



Design, Creativity and Innovation: A Scoreboard Approach

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Executive Summary

Creativity and design are important features of a well-developed knowledge economy, not only for having a favourable impact on people's well-being and business performance, but also on innovation. The importance of creativity for innovation is perhaps best reflected by the fact that 2009 will be the European Year of Creativity of Innovation: "The aim is to exploit and promote creative and innovative approaches and initiatives in different domains of human activity and at all levels. While education and culture will be at the centre of the Year, it feeds into many other policy areas, such as enterprise, information society, employment or regional policy"².

Design is a structured process that transforms creative ideas into concrete products, services and systems, and as such links creativity to innovation. As part of the innovation process, design has the potential to substantially contribute to improving the brand image, sales and profitability of a company.

Following the European Innovation Scoreboard (EIS), we have adopted a 'scoreboard approach' using a set of indicators to capture different dimensions of creativity and design. Starting from a larger set of indicators, the results from a literature review and statistical data reduction analyses have resulted in a final set of 35 indicators which are classified in 7 different dimensions. Of these 7 dimensions, 3 capture the Creative climate and 4 capture Creativity & design.

It should be stressed that there is a general lack of quantitative indicators which directly measure creativity and design. Creativity is defined here as the generation of new ideas, but the number of ideas is an unobserved statistical phenomenon. For design activities there is more statistical evidence, but the number of indicators directly measuring design activities is limited. We therefore have to rely on proxy indicators, which only indirectly measure creativity and design, thereby creating possible errors in the scoreboard approach where countries' performance could be under- or overvalued based on the respective bias in these proxy indicators towards measuring 'true' performance.

Creative skills are important for all economic sectors and activities and not only for the creative industries. The quality of the educational system, the desire of people to express themselves (artistically) and the openness of a society towards different countries and cultures are assumed to determine the Creative climate in a country. A more favourable Creative climate is assumed to result in more ideas, more creativity, which in turn should increase R&D and design activities. R&D and design not only develop further these ideas but also shape them into commercially attractive new products and processes, thus increasing innovation.

The statistical analysis in this paper confirms that a favourable Creative climate has a positive effect on a country's creativity, even after controlling for differences in income levels, thus taking into account that wealthier countries are in a position to spend relatively more resources on their education system. Countries where people are eager to be involved in artistic and cultural activities also appear to be more creative. However, openness to other countries and cultures, e.g. reflected by larger shares of foreign students and employees, does not appear to have a positive impact on creativity as measured in this report.

Higher levels of creativity are associated with increased levels of R&D and design activities. Apparently more ideas create a larger and more diversified pool of potential research projects, tempting firms to increase their R&D and design activities. The statistical results also show strong evidence of a positive link between increased R&D and design performance and innovation, although innovation is also dependent on a range of other framework conditions.

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<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/1389&format=HTML&aged=0&language=EN&guiLanguage=en>

Countries showing a higher performance in creativity and design also show, taking into account differences in per capita income, a higher innovation performance as measured by the EIS Summary Innovation Index. Given their level of innovation performance, Belgium, Bulgaria, Italy, Latvia, Malta, Netherlands and Spain perform relatively well in creativity and design. Creative education is the dimension which shows the strongest relation to innovation. This seems to suggest that policies aimed at improving levels of educational attainment and policies aimed at improving creative thinking in education will, after a number of years, have a positive effect on a society's innovative performance.

1. Introduction

Creativity and design have distinct roles in the innovation and the broader business performance context. Design has emerged as a key differentiator for businesses. As a result of the growing access to technology, firms increasingly have to compete at equal prices and functionality. Design increasingly assumes a new role, one of competitive advantage and differentiator, creating new markets by linking technology with commercial and user considerations, whether linked to functionality, aesthetics, brand or other intangibles.

But measuring creativity and design in statistical terms is still a problem, as there is a lack of indicators to measure their contribution not only at national and international levels, but also in comparison with other economic sectors. In 2005 the UK Department of Trade and Industry concluded that "[t]here are few official statistics to support analysis of creativity and design" (DTI, 2005).

In this report we try to quantify countries performance in creativity and design using proxy indicators to build composite indicators. These composite indicators are then used to examine the link with the innovation performance data from the 2008 European Innovation Scoreboard (EIS).

2. Creativity and design as potential drivers of innovation

2.1 Defining creativity and design

According to Florida (2002) creativity is multidimensional and three different 'types' of creativity can be distinguished: technological creativity (invention), economic creativity (entrepreneurship) and artistic/cultural creativity. All these dimensions of creativity are interrelated, sharing a common process of thinking and reinforcing each other. The creative economy is then the result of the interrelations among technology, arts and businesses. Following the UK Department of Trade and Industry, creativity can be defined "... as the production of new ideas that are fit for a particular business purpose" (DTI, 2005).

As there are only a few indirect indicators for measuring the generation of new ideas, the creative sector is used as a proxy to measure creativity. (cf. Box 1).

Design is a key driver not only of firms, but also of countries' competitiveness. It is not only integrated into businesses as a strategic tool to drive innovation and growth, but also to foster national competitiveness by contributing to general creativity and the image of countries as a brand. For example, countries such as Finland, Ireland, Spain, Denmark and the UK have all developed national design policies and invested in design excellence, as a mean of producing unique and globally competitive products and services, a differentiator and driver of national competitiveness (Design Singapore Report, 2002). The New Zealand Design Taskforce (2003) found that 67% of exporters identified design as a key factor in economic success and for 80% of the companies design had added value to their business.

Box 1. Definition of creativity industries

According to Hartley (2008) the term “creative industries” was introduced by the UK Department of Culture, Media and Sport (DCMS) in 1990, which focused on the industry itself by referring to firms whose outputs were considered creative. A major contribution by DCMS was to move the concept away from its association only with activities with a strong artistic component, to any activity producing symbolic products, and relying on intellectual property. These activities included advertising, film and video, architecture, music, art and antique markets, performing arts, computer and video games, publishing, crafts, software, design, television and radio, and designer fashion. According to this first definition, the creative industries are based on individual creativity, skill and talent.

In a second phase, which according to Hartley (2008) is taking place now, the focus has widened from creative output to the whole economy, taking into account how creative inputs add value to businesses which are not considered creative, in particular in the services sector.

In a third phase (emergent), which is being developed in parallel to the extension of digital media into popular culture, the focus is shifting to user-created content and open networks. Creativity is now seen as a collective process. The focus has been changing from a supply-driven approach to a demand-driven one. Consequently, any model to access creativity and its impact on innovation should incorporate variables that are not only supply but also demand oriented.

What is now defined as the creative sector³ is developing at a higher pace than other economic sectors. Employment is not only growing at a high pace but the sector also offers a high share of highly skilled jobs. The creative sector is estimated to account for more than 7 % of the world’s domestic product (World Bank, 2003) and is expected to grow by 10% per year (Price Waterhouse Coopers, 2003). The creative industries represent a leading sector in many OECD countries, with annual growth rates between 5 to 20% (EESC, 2003) and having a positive impact on trade. Moreover, the creative industries produce significant economic spin-offs and promote integration between technology, arts and business.

The concept of design has been defined in different ways either focusing on design as an economic activity or more general as the translation of the ideas generated by creativity into new products and processes (cf. Bitard and Basset, 2008):

“‘Design’ is what links creativity and innovation. It shapes ideas to become practical and attractive propositions for users or customers. Design may be described as creativity deployed to a specific end.”

“... design can be approached as an economic sector of activity. Basically, design definitions are based on design professions with the following four main ensembles: fashion design, graphic design, interior design and product design The list can be even more detailed, encompassing industrial design, product design (furniture, toys, jewellery), visual, communication, advertising, packaging, fashion design, architecture design, landscape design, interior design, urban design, etc.”

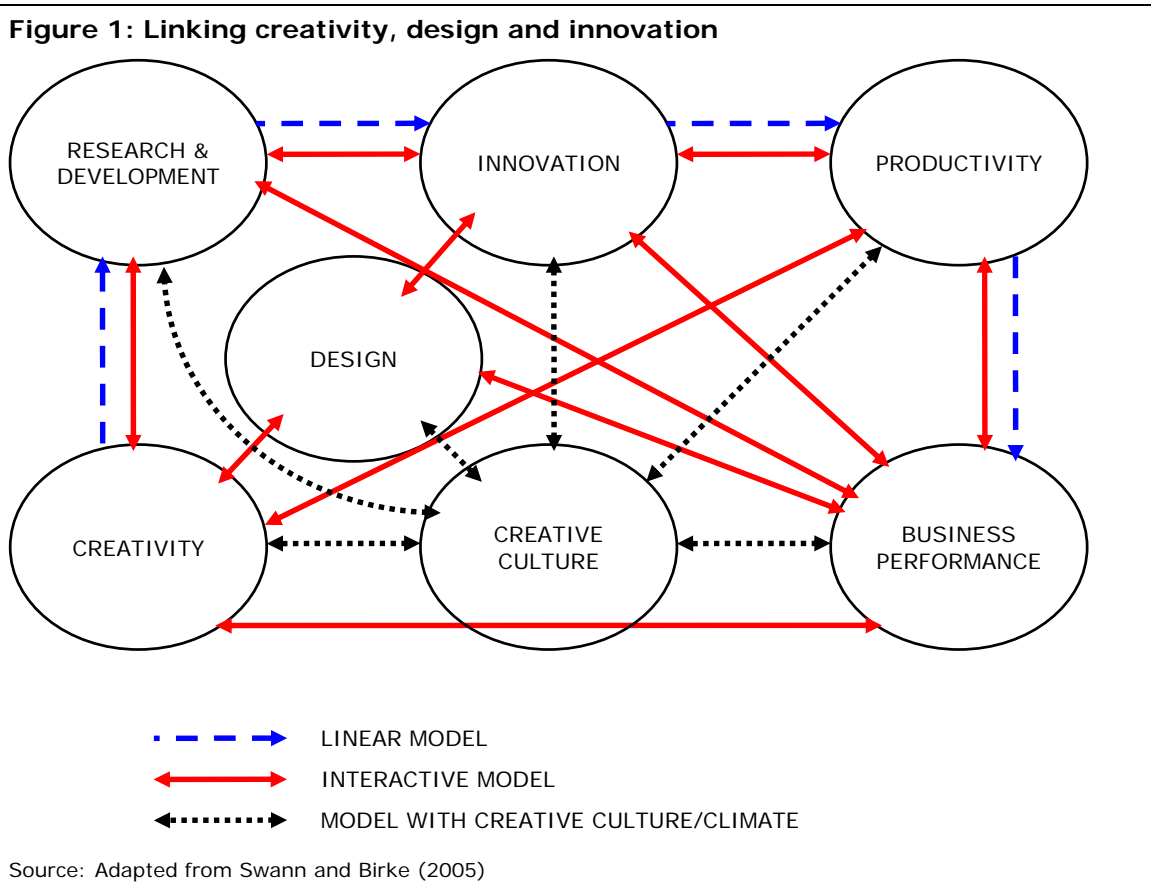
In this report creativity is defined as the generation of new ideas; design is defined as the shaping (or transformation) of ideas into new products and processes; and innovation is defined as the exploitation of ideas, i.e. the successful marketing of these new products and processes. It should be emphasised that creativity, design and innovation and therefore not limited to certain sectors or professions, but apply across the economy.

³ The Creative sector is defined as the mix of non-profit arts and for-profit creative industries, such as technology development, arts and entertainment, design, filmmaking, architecture that exhibit high rates of per employee value added input to the goods and services they produce (Creative Community Index, 2006).

2.2 Creativity, design and innovation

A number of existing studies have examined the link between creativity, design and economic performance. The Danish Design Centre (2003) found a correlation between the use of design and economic performance and macroeconomic growth and that job creation, revenues and exports were higher in firms that used design compared to other firms that did not. Power (2004), in his comparative study of the design sector in five Nordic countries (Sweden, Denmark, Finland, Norway and Iceland), concluded that in spite of the small size of the design industry in these countries, design is crucial to the competitiveness of firms in other industries. The use of design by Nordic firms helped to increase their profitability and level of innovation. Moreover, Power concludes that the design industry has experienced high levels of growth and tends to be concentrated in large cities.

Creativity and design can thus be linked to innovation as the first contributes to the expansion of available ideas and the second to increased chance of successfully commercialising these ideas). Swann and Birke (2005) identified three different models linking creativity and design to innovation. In the linear model creativity has a positive effect on R&D which in turn has a positive effect on innovation (cf. the one-headed blue dashed arrows in Figure 1). The interactive model not only includes feedback effects between the different elements of the linear model (cf. the two-headed red arrows in Figure 1) but also acknowledges the importance of design. Creativity relates directly with design and design relates directly with innovation. In the third and most complete model the creative climate takes a central position (cf. the two-headed dotted arrows in Figure 1).



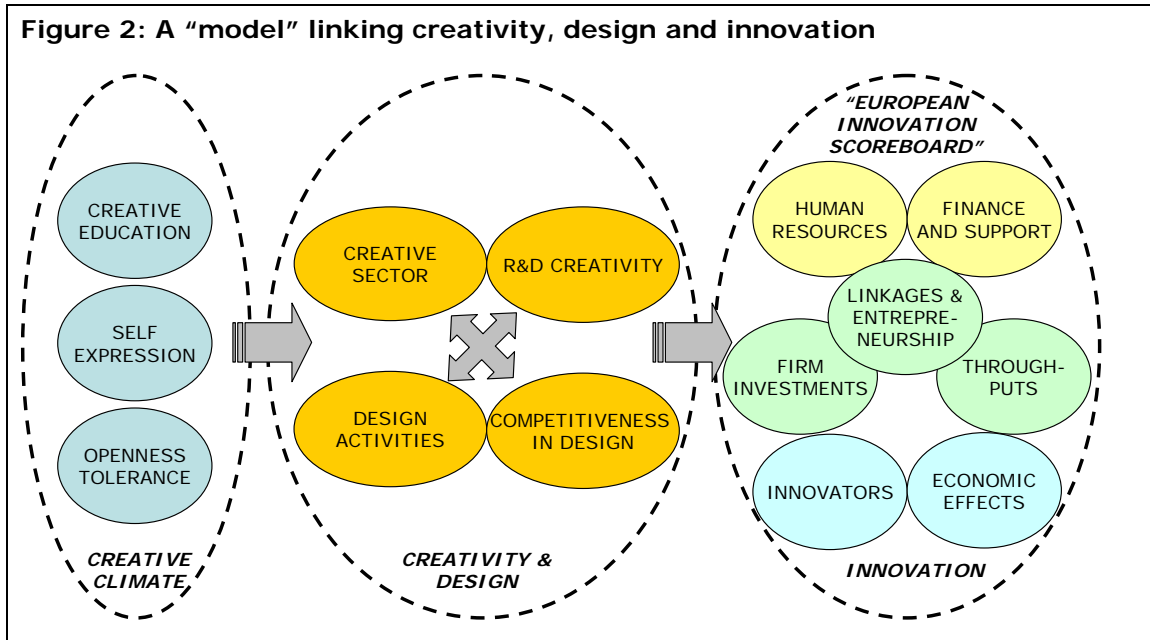
Swann and Birke treat design separately from R&D. Tether (2006) suggests that “much innovation related design is hidden in ‘Development’ “. Lambert (2006) using British data indicated that design inputs into the innovation process have most impact when used together with more technology-based inputs, suggesting that although design and technology are different forms of activity, they complement each other.

The flow-chart model in this report, which will be discussed in the following section, is an adapted version of the third model placing more emphasis on the creative climate and allowing an interaction effect between R&D and design.

3. Measuring creativity and design: a scoreboard approach

Previous studies creating an index to measure creativity or design are rare. A creativity index for Hong Kong using a wide range of indicators has been developed by Hui et al. (2005; cf. Annex 4 for the full list of indicators). The Hong Kong Creativity Index uses six societal conditions (legal system, freedom of expression, international commitment to cultural development, ICT infrastructure, entrepreneurship and financial structure) to provide the context in which creativity takes place. Moreover, this context not only provides conditions for the development of creativity but also for its protection. Many of the indicators used were also used in other studies and come from the Global Competitiveness Report published by the World Forum.

Following the European Innovation Scoreboard (EIS), we have adopted a ‘scoreboard approach’ using a large set of indicators to capture the different dimensions. Starting from a larger set of indicators, the results from a literature review and statistical data reduction analyses have resulted in a final set of 35 indicators which are classified in 7 different dimensions. Of these 7 dimensions, 3 capture performance in the Creative climate and 4 capture performance in Creativity & design.



For benchmarking countries’ performance on design and creativity, we follow a similar approach as in the 2003 NIS and 2004 EXIS reports (cf. Arundel, 2004 respectively Arundel and Hollanders, 2005), by summarizing performance on relevant dimensions using a small sample of indicators in so-called composite indicators, i.e. a ‘scoreboard approach’. In the scoreboard approach, the performance of an observed phenomenon is

measured using a set of indicators which grasp some of the key features of that phenomenon. Potential indicators to be included in the analysis are identified based on a literature review and the indicators are then selected based on the results of both statistical analyses (correlation analyses and factor analyses) and what 'common sense' suggests would be the most directly relevant indicators.

The quality of the educational system, the desire of people to express themselves (artistically) and the openness of the society towards different countries and cultures determine the Creative climate. In a more favourable Creative climate the creation of new ideas is stimulated as people are better educated, have a stronger inclination to self expression and the creation of new ideas, and are being exposed more to new ideas and thoughts from both foreigners and other cultures within the same country. Creativity generates new ideas, so a more favourable Creative climate should increase creativity as it raises the number of ideas. More creativity will result in a stronger creative sector and higher levels of creativity in R&D and design activities. We also introduce a dimension capturing the international competitiveness in design, to highlight the importance of design both within the wider innovation process and as an economic sector. The flow chart is completed with the European Innovation Scoreboard (EIS) dimensions capturing enablers of innovation (Human resources and Finance and support), innovation at the firm level (Firm investments, Linkages & entrepreneurship and Throughputs) and the Effects innovation (Innovators and Economic effects).

The selected indicators and dimensions adopted for measuring creativity and design are shown in Table 1. The rationale for selecting these indicators will be explained in the remainder of this section.

Table 1: Creativity and Design Scoreboard indicators and dimensions

	Indicators	Time period	Data source
A CREATIVE CLIMATE			
A1	CREATIVE EDUCATION		
A1.1	Number of art schools per million population		ELIA (European League of Institutes of the Arts) / Eurostat (population)
A1.2	Quality of educational system (1= does not meet the needs of a competitive economy, 7= meets the needs of a competitive economy)	2006/2007	Global Competitiveness Report 2007/2008
A1.3	Public expenditure on education per capita	Average 2001-2005	Eurostat
A1.4	Share of tertiary students by field of education related to culture	2004/2005	Eurostat
A1.5	Extent of staff training (The general approach of companies in your country to human resources is: 1= to invest little in training and employee development, 7= to invest heavily to attract, train and retain employees)	2006/2007	Global Competitiveness Report 2007/2008
A2	SELF EXPRESSION		
A2.1	Language skills (share of population being able to have a conversation in at least one other language besides their mother tongue)	2005	Special Eurobarometer 243
A2.2	Share of population involved in artistic activities	2007	Eurobarometer 278
A2.3	Self-expression values	Average from 2 nd to 4 th wave of the World Values Survey (1990-2000)	Inglehart and Welzel (2004)
A3	OPENNESS & TOLERANCE		
A3.1	Share of foreign tertiary students	Average for 2002-2006	Eurostat
A3.2	Share of foreigners in employment of population aged 25 to 64	Average for 2003-2007	Eurostat
A3.3	Share of cultural employment in total employment for employees with a completed tertiary education	2005	Eurostat
A3.4	Degree of urbanisation of population aged 25 to 64 (share of population living in densely-populated areas, i.e. at least 500 inhabitants/km ²)	Average for 2003-2007	Eurostat

	Indicators	Time period	Data source
A3.5	Openness to other countries, share of population very interested in arts and culture in own other European countries	2007	Eurobarometer 278
A3.6	Brain drain (reversed) (Your country's talented people: 1= normally leave to pursue opportunities in other countries, 7= almost always remain in the country)	2006/2007	Global Competitiveness Report 2007/2008
B CREATIVITY & DESIGN			
B1	CREATIVE SECTOR		
B1.1	Share of creative occupations (ISCO classes 1 and 2) of population aged 25 to 64	Average for 2003-2007	Eurostat
B1.2	Share of knowledge workers in S&T (HRSTC – Core of Human Resources in Science and Technology)	Average for 2002-2006	Eurostat
B1.3	Value added share of creative industries		KEA (2006)
B2	CREATIVITY IN R&D		
B2.1	National patent applications per million population	Average 2004-2006	WIPO (patents) / Eurostat (population)
B2.2	Scientific publications per million population	Average 2004-2006	Thomson Reuters Web of Science & CWTS (Leiden University) / Eurostat (population)
B2.3	Trademark applications by residents per million population	Average 2004-2006	WIPO (trademarks) / Eurostat (population)
B2.4	Capacity for innovation (Companies obtain technology: 1= exclusively from licensing or imitating foreign companies, 7= by conducting formal research and pioneering their own new products and processes)	2006/2007	Global Competitiveness Report 2007/2008
B3	DESIGN ACTIVITIES		
B3.1	Importance of design staff for innovation (In the last two years, has your company's design staff been a major source of ideas for the innovative activities of your company?)	2007	Innobarometer 2007
B3.2	Number of designers per million population	2006	Bureau of European Design Association / Eurostat (population)
B3.3	Community design applications per million population	Average 2004-2006	OHIM / Eurostat
B3.4	Production process sophistication (Production processes use: 1= labour-intensive methods or previous generations of process technology, 7= the world's best and most efficient process technology)	2006/2007	Global Competitiveness Report 2007/2008
B3.5	Uniqueness of product design (Product designs are: 1= copied or licensed from abroad, 7= developed locally)	2000/2001	Global Competitiveness Report 2001-2002
B4	COMPETITIVENESS IN DESIGN		
B4.1	Exports design related services as a percentage of services exports	Average 2003-2005	UNCTAD (Global databank on world trade in creative products)
B4.2	Exports design as a percentage of merchandise exports	Average 2003-2005	UNCTAD (Global databank on world trade in creative products)
B4.3	Value chain breadth (Exporting companies in your country: 1= are primarily involved in resource extraction or production, 7= not only produce but also perform product design, marketing sales, logistics and after sales services)	2006/2007	Global Competitiveness Report 2007/2008
B4.4	Extent of branding (Companies that sell internationally: 1= sell into commodity markets or to other companies that handle marketing, 7= have well-developed international brands and sales organizations)	2003/2004	Global Competitiveness Report 2004-2005

A1 CREATIVE EDUCATION

The education system is generally seen as having a major impact on the creativeness of individuals and on the creative climate. This concerns all levels and fields of education, although there is an explicit emphasis on creativity in artistic and cultural fields. The following indicators are used to capture performance in Creative education:

- **A1.1 Number of art schools per million population**

There is growing evidence that the arts produce tangible social and economic benefits (Creative Community Index, 2006). Education in arts in particular is assumed to have a positive impact on the creativity of people. Here we use the number of art schools per million population as an indicator of the presence of such schools where a higher number of art schools is assumed to provide better education and easier access. The data on the number of art schools were taken from the website of the European League of Institutes of the Arts (ELIA) and do not necessarily cover all art schools in each country.

- **A1.2 Quality of educational system**

The quality of the educational system is believed to be positively linked to creativity, by meeting the needs of a competitive economy. Moreover, educated consumers are more likely to be comfortable with new ideas, demand sophisticated and novel products and services, and consider different options.

The data on quality of educational system were taken from "The Global Competitiveness Report 2007-2008" published by the World Economic Forum. The indicator reflect answers to the question "The educational system in your country (1= does not meet the needs of a competitive economy, 7= meets the needs of a competitive economy)".

- **A1.3 Public expenditure on education per capita**

Education is assumed to develop people's skills and abilities, for all types and levels of education. We use public expenditure on education per capita as an additional indicator for the quality of the educational system, assuming that higher spending results in better education.

Data were taken from Eurostat's pocketbook on Cultural statistics (Eurostat, 2007).

- **A1.4 Share of tertiary students by field of education related to culture**

The fields of education related to culture include Humanities, Arts, Journalism and information, Architecture and building. Educators have observed that students develop creative thinking through arts and transfer this capacity to other subjects. Whenever arts are a strong element in the school environment, students tend to achieve higher grades. Moreover drop-out rates and absenteeism are lower (Galligan, 2001). Education in arts also helps building specific skills such as goal setting, flexible thinking, tolerance, cooperation, team work, creative problem solving, self-confidence and motivation, all of them valuable in the business field (Business Week, 1996).

Data were taken from Eurostat's pocketbook on Cultural statistics (Eurostat, 2007).

- **A1.5 Extent of staff training**

The extent to which companies invest in their personnel is an indicator of the intensity of on the job training and reflects the relevance of life long education.

Data on extent of staff training were taken from "The Global Competitiveness Report 2007-2008" published by the World Economic Forum. The indicator reflect answers to the question "The general approach of companies in your country to human resources is (1= to invest little in training and employee development, 7= to invest heavily to attract, train and retain employees)".

A2 SELF EXPRESSION

Self expression is seen as an individual person's drive to act creatively. More individual creativity will have a positive effect on the generation of ideas relevant for the process of innovation. Self expression is measured by proxy indicators on language skills, artistic activities and self-expression values.

- **A2.1 Language skills**

The indicator is defined as the share of population being able to have a conversation in at least one other language besides their mother tongue. It is assumed that being able to speak more than one's own language will benefit the exchange of ideas. The willingness of people to invest time and effort in learning more languages reflects their willingness for self expression. Arundel (2004) in the TrendChart report on National Innovation Systems, used this indicator to measure the receptiveness to use new ideas.

Data were obtained for the Special Eurobarometer 243 on "Europeans and their Languages".

- **A2.2 Share of population involved in artistic activities**

Cultural capital⁴ activities can be found in different forms of art and performance, attitude to innovation in everyday life, work context and in social activities. According to the Creativity Community Index Survey (2005), respondents who worked in jobs requiring creative skills attended more cultural outings when compared to those in less creative jobs. Moreover, creativity was associated with "the capacity to generate original ideas". In these sense, participation in cultural activities is linked to the generation of new ideas.

We use the share of population involved in artistic activities as a proxy to measure cultural capital and involvement in creative activities. The data were taken from the Eurobarometer 278 on "European Cultural Values".

- **A2.3 Self-expression values**

The indicator on self-expression values was developed by Inglehart and Welzel (2004). The indicator uses data from the 2nd to 4th round of the World Values Survey (1990-2000) and reflects the percentages of people who (1) emphasize freedom and participation, (2) tolerate sexual liberty, (3) sign petitions, (4) trust other people and report high life satisfaction.

A3 OPENNESS & TOLERANCE

Tolerance relates to the level of acceptance in a society in terms of racism, discrimination and intolerance. Mobility of human capital is related to social conditions that are conducive to cultural exchange, exchange of skills and knowledge as well as international exposure. Creative environments attract talented and ambitious people, who bring new ideas and different world views (Stolarick et al., 2005). Cultural diversity provides sources of creative expression that are captured by the creative industries (Bell and Stolarick, 2008; Florida, 2002).

The following indicators are used to capture performance in Openness & Tolerance:

- **A3.1 Share of foreign tertiary students**

Following the 2003 TrendChart report on National Innovation Systems (Arundel, 2004), "these students increase local diversity, respond to tolerance, and introduce

⁴ The Creative Community Index (2006) used the term cultural capital to refer to more specific activities and qualities related to culture, art and creativity in everyday life. Cultural capital is related to the degree in which people in community value creative activities that are not directly related to economic returns.

new ideas". It is to be noted that this indicator is biased towards the presence of universities or other higher education institutes. There are also cultural and language biases having an effect on the relative attractiveness of a country (or region within that country) for attracting foreign students.

Data were taken from Eurostat's educational statistics.

- **A3.2 Share of foreigners in employment of population aged 25 to 64**

A large share of foreign employees is used as a proxy for the tolerance of the domestic population towards non-nationals. It would be better to have indicator focusing on skilled employees, but such data are not available in the public domain.

Data were taken from Eurostat's Labour Force Survey.

- **A3.3 Share of cultural employment in total employment for employees with a completed tertiary education**

Cultural employment is defined as both employment in cultural occupations in the whole economy and any employment in cultural economic activities. We focus on the share of cultural employment for the higher educated only as these are expected to be involved in the most creative jobs.

Data have been obtained from Eurostat (EU Labour Force Survey, 2005).

- **A3.4 Degree of urbanisation of population aged 25 to 64**

Urban environments are thought to be conducive to creativity through their greater levels of diversity, attractiveness to talent, and proximity of individuals (Sacco and Segre, 2006). The authors highlighted that urban concentrations display a high number of high education and research institutes, facilitating start-ups activities and more complex relationships between producers and consumers in what they called "flexible networks". Firms look for a talented workforce, with talented workers preferring to reside in places where there is a vibrant cultural life (Eger, 2003). Art and culture are fundamental for attracting a talented workforce. Larger cities offer a more developed and diverse recreational, cultural and educational infrastructure, facilitating the exchange of ideas between individuals (and professionals). Larger cities have been found to be more innovative than smaller cities (Carlino, 2001; Therrien, 2003).

We use the share of population living in densely-populated areas, i.e. at least 500 inhabitants/km², as a proxy for the degree of urbanisation.

- **A3.5 Openness to other countries**

Openness to other countries is measured as the share of the population that is very interested in arts and culture in other European countries. Being interested in other cultures increases the exchange of ideas and improves the creative climate.

Data were obtained from the Eurobarometer 278 on "European Cultural Values".

- **A3.6 Brain drain (reversed)**

The development and demand for innovative products can be impacted by the ability of talented graduates to work, stay and consume in their countries after they complete their education. While in the past it was considered that offering companies tax and other incentives was a necessary condition for influencing business location decisions, today the requirements are much different. According to Florida (2002), "traditional economic development and growth strategies had been driven by "demand-side" strategy: attract jobs to get the people. Today's economy requires a "supply-side" strategy: places must offer a balance between technology, talent and tolerance to sustain long term growth and prosperity." This can partly be measured by a reverse indicator for 'brain drain', which is an indicator of the level of domestic opportunities for talented graduates. The inflow of talented people from abroad is assumed to have a positive effect on a country's creativity and the relative size of

this inflow indirectly reflects that country's openness or attractiveness to foreign skilled workers.

Data on brain drain (reversed) were taken from "The Global Competitiveness Report 2007-2008" published by the World Economic Forum. The indicator reflect answers to the question "Your country's talented people (1= normally leave to pursue opportunities in other countries, 7= almost always remain in the country)".

B1 CREATIVE SECTOR

The Creative Community Index (2006) defines the creative sector as the mix of non-profit arts and for-profit creative industries, such as technology development, arts and entertainment, design, filmmaking and architecture that exhibit high rates of per employee value-added input to the goods and services they produce. The Creative sector is also characterized by high-paying jobs. Moreover, the development, production, marketing and sales of technology products involves more and more people trained in artistic skills.

The following indicators are used to capture performance:

- **B1.1 Share of creative occupations (ISCO classes 1 and 2) of population aged 25 to 64**

This indicator reflects the indicator used by Florida (2002) for the share of population in creative occupations. In the NIS 2003 report (Arundel, 2004) a similar indicator was used to capture the receptiveness to new ideas but then also ISCO class 3 (technical and associate professionals) was included. ISCO class 1 includes legislators, senior officials and managers and ISCO class 2 includes professionals. The NIS 2003 report referred to this indicator as coming "closest to measuring social creativity at the national level".

Data were taken from Eurostat's Labour Force survey.

- **B1.2 Share of knowledge workers in Science and Technology (HRSTC – Core of Human Resources in Science and Technology)**

Knowledge workers are central to any knowledge economy. Being university trained and being employed in an S&T occupation, knowledge workers not only add directly to enhancing the pool of creative ideas, but they also indirectly spur the diffusion of existing ideas and technologies. Data on knowledge workers were obtained from Eurostat and reflects average between years 2002 to 2006.

Data were taken from Eurostat's Labour Force survey.

- **B1.3 Value added share of creative industries**

A direct measure of the relative importance of the creative industries is their value added share in the economy. Data were obtained from KEA (2006) (Table 3: Contribution of the European cultural & creative sector to the European and national economies). The definition for the cultural and creative sector is given in Annex 5.

B2 CREATIVITY IN R&D

According to Howkins (2005), "the enforcement of IPR regimes, covering copyrights, patents, trademarks and licensing are fundamental not only to attract FDI (foreign direct investments) but also to create incentives for businesses to adopt new methods of production, and new knowledge." Intellectual property (IP) is considered a fundamental factor in the creative economy, regulating how people share ideas, and how ideas are rewarded and accessed.

The following indicators are used to capture performance:

- **B2.1 Patent applications per million population**

Patent applications is one measure of ongoing ability to innovate and to create. Patents reflect the initial discovery and registration of innovative ideas (Creative Community Index, 2006). The capacity of firms to develop new products will determine their competitive advantage. The number of patents is one indicator of the rate of new product innovation. Patent applications are also a measure of the number of ideas resulting from R&D activities. In the European Innovation Scoreboard EPO patent applications are used as an innovation indicator, but application barriers for EPO patents are higher than for national patent applications. Instead of EPO patents we thus use resident patent filings from WIPO.

- **B.2.2 Scientific publications per million population**

This indicator measures the number of scientific research publications as measured in the Thomson Reuters Web of Science database. Publications can be used as a measure of the creativity of university (but also enterprise) researchers. Being published implies that papers have been accepted after a peer review process. The actual number of "academic ideas" that are published is only a (small) share of all submitted papers.

- **B2.3 Trademark applications per million population**

A trademark is a distinctive sign, which identifies certain goods or services as those produced or provided by a specific person or enterprise. Trademarks are an important innovation indicator, especially for the service sector" (Frietsch, 2005). The EIS uses data on Community trademarks, but application barriers for Community trademarks are higher than for national trademark applications. We thus use data on direct resident trademark applications from WIPO.

- **B2.4 Capacity for innovation**

The data on capacity for innovation was taken from "The Global Competitiveness Report 2007-2008" published by the World Economic Forum. The indicator reflects answers to the question how companies obtain technology (1= exclusively from licensing or imitating foreign companies, 7= by conducting formal research and pioneering their own new products and more intense and creative R&D activities).

B3 DESIGN ACTIVITIES

Design is an important factor driving competitiveness and innovation, both at the micro and macro level (Bitard and Basset, 2008).

The following indicators are used to capture performance:

- **B3.1 Importance of design staff for innovation**

The Innobarometer 2007 asks companies if in the two years prior to the survey the company's design staff has been a major source of ideas for the innovative activities of that company⁵. This indicator can be used as a direct proxy for the importance of design activities for innovation.

- **B3.2 Number of designers per million population**

According to Vinodrai (2005), designers develop and use their skills in a variety of employers (firms and economic sectors). Designers are able to transfer knowledge across via labour mobility, benefiting firms in general.

⁵ I.e. question 7 in the Innobarometer 2007: "In the last two years, have any of the following been a major source of ideas for the innovative activities of your company? a) Your company's production engineers or technicians: Yes/No/[No such unit/department]/Do not know; b) Your company's marketing department: Yes/No/[No such unit/department]/Do not know; c) Your company's design staff: Yes/No/[No such unit/department]/Do not know; d) Your company's management: Yes/No/[No such unit/department]/Do not know; e) Your company's research department: Yes/No/[No such unit/department]/Do not know"

The number of designers was obtained from the European Design Report supplement, based on the World Development Indicators database, World Bank in 2006. The total number of designers in Europe in 2006 amounted to 447.000, generating a turnover of more than 36 billion euros (European Design Report, 2006).

- **B3.3 Community design applications per million population**

Design applications reflect the activities relating to “the outward appearance of a product or part of it resulting from the lines, contours, colours, shape, texture, materials and/or its ornamentation”⁶. For Community designs the same argument to higher application barriers holds as for EPO patents and Community trademarks, but as national design applications from WIPO are not available from 2003 onwards, we have chosen to use Community design data.

- **B3.4 Production process sophistication**

NZIER (2003) defines design as a process applied along the value added chain. It contributes to minimizing production input costs, through more efficient production systems and it helps to maximize revenues, by providing a tool to create a product that satisfies customers' requirements. According to Walsh et al (1988), the use of design affects not only qualitative factors, such as product's performance, reliability, appearance, safety, and ease of but also cost factors, through its impact on how easy the product is to manufacture and its life cycle cost to the user.

Production process sophistication is used as a proxy to measure the relative importance of design in the production system in terms of efficiency. Data on production process sophistication were taken from “The Global Competitiveness Report 2007-2008” published by the World Economic Forum. The indicator reflects answers to the question: “In your country, production processes use (1= labour-intensive methods or previous generations of process technology, 7= the world's best and most efficient process technology)”.

- **B3.5 Uniqueness of product design**

The data on uniqueness of product design were taken from “The Global Competitiveness Report 2001-2002” published by the World Economic Forum. The indicator reflect answers to the question “Product designs are: (1= copied or licensed from abroad, 7= developed locally). Unique product designs are assumed to be a proxy for the success of design activities.

B4 COMPETITIVENESS IN DESIGN

Various studies (Roy et al., 1998; Potter et al., 1991; Walsh et al., 1988; Hertenstein et al., 2005) clearly indicate that there is a relationship between investment in design and innovation and business performance. As summarized by Hertenstein et al. (2005), “results provide strong evidence that good design boost firms' operating performance and growth, which is rewarded by stock market premiums”.

The following indicators are used to capture performance:

- **B4.1 Design related services as a % of services export**

Design related services comprise the following three sub-categories:

- Advertising and market research and public opinion polling services (Advertising): (EBOPS 278, level 3) “Advertising and market research services transacted between residents and non-residents cover the design, creation, and marketing of advertisements by advertising agencies; media placement, including the purchase and sale of advertising space; exhibition services provided by

⁶ Definition taken from the website of the Office of Harmonization for the Internal Market (OHIM): <http://oami.europa.eu/ows/rw/pages/RCD/design.en.do>

services fairs; the promotion of products abroad; market research; and public opinion polling abroad on various issues".

- Architectural, engineering and other technical services (Architectural) (EBOPS 280, level 3): Architectural, engineering and other technical services cover resident and non-resident transactions related to architectural design of urban and other development projects; planning and project design and supervision of dams, bridges, airports, turnkey projects, etc; surveying , cartography, product testing and certification, and technical inspection services".

- Research and development services (R&D) (EBOPS 279, level 3): Research and development services cover those services that are transacted between residents and non-residents and associated with basic research, applied research, and experimental development of new product and processes. In principle, such activities in the sciences, social sciences and humanities are covered; included is the development of operating systems that represent technological advances".

The three sub-categories of creative services data and services exports were obtained from UNCTAD's "Global databank on world trade in creative products" and consisted of the average data for 2003 to 2005.

- **B4.2 Exports design as a percentage of merchandise exports**

Data is based on the 1996 version of the Harmonized System (HS 1996) for creative goods. The classification of "creative goods" and in specific design was based on the UNESCO Framework for Cultural Statistics. Design is defined as comprising fashion (code 49); interior (code 50); toys (code 17); jewellery (code 12) and graphic (code 11).

Both design data and merchandise exports were obtained from UNCTAD's "Global databank on world trade in creative products" and consisted of the average data for 2003 to 2005.

- **B4.3 Value chain breadth**

Related to Business sophistication, data on value chain breadth were taken from "The Global Competitiveness Report 2007-2008" published by the World Economic Forum. The indicator reflect answers to the question "Exporting companies in your country (1= are primarily involved in resource extraction or production, 7= not only produce but also perform product design, marketing sales, logistics, and after-sales services)".

- **B4.4 Extent of branding**

The data on extent of branding were taken from "The Global Competitiveness Report 2004-2005" published by the World Economic Forum. The indicator reflect answers to the question "Companies in your country that sell internationally (1= sell into commodity markets or to other companies that handle marketing, 7= have well-developed international brands and sales organizations)".

4. Do creativity and design drive innovation performance?

4.1 Correlation results at indicator level

Innovativeness is measured using the composite indicator scores from the EIS 2008 for each of its innovation dimensions and overall performance as captured by the Summary Innovation Index (SII). The EIS 2008 distinguishes 7 different dimensions⁷:

The first two dimensions – the Enablers - capture the main drivers of innovation that are external to the firm:

- Human resources capture the availability of high-skilled and educated people with performance being the summary of 5 different indicators.
- Finance and support capture the availability of finance for innovation projects and the support of governments for innovation activities with performance being the summary of 5 different indicators.

The next three dimensions – Firm activities - capture innovation efforts that firms undertake recognising the fundamental importance of firms' activities in the innovation process:

- Firm investments cover a range of different investments firms make in order to generate innovations with performance being the summary of 3 different indicators.
- Linkages & entrepreneurship capture entrepreneurial efforts and collaboration efforts among innovating firms and also with the public sector with performance being the summary of 4 different indicators.
- Throughputs capture the Intellectual Property Rights (IPR) generated as a throughput in the innovation process and Technology Balance of Payments flows with performance being the summary of 4 different indicators.

The final two dimensions – Outputs - capture the outputs of firm activities as:

- Innovators capture the number of firms that have introduced innovations onto the market or within their organisations, covering technological and non-technological innovations with performance being the summary of 3 different indicators.
- Economic effects capture the economic success of innovation in employment, exports and sales due to innovation activities with performance being the summary of 6 different indicators.

The correlation results between the creativity and design indicators and the EIS innovation dimensions and SII are given in Table 2. For ease of reference only the significant correlation results are shown. The correlation results reveal that several of the indicators are strongly correlated with innovation:

- Most correlation coefficients for the indicators capturing Creative education are significant. The coefficients are significant and high for the EIS dimension Human resources, a result which can be explained by the fact that this EIS dimension also includes education related indicators. Public expenditure on education and the Extent of staff training correlate best with innovation performance.

⁷ For more details we refer to both the EIS 2008 report and the accompanying EIS 2008 Methodology Report.

Table 2: Pearson correlations (2-tailed) with EIS dimensions

	ENABLERS		FIRM ACTIVITIES			OUTPUTS		Summary Innovation Index
	Human resources	Finance and support	Firm investments	Linkages & entrepreneurship	Throughputs	Innovators	Economic effects	
A CREATIVE CLIMATE								
A1 CREATIVE EDUCATION								
A1.1 Number of art schools	0.582 ***	0.405 **	0.524 ***	0.501 ***				0.473 **
A1.2 Quality of educational system	0.626 ***	0.640 ***	0.659 ***	0.719 ***	0.711 ***		0.380 *	0.788 ***
A1.3 Public expenditure on education	0.579 ***	0.788 ***	0.551 ***	0.711 ***	0.902 ***	0.470 **	0.402 **	0.865 ***
A1.4 Share of tertiary students in cultural education		0.441 **			0.651 ***	0.346 *	0.495 **	0.508 ***
A1.5 Extent of staff training	0.658 ***	0.711 ***	0.676 ***	0.770 ***	0.764 ***	0.387 **	0.487 ***	0.875 ***
A2 SELF EXPRESSION								
A2.1 Language skills								
A2.2 Share of population involved in artistic activities	0.397 **	0.583 ***	0.663 ***	0.549 ***	0.474 **		0.478 **	0.647 ***
A2.3 Self-expression values	0.631 ***	0.781 ***	0.604 ***	0.717 ***	0.866 ***	0.354 *	0.538 ***	0.834 ***
A3 OPENNESS & TOLERANCE								
A3.1 Share of foreign tertiary students		0.452 **	0.423 **	0.590 ***	0.442 **	0.459 **		0.519 ***
A3.2 Share of foreigners in employment					0.483 **	0.418 **		0.331 *
A3.3 Share of cultural employment of tertiary educated					0.593 ***			
A3.4 Degree of urbanisation	-0.346 *							
A3.5 Openness to other countries					0.544 ***			
A3.6 Brain drain (reversed)	0.602 ***	0.799 ***	0.577 ***	0.743 ***	0.817 ***	0.441 **	0.502 ***	0.875 ***
B CREATIVITY & DESIGN								
B1 CREATIVE SECTOR								
B1.1 Share of creative occupations	0.641 ***	0.587 ***		0.460 **	0.501 ***			0.533 ***
B1.2 Share of knowledge workers	0.676 ***	0.737 ***	0.456 **	0.620 ***	0.614 ***			0.703 ***
B1.3 Value added share of creative industries	0.644 ***	0.529 ***	0.523 ***	0.533 ***				0.533 ***
B2 CREATIVITY IN R&D								
B2.1 Patent applications	0.660 ***	0.637 ***	0.667 ***	0.617 ***	0.656 ***		0.457 **	0.770 ***
B2.2 Scientific publications	0.745 ***	0.776 ***	0.650 ***	0.769 ***	0.655 ***	0.336 *	0.408 **	0.842 ***
B2.3 Trademark applications								
B2.4 Capacity for innovation	0.648 ***	0.682 ***	0.698 ***	0.669 ***	0.744 ***	0.398 **	0.518 ***	0.849 ***
B3 DESIGN ACTIVITIES								
B3.1 Importance of design staff for innovation								
B3.2 Number of designers	0.400 *	0.613 ***		0.562 ***	0.638 ***			0.566 ***
B3.3 Community design applications		0.574 ***	0.451 **	0.530 ***	0.848 ***	0.396 **	0.469 **	0.695 ***
B3.4 Production process sophistication	0.590 ***	0.745 ***	0.643 ***	0.740 ***	0.833 ***	0.451 **	0.592 ***	0.899 ***
B3.5 Uniqueness of product design		0.686 ***	0.572 **	0.601 ***	0.759 ***	0.404 *	0.560 **	0.729 ***
B4 COMPETITIVENESS IN DESIGN								
B4.1 Exports design related services		0.415 *	0.461 **	0.476 **	0.401 *		0.397 *	0.545 **
B4.2 Exports product design	-0.425 **	-0.365 *	-0.442 **	-0.449 **	-0.437 **			-0.523 ***
B4.3 Value chain breadth	0.600 ***	0.705 ***	0.566 ***	0.654 ***	0.782 ***	0.374 *	0.539 ***	0.825 ***
B4.4 Extent of branding	0.587 ***	0.671 ***	0.567 ***	0.635 ***	0.754 ***	0.335 *	0.548 ***	0.803 ***

* Correlation is significant at the 10% level. ** Correlation is significant at the 5% level. *** Correlation is significant at the 1% level.

Table 3: Composite indicator scores and rankings

	CREATIVE CLIMATE		CREATIVE EDUCATION		SELF EXPRESSION		OPENNESS & TOLERANCE		CREATIVITY & DESIGN		CREATIVE SECTOR		CREATIVITY IN R&D		DESIGN ACTIVITIES		COMPETITIVENESS IN DESIGN		DCI INDEX	
		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank
EU27	0.488		0.463		0.516		0.485		0.486		0.460		0.479		0.472		0.531		0.485	
BELGIUM	0.686	4	0.729	6	0.690	7	0.641	6	0.749	5	0.842	3	0.588	10	0.752	4	0.812	7	0.714	5
BULGARIA	0.174	26	0.129	27	0.143	25	0.250	23	0.212	26	0.300	17	0.263	19	0.109	27	0.177	27	0.196	26
CZECH REPUBLIC	0.423	17	0.385	16	0.522	16	0.363	20	0.345	17	0.237	23	0.497	13	0.254	19	0.393	21	0.374	18
DENMARK	0.740	2	0.850	1	0.820	4	0.549	13	0.854	1	0.812	4	0.870	2	0.857	1	0.876	2	0.788	1
GERMANY	0.671	6	0.629	8	0.672	8	0.712	2	0.737	8	0.527	10	0.811	3	0.735	6	0.875	3	0.714	4
ESTONIA	0.602	10	0.528	11	0.638	9	0.639	7	0.368	16	0.611	9	0.389	16	0.184	22	0.288	26	0.462	14
IRELAND	0.583	11	0.836	2	0.280	22	0.634	8	0.517	12	0.652	8	0.468	14	0.649	10	0.301	24	0.570	11
GREECE	0.359	21	0.262	21	0.321	21	0.495	16	0.374	15	0.386	15	0.244	20	0.420	14	0.448	14	0.373	19
SPAIN	0.454	15	0.330	19	0.478	17	0.553	12	0.517	13	0.489	12	0.531	11	0.442	13	0.606	12	0.488	13
FRANCE	0.513	14	0.569	10	0.438	19	0.532	15	0.741	6	0.653	7	0.800	5	0.626	11	0.884	1	0.633	9
ITALY	0.420	18	0.357	18	0.362	20	0.541	14	0.561	10	0.256	21	0.525	12	0.620	12	0.844	5	0.504	12
CYPRUS	0.547	12	0.416	14	0.535	14	0.691	3	0.276	23	0.257	20	0.207	23	0.346	15	0.292	25	0.411	16
LATVIA	0.397	19	0.217	22	0.540	12	0.434	18	0.300	20	0.342	16	0.195	25	0.235	20	0.428	16	0.333	20
LITHUANIA	0.328	22	0.285	20	0.467	18	0.232	24	0.317	18	0.466	13	0.182	26	0.176	23	0.442	15	0.300	22
LUXEMBOURG	0.679	5	0.500	12	0.932	2	0.606	9	0.534	11	0.490	11	0.395	15	0.831	2	0.420	18	0.581	10
HUNGARY	0.270	24	0.193	24	0.170	24	0.446	17	0.255	24	0.263	19	0.239	21	0.126	26	0.394	20	0.275	23
MALTA	0.534	13	0.394	15	0.628	10	0.582	10	0.294	21	0.148	25	0.353	18	0.306	17	0.368	22	0.406	17
NETHERLANDS	0.712	3	0.579	9	0.883	3	0.673	5	0.777	3	0.882	2	0.717	7	0.788	3	0.721	9	0.731	3
AUSTRIA	0.655	8	0.741	5	0.538	13	0.686	4	0.632	9	0.252	22	0.810	4	0.675	8	0.791	8	0.661	8
POLAND	0.187	25	0.157	25	0.227	23	0.179	25	0.286	22	0.279	18	0.197	24	0.168	24	0.498	13	0.233	25
PORTUGAL	0.272	23	0.371	17	0.113	27	0.331	21	0.305	19	0.125	26	0.367	17	0.304	18	0.425	17	0.308	21
ROMANIA	0.130	27	0.147	26	0.142	26	0.100	27	0.195	27	0.095	27	0.135	27	0.134	25	0.417	19	0.169	27
SLOVENIA	0.439	16	0.434	13	0.579	11	0.304	22	0.510	14	0.452	14	0.613	9	0.337	16	0.637	11	0.459	15
SLOVAKIA	0.365	20	0.213	23	0.742	6	0.141	26	0.241	25	0.208	24	0.208	22	0.190	21	0.360	23	0.269	24
FINLAND	0.670	7	0.832	3	0.768	5	0.411	19	0.770	4	0.886	1	0.778	6	0.744	5	0.673	10	0.704	7
SWEDEN	0.755	1	0.769	4	0.939	1	0.558	11	0.788	2	0.732	6	0.916	1	0.658	9	0.845	4	0.751	2
UNITED KINGDOM	0.652	9	0.674	7	0.523	15	0.758	1	0.741	7	0.783	5	0.645	8	0.717	7	0.817	6	0.705	6

- Except for language skills the indicators capturing Self expression correlate well with the EIS dimensions. In particular a high degree of Self-expression values relates well with Throughputs and the Summary Innovation Index.
- The indicators capturing Openness & Tolerance correlate less well with the EIS dimensions, with the exception of the Share of foreign students and Brain drain. The indicators correlate best with the EIS dimension Throughputs. These results are in contradiction to the importance assigned to Tolerance by a.o. Florida and Tinagli (2004) which can be partly explained by the use of different indicators to measure Tolerance⁸.
- The Creative sector indicators correlate well with Enablers and Firm activities, but less well with Outputs. This would suggest that creativity is more important for creating favourable input and throughput conditions but less so for the actual successful marketing of the outputs of the innovation process.
- The indicators capturing Creativity in R&D correlate well with the EIS innovation dimensions, a result which can be explained by the fact that two of these indicators are included in the EIS dimension Throughputs (patents and trademarks, albeit at international rather than domestic levels) and that those scientific publications including at least one private and one public partner are included in the EIS dimension Linkages & entrepreneurship.
- Design activities correlates well with the EIS innovation dimensions, except for the indicator on the importance of design staff for innovation. Thus although more designers, more design applications, a more sophisticated production process and a more unique product design seem to have a positive effect of the degree of innovativeness, the relative importance of design staff decreases with countries' increasing innovation performance. This can be explained by the fact that in more innovative countries relatively more firms innovate by performing R&D and, and as R&D and design can be complementary (see Tether 2006) such firms may be less likely to report design staff as a major source of ideas for innovation⁹. Another explanation could be that although design staff are important in the innovation process they are perceived to be the source of ideas for innovations (consistent with the definition used in this report that design "shapes" ideas).
- The indicators measuring Competitiveness in design correlate well with the EIS innovation dimensions, in particular the Value chain breadth and the Extent of branding. However, exports of product design correlate negatively with 5 of the 7 innovation dimensions. This may be because this indicator measures the volume of such exports (fashion, interior, toys, jewellery and graphic) and not necessarily their quality or indeed whether the design activities that lead to the exports took place in that country. Therefore, this measure of exports of product design is only a weak indicator of a country's success in either innovation or economic terms¹⁰.

⁸ Florida and Tinagli (2004) use data from the World Values Survey measuring to what degree a country reflects traditional as opposed to modern or secular values.

⁹ Cf. footnote 5 showing the question from the Innobarometer 2007 on the major sources of ideas for a firm's innovative activities.

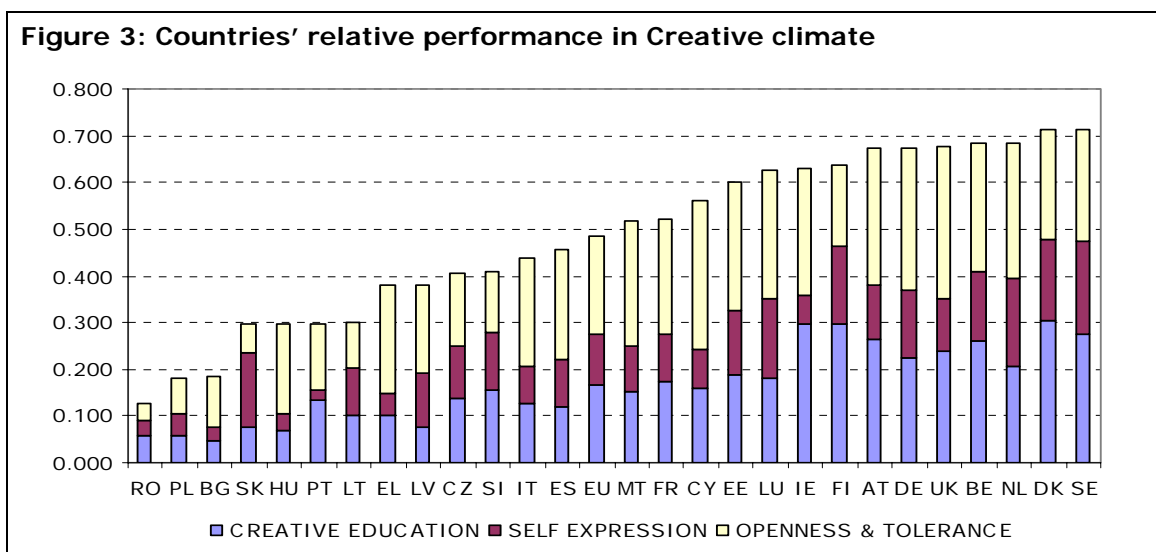
¹⁰ Another explanation is that, according to the Creative Economy Report (UN, 2008), it is problematic to measure trade in the creative economy, considering that available information sources have been developed to capture physical and financial flows, which are not always clear in the case of the creative economy. According to the report "much of the value in the creative economy has been a result of trade in physical products that are of relatively low value as materials but that contains real value in intellectual property". While conventional trade measures focus on the flow of material goods, by either registering their price or weight, in the case of the creative economy, it is impossible to separate the intellectual property value or even to recognize it. Moreover, digitization is facilitating the transfer and trade in intellectual property online, which is not monitored. For these reasons, trade in the creative economy is relatively invisible. Moreover, with rapid technological change, the relationships between goods and value are constantly changing. Traditional measures used in the evaluation of economic activity, such as output or turnover, may not be appropriate for

4.2 Relative performance in Creative climate and Creativity & design

The indicators discussed in Section 3 are used to measure average performance by using composite scores. The methodology for calculating these composite indicators is explained in Annex 1 and the results for each country are shown in Table 3.

Sweden is the best performing country in Creative climate, closely followed by Denmark (Figure 3). Bulgaria, Poland and Romania show the least good performance. Figure 3 also shows that the relative importance of the different Creative climate dimensions differs among the EU Member States. Performance in Creative education is a relative strength¹¹ in Finland and Ireland and a relative weakness in Latvia. Self expression is a relative strength in Latvia, Lithuania and Slovakia and a relative weakness in Cyprus, Greece, Hungary, Ireland and Portugal. Openness & Tolerance is a relative strength in Bulgaria Greece and Hungary and a relative weakness in Finland and Slovakia.

Figure 3: Countries' relative performance in Creative climate



Denmark is the best performing country in Creativity & design, followed by Sweden (Figure 4). Bulgaria and Romania show the least good performance. Figure 4 also shows that the relative importance of the different Creativity & design dimensions differs among the EU Member States. Performance in the Creative sector is a relative strength in Bulgaria, Estonia and Lithuania and a relative weakness in Austria, Italy, Malta, Portugal and Romania. Creativity in R&D is a relative strength in Austria, Bulgaria, Czech Republic and Malta and a relative weakness in Lithuania. Design activities are a relative strength in Luxembourg and a relative weakness in Bulgaria, Estonia, Hungary, Lithuania, Poland and Romania. Competitiveness in design is a relative strength in Hungary, Latvia, Lithuania, Poland, Romania and Slovakia and a relative weakness in Ireland and Luxembourg.

the creative economy, since a significant proportion of this economy does not register in trade or economic statistics as the activity may take place in the informal economy. Based on the difficulties to properly measure trade in the creative economy, the indicator exports on product design may not reflect a country's success in either innovation or in economic terms, contributing to the explanation on why it correlates negatively with 5 out of 7 of the EIS innovation dimensions.

¹¹ Relative strengths (weaknesses) are defined as those dimensions with an overall share in explaining the Creative climate composite indicator being 33% above or 33% below the share of the EU27.

Figure 4: Countries' relative performance in Creativity & design

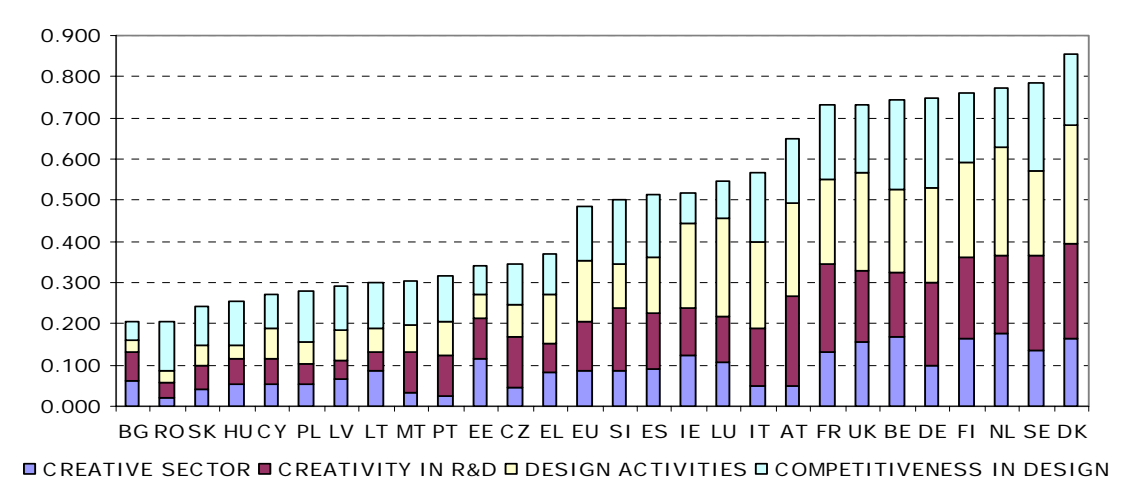


Figure 5: Countries' overall performance: the DCI Index

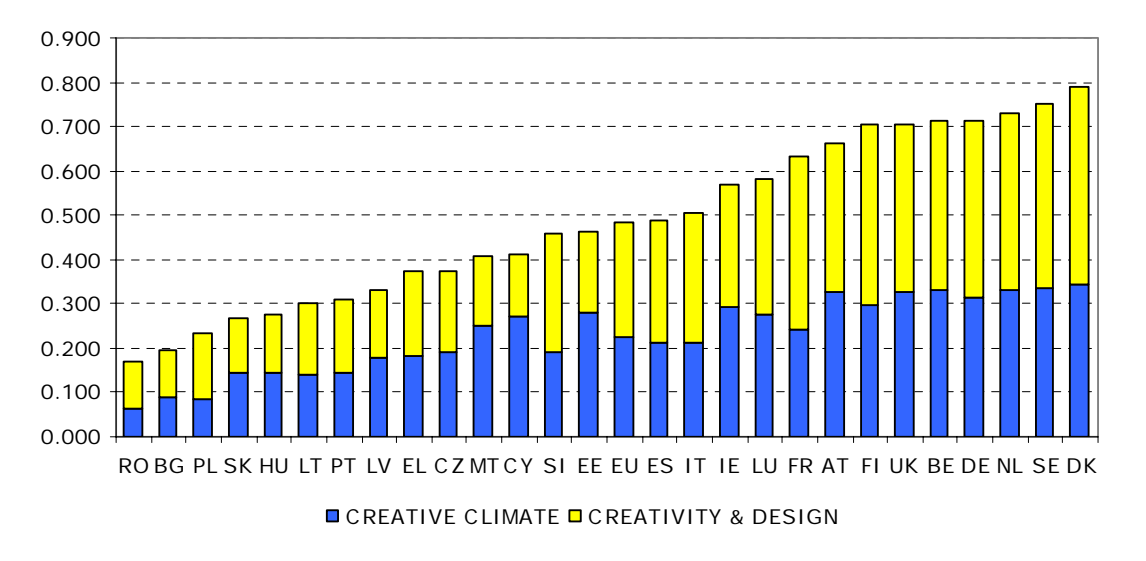


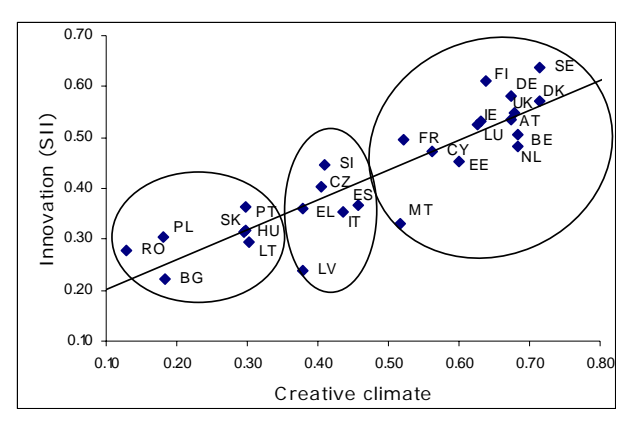
Figure 5 shows the overall performance in the 7 dimensions capturing the Creative climate and Creativity & design. Denmark, Sweden, Netherlands, Germany, Belgium, UK and Finland are in the group of best performers. Austria, France, Luxembourg and Ireland are in the group of second-best performers. Italy, Spain, Estonia, Slovenia, Cyprus, Malta, Czech Republic and Greece show a moderate performance and Latvia, Portugal, Lithuania, Hungary, Slovakia, Poland, Bulgaria and Romania show weakest performance.

4.3 Creativity, design and innovation performance

Our “flow-chart model” predicts that the dimensions capturing the Creative climate should have a positive impact on Creativity and design. Simple correlation results between the different creativity and design dimensions and the EIS innovation

dimensions support this prediction with almost all correlation results being significant¹². The results show a strong correlation between Creativity and design and Innovation performance as measured by the EIS innovation dimensions.

Figure 6: Creative climate and Innovation



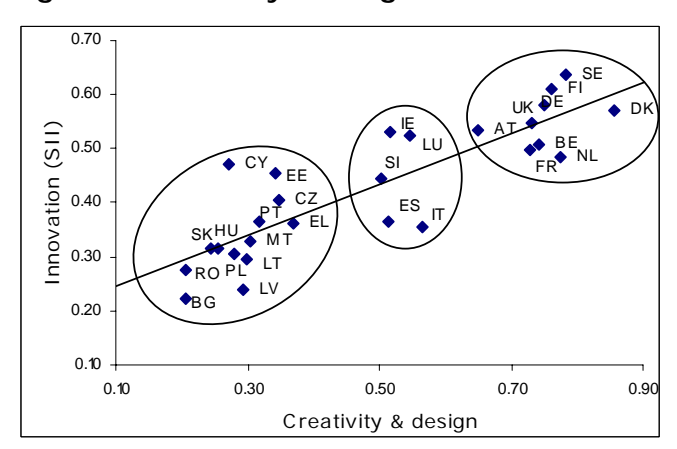
However, these strong correlation results might be the result of what is known as spurious correlation, where two indicators appear to be strongly correlated not because they actually are, but because each of them is correlated with an unobserved third indicator. We therefore repeat the correlation analysis but this time we control for differences in per capita GDP, as many of the composite indicators correlate positively with per capita GDP.

The correlation results controlling for differences in per capita GDP, as

shown in Table 4, confirm that the Creative climate dimensions Creative training and Self expression have a favourable effect on Creativity and design activities. But Openness & Tolerance no longer seems to have a positive effect on these dimensions, nor on innovation performance as measured by the EIS dimensions. The results in Table 5 also confirm the strong correlation between Creativity and design and Innovation performance as measured by the EIS innovation dimensions for Enablers and Firm activities. For Outputs we only find a significant correlation between Creativity in R&D and Economic effects.

Figures 6 and 7 visualize the relation between performance in Creative climate and Creativity & design and Innovation performance. Countries showing a stronger performance in Creative climate also show a better innovation performance. However, as Figure 6 clearly shows, one could distinguish 3 different groups of countries, and within each group the link between Creative climate and Innovation is less clear. Countries showing a stronger performance in Creativity & design also show a better innovation performance. However, as shown in Figure 7, one could distinguish 3 different groups of countries, and within two of these groups the link between Creativity & design and Innovation is less clear. In particular within the dimensions Creative sector and Creativity in R&D the relation with innovation is strong as shown in Figure 8.

Figure 7: Creativity & design and Innovation



¹² These correlations are not shown in this report but are available upon request.

Table 4: Partial correlations (controlling for per capita GDP) between Creativity and design dimensions and EIS dimensions

	CREATIVE SECTOR	CREATIVITY IN R&D	DESIGN ACTIVITIES	COMPETITIVENESS IN DESIGN	CREATIVE CLIMATE	CREATIVITY & DESIGN	ENABLERS		FIRM ACTIVITIES			OUTPUTS		Summary Innovation Index
							Human resources	Finance and support	Firm investments	Linkages & entrepreneurship	Throughputs	Innovators	Economic effects	
CREATIVE EDUCATION	0.666 ***	0.767 ***	0.736 ***	0.500 ***	0.849 ***	0.762 ***	0.658 ***	0.684 ***	0.673 ***	0.775 ***	0.739 ***			0.887 ***
SELF EXPRESSION	0.433 **	0.374 *			0.571 ***	0.388 *		0.418 **	0.528 ***					0.397 **
OPENNESS & TOLERANCE		0.351 *	0.424 **		0.773 ***	0.370 *		0.547 ***		0.482 **	0.381 *			0.425 **
CREATIVE SECTOR		0.564 ***	0.642 ***	0.457 **	0.629 ***	0.746 ***	0.773 ***	0.673 ***	0.423 **	0.556 ***	0.334 *			0.614 ***
CREATIVITY IN R&D			0.789 ***	0.802 ***	0.685 ***	0.917 ***	0.505 ***	0.668 ***	0.615 ***	0.556 ***	0.675 ***		0.390 **	0.783 ***
DESIGN ACTIVITIES				0.821 ***	0.679 ***	0.928 ***	0.466 **	0.560 ***	0.425 **	0.584 ***	0.656 ***			0.647 ***
COMPETITIVENESS IN DESIGN					0.471 **	0.891 ***	0.395 **	0.463 **	0.389 **	0.452 **	0.426 **			0.545 ***
CREATIVE CLIMATE						0.699 ***	0.451 **	0.754 ***	0.641 ***	0.741 ***	0.636 ***			0.792 ***
CREATIVITY & DESIGN							0.601 ***	0.671 ***	0.537 ***	0.610 ***	0.609 ***			0.745 ***
DCI INDEX					0.890 ***	0.948 ***	0.583 ***	0.764 ***	0.627 ***	0.717 ***	0.672 ***			0.828 ***

*** Correlation is significant at the 1% level. ** Correlation is significant at the 5% level. * Correlation is significant at the 10% level.

Figure 8: Creativity & design dimensions and Innovation

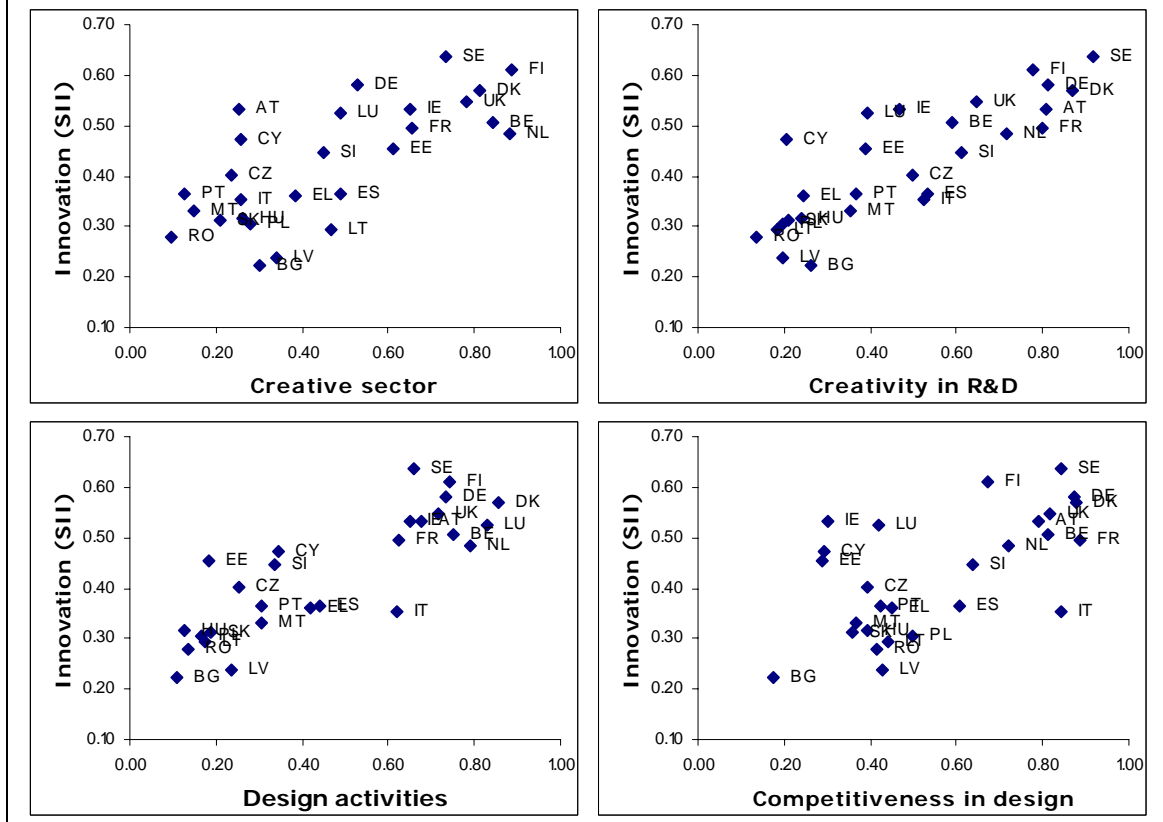
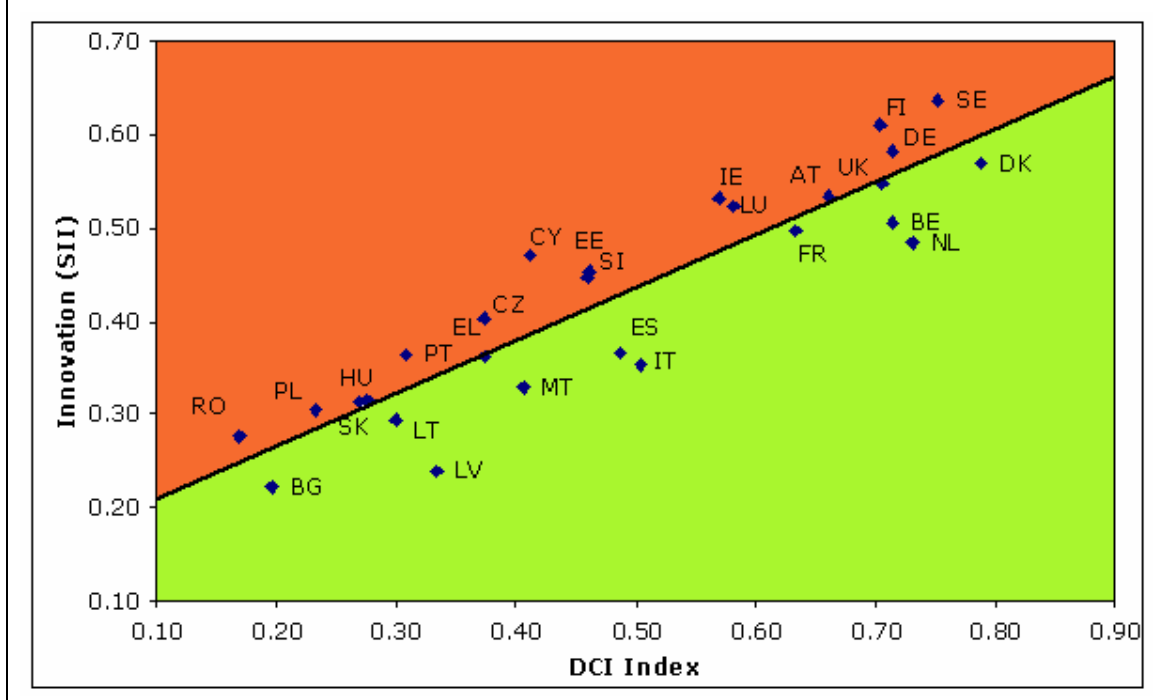


Figure 9: DCI Index and Innovation performance



Overall performance in creativity and design as measured by the DCI index is positively correlated to overall innovation performance as measured by the SII (Figure 9). Figure 9 also provides some evidence about differences in relative strength in creativity and design among the Member States. The countries located in the green coloured area show a relative strength in creativity and design as opposed to the countries located in the orange coloured area. In particular Belgium, Bulgaria, Italy, Latvia, Malta, Netherlands and Spain perform relatively well in creativity and design given their innovation performance. Countries performing relatively less well include Cyprus, Finland, Ireland and Sweden.

5. Conclusions & recommendations

Creativity and design are important features of a well-developed knowledge economy both having a positive impact on countries' innovation performance. However, given the current lack of quantitative indicators it is not possible to directly measure the degree of creativity and design. We therefore have had to rely on a range of so-called proxy indicators indirectly measuring countries' performance in creativity and design. For benchmarking countries a scoreboard approach has been used similar to that used in the European Innovation Scoreboard (EIS).

A flow chart model has been developed linking the Creative climate (measured by 3 distinct dimensions or groups of indicators) to Creativity and design (measured by 4 distinct dimensions) to Innovation (measured by the composite indicator scores from the EIS 2008).

The statistical results show that there are strong relations between creativity, design and innovation. The best performing countries in creativity and design are the same countries – the innovation leaders and innovation followers – that show superior innovation performance in the EIS. Countries with a good creative climate tend to have higher levels of R&D and design activities and also strong overall innovation performance. These findings point to the need to consider design and other non-R&D activities as part of the broader approach to innovation policy as well as to the strong links between creativity and innovation. Creative education is the dimension which shows the strongest relation to innovation. This seems to suggest that policies aimed at improving levels of educational attainment and policies aimed at improving creative thinking in education will, after a number of years, have a positive effect on a society's innovative performance.

But the Scoreboard approach used in this report is seriously hampered by a lack of adequate indicators. For truly understanding the linkages between creativity, design and innovation new data are needed to construct more precise and direct indicators. Measuring creativity will be difficult, as creativity is a multidimensional phenomenon that can comprise technological (invention), economic (entrepreneurship) and artistic/cultural creativity. Each of these would require a different set of indicators for which the data could be collected by special surveys focusing on some key attributes of creativity.

Similar problems may be expected for measuring design, as different definitions for design are being used. The role of design should be better captured in the Community Innovation Survey (CIS), as the current CIS does not include a question on the role of design in product or process innovation. The CIS does include a question on if firms have made significant changes to product design as part of their marketing innovation, but this question does not fully capture the importance of design.

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Annex 1: Methodology for calculating the DCI composite indicators

For each of the 7 dimensions average performance will be summarized by calculating a composite indicator as explained in the following steps:

Step 1: Identifying outliers

Positive (negative) outliers are identified as those values which are higher (smaller) than the mean value plus (minus) 2 times the standard deviation¹³. These outliers are not included in determining the Maximum and Minimum scores in the normalisation process (cf. Step 3).

Step 2: Transforming data

Most of the indicators are fractional indicators with values between 0% and 100%. Some indicators are unbound indicators, where values are not limited to an upper threshold (e.g. the Intellectual property indicators, Publications and Art schools). These indicators can be highly volatile over time and have skewed data distributions (where most countries show low performance levels and a few countries show exceptionally high performance levels). For most indicators we use 3 to 6 year average values and all indicators where initial skewness (after having adjusted for outliers) is below -0.50 or above 0.50 are transformed using a power root transformation such that skewness after the transformation is between -0.50 and 0.50.

Step 3: Determining Maximum and Minimum values

The Maximum (Minimum) score is the highest (lowest) value found within the group of EU27 countries excluding the outliers identified in Step 1.

Step 4: Calculating re-scaled values

Re-scaled values are calculated by first subtracting the Minimum value and then dividing by the difference between the Maximum and Minimum value. The maximum re-scaled value is thus equal to 1 and the minimum re-scaled value is equal to 0. For positive and negative outliers, these re-scaled values are limited to the upper value of 1 respectively lower value of 0.

Step 5: Calculating composite indicators

For each dimension a composite indicator is calculated as the unweighted average of the re-scaled scores for all indicators within the respective dimension.

Step 6: Calculating EU average

For the EU average we use the unweighted average of all EU27 Member States.

¹³ This approach follows the well-adopted Chauvenet's Criterion in statistical theory.

Annex 2: Data Creativity and Design Scoreboard indicators

	A1.1	A1.2	A1.3	A1.4	A1.5	A2.1	A2.2	A2.3	A3.1	A3.2	A3.3	A3.4	A3.5	A3.6
BE	1.24	5.7	7.34	16.38	5.4	74.0	78.0	52.0	10.38	7.58	8.60	53.6	17.0	4.5
BG	0.52	3.4	1.36	12.06	2.8	59.0	21.0	24.0	3.59	0.27	0.10	44.3	9.0	2.1
CZ	0.68	4.4	3.15	14.42	4.5	61.0	73.0	42.0	4.86	1.03	1.30	27.7	8.0	3.8
DK	0.74	5.8	10.56	19.56	5.9	88.0	79.0	59.0	8.03	3.19	3.90	33.8	14.0	4.7
DE	0.23	4.9	5.31	21.05	5.5	67.0	77.0	55.0	10.86	8.34	7.70	49.3	14.0	4.6
EE	2.97	4.3	2.79	17.18	4.7	89.0	87.0	29.0	1.87	18.13	3.50	47.1	15.0	3.8
IE	2.40	5.6	6.23	22.15	5.2	34.0	39.0	51.0	5.42	6.31	7.50	36.0	25.0	5.4
EL	0.36	3.3	3.37	16.25	3.9	57.0	46.0	--	2.41	6.34	2.80	67.7	15.0	3.5
ES	0.23	3.8	4.27	17.22	4.0	44.0	80.0	43.0	2.14	10.40	8.50	51.7	15.0	4.3
FR	0.49	4.8	6.42	--	5.0	51.0	59.0	47.0	11.12	4.91	4.70	46.9	13.0	3.9
IT	0.17	3.4	5.09	24.87	3.5	41.0	51.0	49.0	2.02	5.79	--	45.2	18.0	3.3
CY	1.32	4.9	6.03	12.02	3.6	78.0	53.0	--	26.93	13.35	7.90	58.3	13.0	3.7
LV	0.43	4.1	2.34	10.80	4.0	95.0	57.0	32.0	2.02	1.01	--	47.3	18.0	3.3
LT	0.59	4.1	2.58	12.16	4.3	92.0	44.0	33.0	0.47	0.75	--	43.0	4.0	3.1
LU	0.00	4.2	9.41	--	5.1	99.0	84.0	--	--	45.21	35.50	31.4	22.0	4.3
HU	0.30	3.6	3.36	12.90	3.6	42.0	48.0	25.0	3.19	0.71	0.40	32.8	19.0	3.5
MT	0.00	4.8	3.33	20.45	4.2	92.0	51.0	--	5.71	2.70	3.10	84.7	20.0	3.7
NL	0.86	5.2	6.59	11.92	5.5	91.0	78.0	66.0	4.63	3.53	4.30	64.7	13.0	5.0
AT	0.73	5.2	6.99	20.60	5.6	62.0	66.0	48.0	14.56	9.59	10.20	36.4	14.0	4.9
PL	0.10	4.0	2.67	11.30	3.7	57.0	38.0	29.0	0.44	0.16	0.40	42.6	8.0	3.0
PT	0.76	3.5	4.18	18.50	3.9	42.0	27.0	31.5	3.43	3.18	3.40	45.2	10.0	3.9
RO	0.18	3.7	1.07	14.33	3.5	47.0	42.0	22.0	1.58	0.16	--	--	11.0	2.4
SI	2.00	4.1	5.04	12.07	4.4	91.0	68.0	32.5	1.06	0.42	--	18.4	9.0	4.0
SK	0.37	3.7	2.31	11.74	4.2	97.0	83.0	40.0	0.98	0.19	--	22.0	6.0	3.0
FI	3.43	6.0	7.19	18.45	5.3	69.0	82.0	63.0	2.64	1.44	1.30	28.7	11.0	5.2
SE	1.11	5.2	8.80	17.35	5.8	90.0	93.0	64.0	8.56	4.36	4.10	22.6	15.0	4.7
UK	0.93	4.6	6.24	21.43	5.2	38.0	74.0	57.0	14.53	6.03	--	66.9	13.0	4.9

Annex 2: Data Creativity and Design Scoreboard (continued)

	B1.1	B1.2	B1.3	B2.1	B2.2	B2.3	B2.4	B3.1	B3.2	B3.3	B3.4	B3.5	B4.1	B4.2	B4.3	B4.4
BE	32.63	22.86	2.60	49	1288	764	5.1	42.0	--	117	5.9	0.100	0.020	5.7	5.5	0.100
BG	19.93	17.70	1.20	33	223	878	2.9	21.0	--	1	2.9	0.010	0.020	3.2	2.6	0.010
CZ	17.85	11.32	2.30	60	596	918	4.3	13.9	314	34	4.7	0.010	0.020	4.7	4.1	0.010
DK	25.53	26.70	3.10	310	1723	804	5.5	26.0	2030	182	6.0	--	0.030	6.0	6.0	--
DE	21.66	19.14	2.50	310	940	803	6.1	17.2	970	182	6.3	0.120	0.010	6.2	6.7	0.120
EE	27.54	17.96	2.40	21	585	939	3.7	6.9	468	11	4.4	0.030	0.020	3.8	2.7	0.030
IE	35.64	18.50	1.70	189	1033	369	4.4	40.7	1927	63	5.3	0.010	0.000	5.2	4.8	0.010
EL	25.29	17.36	1.00	44	737	520	3.0	55.5	767	2	4.1	--	0.030	3.9	3.6	
ES	21.16	19.00	2.30	69	743	1248	3.8	24.5	489	97	4.7	0.050	0.040	4.9	4.3	0.050
FR	22.18	19.46	3.40	227	880	1022	5.5	38.8	198	85	5.8	--	0.030	6.0	6.1	--
IT	18.30	11.66	2.30	134	722	674	4.7	34.5	258	168	4.8	--	0.070	5.6	5.6	--
CY	17.45	20.52	0.80	21	411	681	3.0	31.3	--	25	3.9	0.010	0.020	4.0	3.4	0.010
LV	22.57	13.78	1.80	48	144	596	3.3	25.4	209	15	3.9	0.060	0.030	3.7	3.1	0.060
LT	25.68	16.88	1.70	20	287	565	3.6	19.0	117	6	4.2	0.020	0.030	4.7	3.8	0.020
LU	27.79	21.84	0.60	36	432	738	4.7	30.3	1971	182	5.5	--	0.000	5.3	4.9	--
HU	21.33	14.66	1.20	72	492	373	3.7	6.5	248	13	4.2	0.040	0.010	4.4	4.0	0.040
MT	21.72	12.36	0.20	54	163	1020	3.1	26.7	--	11	4.2	0.010	0.040	4.1	3.3	0.010
NL	33.47	23.42	2.70	134	1505	765	5.3	29.8	2817	134	5.8	--	0.010	5.7	6.0	--
AT	19.22	13.16	1.80	275	1126	913	5.4	17.1	1157	182	5.9	--	0.020	6.0	5.6	--
PL	21.85	14.86	1.20	57	376	364	3.7	26.6	157	19	3.7	0.040	0.040	4.3	3.8	0.040
PT	18.18	10.74	1.40	15	548	904	3.9	16.8	625	44	4.2	0.030	0.030	4.3	3.6	0.030
RO	12.84	10.24	1.40	41	119	526	3.1	21.8	--	1	3.4	0.050	0.050	3.5	3.1	0.050
SI	22.54	16.54	2.20	153	1024	754	4.7	18.9	851	34	4.5	0.070	0.030	5.0	4.3	0.070
SK	17.62	11.88	2.00	35	414	525	3.4	14.8	436	15	3.9	0.030	0.020	4.0	3.6	0.030
FI	29.24	24.94	3.10	310	1649	523	5.8	44.5	381	101	6.0	0.060	0.010	5.7	5.9	0.060
SE	26.23	24.44	2.40	285	1923	869	5.9	11.9	1108	126	6.1	0.110	0.010	6.2	6.2	0.110
UK	31.69	18.92	3.00	302	1400	413	5.1	37.1	3081	74	5.4	--	0.020	5.8	6.2	--

Annex 3: Normalised data Creativity and Design Scoreboard indicators

	A1.1	A1.2	A1.3	A1.4	A1.5	A2.1	A2.2	A2.3	A3.1	A3.2	A3.3	A3.4	A3.5	A3.6
EU27	0.51	0.43	0.46	0.47	0.44	0.53	0.54	0.48	0.46	0.40	0.45	0.51	0.48	0.52
BE	0.72	0.89	0.75	0.49	0.79	0.62	0.77	0.68	0.81	0.64	0.84	0.71	0.69	0.70
BG	0.46	0.04	0.03	0.11	0.00	0.38	0.00	0.05	0.39	0.02	0.00	0.53	0.19	0.00
CZ	0.53	0.41	0.25	0.32	0.42	0.42	0.70	0.45	0.49	0.11	0.12	0.19	0.13	0.47
DK	0.55	0.93	1.00	0.77	1.00	0.83	0.79	0.84	0.69	0.32	0.38	0.31	0.50	0.77
DE	0.31	0.59	0.51	0.90	0.83	0.51	0.76	0.75	0.84	0.69	0.75	0.63	0.50	0.73
EE	1.00	0.37	0.21	0.56	0.50	0.85	0.91	0.16	0.22	1.00	0.34	0.58	0.56	0.47
IE	1.00	0.85	0.62	1.00	0.71	0.00	0.18	0.66	0.53	0.55	0.73	0.36	1.00	1.00
EL	0.39	0.00	0.28	0.48	0.17	0.35	0.29	--	0.28	0.56	0.27	1.00	0.56	0.37
ES	0.31	0.19	0.38	0.57	0.21	0.15	0.80	0.48	0.25	0.82	0.83	0.68	0.56	0.63
FR	0.45	0.56	0.64	--	0.63	0.26	0.48	0.57	0.85	0.45	0.46	0.58	0.44	0.50
IT	0.27	0.04	0.48	1.00	0.00	0.11	0.36	0.61	0.24	0.52	--	0.54	0.75	0.30
CY	0.74	0.59	0.59	0.11	0.04	0.68	0.39	--	1.00	1.00	0.77	0.81	0.44	0.43
LV	0.43	0.30	0.15	0.00	0.21	0.94	0.45	0.23	0.24	0.11	--	0.59	0.75	0.30
LT	0.49	0.30	0.18	0.12	0.33	0.89	0.26	0.25	0.01	0.08	--	0.50	0.00	0.23
LU	0.00	0.33	1.00	--	0.67	1.00	0.86	--	--	1.00	1.00	0.26	1.00	0.63
HU	0.35	0.11	0.27	0.19	0.04	0.12	0.32	0.07	0.36	0.08	0.03	0.29	0.81	0.37
MT	0.00	0.56	0.27	0.85	0.29	0.89	0.36	--	0.55	0.28	0.30	1.00	0.88	0.43
NL	0.60	0.70	0.66	0.10	0.83	0.88	0.77	1.00	0.47	0.34	0.42	0.94	0.44	0.87
AT	0.55	0.70	0.71	0.86	0.88	0.43	0.59	0.59	1.00	0.77	1.00	0.37	0.50	0.83
PL	0.21	0.26	0.19	0.04	0.08	0.35	0.17	0.16	0.00	0.00	0.03	0.49	0.13	0.20
PT	0.56	0.07	0.37	0.68	0.17	0.12	0.00	0.22	0.38	0.32	0.33	0.54	0.25	0.50
RO	0.28	0.15	0.00	0.31	0.00	0.20	0.23	0.00	0.19	0.00	--	--	0.31	0.00
SI	0.91	0.30	0.48	0.11	0.38	0.88	0.62	0.24	0.12	0.04	--	0.00	0.19	0.53
SK	0.39	0.15	0.15	0.08	0.29	0.97	0.85	0.41	0.11	0.00	--	0.07	0.00	0.20
FI	1.00	1.00	0.73	0.67	0.75	0.54	0.83	0.93	0.31	0.16	0.12	0.21	0.31	0.93
SE	0.68	0.70	0.93	0.58	0.96	0.86	1.00	0.95	0.72	0.41	0.40	0.09	0.56	0.77
UK	0.62	0.48	0.62	0.94	0.71	0.06	0.71	0.80	1.00	0.53	--	0.98	0.44	0.83

Normalised data for EU27 has been calculated as the unweighted average of the normalised data for the EU27 Member States.

Annex 3: Normalised data Creativity and Design Scoreboard indicators (continued)

	B1.1	B1.2	B1.3	B2.1	B2.2	B2.3	B2.4	B3.1	B3.2	B3.3	B3.4	B3.5	B4.1	B4.2	B4.3	B4.4
EU27	0.41	0.49	0.48	0.48	0.46	0.53	0.44	0.50	0.42	0.44	0.49	0.51	0.37	0.71	0.56	0.48
BE	0.95	0.86	0.71	0.28	0.77	0.61	0.69	0.93	--	0.71	0.86	0.50	1.00	0.71	0.83	0.71
BG	0.18	0.51	0.21	0.18	0.09	0.78	0.00	0.38	--	0.01	0.00	0.04	0.00	0.71	0.00	0.00
CZ	0.03	0.07	0.61	0.34	0.37	0.84	0.44	0.19	0.15	0.27	0.45	0.21	0.00	0.71	0.50	0.37
DK	0.54	1.00	0.89	1.00	1.00	0.67	0.81	0.51	1.00	1.00	0.90	0.88	--	0.87	0.93	0.83
DE	0.30	0.61	0.68	1.00	0.58	0.67	1.00	0.28	0.52	1.00	1.00	0.88	1.00	0.50	1.00	1.00
EE	0.67	0.53	0.64	0.07	0.36	0.87	0.25	0.01	0.24	0.11	0.34	0.21	0.22	0.71	0.20	0.02
IE	1.00	0.56	0.39	0.76	0.63	0.01	0.47	0.90	0.96	0.44	0.66	0.29	0.00	0.00	0.67	0.54
EL	0.53	0.48	0.14	0.25	0.46	0.24	0.03	1.00	0.41	0.02	0.24	--	--	0.87	0.23	0.24
ES	0.26	0.60	0.61	0.38	0.46	1.00	0.28	0.47	0.26	0.62	0.45	0.42	0.44	1.00	0.57	0.41
FR	0.33	0.63	1.00	0.84	0.54	1.00	0.81	0.85	0.06	0.56	0.83	0.83	--	0.87	0.93	0.85
IT	0.06	0.10	0.61	0.62	0.45	0.47	0.56	0.74	0.11	0.94	0.48	0.83	--	1.00	0.80	0.73
CY	0.00	0.70	0.07	0.08	0.24	0.48	0.03	0.65	--	0.21	0.17	--	0.00	0.71	0.27	0.20
LV	0.36	0.24	0.43	0.28	0.02	0.35	0.13	0.50	0.07	0.14	0.17	0.29	0.56	0.87	0.17	0.12
LT	0.55	0.45	0.39	0.06	0.15	0.31	0.22	0.33	0.00	0.06	0.28	0.21	0.11	0.87	0.50	0.29
LU	0.68	0.79	0.00	0.19	0.25	0.57	0.56	0.63	0.97	1.00	0.72	--	--	0.00	0.70	0.56
HU	0.27	0.30	0.21	0.40	0.30	0.01	0.25	0.00	0.10	0.13	0.28	--	0.33	0.50	0.40	0.34
MT	0.30	0.14	0.00	0.31	0.04	1.00	0.06	0.53	--	0.11	0.28	--	0.00	1.00	0.30	0.17
NL	1.00	0.90	0.75	0.62	0.89	0.61	0.75	0.61	1.00	0.79	0.83	0.71	--	0.50	0.83	0.83
AT	0.13	0.20	0.43	0.94	0.68	0.84	0.78	0.28	0.61	1.00	0.86	0.63	--	0.71	0.93	0.73
PL	0.31	0.31	0.21	0.33	0.21	0.00	0.25	0.53	0.03	0.17	0.10	0.00	0.33	1.00	0.37	0.29
PT	0.05	0.03	0.29	0.00	0.33	0.82	0.31	0.27	0.34	0.34	0.28	--	0.22	0.87	0.37	0.24
RO	0.00	0.00	0.29	0.23	0.00	0.25	0.06	0.40	--	0.00	0.00	--	0.44	1.00	0.10	0.12
SI	0.35	0.43	0.57	0.67	0.63	0.59	0.56	0.33	0.46	0.27	0.38	0.25	0.67	0.87	0.60	0.41
SK	0.01	0.11	0.50	0.19	0.24	0.24	0.16	0.22	0.22	0.14	0.17	--	0.22	0.71	0.27	0.24
FI	0.76	1.00	0.89	1.00	0.96	0.24	0.91	1.00	0.19	0.64	0.90	1.00	0.56	0.50	0.83	0.80
SE	0.59	0.97	0.64	0.96	1.00	0.77	0.94	0.14	0.59	0.76	0.93	0.88	1.00	0.50	1.00	0.88
UK	0.90	0.59	0.86	0.99	0.83	0.08	0.69	0.81	1.00	0.50	0.69	0.58	--	0.71	0.87	0.88

Normalised data for EU27 has been calculated as the unweighted average of the normalised data for the EU27 Member States.

Annex 4: Hong Kong Creativity Index indicators

Hui et al. (2005) have developed a creativity index distinguishing between 4 forms of capital and outcomes of creativity where “creativity is a social process continuously shaped and constrained by the values, norms, practices and structures of Social Capital, Cultural Capital as well as the development of Human Capital” whereas “its articulation would be promoted or constrained by the availability and accessibility of facilities, institutions, market and social enablers, or in short Structural/Institutional Capital”. “The accumulated effects and interplay of these different forms of capital are the Outcomes of Creativity which could be measured in terms of economic outputs, incentive activities and any other forms of creative goods, services and achievements”. The indicators used by Hui et al. (2005) are listed in the following table.

OUTCOMES OF CREATIVITY

Economic contribution of creativity
1. Value added of creative industries as percentage of GDP
2. Number of persons engaged in creative industries as percentage of total employment
3. Share of cultural goods relative to total export trade in goods
4. Share of cultural goods relative to total import trade in goods
5. Percentage of business receipts from selling goods, services or information through electronic means (as an indicator measuring innovative activity of e-commerce)
Inventive activity of economic sector
6. The ability of local enterprises to sell branded products in international market (<i>Global Competitiveness Report</i>)
7. The ability of local enterprises to acquire new technologies (<i>Global Competitiveness Report</i>)
8. Total number of patent applications per capita
9. Percentage of patent applications originated from local applicants relative to gross number of patent applications
Other outcomes of creative activity
10. Daily circulation of newspaper per capita
11. Total number of book and periodical titles newly registered per capita
12. Total number of music titles composed per capita
13. Total number of lyrics written per capita
14. Total number of films produced per capita
15. Total number of film shows presented by government cultural services per capita
16. Total number of performances (performing arts) by government cultural services per capita
17. Gross floor area of new buildings per capita
STRUCTURAL/INSTITUTIONAL CAPITAL
Independence of the legal system
1. Enumerated data about independence of the legal system (<i>Global Competitiveness Report</i>)
Corruption perceptions
2. Percentile scoring in Corruption Perception Index (<i>Transparency International (TI), Corruption Index</i>)
Freedom of expression
3. Percentile scoring on freedom of press
4. Percentile scoring on freedom of speech
Infrastructural conditions of ICT
5. Percentage of establishments using personal computers
6. Percentage of establishments with internet connection
7. Percentage of establishments with web page / web site
8. Percentage of households using personal computers
9. Percentage of households with internet connection
10. Mobile phone subscribers per population
Robustness of social and cultural infrastructure
11. Total number of Non-government Organizations (NGOs) per capita
12. Registered public library users per capita
13. Number of books in public libraries per capita
14. Total number of seats in all government cultural services' performance venues per capita
15. Number of declared monuments per city
16. Number of museums per city
Availability of community facilities
17. Number of community halls and community centres per capita
18. Total number of civic centres per capita
Financial infrastructure
19. Number of listed companies per capita
20. Capitalisation of stock market per GDP
21. Venture capital under the place's management per GDP

Robustness of entrepreneurship
22. Share of Small-and-Medium Enterprises (SMEs) to total number of establishments
23. Percentile scoring in Labour Productivity Index (whole economy)
HUMAN CAPITAL
R&D Expenditure & Educational Expenditure
1. R&D expenditure (business sector) as percentage of GDP
2. R&D expenditure (higher education) as percentage of GDP
3. R&D expenditure (public) as percentage of GDP
4. Public expenditure in education as percentage of GDP
Population of knowledge workers
5. Share of population aged 15 and above with educational attainment at tertiary level (non-degree)
6. Share of population aged 15 and above with educational attainment at tertiary level (degree)
7. Number of R&D personnel as percentage of total working population
Transience/mobility of human capital
8. Total number of visitor arrivals per population
9. Total number of resident departures per population
10. Estimated number of emigrant per population
11. Number of working visas per working population
SOCIAL CAPITAL
Development of social capital
1. Amount of approved charitable donations allowed under Salaries Tax as percentage of GDP
2. Amount of approved charitable donations allowed under Profits Tax as percentage of GDP
3. Expenditure on "social welfare" as percentage of total public expenditure
Network quality: norms & values from World Value Survey
4. Indicators on generalized trust (<i>World Value Survey</i>)
5. Indicators on institutional trust (<i>World Value Survey</i>)
6. Indicators on reciprocity (<i>World Value Survey</i>)
7. Indicators on sense of efficacy (on control) (<i>World Value Survey</i>)
8. Indicators on cooperation (<i>World Value Survey</i>)
9. Indicators on attitude towards diversity (<i>World Value Survey</i>)
10. Indicators on acceptance of diversity (<i>World Value Survey</i>)
11. Indicators on attitude towards human rights (<i>World Value Survey</i>)
12. Attitude towards rights and wrongs of foreign immigrants (<i>World Value Survey</i>)
13. Attitude towards foreigners' life style (<i>World Value Survey</i>)
14. Indicators on modern versus traditional values (<i>World Value Survey</i>)
15. Indicators on self-expression versus survival (<i>World Value Survey</i>)
Network quality: social participation from World Value Survey
16. Interest in public affairs (<i>World Value Survey</i>)
17. Participation in social organization (<i>World Value Survey</i>)
18. Social contact with acquaintance (<i>World Value Survey</i>)
19. Social contact with community (<i>World Value Survey</i>)
20. Indicators on sense of efficacy (on what you did) (<i>World Value Survey</i>)
21. Total number of volunteers per capita
CULTURAL CAPITAL
Cultural expenditure
1. Expenditure on "the arts & culture" as percentage of total public expenditure
2. Household expenses on designated cultural goods & services as percentage of total household expenses
Network quality: norms & values
Attitude towards arts, cultural and creative activities
3. Value placed on creative activity
4. Value placed on school-aged children's creative activity
5. Value placed on arts and cultural activities
6. Value placed on school-aged children's art and cultural activities
7. Community leader to be a strong advocate for advancing the arts and culture of the place
Environmental factors for cultural and creative activities
8. Evaluation on milieu that encourages creative activities
9. Evaluation of milieu that encourages cultural participation
10. Value placed on the morality to buy pirated or counterfeit goods
Network quality: cultural participation
11. Number of library books borrowed per year per population
12. Royalty fees paid to copyright fees collecting agents (excluding revenue from overseas) per population
13. Average hours per week spent on internet for personal use as percentage of 168 hours
14. Number of visits to government cultural services' museums per population
15. Number of attendance to performances by government cultural services per population
16. Number of attendance to film and video shows presented by government cultural services per population

Annex 5: KEA (2006) definition of cultural & creative sector

Domains	Sector	Sub-sector activities	NACE
Architecture	N.A.	Architectural services; Landscape architectural services; Engineering services; Other scientific and technical consulting services	7420 Architectural and engineering activities and related technical consultancy
Design	N.A.	<p>Fashion design, i.e. a portion of companies whose main activities are classified as retail, wholesale and agencies of textiles and clothing and footwear, manufacture of textiles, apparel, and footwear manufacture and design of printing plates, and design and design consultancy services</p> <p>Graphic design, i.e. a portion of companies whose main activities are classified as: printing and ancillary services related to it, architectural activities, artistic creation and graphic design and advertising services</p> <p>Interior design, i.e. a portion of companies whose main activities are classified as other business activities and services and artistic creation</p> <p>Product design, i.e. a portion of companies whose main activities are classified as other business activities and services and artistic creation</p>	<p>Fashion design:</p> <p>1700 Manufacture of textiles 1800 Manufacture of wearing apparel 1930 Manufacture of footwear 2624 Manufacture of other technical ceramic products 5116 Agents involved in the sale of textiles clothing, footwear and leather goods 5141 Wholesale of textiles 5142 Wholesale of clothing and footwear 5241 Wholesale of textiles 5242 Wholesale of clothing and footwear 7487 Other business activities n.e.c. 9305 Other business activities n.e.c.</p> <p>Graphic design:</p> <p>2222 Printing n.e.c. 2225 Ancillary services related to printing 7420 Architectural and engineering activities and related technical consultancy 7440 Advertising 7487 Other business activities n.e.c. 9231 Artistic and literary creation and interpretation 9305 Other service activities n.e.c.</p> <p>Product design:</p> <p>2222 Printing n.e.c. 2225 Ancillary services related to printing 7420 Architectural and engineering activities and related technical consultancy 7440 Advertising 7487 Other business activities n.e.c. 9231 Artistic and literary creation and interpretation 9305 Other service activities n.e.c</p>
Visual arts	Crafts	Ranges in most categories in manufacturing and retail. Can only be captured in individual firms' trade descriptions including "crafts" "hand made products" etc.	
	Paintings	A portion of companies whose main activities are classified as retail in specialised and non-specialised stores, renting own property (e.g. for exhibitions) creation of arts and operation of arts facilities and museums	<p>Paintings, picture framing and sale of art:</p> <p>5212 Other retail sale in non-specialised stores 5248 Other retail sale in specialised stores 7020 Letting of own property 7487 Other business activities n.e.c. 9231 Artistic and literary creation and interpretation 9232 Operation of arts facilities</p>

Domains	Sector	Sub-sector activities	NACE
	Sculpture	Idem as for paintings	9252 Museums activities and preservation of historical sites 5212 Other retail sale in non-specialised stores 5248 Other retail sale in specialised stores 7020 Letting of own property 7487 Other business activities n.e.c. 9231 Artistic and literary creation and interpretation 9232 Operation of arts facilities 9252 Museums activities and preservation of historical sites
	Photography	Commercial and consumer photograph production, Photography for commercials, publishers, fashion, real estate or tourism purposes and news and photo agencies	7481 Photographic activities 9240 News agency activities
Performing Arts	Theatre	i.e. a portion of companies whose main activities are classified as artistic and literary creation and interpretation	9231 Artistic and literary creation and interpretation
	Dance	Idem as for theatre	9231 Artistic and literary creation and interpretation
	Circus		9234 Other entertainment activities n.e.c
Audiovisual	Film and video	Production (including the production of commercials, activities of studios) Distribution Exhibition Video sale through and rental These companies include film production, distribution and exhibition plus sales and rentals of videos and DVDs	9211 Motion picture production 9212 Motion picture distribution 9213 Motion picture exhibition 5248 Other retail sale in specialised stores 7140 Renting of personal and household goods n.e.c.
	Radio and Television	- Production of radio and television programmes whether or not combined with the broadcasting - Cable and satellite distribution of TV –programmes	9220 Radio and television activities 6420 Telecommunications
	Software publishing including games	Development, production, supply and documentation of ready-made (non-customized) software including games	7221 Publishing of software 2214 Publishing of sound recordings
Advertising		Operations of advertising agencies and services	7440 Advertising agencies
Music		Creation and interpretation; Publishing revenues; Production activities; Distribution activities; Wholesale and retail; Performance rights	9231 Artistic and literary creation and interpretation 5248 Other retail sale in specialised stores
Books And Press		Publishing of books, magazines, newspapers and wholesale of books, Retail of magazines and newspapers and books Mail order retail of books	2211 Publishing of books 2212 Publishing of newspapers 2213 Publishing of magazines 5147 Wholesale of other household goods 5247 Retail sale of books newspapers 5261 Retail sale via mail order houses
Heritage	Museums Arts & antique markets Libraries Archaeological activities Archives		9251 Library and archives activities 9252 Museums activities and preservation of historical site