Impulse paper on the role of cultural and creative sectors in innovating European industry

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1. INTRODUCTION

1.1. Policy context: synergies of industrial and creativity agendas

European industry is undergoing a deep transformation with increased digitisation disrupting production and distribution processes, the need for greater resource efficiency to undertake the transition to low-carbon and circular economy, new business models, greater consumer demand for manufacturing activities being bundled with services.

New technologies in particular impact the industrial landscape and represent a critical asset to the competitiveness of European industries on global markets as underlined in the new Industrial Policy Strategy. Europe is leading a number of industrials areas such as pharmaceuticals, chemicals, mechanical engineering and fashion industries nevertheless, to maintain and reinforce its competitive advantage, it needs to modernise its industry.

The 2017 renewed EU Industrial Policy Strategy put forward by the European Commission provides a flexible comprehensive policy and action framework to address cross-cutting challenges and opportunities for the modernisation of EU industry. Such industrial strategy is grounded on bringing together horizontal and sector-specific stakeholders and initiatives, including the cultural and creative sectors. The latter is called for the importance of integrating creativity, design, and non-technological innovations with cutting-edge technology to generate new products, new industrial value chains and revitalise traditional industries.

As the joint CULT and ITRE Committees of the European Parliament report on 'A coherent EU policy for Cultural and Creative Industries' underlines, cultural and creative industries (CCIs) play a key role in the reindustrialisation of Europe, drive growth and are in a strategic position to trigger innovative spill-overs in other industrial sectors.[1] The report recalls that CCIs are among the most entrepreneurial sectors in the EU, developing transferable skills such as creative thinking, problem-solving, teamwork and resourcefulness.

Adopted in May 2018, the New European Agenda for Culture recognises for its part the role of the cultural and creative sectors in 'generating innovative solutions that impact positively in other sectors and help boosting the competitiveness of our economy'.[2] The Agenda sets out the organisation of 'a regular dialogue with cultural and creative sectors in the context of the renewed Industrial Policy Strategy, to identify policy needs and underpin a comprehensive policy framework at EU level'.

This dialogue, as a vehicle for synergies between cultural and creative sectors and other industrial sectors, is yet to be defined to install sustainable and effective collaborations underpinning European excellence on the global stage.

1.2. Objectives and scope of the impulse paper

This impulse paper ambitions to make a timely contribution to setting up the dialogue with cultural and creative sectors in the context of the renewed Industrial Policy Strategy called for in the New Agenda for Culture, building, in particular, on the knowledge base on creative spill-overs and on evidence from practical experiences of cross-innovation between the industry and cultural and creative sectors, especially dealing with latest technology developments.

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[1] European Parliament (2016) *Report on a coherent EU policy for cultural and creative industries* (2016/2072(INI)), p. 8
[2] COM(2018) 267 A New European Agenda for Culture

The main objective of the impulse paper is to provide an overview of the main issues of the creative economy in relation to the new Industrial Policy Strategy.

This impulse paper focuses on how the cultural and creative sectors (CCS) contribute to triggering innovation in the wider economy and society, especially in relation to the most advanced technological/digital trends (e.g. Artificial Intelligence (AI), Internet of Things (IoT), etc.) and the social impact of these technologies.

The present research focuses on:

- Needs, challenges and opportunities for CCS as industrial sector today, in particular in Industry 4.0;
- Main trends in CCS;
- Main CCS spill-overs;
- Value chains that benefit from CCS;

1.3. Definitions of terms

For the purpose of this research, we refer to the definition of **CCS** used at EU level since 2012: architecture, archives and libraries, artistic crafts, audio-visual (including film, television, video games and multimedia), cultural heritage, design (including fashion design), festivals, music, performing and visual arts, publishing and radio[3].

The terms 'cultural and creative sectors/CCS' and 'cultural and creative industries/CCIs' are used interchangeably by the European Commission and the European Parliament. This said, a distinction exists between 'core cultural' sub-sectors (i.e. archives, heritage, museums, theatre), largely relying on public funding, and other sub-sectors with distinct value chains (i.e. video and film, music, visual arts, book and press, architecture) or an 'industrial' dimension (i.e. design, fashion, advertising, software and video games) and industries driven by creativity such as high-end industries.

Aligning with the policy actions of DG GROW in the CCS, the impulse paper mainly looks at specific subsectors of the core cultural and creative industries with business-oriented innovation capacities (e.g. design), fashion and high-end industries as defined in the 2016 study on 'Boosting the competitiveness of cultural and creative industries for growth and jobs' (see figure below).[4] However, other creative industries with defined value chains are also considered when relevant in relation to the Industrial Policy Strategy.

Our research will examine the added value of CCS in relation to industry 4.0 and the fourth industrial revolution.

Industry 4.0 designs a group of rapid transformations in the design, manufacture, operation and service of manufacturing systems and products[5]. This includes using large-scale Machine to Machine (M2M) and Internet of Things (IoT) deployments but is also covered by the terms 'Smart factories', the 'Industrial Internet of Things', 'Smart industry', or 'Advanced manufacturing'[6].

The integration of technology in production systems and products as well as its permeability in consumers and citizens' everyday life is often referred to as the **Fourth-Industrial Revolution**, driven by new-generation information technologies such as the Internet of Things (IoT), cloud computing, big data and data analytics,

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[3] See Annex pdf

[4] European Commission (2016) *Boosting the competitiveness of cultural and creative industries for growth and jobs*.

[5] European Parliamentary Research Service, *Industry 4.0 Digitalisation for productivity and growth*, Briefings, September 2015

[6] European Parliamentary Research Service, *op. cit.*

robotics and 3D printing. They open new horizons for industry to become more adventurous, more efficient, to improve processes and to develop innovative products and services.[7]

This research therefore focusses on the interaction between the CCS and the industry through 'creative spill-overs' as well as on 'cross innovation', particularly in relation to a new-generation of digital technologies.

Cultural and creative spill-overs are defined as the 'process by which an activity in the arts, culture and creative industries has a subsequent broader impact on places, society or the economy through the overflow of concepts, ideas, skills, knowledge and different types of capital'[8]. Cultural and creative spill-overs in our understanding designates the benefits arising from the activities of CCIs, including artists and creative professionals, which determine positive effects on other sectors of the economy or society. Those positive externalities result from processes through which culture-based creativity spreads out from the CCS, across other sectors and industries, thus contributing to innovation in the wider economy.[9] Creative spill-overs are generated through the interaction between culture-based creativity and other forms of innovation and processes (scientific, technical, commercial).

By the term **cross innovation**, it is meant a process by which creative industries share information, collaborate and work with other growth sectors to promote new thinking, innovative products and services.[10]

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[7] https://ec.europa.eu/digital-single-market/en/policies/digitising-european-industry
[8] European Research Partnership on Cultural and Creative Spillovers
[9] KEA (2015) *The Smart Guide to Creative Spill-overs*, URBACT Creative SpIN project
[10] Cross Innovation Toolkit, *How to make cross innovation happen in your city*

2. CULTURAL AND CREATIVE SECTORS, A HIGH INNOVATION POTENTIAL FOR EUROPE

2.1. Characteristics of the CCS in Europe

Cultural and creative sectors (CCS) are one of Europe's strategic assets accounting for 4.4% of the EU's GDP, 12 million full-time jobs and €509 billion in value added to GDP.[11] Their economic, social and cultural contribution has been largely demonstrated by research.

CCS can contribute to the revitalisation of the economy and territories (including former industrial areas) with hybrid, dynamic economic and cultural exchanges fostering innovation.[12] In the EU, more than 90 regions have included the CCS in their regional smart specialisation strategies (RIS3) funded under the European Structural and Investment Funds (ESIF) to advance regional development and reduce economic and social disparities between regions. Numerous examples of cultural investment for local economic development, urban regeneration, economic growth, social inclusion and social innovation can be found across Europe.[13]

On the economic side, CCS are growing fast and have shown to be resilient to the economic crisis.[14] Recent studies from regional to European levels have highlighted the considerable economic weight of the CCS (number of businesses, added value, employment) as well as the significant spill-over effects they generate for other industrial sectors.

Cross sectorial by nature (as sub-sectors' value chains often rely on other sub-sectors to create new products for instance music in films or design in fashion and video games), the CCS demonstrates long-term growth perspectives as they do no depend on sector-specific developments or singular shifts in competitiveness between countries.

2.2. Innovation in the CCS

The CCS rely on the development and exploitation of new ideas and intellectual property (IP). As such, they are 'one of the original knowledge-based industries and continue to introduce disruptive technologies and business models in fast moving, complex and highly competitive markets'.[15] The multidisciplinary nature of the cultural and creative workforce is moreover consistent with the literature identifying the competitive advantage for companies that combine skills in art and science, the so-called 'fusion skills'.[16]

Successful innovation in the CCS is multidisciplinary and involves three areas in a non-exclusive way:
- Technology Innovation
- Business Model Innovation
- Creative ('Aesthetic' or 'Soft') Innovation[17] including social innovation

Creative risk-taking and innovation are at the heart of creative industries which need a mix of highly skilled workforce, new ideas, technological and creative innovation to thrive. This is why the CCS are early adopters of new technologies and particularly digital

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[11] European Parliament (2016) *Report on a coherent EU policy for CCIs*
[12] UN Report on Creative Economy 2013
[13] See the catalogue of 71 practices gathered through the EU funded project Culture for Cities and Regions (http://www.cultureforcitiesandregions.eu/culture/resources/Case-studies-catalogue-2-0-complete-version-WSWE-AFJFF5)
[14] European Parliament (2016) *op.cit.*
[15] EKOS (2017), *Creative Industries Innovation: Overview Report*, (p.9)
[16] Nesta (2016) *The Fusion Effect: the economic returns to combining arts and science skills*.
[17] EKOS (2017), *op. cit.*

natives, using digital platforms (social media, search engines, online marketplaces) to connect, distribute cultural and creative content, generate new products and services and to transform their creative processes.[18]

The increasing integration between the digital and physical worlds under the fourth industrial revolution provides opportunities for innovation within the CCS through using new materials and production techniques (such as 3D printing) that facilitate greater and closer access to markets and customers as well as higher involvement of customers in the design process.[19] Nonetheless, sub-sectors producing or consuming digital content have benefited from the bulk of the interest: for instance in the UK the 'IT, software and games sub-sector contributes almost 40% of the GVA of the Creative Industries'.[20]

2.3. Digitisation in the CCS

Digitisation has led to more complex value chains across the CCS, introducing new players and increasing the number of business models co-existing. Although the impact differs from sub-sector to sub-sector, digitisation brought new tools allowing to automatize or reorganise existing activities, to explore new market opportunities, develop new activities and business models. Digitisation had a challenging impact on existing power balances by providing alternative models to creation, production, promotion or distribution. New technologies give creators access to essential resources to bypass traditional intermediaries ('disintermediation') and open the potential to create greater economic value for themselves. Nonetheless, gatekeepers having dominated the value chains before digitisation mostly remained in place in the current economic organisation as recent research demonstrated.[21]

Moreover, digitisation and its full innovation potential for the CCS has not yet been realised due to the fragmentation of the CCS mainly composed of small and micro entities. Although new digital tools allow them to get involved in activities down the value chain, they mostly do not have the capacity to take full advantage of these opportunities. The CCS is equally knowledge- and labour-intensive which means that established practices often dominate over technologically driven innovation while 'soft innovation' (cultural, social and content innovations, new processes and business model innovation) are not fully grasped and measurable with traditional technological innovation impact assessment tools. CCS are also highly reliant on intangible assets (intellectual property), people-centred assets (culture-based creativity, experience) which are challenged by the business model of new digital distribution platforms.[22]The innovation potential of CCS is not limited to technological innovation and is increasingly being employed to benefit the wider economy and society.

Indeed, enterprises in the creative industries support their customers in a variety of innovation activities: from developing new ideas, research and development, product design to market launch and marketing concepts that have been transferred to other sectors of the economy through the generation of 'spill-over effects' and integrated in cross-innovation processes. The challenge is to go beyond the provision of services by CCS to support or trigger innovation in industry and create partnerships allowing for co-creation and cross-innovation.

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[18] Bryan-Kinns, N., 'Wear Sustain Network: Ethical and Sustainable Technology Innovation in Wearables and Etextiles' Presented at GFC 2018, 31 October 2018
[19] Bryan-Kinns, N. op. cit.
[20] Bazalgette, P. (2017) *Independent Review of the Creative Industries*.
[21] IDEA, KEA and SMIT (2017), *Mapping the Creative Value Chains – study on the economy of culture in the digital age*, for the European Commission DG EAC, Brussels
[22] The Arts+, European Manifesto on Supporting Innovation for Cultural and Creative Sectors, 11/10/2018 https://theartsplus.com/2018/10/11/european-manifesto/

2.4. Contribution of CCS in innovation in the wider economy

The positive impact of culture and creativity on other sectors of the economy has been widely analysed and recognised by European policy documents, national, regional and local strategies.[23] CCS initiate spill-over effect on other industries, acting as catalysts for innovation in the overall economy.

Fig. 1 Innovation potential of the CCS in relation to the European industry
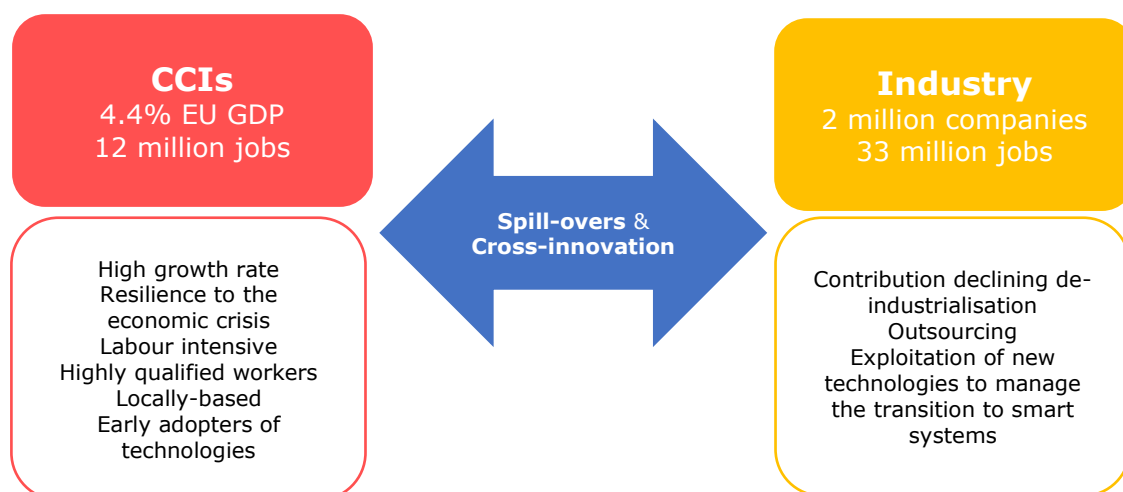
The European Research Partnership on Cultural and Creative Spillovers identifies 17 types and subcategories which can be grouped as follows[24]:

- **Knowledge spill-overs**: new ideas, innovations and processes developed within arts organisations and by artists and creative businesses spreading in the wider economy and society without directly rewarding those who created them;
- **Industry spill-overs**: referring to the vertical value chain and horizontal cross-sector benefits to the economy and society in terms of productivity and innovation influenced by a dynamic cultural and creative ecosystem. This type of spill-over effect entails five sub-categories: CCS stimulating (1) business cultures and entrepreneurship in other industries; (2) property markets; (3) private and foreign investment; (4) productivity, profitability and competitiveness, (5) innovation and digital technology;
- **Network spill-overs**: impacts and outcomes to the economy and society coming from a high density of arts and/or creative industries in a specific location (such as a cluster or cultural quarter). The European Research Partnership on Cultural and Creative Spillovers consider the effects of network spill-overs to be similar to those of clustering (such as the spread of tacit knowledge) and agglomeration. Their benefits range from economic growth and regional attractiveness to local pride and identity.

Spill-over processes are led by different mechanisms[25], which fall into two main groups:

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[23] See the list of references at the end.

[24] European Research Partnership on Cultural and Creative Spillovers and Tom Fleming Creative Consultancy (2015)

[25] For a literature review on spill-over mechanisms, see Döring, T. & Schnellenbach, J. (2006). What do we know about geographical knowledge spillovers and regional growth?: A survey of the literature. *Regional Studies*, 40:03, 375-395.

- 'Spontaneous' transfer of knowledge, competences and solutions between companies and individuals resulting from, for instance, labour mobility and 'competences' flows', trade or transfer of creative goods, services or technologies, informal communication between professions/companies' personnel and informal clusters and (social) networks;

- 'Spurred' promotion of knowledge, competences and solutions between companies and individuals encouraged by, among others, sharing and co-creation platforms, co-working spaces, creative hubs and incubators, incentives for collaborative and/or multidisciplinary projects (such as arts + science/technology/research) and formalised clusters and networks. 'Spurred' spill-overs can result from more or less planned instruments (e.g. incentives to collaborate vs. 'pop up' collaborative working spaces).

The role of creativity in innovation is illustrated in the application of creative skills and knowledge in diverse industry contexts. Thanks to the wide range of its products and services, the CCS can be a partner to diverse sectors by supporting the development of new processes, products and services as well as their manufacture and marketing.

Fig. 2 The CCS play a role in promoting innovation throughout the business value chain:[26]

Product and service	Human resources	Process	Branding	Communication
Combining new ideas, designs or expressive components to engage with customers' sensibilities and create a unique relationship.	Creativity infused in companies' HR management strategies and translated into better products and services.	Creative production or delivery methods that directly involve and/or better take into account consumers' needs in a "user-led" fashion and/or societal concerns such as sustainability; Collaborative and decentralised work that entrusts creative professionals or that are based on the combination of multi-disciplinary competences.	Adding a creative or artistic dimension as part of a brand's distinctive identity.	To illustrate companies' results and communication in a clearer or more appealing way either to investors or end-users; To engage with the general public on complex issues such as sustainability and ethics, calling on emotional responses.
E.g. cultural content such as music or videos contribute to provide entertainment but also emotional experiences in relation to various (ICT) products and services, in tourism and retail to enhance the visitor or customer experience.	E.g. Through design management, artistic interventions in companies or valorisation of creative functions.	E.g. Through the introduction of design-thinking techniques; CEOs coming from the creative field in the executive board of technological companies artists mingling with scientists open new R&D avenues	E.g. Large fashion brands are linking up with artists, designers, crafts and art to give higher end status to handbags, perfumes and catwalks; museums' collections, art exhibitions or performances are sponsored by private companies as part of branding or Corporate Social Responsibility (CRS) strategies.	E.g. Through communication campaigns including exhibitions, artistic interventions.

CCS connect the EU's cultural diversity and creative capabilities to economic activities, economic performance and job creation[27] but beyond economic views, they also trigger innovation at societal level addressing citizens' needs and issues. For instance, 21% of the creative enterprises in Austria supported innovation activities of associations and initiatives between 2014 and 2017. About one fifth of the creative enterprises primarily introduce innovations aiming at solving social problems, the highest share of which can be found in the field of architecture (38%).[28]

It has become widely understood that the CCS provide a unique bedrock for the European economy and offer significant opportunities whereby the role of culture and creativity intelligence can stimulate the kind of crossover innovation that our changing society increasingly requires. As designers, scientists and engineers are working towards future renewable and smart clothes, wearable healthcare technologies or

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[26] KEA (2014) *Creative spill-overs – short concept paper for DG ENTR*
[27] European Commission (2015) *Boosting the competitiveness of cultural and creative industries for growth and jobs*
[28] Kreativwirtschaft (2017), *Seventh Austrian Report on Creative Industries, Focus on Creative Industries and Innovation*.

user-friendly, low-emission transports, creativity is essential to addressing societal challenges in a sustainable and inclusive way. Industry 4.0 and creative industries together can contribute to create solutions for those societal challenges (e.g. circular society, healthy behaviour, resilience in society, energy and behaviour),[29] through innovative processes and products.

2.5. Relevance of the CCS in industry 4.0

'The technology is the easy part. The hard part is figuring out the social and institutional structures around the technology.' John Seely Brown

- **Cross sectorial perspectives for meaningful innovation**

Innovation processes are increasingly being transformed and rethought beyond lineal and silo thinking whereby research and development provide socially and spatially segregated solutions towards generating solutions in collaborative, multi-stakeholder ways taking inputs from and testing solutions in society.[30]

Multidisciplinary and cross sectorial innovation including the perspective of a diversity of stakeholders contributes to meaningful innovation taking into account ethical, environmental, social and well-being related concerns to respond to societal challenges in a sustainable and inclusive way.

> **Responsible Research and Innovation** (RRI) is an approach put forward and encouraged by the European Commission whereby 'societal actors work together during the whole research and innovation process in order to better align both the process and its outcomes, with the values, needs and expectations of European society'. RRI takes into account societal needs and expectations in research and innovation with the aim to foster the design of inclusive and sustainable solutions involving multiple actors from citizens to civil society organisations, to businesses and policy.

From an industrial perspective, this approach means taking into consideration *Diversity and Inclusion* in defining products and services including a wide range of stakeholders at the early stages of research; *Openness and Transparency* in research and innovation processes to establish open relations with consumers; *Responsiveness and Adaptive Change* adjusting organisational structure and systems to changing circumstances, paying attention to insights and diverse stakeholders' values.[31]

While the industry needs to innovate to remain relevant, not only on the market but also in society, forward looking approaches, future visions and long-term perspectives are needed to anticipate what individual consumers and society at large will need and value in the future. This is where creativity enters in the process as artists and creative people have the ability to think beyond the function of products or technology. Developing visions that differ from researchers or engineers' they can inspire new applications for technologies through co-creation.

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[29] Click NL (2017) *Knowledge & Innovation Agenda, Top sector creative industry 2018-2021*.
[30] Forum D'Avignon Rhur (2013), Culture is the key, Research, Interaction, Forum, Innovation, European Centre for cultural economy, https://www.e-c-c-e.de/en/forum-europe-ruhr/forum-davignon-ruhr-2013.htm l
[31] RRI Tools website https://www.rri-tools.eu/business-and-industry

- STARTS Residencies encourage Tech Projects to host artists to boost the innovation potential of any technology. By thinking "out of the box", artists can expand technological boundaries, develop unexpected use-cases, produce new prototypes, provide additional knowledge and stimulate ground-breaking processes.
- Ars Electronica (Linz, Austria), organises workshops with industry players to help them understand the potential of working with artists and designers (through collaboration with the arts university) towards future needs. By showcasing results of artistic-industry collaborations, they help accompanying the integration of art and design inside companies' processes to innovate with a future-looking mind-set.

- **Creativity and the future of skills and jobs**

In a digital and automated world, skills have been evolving to adapt to changing job requirements and environments. Today's world and the future economy will increasingly rely on creativity and technology, requiring to balance technical competences with an unprecedented level of moral complexity entailed by new technologies[32] in which ICT skills alone are not sufficient to thrive. While artificial intelligence is taking over routine tasks, there will be immense opportunities for people who combine creative, technical, social and emotional skills which are resilient to future automation.[33]

Being able to adapt to an uncertain future, cooperating with people from different backgrounds, solving problems collaboratively and generating innovative solutions to new challenges is what today's students will be required to do. Among the future transferable skills of employment, 'creativity' is reportedly the most significant predictor for an occupation's chance of growing, as a percentage of the workforce by 2030.[34] An IBM study showed, creativity was believed as the single most important leadership competency for enterprises seeking a path through a substantially more volatile, uncertain and complex society.[35]

According to the OECD Science, Technology and Industry Scoreboard 2017, workers in digital intensive industries show both higher levels of cognitive skills (e.g. literacy, numeracy and problem solving), and non-cognitive and social skills (e.g. communication and creativity). Solid cognitive skills coupled with the ability to solve problems and learn and think creatively therefore make a powerful mix which is key to adapting to the scale, speed and scope of digital transformations.[36]

Empathy, imagination and creativity are more and more required to navigate the knowledge-, experience- and digital economy. Such abilities are developed through education and life-long learning that are interdisciplinary, cross-functional, cross-industry and cross-cultural. In order to reduce the skill gap that the future generations will be facing in tomorrow's labour market, integrating the arts into STEM (Science, Technology, Engineering and Maths) education is a measure as commendable as

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[32] Bandelli, A. (2018), '4 ways art is sculpting the Fourth Industrial Revolution', World Economic Forum.
[33] Nesta (2018), Creativity and the Future of Work, Edited by Eliza Easton and Caroline Julian, Creative Industries Federation and Nesta.
[34] Bakhshi, H., Downing, J., Osborne, M. and Schneider, P. (2017). The Future of Skills: Employment in 2030. London: Pearson and Nesta.
[35] IBM (2010) 'Capitalizing on Complexity: Insights from the Global Chief Executive Officer Study'
36 OECD (2017), OECD Science, Technology and Industry Scoreboard 2017: The digital transformation, OECD Publishing, Paris

necessary to undertake now. This strategy is also highly pivotal to ensure that science, industry and technology are developed in a human-centred fashion as the technological breakthroughs of the Fourth Industrial Revolution can make society more sustainable and inclusive, or they can aggravate its cleavages and inequalities.[37]

The set of skills required to navigate a digitalized work environment and new technologies in processes, products and services highlight the importance of the human touch in innovation. Involving creative professionals as well as nurturing artistic skills for learners and workers contribute to an industry that is human centred, bridging the gap between technologies and people.

- **Human centred design, towards purposed-driven industry**

Design as a process is now widely recognised as a tool of innovation. Design-driven innovation has become increasing acknowledged and supported by a growing number of countries around the world (e.g. Australia, Belgium, Czech Republic, Denmark, Estonia, Finland, Hong Kong, Korea, New Zealand, Norway, Sweden, UK) and by the European Commission[38] as a key driver of business growth, employment and competitiveness.[39]

Design, as a creative approach looks at culture, behaviours, processes and knowledge sharing across an organisation. In doing so, it provides the required framework with vision and strategy that will support the innovation capacities of organisation (knowledge, competence, organisational structures, managerial systems, processes and mind-set).

Fig. 3 The various roles of design in innovation:[40]

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[37] Bandelli, A. (2018), op. cit.

[38] European Commission (2013) Commission staff working document - Implementing an Action Plan for Design-Driven Innovation, SWD(2013) 380, Brussels.

[39] Northern and Western Regional Assembly (2015) Design Driven Innovation, What matters for SMEs competitiveness.

[40] Galindo-Reuda, F. and Millot F. (2015). "Measuring Design and its Role in Innovation", OCED Science, Technology and Industry Working Papers, OECD Publishing, p.8.

User-Centred, Creative Development Activity Driving Innovation	Organisation or business capability	Link between the Innovation Activity of the Firm and the Market	Source of competitive advantage
Design plays a role in integrating the development and implementation of innovations. Design helps breaking the linear model of innovation whereby creation is driven by function and usage. In this logic, ideas can become potentially radical innovations.	Design as a set of (in-house or outsourced) skills and as an enabling efficiency production and use in strategic decision making.	Design as a key activity in the preparation of product and process innovations, and in efforts to modify the appearance and perception of existing goods and services.	Data from across Europe and around the world demonstrates that companies that use design are more profitable, innovative and export orientated than companies that do not. Where design is an integral part of the innovation process, the return on investment is greater than when design is only used for styling.

In the particular frame of industry 4.0, design can provide solutions for better interactions between human workers and the technological systems. Exploring the environment of new production systems, design helps us to conceive the protocols and devices that improve our relationship with the technology and ultimately production processes. For instance, the German company Proglove combines creative skills from design, fashion, engineering and manufacturing to create smart wearables connecting factory workers and industrial IoT.[41]

Not only the technology itself needs to be well designed but also the environment enabling better modes of human-computer collaboration. In their applications, new technologies such as artificial intelligence (AI) must reflect realistic conceptions of users' needs and human psychology to engender smart adoption and therefore smart outcomes.[42] Digital technologies and the environment around them should be conceived as facilitators for human decision-makers in order to produce engaging outcomes for the end-users. While engineers are usually trained to consider the function of a product before its usability, creativity and design integrates the needs and desires of users at the very inception of the innovation process, adopting a user-led approach.

This approach equally reinforces the competitiveness of firms. Indeed, design-driven approach fosters organisational learning through the integration of design-thinking. Research has demonstrated that businesses harnessing designer-like thinking across the entire business model nurture dynamic cultures, more desirable products and services, faster growth and passionate customers.[43] According to a recent McKinsey study, companies with the strongest commitment to design and the most adept

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[41] https://www.proglove.de
[42] Deloitte (2018) Industry 4.0: Are you ready?, Deloitte Review, issue 22
[43] Northern and Western Regional Assembly (2015) Design Driven Innovation, Why it matters for SMEs competitiveness.

execution of design principles showed 32% more revenue and 56% more total returns to shareholders.[44]

The arts and applied creativity such as design are powerful assets to create an emotional and intimate relation with products, whether digital or not, that is being called on to engage people with innovation.

- **Creativity to connect innovation and society**

The CCS develop experiences, they question beliefs and affirm values through proposing new visions of the world, questioning economic and societal balances, bringing together a plurality of points of views and expertise and applying creative skills (creativity and methodologies) in the development of new products, services and processes. This very ability to convey meaning through creation makes CCS professionals in a position to contribute to human, social, scientific and economic development even more so as applied digital technologies increase the impact of their work.[45]

It is argued that art and cultural experiences are necessary to approach the transformations at the heart of the fourth industrial revolution with an 'emotional framework' to make sense out of the ethical debates and challenges linked to fast-speed innovations[46] (e.g. data protection and privacy, gene sequencing and transhumanism). The arts and culture can translate these debates, build trust and engage the general public in the conversation with dynamic and innovative approaches, highlighting the values that are embedded in the process of technological innovation.

The CCS play an important role in bridging the gap between society, technology and innovation. As fashion tech designer Anouk Wipprecht, points out in relation to her collaboration with the car manufacturer Audi: 'It is really important that high end technology gets more emerged with everyday objects or everyday vehicles, but also everyday fashion'.[47]

The CCS are at the inception of making use of latest digital technologies, in a yet experimental way but the potential is enormous. For instance, the IoT enables the fashion industry to tell the story of a product, through its value chain (production site, manufacturer, life time and ways to dispose it), engaging the consumers in more responsible behaviours.

Cross sector practices are spreading across Europe, with established hot spot such as Eindhoven, Berlin or Linz which have been precursors, benefiting from supportive ecosystems and policies or infrastructures. The following chapter explores the context, objectives, practices, concerned sectors and perceived benefits of such activities.

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[44] Fast Company, 'This McKinsey study of 300 companies reveals what every business needs to know about design for 2019', 25/10/2018
[45] Click NL (2017) Knowledge & Innovation Agenda, Top sector creative industry 2018-2021
[46] Bandelli, A. (2018), '4 ways art is sculpting the Fourth Industrial Revolution', World Economic Forum.
[47] https://3dprint.com/83069/audi-a4-3d-printed-dresses/

3. CCS-INDUSTRY COLLABORATIONS

Backed with evidence gathered through desk research and interviews with key stakeholders, this chapter focuses on the results of the survey conducted as part of this impulse paper (see the Annex for the methodology and a summary of global insights).

3.1. Context of cross-sector activities

Applied creativity is a valued input to the innovation process in other contexts: this creative input comes from students/graduates, cultural organisations/ practitioners and/or creative disciplines within the academic community. Creativity is best employed as one of a number of discipline inputs in combination with expertise in science, technology, business and social sciences as part of multidisciplinary propositions. Common approaches and practices of cross sector activities between the CCS and other sectors have been identified by research:[48]

- They concern **innovation activities**, whether targeting social or civic challenges (healthcare, environment, transport, anti-poverty etc.) or focussing more on industry opportunities (e.g. new product and service development).

- They adopt a **human-centred design**, **service-user** perspective and a creative, **multidisciplinary** approach.

- They feature **collaborative working** at the heart of the projects, and was actively facilitated and supported. building the right collaborative teams and supporting the process rather than leaving this to chance.

- Cross sector projects are structured to deliver **multiple benefits** and impacts for different categories of participants (students/graduates; public sector and government, industry; universities etc.) who perceive the collaboration with different objectives.

- Cross sector collaborations with the CCS and other sectors take place in **open innovation** setups, whereby insights are generated through the combination of different perspectives involving multiple partners.

53%

of CCS engage in cross-sector collaborations

When asked, 53% of individual professionals and CCS companies declare collaborating often or very often with other industries.

42%

of business support organisations facilitate cross-sector collaborations

When asked, 41.9% of creative business support organisations declare facilitating the meeting between CCS and other industries often or very often but 51.7% do it sometimes or rarely.

63%

of public authorities are not regular in the practice of cross-sector collaborations

When asked, 63.1% of local authorities declare facilitating the meeting between CCS and other industries sometimes or rarely while 36.8% do it often or very often.

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[48] EKOS (2017), *Creative Industries Innovation: Overview Report* (p.19-20)
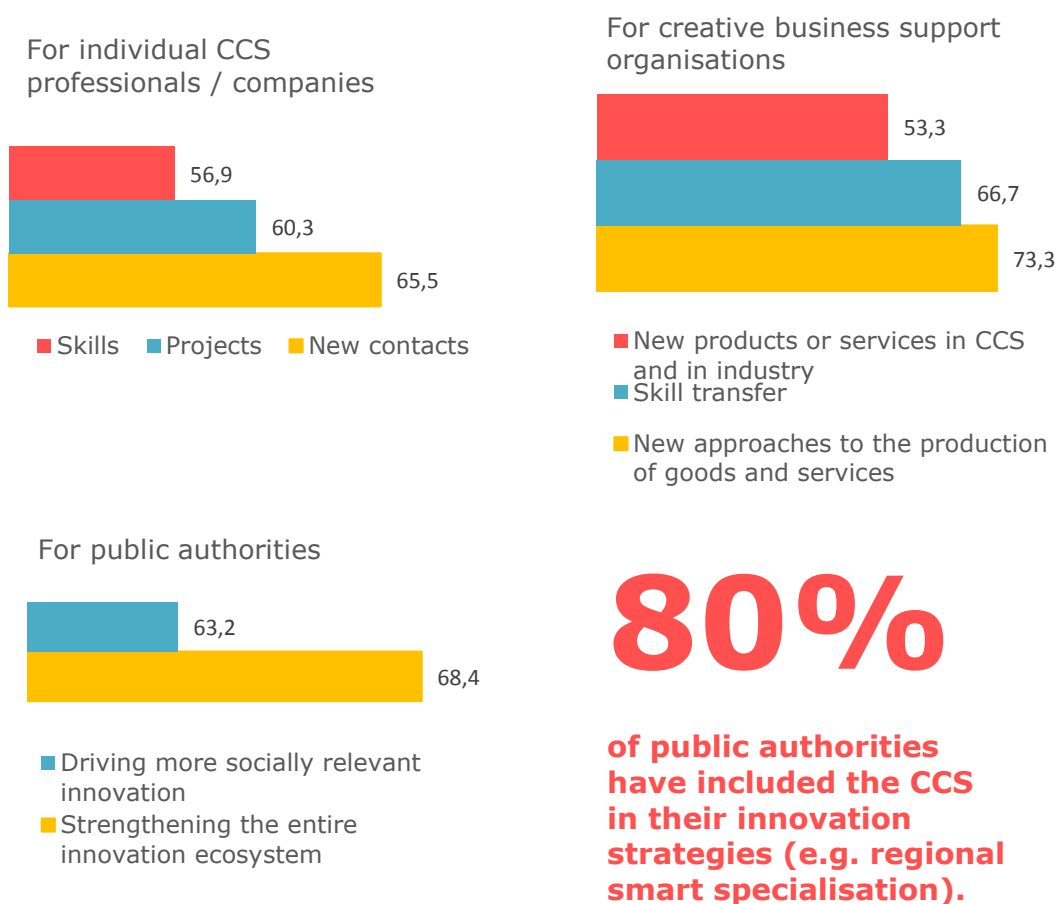
3.2. Purpose and impact of collaboration between the CCS and other sectors

Cross sector activities between the CCS and other industries can take place at various steps of the innovation process:

- **Ideation** through collaborative processes and engagement with customers and the wider public;

- **Collaborative Research & Development projects** addressing social or industry challenges, including for some the development of commercial IP;

- **Education and training**, with a strong focus on innovation and entrepreneurship;

- **Knowledge dissemination and public engagement** in various forms with diverse audiences including industry, academic and public audiences. [49]

Across stakeholder groups, positive outcomes of cross-sector collaboration are expressed in terms of networking, skill transfers and projects involving new products and services both in the CCS and in industry. Such activities benefit territories as well, improving the innovation ecosystem towards socially relevant innovation through R&D capacities and attractiveness.

Main benefits of cross-collaboration perceived by respondents to the survey (in %):
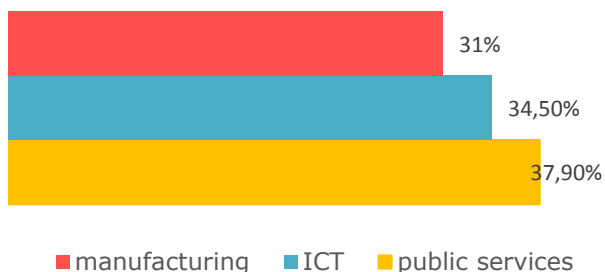
For individual CCS professionals / companies

56,9
60,3
65,5

■ Skills ■ Projects ■ New contacts

For creative business support organisations

53,3
66,7
73,3

■ New products or services in CCS and in industry
■ Skill transfer
■ New approaches to the production of goods and services

For public authorities

63,2
68,4

■ Driving more socially relevant innovation
■ Strengthening the entire innovation ecosystem

80%

of public authorities have included the CCS in their innovation strategies (e.g. regional smart specialisation).
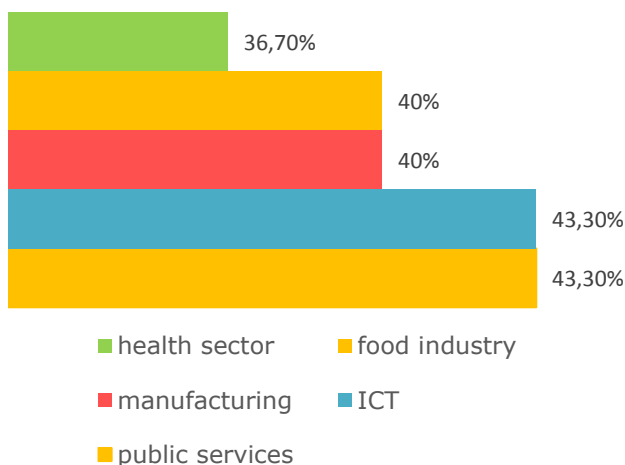
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[49] EKOS (2017), op. cit.

3.1. Industrial sectors concerned

Responses to the survey highlight established collaboration mechanisms between the CCS and public sectors as well as ICT and to a lesser extent manufacturing and the food industry.
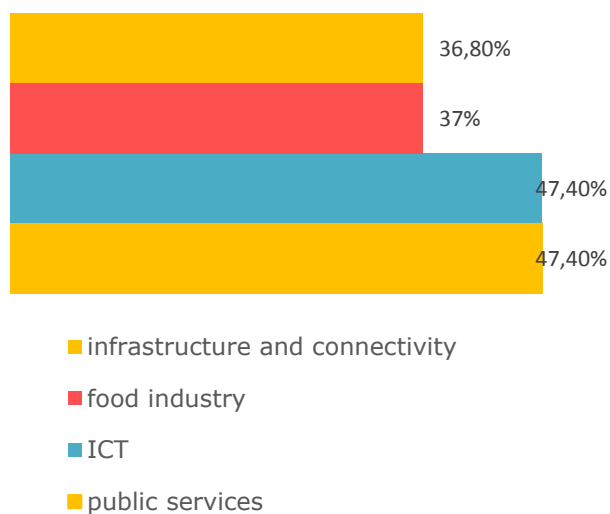
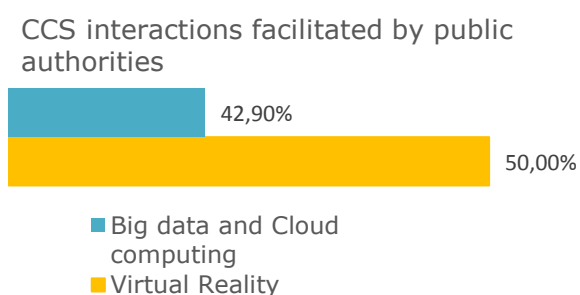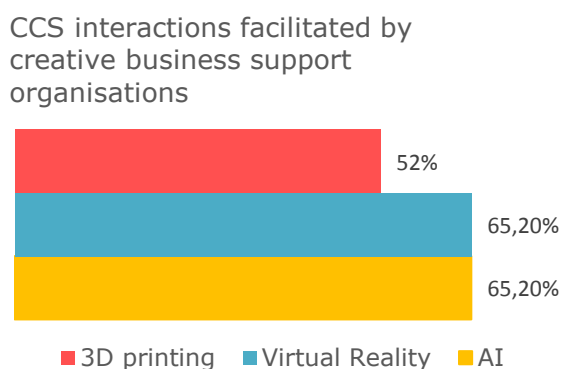Individual professionals and CCS companies collaborate with:

31% manufacturing

34,50% ICT

37,90% public services

■ manufacturing   ■ ICT   ■ public services

Creative businesses support organisations have enabled collaboration between CCS and:

36,70% health sector

40% food industry

40% manufacturing

43,30% ICT

43,30% public services

■ health sector   ■ food industry

■ manufacturing   ■ ICT

■ public services

Public authorities have enabled the collaboration of CCS with:

36,80% infrastructure and connectivity

37% food industry

47,40% ICT

47,40% public services

■ infrastructure and connectivity

■ food industry

■ ICT

■ public services

Collaborations involving digital technologies mainly concern CCS and virtual reality although other technologies are also mentioned notably big data and cloud computing, AI and IoT.

Interactions between CCS and digital technologies

Big data and cloud computing	37,70%
3D printing	36%
IoT	42,90%
virtual reality	54,80%

CCS interactions facilitated by creative business support organisations

3D printing	52%
Virtual Reality	65,20%
AI	65,20%

CCS interactions facilitated by public authorities

Big data and Cloud computing	42,90%
Virtual Reality	50,00%
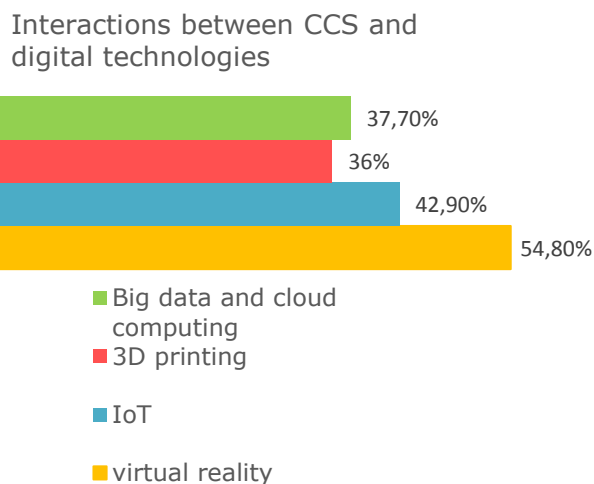
The context in which these cross-sector activities take place range from art competitions, and artistic projects or commissions to communication, audience development and marketing strategies, from integration of tech into services to innovation in areas such as sports, health, museums and cultural heritage.

3.2. Role of the CCS in cross-sector collaborations

Such innovative activities do no present a fix model and cross-sector collaboration take place under various set-ups.
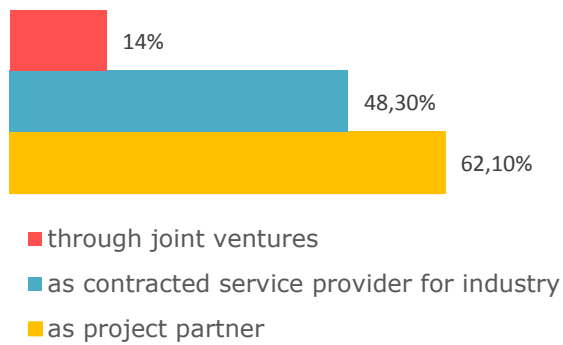
Individual professionals and CCS
companies have engaged in cross-
sectoral activities

14%

48,30%

62,10%

■ through joint ventures

■ as contracted service provider for industry

■ as project partner

Contractual arrangements remain a challenge for CCS professionals to engage in cross sector activities, alongside other barriers linked to lack of awareness from both sides, communication, working methods, technological developments as explained in the following chapter.

4. OBSTACLES AND OPPORTUNITIES FOR CREATIVE CROSS-OVERS IN INDUSTRY

Research and consultation with key stakeholders as well as the survey highlighted various obstacles hampering fluid cooperation between the CCS and other industry sectors. When overcome, such challenges provide important opportunities for cross-innovation. They equally represent key topics for kick starting a dialogue with the CCS as part of the renewed industrial policy.

4.1. Awareness and global vision

Lack of understanding and interest in cross-collaborations between CCS and industry.	**Lack of visibility of existing collaborations to start a community of practices.**	**Lack of business case & market hence the reluctance of industry to engage in cross sector collaborations.**

CCS are very often limited to their contribution to making products 'look nicer'. The challenge is to raise awareness in the traditional industrial sectors about the opportunities and benefits coming from the creative sectors, not only as an additional input at for branding and aesthetics purposes but as an integrated aspect since the very basis of the innovation process.

Manufacturing and technology sectors are not interested in developing creative products *per se* but communication and brokerage should help them understand the innovative and market potential of integrating creativity as an asset in the innovation process, products and related services. On the long term, this approach also means moving beyond traditional forms of customer/client relationship where the creative professional is a service provider towards actual forms of co-creation and co-design. Living Labs methodologies can be inspirational in testing co-creation approaches.[50]

For cross sector innovation to take place, both sides need to see the necessity to collaborate. The difficulty to find a common goal and vision also relates to communication barriers between the CCS and industry.

4.2. Communication

Lack of a common language between the CCS and industry to collaborate.	**Different training, working methods, expectations, objectives and timeframes.**

Expectations, objectives of the collaboration, working methods differ significantly across CCS and industry. Misrepresentations can hamper contacts to be made in the first place as the creative sectors are still considered risky to invest in and collaboration

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[50] See resources of the European Network of Living Labs (ENoLL) Living Lab methodology handbook and Co-creative workshop methodology

with the CCS remains relatively marginal in industry. Successfully combining different competences and working methods from the CCS and other sectors are key to cross innovation as stressed in the second chapter of this paper. During the collaboration, both sides need to be well aware of each other's timeline, constraints and processes to engage in a fair and fruitful partnership.

International collaborations add complexity to the process. Therefore, they need to be well managed by dedicated teams or facilitators experienced in intercultural and cross-sector teams. Understanding and acknowledging the value of the creative process in industry is pivotal to ensure that the CCS equally benefit from the collaboration (see also 'Legal Issues' below).

4.3. Funding

> **Lack of financial resources is the first barrier to collaboration**
> 75% of individual professionals and companies in the CCS and 67.8% of business support organisations consider it as a very or extremely important obstacle.

Access to finance is a recurrent obstacle to research and development for innovation in the CCS.[51] On the side of the industry, start-ups or smaller companies, although more flexible and eager to engage in collaboration with the CCS to overcome innovation challenges, have budget constraints that prevent them from resorting to creative inputs on a more regular or long-term basis.

As companies can hesitate to engage in challenging business ideas, cross-innovation vouchers could be a tool to help them step into new partnerships and engage with the CCS.

4.4. Technological developments

The digital era represents both a challenge and an opportunity for innovation and growth in the CCS as well as cross-innovation with other sectors. The platform economy - analytics-based, cloud-enabled, data-driven, mobile-focused, user-centred - is changing the playing field for almost all CCS actors. The 2017 report on 'Mapping the creative value chains' showed how digitisation has given rise to crossover innovation trajectories by challenging existing balances and sectoral relations by providing alternative models to create, produce, promote or distribute.[52]

New technologies such as virtual and augmented reality, blockchain, 5G and 3D printing could trigger innovation at all levels of the CCS and reinforce their capacity to innovate and intervene in other sectors.[53] Yet technological barriers remain in the CCS and these developments are not fully exploited in creative value chains. Access to technology can remain difficult or costly for small players which have not reached the scale to maximise their impact on society.

The complexity of technologies can prevent creative players to get into cross-innovation and invest in cross-sector collaborations such as fashion tech for high street brands.

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[51] OMC group (2016), Innovative instruments to facilitate access to finance for the cultural and creative sectors (CCS): good practice report.
[52] IDEA, KEA and SMIT (2017), *Mapping the Creative Value Chains – study on the economy of culture in the digital age*, for the European Commission DG EAC, Brussels.
[53] European Manifesto on Supporting Innovation for Culture and Creative Sectors (2018), Innovation Summit 2018, Frankfurt.

Fashion and industry 4.0:

While a deep level of digital change has not happened yet in the industry, technology offers a promising future for fashion, more convenient for customers, enabling designing clothes with a positive impact on workers and the environment, with life changing benefits. Experts see the future of fashion with automation of the industry through at home production in a near-shore perspective (as opposed to offshore), production on demand, 3D printing and customization. Technology allows for more transparency in the value chain, giving a higher role to craftsmanship, improving the value of clothes. As the Global Fashion Agenda in its latest Report on the pulse of the industry (2018) highlights:

- Artificial intelligence and the internet of things (IoT) enable the customer to know when, where and by whom garments were produced but also when the product reaches the end of its life and how to dispose or recycle it.
- Virtual design software connects 3D design with the 2D pattern environment
- On-demand and 3D printing have the potential to reduce waste and shorten time-to-market dramatically.
- Sensors and IoT technologies offer tracking and tracing opportunities that could serve multiple uses.

The global market for smart textiles is rapidly growing towards a predicted 4.72 Billion by 2020 with a predicted growth of 33.58% between 2015 and 2020 (PRSNewswire, 2015). This specific sector plays on the combination of physical and digital innovations at the intersection between fashion, technology and science (Wear Sustain Network: Ethical and Sustainable Technology Innovation in Wearables and Etextiles' at GFC 2018).

4.1. Legal issues

To fully harness the innovative potential of the CCS in relation to industry, there is a need to address the value of the IP in the CCS. Invest in R&D in the sectors will ensure sustainable innovative content creation and thus support their ability to engage in innovative practices with other industries. The approach to CCS in innovating industry needs to shift towards a 'creative tech sector', adding value not only within the CCS but also acting as an enabler to the wider economy.[54]

Business models and monetisation of the creative outputs are not established enough to provide a safety net to cross-sector collaborations, notably between small CCS players and large industry corporations. Copyright and legal issues need to be dealt with in cross-collaborations processes, especially dealing with new technologies and the platform economy.

Providing a legal framework with clear contracts to deliver in cross sector innovation would help often small creative organisations to engage in collaborations with industry. Legal facilitation would enable shared ownership and credits for the innovative results, shifting from a customer/client relationship towards actual co-creation.

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[54] Bazalgette, P. (2017) Independent Review of the Creative Industries, p.5

5. INCENTIVES FOR CROSS-INNOVATION

Creative spill-overs and cross-overs are rarely accidental although they can happen in open, dynamic ecosystems and networks. In order to mediate new relationships, initiate new connections between different competences, fields and sectors, public authorities, creative business support organisations and sometimes CCS companies themselves have put in place a series of incentivising strategies and tools supporting the encounter of CCS and other sectors.

The survey shows that public authorities mainly work on locally-based networks, mapping of relevant stakeholders and cross-innovation projects as well as embedding CCS in innovation strategies and action plans. Business support organisations on their side mainly undertake facilitation activities connecting CCS and industry in locally-based networks as well. Targeted business support to cross sector activities and joint ventures such as direct funding, support between smaller companies and scale up programmes are almost absent from the picture of incentives already in place by public and private organisations surveyed. Nevertheless, both public authorities and support business organisations demonstrate an interest in enlarging the range of their support activities to direct funding to collaborations, experimentation and prototyping spaces, targeted support to SMEs and acceleration and incubation programme dedicated to collaborations between CCS and industry.

The main categories of incentives have been identified as in the following sub-chapters.

5.1. Brokerage and networking

Local and international networks come as highly important incentives across all surveyed categories, with the local dimension particularly stressed by public authorities and business support organisations.

Facilitators / organisations connecting the CCS with the industry are also considered by the three types of stakeholders as main incentives.

CCS and industry need connecting points, actors and brokers: **facilitators** with interdisciplinary skills, able to navigate through various sectors and understand different mind-sets, languages and cultures. Such intermediary organisations translate challenges into applicable solutions, they present new visions for CCS and industry to share an interest in working together and present the business case for it.

Facilitators act as bridges between the CCS, industry and ICT. This is a challenging activity which takes into consideration new dimensions of innovation in traditional sectors (social innovation, creativity) hence the need to benchmark and exchange internationally, to be present at networking events and on platforms (e.g. RIS3 platform to bring CCIs in the industrial modernisation group, clusters).

Indeed, face to face meetings (in brokerage or networking events, festivals, conferences, workshops) create stimulating conditions for cross sector meetings.

> [Wear it Berlin](#) organises events bringing professionals from various background around a common topic for instance: hackathons on fashion and electronics; meet-ups or after-work networking sessions with short presentations, talks, food and drinks; larger events such as conferences with sessions and workshops with representatives from creativity, industry, technology and policy.

However, identifying the right stakeholders, their innovation needs and competences available are crucial to successful matchmaking and necessarily takes place upstream the events.

5.2. Physical and online spaces

Spaces to meet and network: a very important incentive to collaborate more with other industries
for the majority of individual professionals and companies. This opinion is shared by public authorities.

Experimentation spaces with prototyping facilities
is important to the almost totality of creative business support organisations.

Neutral and safe spaces facilitate the exchange of information, knowledge and ideas between various actors, entities and disciplines. Sociability and conviviality are conductive to encounters across fields. Fab labs, living labs, maker spaces, field labs provide such tinkering, experimentation and prototyping spaces needed to trigger cross-innovation on short term projects.

In a globalised world, online spaces on social media or dedicated platforms are important spaces for the community to exchange experiences, work opportunities as well as to find new partners. Site-based and digital spaces are complementary to engage in the discussion on creative innovation in the CCS and other sectors.

5.3. Funding and support

Direct financial support would be the most important incentive for cross-sector collaborations
79% of individual creative professionals and companies responding to the survey identify it as very to extremely important to collaborate more with other industries.

Risk taking, research and development is at the core of CCS activities to thrive and gain new audiences and customers. However, this activity is not recognised and does not qualify for existing R&D support schemes as traditional measures of R&D and innovation fail to capture adequately soft innovation taking place in the CCS. Public institutions and industry therefore need to ensure that the contribution of creative disciplines to R&D is valued and supported.

Appropriate finance and business support are key through the whole CCS and so is the type of financial instrument.[55] Currently a small proportion of SMEs in the sector seek equity finance but this represents an important funding support for young businesses with high growth potential. The Guaranty Facility for Cultural and Creative Sectors implemented by the European Investment Fund under the Creative Europe Programme could provide another funding source through debt finance[56]. In the next programming period, it will be integrated in the European Fund for Strategic Investments currently providing funding notably to SMEs, especially for projects with a higher risk profile than usually taken on by banks to overcome the investment gap.[57] Parallel contribution from public authorities, investment from industry and private funds is needed to spur collaborations between the CCS, technological and industrial sectors for Europe to take a strong position on the global market. Europe boasts a wealth of world-renowned fashion, high-end and technological brands that need to be mobilised to champion the initiative and build support in the early stages.

KEA Smart Guide to Creative Spill-overs (2015) developed for the Creative SpIN URBACT project proposes a range of financial incentives including:

- Reviewing public procurement documentation to integrate CCIs and smaller structures;
- Reviewing the "mandate" of clusters to encourage inter-clustering - inter-clustering is promising between CCIs and ICT or Health sectors;
- Making public subsidies dependent on minimum interaction efforts with urban or economic projects;
- Introducing design-thinking obligations in call for tenders;
- Providing grants through calls for projects embodying interdisciplinary skills;
- Establishing innovation vouchers, namely small grants to encourage companies to access creative services (design, advertising, artistic intervention etc.).

Access to finance remains a challenge in the CCS, therefore training and facilitation in alternative ways of financing cultural and creative organisations and businesses such as crowdfunding, venture capital funds and business angels should be improved to support innovation in the sector.

Easy access to services such as mentoring on technological (prototyping, user experience), business and legal issues (patenting) is another form of public support that would be valued by the CCS to engage in cross sector activities.

The Worth Partnership Project, funded under the COSME programme, creates and supports transnational collaborations between fashion designers, creative people, manufacturing enterprises (SMEs) and technology firms looking to develop design-driven and innovative products blending fashion, design and technology. The project provides coaching for successful collaborations between the involved creative and industrial stakeholders, support for market analysis, pitching to investors, participation in trade shows as well as legal advice.

European funded projects enable exchanging knowledge on support schemes and experimentation through pilot actions testing solutions supporting cross-innovation which, if successful can be integrated in regional programmes. Interreg Europe projects for instance mobilise European Structural and Investment Funds on the long term (e.g. Design for Innovation[58] and RegionArts[59] projects). They open networking and benchmarking spaces at international scales for stakeholders to meet and to learn

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[55] EKOS (2017), *op. cit.*
[56] https://ec.europa.eu/programmes/creative-europe/cross-sector/guarantee-facility_en
[57] http://ec.europa.eu/growth/industry/innovation/funding/efsi_en
[58] https://www.interregeurope.eu/design4innovation/
[59] https://www.interregeurope.eu/regionarts/

from regional cooperation. Moreover, such projects provide additional funding for new concepts in wearable of fashion tech (e.g. STARTS projects Vertigo Starts[60] and Wear Sustain[61]) or circular economy (see the box below).

The Horizon 2020 project C-VoUCHER combines design and technology to support SMEs (including manufacturing, agro-food, textile, health and sea industry) in their transition towards circular economy. 24 SMEs will be awarded access to the 'Circularity Programme' - an acceleration programme lasting up to 9 months with up to €60k vouchers and dedicated services from high level Designers-in-Residence and top business professionals who will guide them along the programme to design new, circular solutions.

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[60] https://vertigo.starts.eu
[61] https://wearsustain.eu

6. FRAMEWORK CONDITIONS

Framework conditions relate to structural requirements enabling creative spill overs. They prefigure the way forward in stimulating and sustaining long-term cross innovation between the CCS and industry.

6.1. Supportive ecosystems

Policy support (e.g. CCS-friendly innovation strategies)
is cited as an important incentive for 88% of individual professionals and companies in the CCS and for 79% of creative business support organisations.

Supportive public policies providing vision, strategy for creative integration in industry sectors constitute the backbone of a dynamic innovative and competitive economy. Incentives and support tools are put in place to spur creatives spill-overs in industry while institutional and regulatory framework provide a 'safety net' for small players to engage safely into cross sector collaborations.
CCS are included in RIS3 to unlock funds and go further than the cultural silo in policy making, taking and economic and innovation approach to CCS and creative technologies. Creative hubs, incubators, accelerators and clusters are key players to support and allow the insertion of new players in the ecosystem.

The open innovation framework that could be favourable to cross-innovation from the research step are not usual practice in the CCS. Through its Cultural and Creative Industries Clust-ER, the Emilia Romagna Region (IT) works in collaborative research between creative companies and research entities towards bridging innovation needs from both sides. In doing so, the cluster embeds open-innovation in the thinking about and within the CCS.

Raising awareness and building capacity in the CCS and industry is likely to open new pathways for shared visions about innovation and common objectives of the collaboration. Creative inputs need to be inserted at the inception of the process not as an end add-on

A positive attitude to technology and a community of early adopters that allow real life testing of new products is equally important to drive cross innovation at the nexus of disciplines. End-users are involved and can contribute to the innovation process.

Universities interact with industry in a way that supports the development and transfer of knowledge and expertise into commercial applications (see below).

6.2. STEAM education and skills

The EU needs to nurture its human capital and knowledge base to adapt to technological developments. As outlined in the second chapter, the fourth industrial revolution requires a new generation of life-long learners and makers equipped with problem solving and creative thinking skills. The future of work will increasingly rely on those combining creative and technical skills to apply them within and beyond the CCS.

However, education and skills systems are still predicated on employment models of the past rather than the future. Many barriers impede to access to creative and

technical learning. Multidisciplinary skills allying STEM and the Arts into STEAM empowers individuals to think creatively and find solutions to complex challenges in multidisciplinary contexts.

Increasing the interaction between creative professionals and young people as part of artistic but also entrepreneurial and digital education (through for instance artist in residence programme, artistic interventions, hackathons…) could contribute to this transition.

STEAM competences also help overcome technological barriers so that creative professionals can take competence over new conception, production, and distribution models and propose innovative applications of technologies.

7.   CONCLUSIONS AND RECOMMENDATIONS

7.1.   Conclusions of the impulse paper

The European industry needs to generate high quality products and services with values and meaning in the experience economy. CCS are a strength for the EU as its cultural diversity and vibrant artistic scene stimulate creativity that is increasingly needed to face economic and societal challenges with relevant innovations.
The challenge for Europe is to make the best of its cultural and creative assets to address the digital transformation affecting all areas of the economy and society from skills and jobs to industrial processes, from content creation to ethical concerns. Harnessing the power of interconnected thinking and multidisciplinary innovation is therefore the way forward for Europe to face competition on the global stage.

By asserting and developing its creative capacities, the EU can become a powerhouse for innovative ideas and services which have both significant economic value and the ability to improve citizens' quality of life.

A renewed Industrial Policy Strategy taking into consideration the positive integration of creativity in innovation is an opportunity to make the most of Europe's cultural and creative diversity and dynamism to help the EU industry remain competitive and to design a sustainable and inclusive economy against the backdrop of the fourth industrial revolution.

- These ambitions can be achieved through mobilising industry, technology and creativity stakeholders at EU level; through **awareness raising and showcasing** existing successful collaborations; with a view to inspire and promote a shared understanding of the impact of the CCS on innovation. going beyond design that has already been advocated for at local, national and EU levels and well documented.

- In reinforcing cross-sectoral fertilisation, the European Union should seek to break policy silos and **maximise synergies** between existing programmes for research and innovation, industry, SMEs, clusters, culture and education. For instance, this would facilitate the access to funding for industry and creative companies engaging in cross innovation from R&D, for the transition from experimental stage to market uptake. Investing instruments should be mobilised to provide incentives for creative spill-overs investments beyond one-off projects.

- **Cities and regions** pioneering the field, notably through ESIF and smart specialisation strategies, should be engaged in regular dialogue to encourage the exchange of experiences across Europe in a joint effort to correct innovation imbalances between regions.

- **Brokerage organisations and mediators of cross innovation** should be also helped to build capacity at European level to create a driving force for creative spill-overs across Member States.

- **Innovation and digitisation in the CCS** should be spurred by facilitating access of individual professionals and companies to new technologies and related (e.g. business, legal) services in clusters, research centres, maker spaces, fab-labs and creative hubs to make use of them in cross-collaboration projects, from research to market uptake. Latest technological developments such as AI, AR, IoT and 3D printing are definitely a field full of potential for the CCS in terms of content creation, modelisation, distribution and relation to audiences. Capacity should be built in the sector to engage successfully in collaboration with the tech industry.

- Finally, to respond to the lack of evaluation tools showing the impact of the CCS in industry, **monitoring and evaluation indicators** should be developed by the European Commission Joint Research Centre, universities or competent research centres.
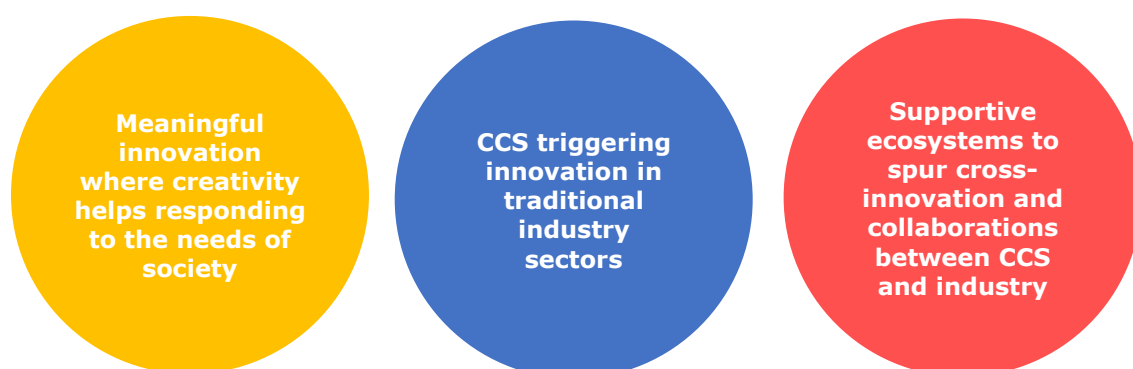
A creative spill-over agenda targeting notably B2B relations within the overall supply chain is the opportunity to associate European-grown creative talents in innovation processes. It is also the occasion to further develop the CCS as one of the most relevant industries, notably in relation to industry 4.0, opening many possibilities for creative digital developments.

7.2. Recommendations for a regular dialogue with cultural and creative sectors in the context of the renewed Industrial Policy Strategy

- **Agenda topics**

For the two workshops coming in 2019, the present paper suggests to reflect on concrete ways to promote multi-disciplinary interactions and raise awareness on their potential for innovation.

The survey, conducted among three groups of stakeholders of the CCS (cultural and creative professionals, creative business support organisations and public authorities) highlighted the following priority topics for discussion:

Meaningful innovation where creativity helps responding to the needs of society

CCS triggering innovation in traditional industry sectors

Supportive ecosystems to spur cross-innovation and collaborations between CCS and industry

Discussion topics therefore can be grouped in three categories:
- The area of focus for the CCS-industry dialogue and related instruments;
- The purpose of cross sector collaborations between the CCS and industry;
- The enabling environment for cross sector collaborations to take place.

We suggest the following key topics under each category:

Meaningful innovation where creativity helps responding to the needs of society
- Tackling global challenges: e.g. sustainability, circular economy;
- Responsible innovation (e.g. user-centred innovation, ethics and public engagement);
- CCS and social economy

> **CCS triggering innovation in traditional industry sectors**
> - Enabling technologies and wearables: designing the innovation environment, empowering humans through creative technologies;
> - Putting users at the centre of the innovation process;
> - Creativity in the experience economy.

> **Supportive ecosystems to spur cross-innovation and collaborations between CCS and industry**
> - Incentives to industry-CCS cross-collaboration: finance instruments, brokerage and networking, spaces for collaborations, access to technology, supporting services.
> - Framework conditions: policy instruments at EU and national/regional/local levels; STEAM education and skills.

In relation to the third element, survey results related to incentives and framework conditions for cross innovation could serve as a basis for discussion, assessing the feasibility of implementing such named incentives by the European Commission.

- **Formats of the workshops**

To align on the practices of the concerned sectors, we suggest that the workshops adopt an interactive, flexible and an informal character in order to spur the discussion between stakeholders of various backgrounds and sectors in a highly engaging way.

Design thinking approaches and professional facilitation should be sought for in the management of the process in order for industry stakeholders to experience it and as a way of introducing creative spill-overs in European policy design processes.

Formats for the meetings could include: world café, open space or scenario workshop.[62]

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[62] The scenario workshop is an adaptation of the format developed in the frame of the Sparks project: http://sparksproject.eu/sites/default/files/SPARKS%20TOOLKIT.pdf

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