challenge of ´moving towards a sustainable society´. To do so it is paramount to look across the whole life cycle of products and services, thus integrating the innovation chain in designing, producing and consuming goods and services. A KIC could be launched at the broadest level considering the need to integrate around innovation chain elements such as: i) design phase: eco-design; use of modelling and simulation for experimenting solutions across their life cycles before their development; design of mutable products that can be reconfigured to meet changing user demand; ii) production or development phase: need to take into account issues such as security and a safe working environment, as well as standards, energy use, CO2 and other emissions; and iii) consumption: also includes safety of products and services, use of energy, CO2 absorption, and finally behavioural/ societal aspects. This KIC proposal can be broken down by exploring the integrated innovation potential in specific areas[9] such as:

1. Sustainability through integrated design, production and consumption in manufacturing
2. Sustainability through integrated design, production and use of mobility systems

9 These areas are based on the ideas proposed in the platform and the workshop discussions.

Graph 2: Selectivity Index for public and private sector participants



3. Sustainability through integrated design, production and consumption in agriculture and food

4. Sustainability through integrated design, production and use in construction

As part of the concept of co-location, a KIC consists of 5 to 6 nodes or cities, where each one could be a part of the innovation chain (the output of one node could be input to another node). Applied to this proposal, there could be two nodes concentrating on design, two on production and two on consumption. Appendix 2 gives a more

detailed description of each of the more specific proposed potential KIC priority areas.

3.3 Proposal 2 for a KIC priority area: *Services through ICT*

The second general priority areas addresses the increasing demand for tailor-made services, which nowadays are still very labour and energy-intensive as well as market push rather than addressing growing specific demands. New approaches to services based on ICTs could allow offering high volumes of customised services at low costs building on a (future) high-speed internet infrastructure that connects everyone and everything at any time, which could then be applied in a range of sectors. This requires not only technical progress in terms of infrastructure and in virtualisation technologies[10], but also in bringing together a wide set of actors in fields such as education, business, research, and including designers and artists, psychologists and sociologists, marketers, modellers, and economists. More specifically, to address the challenge of high volumes of customised services through ICTs builds on the following elements of the innovation chain:

- Understanding the user needs: this relates to differences among individual users and of what each perceives as added value to improved service delivery. This requires demand-driven approaches up to the individual level, in order to be able to deliver customised services.

- Services development: this refers to the capability to produce customised services in huge amounts, thanks to the ability to keep in touch with users and the possibility to use and shape social networks.

- Service delivery: this relates to interfaces, client interaction, monitoring the use of products to better target their design and production and the need to allow greater interaction with users, moving towards becoming co-producers.

This general approach is applied in 3 specific areas[11], leading to the following more specific possible KIC priority areas:

- Services through ICT in healthcare and in support of a healthy life
- Services through ICT in cultural and creative industries
- Services through ICT in education and learning

Appendix 3 gives a more detailed description of each of the proposed KIC potential priority areas.

10 For an overview of research needs in this area, see: European Commission, DG INFSO, Future networks & services - Developing the Future of the Internet through European Research, ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/futint-book_en.pdf.

11 These areas are based on the ideas proposed in the platform and the workshop discussions. A possible 4th area not discussed in the workshop could be the area of financial services, focusing on the creation of innovative, resilient and safe financial services that support the creation of new private and social enterprises across Europe.

4. Characteristics for the design of KIC priority areas

From the ideas submitted to the EIT-IPTS platform, some more general drivers of successful innovation also emerged. Based on these inputs a set of general characteristics are formulated, which could be considered when designing new KIC priority areas. It concerns the following issues:

- *Strong leadership and vision:* The implementation of any project involving the whole knowledge triangle needs strong leadership, capable of understanding the needs and culture of the different stakeholders across the EU and beyond.

- *Focus on process and on specific outputs:* This issue relates to an alternative frame of mind, focused also on new ways of doing things, and not only on new artefacts. The idea is to focus on design-led innovation, i.e. innovation developed through iterative shaping of ideas by different stakeholders and user groups. Whilst innovative projects should be still funded on the basis of scientific excellence and thematic priorities, more focus could be given to the way in which the process is organised in addition to their specific outcomes and deliverables.

- *Stakeholder involvement:* Linked to the point above is the recognition that the successful implementation of innovations requires, from the very beginning, involvement of all concerned stakeholders.

- *Interdisciplinarity:* There is a clear need for innovation to cross boundaries, within hard sciences, but also between hard sciences and social sciences. Economists, sociologists and anthropologists need to be involved not only in identifying new potential markets, but also in driving systemic changes and supporting awareness and changes in the mindset of consumers and producers/ inventors, as detailed below.

- *New consumers:* The move towards a more sustainable and knowledge intensive economy requires a shift in the attitude and behaviour of consumers (with an important role for education). On the one hand, they can have an increasing engagement in the design of the process. On the other, they could become more aware of their role in supporting sustainable development, looking at their attitudes to waste, healthy lifestyles, the concept of value for money and the intrinsic value of products and services.
  Innovative mindset: The need to develop an innovative and creative mindset emerges in several of the ideas proposed. In a lifelong learning perspective the education system empowers citizens with the skills and confidence to solve problems and to generate ideas of use to society. This could involve the teaching of problem solving skills, benchmarking and observation skills, ideation skills, project based learning, project management, skills for in-depth understanding of societal needs, etc.

- *Personalisation:* This relates to the need of individual citizens to personalise products and services. Also the elements of design and culture are important to such personalisation.

- *Social innovation:* EIT-IPTS platform and workshop participants recognise the need to focus not only on technological innovation, but also to include social and other non-technological innovation in new KIC proposals.

5. Conclusions

As became clear from the workshop discussions, an optimal level of granularity of KIC priority areas is difficult to define. This brief has therefore proposed a two level approach for the formulation of potential priority areas. It does so by focusing on two broad areas: sustainability through integrated design, production and consumption; and services through ICTs.

As these proposals were made based on qualitative inputs from the research communities outlined above, they should be seen as complementary to the views of other stakeholders, namely business and education. The criteria applied for formulating these proposals have been used in a qualitative way, exploring possibilities based on expert opinions. In order to estimate their market potential in quantitative terms additional research is needed.

In further detailing priority areas the brief also explored some characteristics for the design of KIC priority areas. They should be seen as complementary to other inputs such as the lessons learned from the existing KICs.

Appendix 1

R&I Instruments[12] at EU and national level and the involvement of the knowledge triangle

	Stakeholder involvement		
	Research	**Education**	**Business**
ETPs	x	-	x
ERANETs	x	?	-
Art 185/169	x	?	-
JTI	x	-	x
KICs	x	x	x
CIP	-	-	x
The Lifelong Learning Programme	-	x	-
EUREKA	x	-	x
JPIs	x	-	-
COST	x	-	-

12 ET 2020 (Education and Training 2020) is not included in the table, as it is not an instrument in itself, but a strategic framework for European cooperation in education and training. It provides common strategic objectives for Member States, including a set of principles for achieving these objectives, as well as common working methods with priority areas for each periodic work cycle.
See: http://europa.eu/legislation_summaries/education_training_youth/general_framework/ef0016_en.htm

Appendix 2: Application of the potential KIC priority area 1 "Sustainability

	1.1 Manufacturing	1.2 Mobility systems
Description	New approach to manufacturing looking at products and services life cycles from design till end of consumption phase (e.g. considering assembling, disassembling, packaging, marketing, recycling and reuse, etc). This includes using resources based on eco-design of products and process, and use of bio-based materials.	Sustainable mobility of goods and persons, i.e. minimising CO2-emissions and energy consumption, maximising safety, minimising congestion and health related effects;
Innovation chain	• Sustainability in design of goods and services: design products and packaging taking to account safety, possibilities of re-use, use of bio-based products; • Sustainability in production: e.g. use of low carbon and energy efficient production processes, as well as reduction in the use of materials (i.e. efficiency) and the use of waste in further processes (i.e. re-use/ recycling); • Sustainability in consumption: e.g. attitudes to waste and recycling, design of waste as resources for new goods and services;	• Sustainability in design of mobility solutions: e.g. through smart urban planning co-modality as well as new public systems and transport; • Sustainability in production: e.g. sustainable ways of manufacturing vehicles; • Sustainability in use/consumption: e.g. through energy efficiency, user behaviour, low carbon energy use;
Research: topics and technologies	Biotechnology, ICT, nanotechnologies, smart[14] and new (sustainable) materials, lifecycle and footprint analysis, embedding safety in product design, cradle-to-cradle design; modelling and simulation (to test products and processes life cycles still in their design phase); graphic design; law;	Intelligent Transport Systems (ITS), impact of on-site customisation on the distribution chain, Energy Storage, Fuels, renewable energies, new materials, optimisation of conventional engines and parallelism of new technologies, safety, sensor networks and radio frequency tags, positioning systems and internet technologies;
Education: Behavioural change and science fields involved in curricula	Need for industry and consumers to focus more on life cycle thinking in product design, material use; new attitudes to collecting and designing waste; need for experience-based work with a strong emphasis on synthesis and evaluation and interaction between design, production and consumption, requiring innovation in education (e.g. more teamwork) Science fields: Systems thinking; Life cycle design; consumer psychology; visualisation to improve engagement and understanding; materials sciences;	Changes in attitudes towards mobility patterns, towards automatic ways of cars driving, towards multimodal transport; Use information systems to make users more aware of the implications of their use; Science fields: materials sciences; consumer psychology; renewable energy and materials

13 Examples are e.g. the use of basic basalt for absorption of CO2, which can be used – when crushed – as fertilizer for rice carbon storage in order to produce both biofuels and nutrition.

14 Including recycling of smart materials.

15 Examples are micro- and nano-particles stemming from engine combustions, waste incineration, but also e.g; engineered

through integrated design, production and consumption" to 4 specific areas

1.3 Agriculture/food	1.4 Construction
Sustainability in the food chain, i.e. minimising the negative impact on environment of the way food is produced and harvested, of food processing and preservation, food consumption and diets. It has relations to other challenges in food (food safety, food security, prevention and health), as healthy, safe and appealing food for a growing world population should achieved in a sustainable way.	Embed in the construction and civil engineering sectors innovations able to address climate and demographic change, with buildings that are smart in optimising maintenance, energy generation and use, water collection, use and recycling, ambient assisted living, safety and in combining working, leisure and living
• Sustainability in design: relates to the optimal use of land, the choice of crops and seeds best adapted to land and climate conditions, the (non) use of pesticides, design of ecological packaging, focus on locally available food, innovations that make the agricultural production of food and bio-based energy complementary instead of competing, link of food production to CCS[13]; • Sustainability in production: e.g. innovations can relate to selection of crops and seeds, seeding and harvesting, processing, preservation, packaging, logistics, use of clean technologies. • Sustainability in use/consumption: relates to changes in diets and their impact on climate change and health, to the need for an end-user focus instead of a product push strategy that leads to market withdrawals due to low sales, consumption of low carbon food and bio-food, use of waste across the food chain as input to other chains (i.e. energy production);	• Sustainability in designing buildings: e.g. use of renewable materials, resource efficient design (in use of energy, water, etc.), use of tailor-made and flexible solutions to address mobility and social needs, connecting work, leisure and living, • Sustainability in construction: e.g. through design of energy efficient and safe production processes, use of new materials; • Sustainability in the use of buildings: e.g. limiting use of energy and water, optimisation of maintenance and building management;
The relation between food design, production and consumption and CO2; impact of agriculture on ecosystems; consumer psychology; biotechnology, nanotechnology, automation, robotics and ICT, intelligent packaging, materials research, smart environmental information systems using sensor networks; impact of environmental pollution on food production[15];	ICT, new technologies for energy supply and energy efficiency, advanced manufacturing, nanotechnology, biotechnology, smart and sustainable materials and sensors; ambient assisted living;
Changes in consumer attitudes towards footprint of food and bio-products; different mind-set for industry to focus more on life cycle thinking in food and on consumer-driven innovations; Science fields involved: consumer psychology, systems thinking, life cycle design, agriculture, nutrigenomics and neurosciences, materials science, chemistry and physics (e.g. in regard to separation techniques);	Changes in the way architects and urban planners look at design, production and use of buildings; new attitudes to use of buildings in relation to age, mobility, use of resources; Science fields: Urban planning, architecture, materials science, sociology, psychology, gerontology;

and other crops. Another example is the use of biotech expertise to further develop algae technologies to efficiently exploit

nanoparticles released by nanoproducts.

	1.1 Manufacturing	1.2 Mobility systems
Business involved:	Manufacturing industry, materials production sectors, packaging, consulting, biotechnology sector, ICT-sector (including modelling and software), recycling industry, chemistry, energy, agriculture;	Public and private transport sector, automotive, energy, ICT, telecom; materials production sectors, consulting;
Potential markets/ concrete examples	Potential to replace in the future many conventional production processes and cause numerous transformation processes in industry and economy. Potential for growth through substitution, e.g. use of biomaterials in the production of energy devices (solar panels, wind mills, etc.); looking at trade-offs between sale and lease/loan might open up many lower value markets while enhancing sustainability;	Whereas Japan leads in hybrid technologies and Asia in low cost production, the EU could lead in sustainable transport systems. Examples: new services for travellers, for maintenance, for management of traffic movements and road congestion; new applications in vehicles; immersive communication services to support communication and avoid travelling;
New business models	Products owned by the producer and rented to consumers or developed by customers by renting small production facilities which fit within their homes. Business models giving more value to the use of resources across their life cycle, and lead companies to use a longer term perspective.	Closer collaboration between public and private sector
Role of PPP	Need for standardisation in the use of labelling and stamps	Collaboration between public and private transport sectors and with urban and city planning for traffic and resource management, for the development of multimodal systems & for optimal land use.
Potential societal impacts	Decreased emissions, waste and pollution; less pressure on non-renewable resources; lower dependence on raw materials and energy;	Decrease in congestion, pollution and related diseases, accidents, emissions; increase in energy efficiency, healthy and safe environment;
Framework conditions	Move towards (global) regulations that internalise all costs related to the life-cycles of products and services in their prices, including external costs deriving from their impacts on CO2 emissions and sustainable development.	Need for diverse regulations shaping the development of new automotive technologies and mobility solutions. Infrastructural aspects may have a longer term horizon;
Actors involved	Integration of entrepreneurs, universities, researchers, product designers, policy actors and overall citizens as potential co-producers and consumers	Integration of entrepreneurs, universities, researchers, developers, suppliers, infrastructure actors and policy actors (including cities/ regions).
Potential EIT added value of a KIC	Bring together actors and initiatives that are currently fragmented. Bring in new actors able to strengthen the integrated knowledge triangle; many opportunities for SME´s.	Bring together actors and initiatives that are currently fragmented. The concept of co-location can be used for different types of co-modality in different cities.

1.3 Agriculture/food	1.4 Construction
Food manufacturing industry, packaging, energy, agriculture, ICT-sector (including for sensor networks, automatisation,...), transport, chemistry, consulting;	Manufacturing industry, construction, energy, materials production sectors, waste sector, transport sector, ICT, medical sector, social sector, consulting;
Potential of more energy efficiency in production, market potential for environmental information systems, for bio-products, for more user-oriented innovation;	Potential to reshape a strategically important sector in the EU (biggest sectoral employer). Examples: Advanced use of sensors and engineering knowledge allowing to do maintenance only when needed, thus optimising the useful life of products;
Different innovation models and market strategies that focus on consumers´ needs and trends built upon enhanced awareness of the food chain have the potential to get innovations and technological possibilities in line with consumer interests and to create new business opportunities	Models of user engagement & behaviour change creating new maintenance demand driven by lower costs of building usage; customization of products, e.g. smart meter data on websites with tailored energy management packages;
Need for standardisation in the use of labelling and stamps Need for PPP in creating behavioural change of consumers and business	Need for collaboration with social and medical sector, urban planning actors, regulatory actors;
Healthier environment, healthier food, potential positive impact on biodiversity, helps addressing climate change;	Decrease of emissions, waste; More efficient use of resources, healthier and safer living and working environment, more independent lives for elderly;
Move towards regulations that improve sustainability in agriculture and in food production and consumption; Move towards regulations that internalise all costs of food production (including emission costs related to food).	Conservative innovation environment, with predomination of material and process costs. Regulatory provisions are needed to trigger change
Entrepreneurs, universities, researchers, farmers, NGO´s, actors in developing countries;	Architects, designers, social workers, carers, SME´s, researchers, universities, developers, urban planners, sociologists, gerontologists,
Sector is quite fragmented, co-ordination can add value. Many opportunities for SME´s.	Big and fragmented sector, where SME´s compose the majority of the companies. Opportunities to ensure coordination and a higher diffusion of technologies in SMEs;

Appendix 3: Application of the potential KIC priority area 2 "Services

	2.1 Services through ICT in healthcare and in support of a healthy life
Description	Development of services through ICT in support of efficient, affordable and easily accessible care, disease prevention, diagnosis and treatment and a healthy and independent live;
Innovation chain	• Understanding the service needs: design business models that focus on real needs of patients (many medical needs may not be medical, but rather social); develop systems for understanding real needs of doctors; develop systems that identify preferred modes for interaction and the extent to which patients (or potential patients) feel comfortable about releasing data • Services development: development of services that increase efficiency in the processes; services that support sense-making out of huge amounts of data such as patient records, analytical results of test,…; (mobile) applications that support behaviour change and attitudes related to healthy eating patterns and a healthy lifestyle; ´patients like me´ services; solutions that shorten lead times in drug development and lower societal costs for new drugs; • Service delivery: simplify the use of internet technologies, develop interfaces that are adjusted to each target group, connect to semi-formal and informal ways of service delivery through engagement with family, friends and voluntary organisations.
Research: topics and technologies	Development of models and software for processing and interpreting lots of information of different types (pictures, text, etc…); Interdisciplinary research on human-technology interaction; research on genome and patient data related to probabilities for certain diseases; application of smart materials for monitoring (sensors) and for regenerative medicine; Technologies involved: ICT; mobile technologies; sensors and smart materials; ambient assisted living technologies; internet and electronic media;
Education: Behavioural change and science fields involved in curricula	Create the right mindset" to delivering the right process/product innovation; importance of understanding real needs, looking beyond the technological aspect, also including social dimension; Science fields: Traditional ICT and health training should incorporate insights from science fields like gerontology, market research, marketing, sociology, psychology, media, cultural studies, organisational science, informatics, computational science, electronics, mathematics, social science, economics, law; modelling and simulation;
Business involved:	Software and hardware developers (including modelling), private (and public) healthcare centres and hospitals, telecom sector, multimedia sector, health insurance companies;
Potential markets/ concrete examples	Applications that treat, code, standardise, understand and interpret data of all sorts (e.g. esp. in life-threatening areas like cancer, cardiovascular diseases, etc), tools for risk assessment and early detection, potential to leverage public sector funds and to drastically improve efficiency in public medical health service delivery, tools and interfaces for understanding real patient needs thus increasing efficiency;

16 SEC(2011) 399 final, Commission Staff Working Document, Analysis of the consultation launched by the Green Paper on

17 COM(2010) 183 – GREEN PAPER - Unlocking the potential of cultural and creative industries.

through ICT" to 3 specific areas

2.2 Services through ICT in cultural and creative industries	2.3 Services through ICT in education and training
Development of services through ICT in support of consumer demand for new creative services and experiences.	Development of globally competitive education and learning systems enabled by ICT, able to deal with people from many different nationalities and cultural backgrounds;
• Understanding the service needs: creation of virtual and meeting places for artists, business, ICT researchers and experts; create analytical tools for analysing user demand and behaviour and develop simulation tools on future consumer behaviour; create new networks between small creative companies and individuals, and large information infrastructures. • Services development: e.g. develop freely available innovation tools allowing easy access to innovation for creative people; development of language applications to extend the potential of creative and cultural services and experiences beyond national boundaries; • Service delivery: e.g. social networking and computation tools for increased user participation and user co-production; applications that assist people in the content management of music, images, and other sorts of information;	• Understanding the learning needs: e.g. development of tools to test learning needs and competences; tools that identify preferred learning modes for individuals and different learning situations; meeting and knowledge platforms for teachers and trainers; • Development of learning: e.g. use of multimedia technologies for new ways of learning (e.g. through gaming, interactive TV, etc.); • Service delivery: e.g. development of multi-faceted learning networks, combining formal and informal learning; mobile applications for behavioural change, planning and motivation; develop interfaces adapted to different needs, cultures and preferences;
Tools for content creation and manipulation, Intelligent delivery, networks between information infrastructures and small companies, user satisfaction and quality of user experiences, home and extended home networks, network architectures, innovative financing systems; Technologies involved: virtual technologies and gaming, modelling and simulation, immersive technologies, graphics, translation technologies;	Lifelong learning, through both formal and informal mechanisms; new learning methods; competence testing; Technologies involved: multimedia, internet technologies, modelling; software development;
Need for change in mindset in creative and cultural actors to become aware of the importance of technologies, and to develop e-skills and improve media literacy[16]; Artistic and creative actors need to develop entrepreneurial skills, marketing, knowledge about IPR,...; Science fields: media and multimedia, arts, culture, ICT, marketing, psychology, modelling, law, economics, finance, graphic design, market research;	Need for traditional education and learning systems to become learner centred, to incorporate informal learning and to adapt to the needs of the knowledge society; need for citizens for an open attitude towards lifelong learning; overall need to develop ICT skills; Science fields involved: sociology, psychology, cognitive sciences, marketing, cultural studies, media, pedagogy, multimedia;
ICT sector, entertainment sector, architects and designers, multimedia, music industry, visual and performing arts, cultural heritage, gaming industry, translation sector.	Private schools & universities, learning providers, search & selection, cultural & creative industries, psychologists, internet and multimedia industry, ICT;
High export opportunities for the very rich base of domestic culture; indirect support to touristic promotion of Europe; According to COM(2010) 183[17], there is a lot of untapped potential in the cultural and creative industries to create growth and jobs. Beyond their direct contribution to GDP, the sector is also an important driver of economic and social innovation in many other sectors.	Wide set of applications both in formal and informal learning. In formal learning potential both in private schools and in services to public schools; In informal learning many opportunities related to new ways of learning, to coaching and planning, social learning, etc.

"Unlocking the potential of cultural and creative industries"

2.1 Services through ICT in healthcare and in support of a healthy life	
New business models	See also PPP. People can work longer using ICT (and thus stay mentally active and avoid alzheimer), which requires new business models. Potentially shorten time between scientific breakthroughs and patient treatment by facilitating the implementation of the huge amount of collected preclinical and human data in clinical practice. Potential for business models using informal labour coordinated via the internet and able to integrate expertise from a range of sources
Role of PPP	As many medical services are delivered by the public sector, this area implies a transforming public service delivery; The public sector has potential to drive this area, by leveraging the funds it invests hospitals, reimbursement systems, etc; Importance of early identification of successful medical services, in order for reimbursement systems to support diffusion; Provision of (information and material) infrastructures that provide a platform for innovative provision of healthcare
Potential societal impacts	Reduced pressure on public healthcare budgets; more efficient medical services; healthier and more qualitative lives for citizens;
Framework conditions	Electronic ID for patients Need for clear rules for management of personal data and records Payback systems are not easy to change, and include many national and regional differences Need for debate on ethical issues: will patients with genetic risks to long cancer be entitled to get reimbursed if they smoke and get sick?
Actors involved	Bring together patients, potential patients, medical practitioners (doctors, nurses, but also informal practitioners such as family, friends,…), voluntary and social organisations, with business public and private research organisations, and education;
Potential EIT added value of a KIC	Until now the area has been looked at mainly from the technological perspective. The failures indicate that a wider perspective and partnership is needed. Potential for SME´s esp. in the area of data sense-making. A KIC can give an answer to the need for strong leadership, which is required to manage any interdisciplinary approach, understanding different working-cultures and stimulating change towards commonly agreed ends. In an area with many national and regional differences, the element of co-location can bring real added value. Successful transformation of public service delivery in medicine can also have potential to be applied in other areas of public service delivery.

2.2 Services through ICT in cultural and creative industries	2.3 Services through ICT in education and training
New and alternatives funding models: micro-funding, crowd-funding, sponsorship and donation; Potential for innovative business models that make content available online;	Potential for training services that link offers to business results; Potential for new learning models necessary for lifelong learning in a distributed and networked learning environment;
Collaboration between SME´s, cultural sector, public and private broadcasting companies, for sharing information infrastructures.	Collaboration between public and private learning systems is essential; Also role of public sector in awareness raising around life-long learning, ICT literacy,...
Support to cultural diversity, unlocking of often inaccessible cultural heritage, increased mutual understanding and tolerance through increased cultural exchange, increased cultural offer, improved ICT literacy; potential for regional development and regeneration of cities;	Increases inclusion, supports the demand for new skills and competences, increases ICT literacy, self-confidence and self-esteem, employability and general health of citizens;
Need for motivating IPR Need for flexible rules to start a business for small companies, freelancers, temporary (project) businesses	Electronic ID for students and teachers Issues related to standardisation, certification and recognition of formal and informal learning.
Artists, (ICT) researchers, companies and public sector actors owning big information and culture infrastructures, universities, public and private media actors;	Developers, teachers, business, researchers in cognitive and field sciences, students, designers, artists, cultural actors, sectoral actors;
Potential for both big and small to very small companies; Sector with high fragmentation but with very big potential, not only in the sector itself, but can have important spill-over effects to other sectors; High potential is also described in COM(2010) 183.	Sector mainly dominated until now by public sector learning systems, which adapt slowly to the needs of the knowledge society. Proposal with high societal impact on the “New skills for new jobs” agenda, and with many business opportunities both for big companies and SME´s.