

Monitoring Creativity at an Aggregate Level: a proposal for Europe

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Introduction

In 2000, the European Union set up the Open Method of Coordination (OMC) as an accompanying measure of the Lisbon Strategy (Council of the European Union, 2000). The OMC consists of a soft-law policy instrument (Gornitzka, 2006) where Member States agreed on specific objectives. It is based on three main pillars: (1) common definition of objectives, (2) common definition of instruments and monitoring measures, and (3) exchange of best practices, peer review and mutual learning. When, in 2002, the European Commission established a work plan for education and training (Council of the European Union, 2002), the process of monitoring progress to achieve the agreed goals was an important part of it. This included several indicators and five benchmarks in different areas of education and training, where Member States agreed to be monitored by the European Commission. Since 2005, the Commission has been assessing progress towards the goals in a yearly report (European Commission, 2005; 2006; 2007; 2008a) and, in 2007, Member States agreed to a 'coherent framework of indicators' (Council of the European Union, 2007) which was updated in 2009. The updated strategic framework guides European actions in the field of education and training up to 2020 (European Commission, 2008b). It introduces four key challenges, one of them being: 'enhancing creativity and innovation' (Council of the European Union, 2009). Under this heading, the Commission states (European Commission 2008c, p. 11):

In the context of developing the policy cooperation, research, analysis and the exchange of ideas on how to measure creative and innovative skills needs to be promoted at EU level and with the relevant international organizations.

This article presents several indicators that could be used to measure creativity at an aggregate (or societal) level, in line with the indicators and benchmarks agreed by the OMC.

In education and training, in addition to the OMC, the European Commission has shown interest in using current best evidence to take decisions and choose between policy options (European Commission, 2007). It is not the intention of this article to discuss the use of scientific knowledge and the tension between policy making and scientific research (Pawson, 2006), but it seems clear that more and more policy making is looking towards the scientific community to find guidance. For example, in his speech to the Parliament at the time of facing confirmation, Jose Manuel Barroso, president of the European Commission, stated (Barroso, 2009, p. 5):

We also need a fundamental review of the way European institutions access and use scientific advice. In the next Commission, I want to set up a chief

scientific adviser who has the power to deliver proactive, scientific advice throughout all stages of policy development and delivery.

This emphasis on knowledge-based policies and the use of the OMC gives greater importance to the provision of adequate statistical data. Measuring progress towards the agreed objectives requires comparable statistics that capture the complexity of education. There is an increasing demand to develop new measures to monitor different aspects of European policies in education and training. One area that is gaining in importance is *creativity*. The Union declared 2009 the *European Year of Creativity and Innovation* (Council of the European Union and European Parliament, 2008) to raise awareness of the importance of creativity and innovation for personal, social and economic development; to disseminate good practices; to stimulate education and research, and to promote policy debate on related issues. It was in this context that this article was conceived as an input into the debate concerning policy on how to measure creativity.

The Importance of Creativity

The need to adapt to new environments has been a must for any species to survive. This adaptability depends heavily on the creative capacity to provide new adequate solutions to problems never before encountered. With the current pace of change, people are constantly faced with new demands and situations.

Florida (2002a) argues that creativity is the new source of wealth. For him, there is a paradigm shift in life style from the old economy to a new economy driven by creative individuals. The creative class, for Florida, is the main reason to produce growth in a region. This class seeks a balance between working life and leisure and is attracted to places that will stimulate its creative potential (Florida, 2002b). For Florida, economic growth is determined by the capacity of an area to attract these talented individuals (Florida, 2002c). His thesis has received wide media coverage and has mobilised policy-makers to start thinking about how to promote creative activities to attract talents. He also developed a creative index that has been used to benchmark US regions in their creative capacity which will be described later on in this article. Florida's framework helped to establish a debate around the importance of creativity.

Creativity is also seen as a crucial element in producing innovations (Cropley, 2009). OECD and the European Union's statistics agency EUROSTAT defined innovation for data collection purposes as 'the implementation of a new significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations' (OECD & EUROSTAT, 2005, p. 146). There can be creativity without innovation, but there cannot be innovation without the creative generation of ideas. A step model of creativity establishes a sequence in which innovation is the final output of a creative process. The process starts with the generation of ideas in which divergent thinking skills (the capacity to give many answers to a similar problem) are important, followed by a phase to evaluate the different choices that will be validated, provided an innovation can be seen as a creative product (Cropley, 2009).

Since the re-launch of the Lisbon Strategy in 2005, innovation has become one of the main pillars in the construction of Europe (Villalba, 2008a). In general terms, creativity is seen to be important for producing economic growth and increasing social cohesion (European Commission, 2008). In this context, it is

understandable that educational systems are requested to train students to be creative. The European Commission, in its definition of key competences adopted by the Council in 2006 (Council of the European Union and European Parliament, 2006), maintains that creativity plays a role in all key competences, together with other transversal themes such as critical thinking, problem solving or risk assessment. Gordon *et al.* (2009) in their study of key competences in Europe found that cross-curricular competences were gaining importance in the school policy agenda of the Member States, but how far they are integrated into the teaching and learning processes is still not clear. Sternberg (2006) claims that creative potentials could be stifled in children by society and educational systems that tend to encourage conformity. In fact, one could argue that there is a growing concern about education and training systems worldwide. According to Sir Ken Robinson (2006), educational systems are not providing young people with the tools to adapt adequately to the knowledge-based economy. In his speech at Technology Entertainment Design (TED) 2006 he maintained that 'we are educating children for jobs that do not exist yet, using technologies that have not been invented yet, in order to solve problems that haven't even been identified yet' (Robinson, 2006). He also argues that 'creativity is as important in education as literacy and should be treated with the same status' (*ibid.*). His speech illustrates how educational systems are designed for an obsolete economy which is incapable of seeing the talents of the youngsters they are educating.

The Importance of Measuring Creativity

Measuring is a crucial issue to establish knowledge-based policies. In order to evaluate the impact of a newly established policy, it is necessary to have adequate measures that can say something about its effectiveness. It is not surprising that large scale surveys are gaining importance in the field of education. They provide comparable evidence that can be used to assess the achievements of the policies in place. The importance of measuring creativity comes from the need to provide adequate policies for its promotion. If there is a clear need to promote creativity, as it is shown in the paragraphs above, it will not be enough to put policies in place to promote it, it is also necessary to evaluate their effectiveness.

Gordon *et al.* (2009) in their case study of six countries found that there were only a few references to teaching and assessing transversal key competences in teachers' and principals' training schemes. The development of adequate measures for creativity will improve this lack of assessment of non-traditional competences. They will offer increasing visibility to the syllabus and curriculum. If they are considered within the assessment criterion and can be used to hold systems accountable for their efficiency, it is likely that educational systems will feel obliged to change and foster creativity. A measure of creativity will make it easier for it to become a more explicit aspect when evaluating student and systems performance.

There is another reason why measuring creativity — at least at aggregate level — is important. Measurements provide bases for debate. The OECD Programme for International Student Assessment (PISA), for example, has been instrumental in creating policy debate around educational systems worldwide (Ferry & Sapir, 2006). Once a measure for creativity is found, results could be used to promote the debate on how the results can be explained and on the conditions that seem more effective. In addition, the measure of creativity requires a debate to create consensus around what it is and how it can be measured. For many people, creativity is related

to some sort of magical energy that emerges from the self and cannot be studied or measured. Sternberg and Lubart (1999) state that creativity, like love, is seen as something that does not lend itself to scientific inquiry. Consensus of all stakeholders is crucial for a measure of creativity to be useful and to improve the effectiveness of policies. This debate would also be beneficial for education since it would help to make more explicit the aspects of creativity that policies wish to promote.

The intention of this article is not to provide a clear answer to what is creativity, but it is important to establish some basic elements concerning its definition. This is briefly treated in the following section.

Defining Creativity

Researchers on creativity agree that it is a complex construct. The everyday use of the construct and the recent policy interest make even more difficult to pinpoint a concrete definition. Sternberg (2006a) claims that there are five commonalities in the research on creativity worldwide. First, creativity ‘involves thinking that aims at producing ideas or products that are relatively novel and that are, in some respect, compelling’ (Sternberg, 2006a, p. 2). Second, it has some domain-specific and domain-general elements, i.e. it needs some specific knowledge, but there are certain elements of creativity that cut across different domains. Third, creativity is partly measurable. Fourth, it can be developed and promoted. And fifth, ‘creativity is not highly rewarded in practice, as it is supposed to be in theory’ (ibid.).

The novelty and adequacy of a product or of an idea will depend on the reference point. Csikszentmihalyi (1996) maintains that creativity is a social attribution. For him, it is the compound of the gatekeepers of the domain that would determine what is and what is not creative. Csikszentmihalyi (1996; 2009) only considers as creative those who are capable of producing a cultural change, or as Simonton puts it ‘those that have gone down in history’ (Simonton 1999, p. 176). This has been referred to by The UK National Advisory Committee on Creative and Cultural Education (NACCCE) (1999) as historic originality. Csikszentmihalyi would also consider creative what NACCCE would define as relative creativity regarding products that are considered new by a reference group. Csikszentmihalyi (1996) however, does not consider individual creativity. Individual creativity implies the creation of something new in respect to the person that produces the creative output. This has also been referred to as personal creativity (Mayer, 1999) or everyday creativity (Richards, 1999). Historical creativity is usually referred to as big ‘C’ creativity, whilst individual creativity is called little ‘c’ creativity. For the purpose of this article, the main focus will be on everyday and relative creativity. However, some of the aspects that foster historical creativity are likely to play a major role in the promotion of everyday or relative creativity. Everyday or personal creativity is generally considered as something that everyone possesses, i.e. it is considered in a democratic manner (National Advisory Committee on Creative and Cultural Education (NACCCE), 1999) as opposed to big ‘C’ creativity that is usually seen as the characteristic of exceptional people and usually only related to arts or specific areas.

Wehner, Csikszentmihalyi and Magyari-Beck (1991, p. 270) maintained that the situation in creativity research was similar to the fable of the blind men trying to describe an elephant by touching different parts of the animal, where the one touching the tail said it was like a snail and the other touching the flank said it was like a wall. In the last 20 years, however, research on creativity has been converging

slowly in what Sternberg and Lubart (1999, 10) refer to as ‘confluence approaches’ or what Runco (2007, p. 30) refers to as ‘componential theories of creativity’. This line of research brings together multiple views on creativity, where different components must converge for creativity to occur. The basic idea is that creativity involves different resources that not only pertain to the individual, but also to the environment in which it appears. Sternberg and Lubart (1991; 1992; 1995; 1996) developed their investment theory of creativity. Their basic idea is that ‘creative people are the ones who are willing and able to “buy low and sell high” in the realm of ideas’ (Sternberg, 2006b, p. 87). According to this theory, creativity requires six distinct but interrelated resources: intellectual abilities, knowledge, styles of thinking, personality, motivation and environment. Sternberg and Lubart (1999) describe a complex system where these different resources must have a proper balance. For example, in the case of knowledge, Sternberg maintains: ‘On the one hand, one needs to know enough about a field to move it forward [. . .] On the other hand, knowledge about a field can result in a closed and entrenched perspective’ (Sternberg, 2006b, p. 89). The other six resources also require the right balance of attributes. As Lubart (2009) has argued, this balance could be highly dependent on the task, and therefore context dependent.

In a similar line, Csikszentmihalyi (1996) proposes that creativity can only be understood in the interrelation between three elements: the actor, the domain and the field. The domain refers to specific areas in the ‘culture’ where the creative product has been constructed, e.g. mathematics, poetry, music, or sports. Thousands of domains compound the culture. The field refers to all those who act as gatekeepers to the domain. They evaluate if a product is creative or not. The actor refers to the individual who pursues the creative action.

Confluence approaches present challenges for measurement. They claim that it is not only necessary to measure one aspect, but several in order to understand how creativity occurs. In addition, the aspects to be measured do not only pertain to the individual, but also to the environment, the tasks and the conditions in which creative actions take place. A clear implication is that any measurement of creativity will have to involve not only the individual who is regarded as creative, but also the context that is conducive to creativity. Measurement approaches to creativity can be broadly divided into approaches that target the individual and those that are interested in aggregate level measures. I have referred to them as ‘psychological approaches’ and ‘sector approach’ respectively (Villalba, 2008b). For this article, the focus will be on the aggregate level measures that can be regarded as complementing human capital measurement approaches. They are based on, but go beyond the creativity index developed by Florida in the rise of the creative class (Florida, 2002a; 2004) and that has had important implications for policy.

Measuring Creativity at an Aggregate Level

The different initiatives that exist to measure creativity at the aggregate level are measuring the contextual characteristics that could be associated with creativity, or the different aspects in society that can be regarded as the output of a creative process (such as innovation). They therefore constitute pointers of aspects that can be related to creativity, rather than measures of creativity *per se*.

Measurement approaches at this level are brought together inspired by Richard Florida’s creativity index (Florida, 2002a). Florida has become instrumental in the promotion of creativity and has had an important influence in urban planning

(Peck, 2005). For him, the economic success of a region depends on its capacity to attract talented individuals who will ensure economic prosperity. The creativity index ranks metropolitan statistical areas in the US. It is compounded by three sub-indexes that he calls the three Ts: Technology, Talent and Tolerance. They create the ecosystem that fosters creativity and turn it into economic values (Florida, 2004). He maintains that the three aspects are necessary, but not sufficient. A place must have all three T's 'to attract creative people, generate innovation and stimulates economic growth' (Florida, 2004, p. 249). Table I shows the different indices that compound the creativity index.

TABLE I. Richard Florida's Creativity Index

Technology	Innovation Index:		Patented innovation per capita (version 2002), Average annual patent growth from 1990 to 1999 (version 2004)
	High-Tech Index	Developed by DeVol <i>et al.</i> (1999)	Metropolitan High-tech industrial output as a % of total U.S. high-tech industrial output % of region's own total economic output that comes from high-tech industries compared to national percentage
Tolerance	Gay index	Developed by Graves <i>et al.</i> (2000)	Fraction of all U.S. gay people who live in a given metropolitan area divided by the fraction of the total U.S. population that live in that area
	Bohemian index		Fraction of all artistically creative people (includes authors, designers, musicians, composers, actors, directors, painters, sculptors, artists, printmakers, photographers, dancers, artists, and performers) who live in a given metropolitan area divided by the fraction of the total U.S. population that live in that area
	Racial integration index	(In version 2004 only)	Census track ethnicity composition in relation to the composition of the whole MSA (Metropolitan Statistical Area)
Talent	Creative class index		Percentage of creative occupations in total employed

Peck (2005) summarises the main criticisms to Florida's approach. He maintains that the index is over-simplistic and has been over-used by policy makers without reflection of what the measurements really mean. Florida's 'correlational' evidence cannot be confused with casual evidence, and thus, we do not necessarily know if places attract individuals or if individuals 'grow' in the creative places. Florida also fails to make a proper connection between creativity and his three Ts.

Despite a considerable amount of criticism (MacLeod, 2002; Maloszewsk, 2004; Malanga, 2004; Peck, 2005), Florida's framework has had a remarkable impact on policies, mainly urban policies. It is taken as a starting point to study the measurement of creativity at an aggregate level using existing statistical evidence. It is important to emphasise that it is a starting point, since the three Ts seem a logical beginning to group different pointers of creativity. Florida's views on creativity can be extended to consider other types of indicators to be used as

proxies for the creativity potential of a place, different from psychological methods and constructs, which are more traditionally associated with the research on creativity. It is important to note, however, that an adequate measure of creativity would require both aggregate measures that are similar to Florida's and individual measures, such as divergent thinking skills, or personality traits. Only through these two types of measures can the complexity of creativity be addressed. In this article, emphasis is on the former.

Technology

The first T refers to technology. The technology index is compounded by Florida with the innovation index and the high-tech index. The innovation index refers to the patented innovation per capita and the average annual patent growth in a region from 1990 to 1999. The high-tech index was developed by the Milken Institute and refers to the area high-tech industrial output as a percentage of the US total high-tech industrial output. Later on, Florida developed a European creativity index ranking European nations (Florida & Tinagli, 2004) where the technology pillar of the composite indicator on creativity was formed with three indices referring to patents and to R&D expenditure.

The use by Florida of high-tech and innovation statistics can be further seen as pointing to the creative products that firms are capable of producing. A successful innovation can be seen as the result of a creative process. At an aggregate level, innovation has been studied in Europe in recent years using the European Innovation Scoreboard (EIS) developed by the University of the United Nations-Maastricht Economic Research Institute on Innovation and Technology (UNU-MERIT) and others (Arundel & Hollanders, 2008; Celikel-Esser *et al.*, 2008). The Directorate General of Enterprise of the European Commission was its main promoter. Like Florida's index for creativity, the EIS has been instrumental in creating a debate around innovation in Europe. It has provided a starting point for discussion on policies for innovation and on policies to improve innovation and monitor it. In 2008, EIS adopted a different structure that included three main pillars and seven sub-pillars. The three pillars are enablers, firms' activities and outputs, while the sub-pillars are human resources, finance and support, firms' investments, linkages and entrepreneurship, throughputs, innovators and economic effects (Hollanders & van Cruysen, 2008). The EIS includes several indicators that are similar to Florida's technology pillar and has more sophisticated indicators on patents and innovations. It also comprises several indicators related to the high-tech industries and information on the investments in research and development. It adds several indicators on venture capital and other input economic factors. It also has some measures related to technology that address the absorptive capacities of companies in a country. In the EIS, there are also indicators that point to human resources or entrepreneurship, aspects that relate more to the talent aspects in Florida's view. Thus, a subset of EIS indicators would constitute a better indicator of the Technology pillar in the description of a creative eco-system. Some other EIS indicators could enrich the information about the talent aspect that will be treated later on.

Tolerance, Heterogeneity, Culture and Leisure

The second T refers to Tolerance. This, for Florida, is an indication of the willingness of a place to accept different views. In the first edition, he only used the

controversial Gay index that accounted for the number of homosexual couples in a given area compared to the national level. In a later publication, he also uses the Bohemian index and the racial integration index (see Table I).

Florida's underlying idea is that tolerance is an indication of the capacity of places to accept original ideas. Creative individuals feel attracted to places that allow them to express themselves. In a similar line of reasoning, Das, Di Rienzo and Tiemann (2009) argue that heterogeneity has a positive effect on the GDP/per capita in high income countries. They maintain that it enhances creativity by providing a wide variety of ideas for the creative people to combine in new ways. Using data from the world values survey, Das, Di Rienzo and Tiemann (2008) created a *global tolerance index* for 62 nations. Their findings support the view that more tolerant countries have greater net migration, and thus more heterogeneity. For them, social capital is the catalyst for greater heterogeneity and creativity.

Related to the importance of heterogeneity and tolerance is the importance of cultural amenities in a place to attract creative individuals and as a promoter of creativity *per se*. Supply of cultural activities is, once more, an indicator of an environment that accepts and nurtures creativity. Kern and Runge have developed an index that looks at the possibilities of constructing an index on creativity that is focused on cultural consumption.

These types of indicators are usually not considered when looking into creativity or innovation. However, there is an increasing awareness of the importance of the so-called cultural sector not only as a pointer of the creative potential of a place, but also as a major contributor to economic growth and as a catalyst to increase the innovative capacity of a place (Kimpeler & Georgieff, 2009).

Talent — the Creative Class

Talent, in Florida's index, refers to the number of people regarded as 'creative class' in a region. For Florida, the creative class constitutes the main driver of the economy. These creative individuals are those that regions should seek to attract in order to have economic prosperity. The talented individuals search for a balance between places that permit them to work in interesting, exciting creative jobs and provide them with an environment for their self-expression and leisure, i.e. a tolerant environment (the other T). These creative occupations are divided into the 'super-creative core' and the 'creative professionals' (see Table II).

TABLE II. Creative class classification

Super-Creative Core	Computer and mathematical, Architecture and engineering, Architecture and engineering Life, Physical, and social science Education, Training, and Library occupations Art, Design, entertainment, sports, and media
Creative Professionals	Management Business and financial operations Legal occupations Healthcare practitioners and technical occupations High-end sales and sales management

Inspired by Florida's creative class, Lorenz and Lundvall (2009) developed a measure for creativity at work. Using data from the 4th European Working Condition Survey carried out in 2005, they developed an index that accounts specifically for the activities of people at work in relation to creativity. Using a hierarchical clustering analysis, they group the working population into 'creative workers, routine problem solvers and taylorised workers' (Lorenz & Lundvall, 2009, p. 161). The advantage of this measure as an alternative to the creative class is that it is less bounded to the differences in the organisation of work and thus allows for a more comparable measure at the international level. In addition, an occupational categorization does not account for creativity used by other workers at the shop floor for example. Furthermore, different technological dynamisms within each sector will make occupations differ in their creative activity. Table III shows the variables that compound the creative work index.

TABLE III. Creative work variables

	Percent of occupied persons affected
Problem solving activities in work	79
Learning new things in work	68
Undertaking complex tasks	62
Using one's own ideas in work	50
Able to choose or change one's work methods	60
Able to choose or change the order of one's tasks	56
N	9,240

Source: Fourth Working Conditions survey, 2005. European Foundation for the Improvement of Living and Working Conditions (Lorenz & Lundvall, 2009).

Also within the idea of capturing indicators that point to talent, indicators referring to entrepreneurship could be used. These are not specifically considered by Florida in *The Rise of the Creative Class*. However, in an article for *Regional Studies* (Lee *et al.*, 2004) the authors linked creativity using Florida's index to entrepreneurship. In their analysis, they measure entrepreneurship in the US as firm birth per 1000 people.

To measure entrepreneurship, OECD and EUROSTAT are collaborating in a project launched in 2006 and entitled The Entrepreneurship Indicator Program (EIP). EIP defines entrepreneurs as 'those persons (business owners) who seek to generate value, through the creation, expansion of economic activity, by identifying and exploiting new products, processes or markets' (Ahmad & Seymour, 2008, p. 14). For them, entrepreneurship is mainly concerned with generation of value. Although value can be understood in economic or social terms, EIP is mainly focused on economic value. Entrepreneurship relates to creativity in that it requires the capacity to purposefully exploit new opportunities and requires one of the common characteristics defined under creativity, the capacity to move one's ideas forward (persuasion) (Runco, 2007).

Schmiemann (2009) presents the three-stage entrepreneurship model developed by EIP that constitutes a framework for feasible indicators that are relevant for entrepreneurship. First, it involves determinants that comprise aspects that

policy can affect. This affects the entrepreneurial performance, which constitutes the second step of the model and refers to the amount of entrepreneurship. The final stage refers to the impact of entrepreneurship on economic growth, job-creation or policy reduction (see Figure 1).

EIP has developed a framework and proposed a list of indicators that are related to entrepreneurship. The indicators of entrepreneurial performance are divided into three categories that are related to: firms, employment or others. The list of the considered indicators is presented in Figure 2. Some could be seen as indications of the creative performance of a region. In most cases, they could be regarded as pointers of creative achievements. A new firm is the consequence of a creative act. The indicators point to creativity efforts, since, by definition, they focus on something ‘new’ and with ‘value’. Interestingly enough, Ahmad and Hoffman (2008, p. 15) point out that ‘[F]irms do not need to be new to be entrepreneurial. Older firms can demonstrate entrepreneurship, too’. In this way, they include high-growth firms based on employment and turn-over as indicators of entrepreneurship, under the assumption that firms that have demonstrated rapid growth are doing something ‘significantly different’ (ibid.).

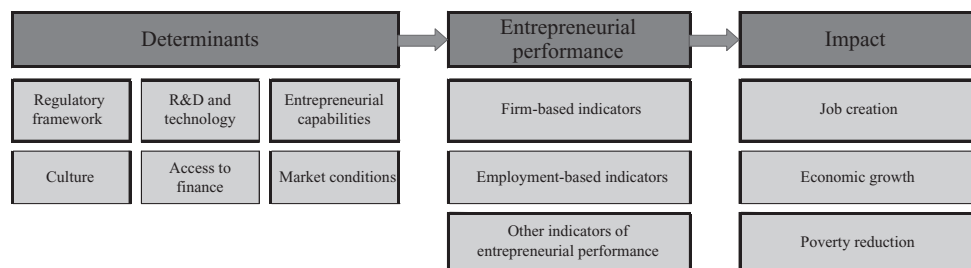


FIGURE 1. Three-stage entrepreneurship model (Schmiemann, 2009)

Entrepreneurial Performance		
Firms	Employment	Wealth
Employer Enterprise Birth rates	High Growth Firm rates by Employment	High Growth Firm rates by Turnover
Employer Enterprise Death rates	Gazelle rates by Employment	Gazelle rates by Turnover
Business Churn	Business Ownership Start-Up rates	Value-Added by Young or Small Firms
Net Business Population Growth	Business Ownership rates	Productivity Contribution, Young or Small firms
Survival rates at 3 and 5 Years	Employment in 3 and 5 Year Old Firms	Innovation Performance, Young or Small Firms
Proportion of 3 and 5 Year Old Firms	Average Firm Size after 3 and 5 Years	Export Performance, Young or Small firms

FIGURE 2. The OECD/EUROSTAT Framework and Indicators for Entrepreneurship (adapted from Ahmad and Hoffman, 2008, p. 17)

The Role of Education

The creative class has served as an alternative measure to traditional human capital measures. OECD (2001, p. 18) defined human capital as 'the knowledge, skills, competences and other attributes embodied in individuals that confer personal, economic and social benefits'. Traditionally, it has been measured as the number of years of education or as the educational attainment of the population. And for many years now, it has demonstrated that education plays a major role in economic growth and individual well being. As acknowledged by Rubenson and Runco (1992; 1995), creativity should be regarded as a form of human capital. Florida (2002a; 2005) opposes his creativity index to human capital when searching for another measure that can better capture the new type of economy, which is more and more dependent on the creative capacity of individuals and not only on acquisition of knowledge. Studies in intellectual capital accounting have developed other type of measures to grasp more than the acquisition of knowledge (Edvinsson, 1997; Sveiby, 2001; Bontis, 2001; Andriessen, 2004). However, there is no conclusive evidence that indicates that Florida's type of measures are more adequate than the traditional human capital measures to predict economic growth and they are not that different. In other words, creative occupations require highly educated individuals in most cases. Glaeser (2004), for example, maintains that Florida's arguments do not differ from the Human Capital Theory. For him, the creative class does not differ very much from the concept of well-educated individuals. Glaeser (2004; 2005) and Hoyman and Faricy (2009) have shown, using similar data to Florida for the US, that human capital models still outperform creative class ones to predict economic growth.

Boschma and Fritsch (2007; 2009) studied the determinants of the share of creative class in seven European countries. In their analysis, including more than 500 regions in Europe, they found supporting evidence of Florida's thesis, namely that the share of creative class is associated with higher levels of openness as measured by the share of foreign born population and regional employment opportunities after verifying a number of factors. Boschma and Fritsch (2009) also investigated the different effects of the creative class and educational attainment on regional economic growth in Europe. They used proxies for talent using the regular indicator for human capital, i.e. the share of the population with at least a bachelor degree and the creative class indices as developed by Florida. They found that regional economic growth between 1996 and 2002 was related to the share of the creative class and of the population holding at least a bachelor degree in regions in Germany and The Netherlands. It also had a positive relationship with employment growth and firm creation.

Furthermore, more education does not necessarily create more talented and creative individuals. Although it is likely that those who succeed in education are creative, a high level of education does not necessarily mean high levels of creativity. As indicated above, educational systems are usually accused of (Sternberg, 2006a; Robinson, 2006) promoting conformity and not divergent thinking, or the capacity to generate many answers to the same question. This probably does not help to increase the inventiveness of individuals that seems a crucial aspect for first phases of the creative process. However, creativity also needs convergence thinking, or the capacity to choose one adequate answer. Therefore, it is likely that more educated people have better capacities to choose an adequate answer.

The lack of comparative international evidence to test these hypotheses makes it difficult to determine the exact role of education in enhancing creativity. What seems clear is that it increases the creative potential of individuals. We need complex measures of creativity to be able to assess in what way education enhances it and relate creativity to a human capital discourse.

The high-level performances of some students in OECD PISA include certain aspects of creativity. In order to correctly answer certain difficult problems it is clear that some degree of creativity is required. For example, the most difficult test items in PISA that only high achievement students will respond to correctly imply the combination of previous knowledge in a new manner to provide an adequate answer to a new problem. That is to say they require creative problem solving. However, PISA cannot be regarded as a measure of creativity, since it is not possible to distinguish between high level performance in measured subjects, i.e. reading, mathematical or scientific literacy, and creative performance. In other words, since the items were not constructed to measure creativity, they cannot find creative students that are not high performers in that subject. In addition, outstanding performance will necessarily require some sort of creative-problem solving, but creativity involves more than the production of one correct answer. The problem identification, the problem definition, the generation of alternative answers, the evaluation of these different ideas, the capacity to take them further and convince others are all part of the creative process. A measure of literacy on traditional pencil and paper tests can only provide a small picture of the creative performance. In order to evaluate creativity as an educational outcome, more sophisticated methods of assessment are needed. Computer-based assessment could provide a good way of evaluating and studying not only the outcomes, but also the process in which the creative ideas have been generated. This would allow for a future measure of creativity in the population at an aggregate level in the same way that PISA does for literacy (Villalba, 2009). This type of measure will require a long-term development phase that will provide insight into the role of creativity in economic and social progress.

Conclusion

Creativity could be described as a complex, three-dimensional polygonal structure with multiple planes and shapes. Each of the planes or polygons could be seen as a specific aspect related to creativity. Despite its complexity, it should be possible to arrive at a specific structure that is identifiable and universal. Such a complex construct will require a sophisticated method of measurement, and it might be possible only to assess specific parts, or a small portion of it. Thus, there is a need for precision to determine what is being measured, i.e. to agree and specify what aspects of creativity are measured, how and at what level.

It seems clear that the study of creativity, both for political, economic or educational reasons requires measures of individual and environmental characteristics. At the aggregate level, environmental characteristics could use existing statistical sources. It could also use existing frameworks to place the data, as the one developed by Florida (2002a; 2004) that includes technology, talent and tolerance. This article has discussed how Florida's framework could be used in Europe using some existing statistical data. The measure should include indicators on innovation, building on the work of the European Innovation Scoreboard. It should also include aspects of cultural consumption, although there is a clear need

to develop statistics in this area. Measure of heterogeneity and people's values that accept different perspectives can be found in Europe in different sources, such as the *European Social Survey* or the *World Values Survey*. The talent pillar can find more accurate indicators in the measures developed by using the *European Survey of Working Conditions* and complemented with educational entrepreneurial indicators.

All these aggregate, environmental measures should be complemented by individual level measures. Such a system for measuring creativity can only be achieved through consensus. The structure mentioned above must be discussed and agreed among the relevant stakeholders. It is necessary to find consensus on what is outside the individual that is also necessary for creativity, for example an environment that is more likely to accept new ideas. In other words, in Csikszentmihalyi's (1996; 2009) terms there is a need to construct consensually a domain and a field for a universal creativity. In a similar way that PISA has created a commonly agreed definition and framework for literacy, it should be possible to agree on a common framework to measure creative skills and on a common framework on what is outside the individual that is necessary for creativity.

The convergence of different theoretical perspectives in recent years seems to provide a window of opportunity for a consensual understanding of creativity and its measurement. In addition, the European Year of Creativity and Innovation should have provided a platform to set up a research agenda for creativity in the near future. The new strategic framework for 2020 clearly evokes the development of creativity and innovation as one of its four pillars for cooperation between the Member States. Without adequate measures to monitor progress and assess the policies in place, all could remain good intentions that do not move forward the *status quo*.

REFERENCES

- AHMAD, N. & HOFFMAN, A. (2008) *A Framework for Addressing and Measuring Entrepreneurship*, OECD Statistics Working Papers, 2 (Paris, OECD).
- AHMAD, N. & R. G. SEYMOUR (2008) *Defining Entrepreneurial Activity: definitions supporting frameworks for data collection*, OECD Statistics Working Papers, 1 (Paris, OECD).
- ANDRIESEN, D. (2004) *Making Sense of Intellectual Capital: designing a method for the valuation of intangibles* (Oxford, Elsevier Inc.).
- ARUNDEL, A. & HOLLANDERS, H. (2008) Innovation scoreboards: indicators and policy use, in: C. NAUWELAERS & R. WINTJES (Eds) *Innovation Policy in Europe* (Cheltenham, Edward Elgar).
- BARROSO, J. M. (2009) *Passion and Responsibility: strengthening Europe in a time of change*. Speech to the European Parliament Plenary, Strasbourg, 15 September 2009.
- BONTIS, N. (2001) Assessing knowledge assets: a review of the models used to measure intellectual capital, *International Journal of Management Reviews*, 3, pp. 41–60.
- BOSCHMA, R. A. & FRITSCH, M. (2007) *Creative Class and Regional Growth — Empirical Evidence from Eight European Countries (The Jena Economic Research Papers 2-007-066)*.
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1023869#.

- BOSCHMA, R. A. & FRITSCH, M. (2009) Creative class and regional growth: empirical evidence from seven European countries, *Economic Geography*, 85, pp. 391–423.
- CELIKEL-ESSER, F., VILLALBA, E. & TARANTOLA, S. (2008) The Lisbon strategy and development of metrics to measure innovation in Europe, in: STATISTICS SWEDEN (Ed) *Yearbook on Productivity 2007* (Orebro, Statistics Sweden) pp. 7–33.
- COUNCIL OF THE EUROPEAN UNION (2000) *Presidency conclusions 01/s-2000* (Bulletin 27.03.2000, PE 289.667).
- COUNCIL OF THE EUROPEAN UNION (2002) *Council Conclusions: Barcelona Council (SN 100/1/02 REV 1)*. http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/71025.pdf.
- COUNCIL OF THE EUROPEAN UNION (2007) *Council Resolution of 25 May 2007 on a Coherent Framework of Indicators and Benchmarks for Monitoring Progress towards the Lisbon Objectives in Education and Training (2007/C 311/10)* <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2007:311:0013:0015:EN:PDF>.
- COUNCIL OF THE EUROPEAN UNION (2009) *Council Conclusions on a Strategic Framework for European Cooperation in Education and Training (ET 2020)* (Brussels, European Council). <http://www.consilium.europa.eu/Newsroom>.
- COUNCIL OF THE EUROPEAN UNION & EUROPEAN PARLIAMENT (2006) *On key competencies for lifelong learning, Official Journal of the European Union, L 394*.
- COUNCIL OF THE EUROPEAN UNION & EUROPEAN PARLIAMENT (2008). Decision No 1350/2008/EC of the European Parliament and of the Council of 16 December 2008 concerning the European Year of Creativity and Innovation (2009), *Official Journal of the European Union, L 348/115–348/117*
- CROPLEY, D. (2009) Fostering and measuring creativity and innovation: individuals, organisations and products, in: E. VILLALBA (Ed) *Measuring Creativity* (Luxembourg, OPOCE), pp. 257–279.
- CSIKSZENTMIHALYI, M. (1996) *Creativity* (New York, HarperCollins).
- CSIKSZENTMIHALYI, M. (2009) A system perspective on creativity and its implications for measurement, in: E. VILLALBA (Ed) *Measuring Creativity* (Luxembourg, OPOCE) pp. 407–415.
- DAS, J., DI RIENZO, C. & TIEMANN, T. K. (2008) A Global Tolerance Index, *The Competitiveness Review*, 18, pp. 192–205.
- DEVOL, R. C., WONG, P., CATAPANO, J. & ROBITSHEK, G. (1999) *America's High-tech Economy: growth, development, and risks for metropolitan areas* (Santa Monica, CA, Milken Institute).
- EDVINSSON, L. (1997) Developing intellectual capital at Skandia, *Long Range Planning*, 30, pp. 366–373.
- EUROPEAN COMMISSION (2005) *Progress towards the Lisbon Objectives in Education and Training* (Brussels, European Commission).
- EUROPEAN COMMISSION (2006) *Progress towards the Lisbon Objectives in Education and Training* (Brussels, European Commission).
- EUROPEAN COMMISSION (2007) *Progress towards the Lisbon Objectives in Education and Training* (Brussels, European Commission).
- EUROPEAN COMMISSION (2007) *Towards more Knowledge-based Policy and Practice in Education and Training (SEC 1098)* (Brussels, European Commission).

- EUROPEAN COMMISSION (2008a) *Progress towards the Lisbon Objectives in Education and Training* (Brussels, European Commission).
- EUROPEAN COMMISSION (2008b) *Proposal for a Decision of the European Parliament and of the Council concerning the European Year of Creativity and Innovation (2009) (COM (2008) 159/final)* (Brussels, European Commission).
- EUROPEAN COMMISSION (2008c) *An Updated Strategic Framework for European Cooperation in Education and Training (COM 865 final)* (Brussels, European Commission).
- FLORIDA, R. (2002a) *The Rise of the Creative Class. . . And How it's Transforming Work, Leisure, Community and Everyday Life* (New York, Basic Books).
- FLORIDA, R. (2002b) The economic geography of talent, *Annals of the Association of American Geographers*, 92, pp. 743–755.
- FLORIDA, R. (2002c) Bohemia and economic geography, *Journal of Economic Geography*, 2, pp. 55–71.
- FLORIDA, R. (2004) *The Rise of the Creative Class. . . And How it's Transforming Work, Leisure, Community and Everyday Life* (2nd Ed) (New York, Basic Books).
- FLORIDA, R. (2005a) *Cities and the Creative Class* (Oxford, Routledge)
- FLORIDA, R. & TINAGLI, I. (2004) *Europe in the Creative Age* (London, DEMOS).
<http://www.demos.co.uk/files/EuropeintheCreativeAge2004.pdf>.
- GLAESER, G. L. (2004) *Review of Richard Florida's 'The rise of the creative class'*.
<http://www.creativeclass.org>
- GLAESER, E. L. (2005) Review of Richard Florida's 'The rise of the creative class', *Regional Science and Urban Economics*, 35, pp. 593–596.
- GORNITZKA, A. (2006) *The Open Method of Coordination as Practice — A Watershed in European Education Policy?* (Oslo, ARENA, Center for European Studies, University of Oslo).
- GORDON, J., HALASZ, G., KRAWCZYK, M., LENEY, T., MICHEL, A., PEPPER, D., PUTKIEWICZ, E. & WISNIEWSKI, J. (2009) *Key Competences in Europe: opening doors for lifelong learners across the school curriculum and teacher education (Case network reports, no. 87)* (Warsaw, Center for Social and Economic Research).
- GRAVES, G. J., BLACK, D., SANDERS, S. & TAYLOR, L. (2000) Demographics of the gay and lesbian population in the United States: evidence from available systematic data sources, *Demography*, 37, pp. 139–154.
- HOLLANDERS, H. & VAN CRUYSEN, A. (2008) *Rethinking the European Innovation Scoreboard: A new methodology for 2008–2010* (Luxembourg, OPOCE & ProInno Europe).
- HOYMAN, M. & FARICY, C. (2009) It takes a village: a test of the creative class, social capital and human capital theories, *Urban Affairs Review*, 44, pp. 311–333.
- KERN, P. & RUNGE, J. (2009) KEA briefing: towards a European Creativity Index, in: E. VILLALBA (Ed) *Measuring Creativity* (Luxembourg, OPOCE), pp. 191–207.
- KIMPELER, S. & GEORGIEFF, P. (2009). The roles of creative industries in regional innovation and knowledge transfer — The case of Austria, in: E. VILLALBA (Ed) *Measuring Creativity* (Luxembourg, OPOCE), pp. 207–221.
- LEE, S. Y., FLORIDA, R. & ACS, Z. J. (2004) Creativity and entrepreneurship: a regional analysis of new firm formation, *Regional Studies*, 38, pp. 879–891.

- LORENZ, E. & LUNDVALL, B. A. (2009). Creativity at work in the European Union, in: E. VILLALBA (Ed) *Measuring Creativity* (Luxembourg, OPOCE), pp. 157–181.
- LUBART, T. (May, 2009) *The multivariate model and its measurement implications*. Presentation at the Conference ‘Can creativity be measured’, 28–29 May, European Commission, Brussels, Belgium.
- MACLEOD, G. (2002) From urban entrepreneurialism to a ‘revanchist city’?: on the spatial injustices of Glasgow’s renaissance, *Antipode* 34, pp. 602–614.
- MALANGA, S. (2004) The curse of the creative class, *City Journal*, winter, pp. 36–45.
- MALOSZEWSK, P. (2004) Flexibility and its discontents, *The Baffler*, 16, pp. 69–79.
- MAYER, R. E. (1999) Fifty years of creativity research, in: R. J. STERNBERG (Ed) *Handbook of Creativity* (London, Cambridge University Press), pp. 449–460.
- NATIONAL ADVISORY COMMITTEE ON CREATIVE AND CULTURAL EDUCATION (NACCCE) (1999) *All our Futures: creativity, culture and education* (London, DFES).
- OECD & EUROSTAT (2005) *Oslo Manual: Guidelines for collecting and interpreting innovation data* (third edition) (Paris, OECD).
- OECD (2001) *The Well-being of Nations: the role of human and social capital* (Paris, OECD).
- PAWSON, R. (2006) *Evidence-based Policy: a realist perspective* (London, Sage Publications).
- PECK, J. (2005) Struggling with the creative class, *International Journal of Urban and Regional Research*, 29, pp. 740–770.
- PISANI FERRY, J. & SAPIR, A. (2006) *Last Exit to Lisbon* (Brussels, Bruegel) <http://www.bruegel.org>.
- RICHARDS, R. (1999) Everyday creativity, in: M. A. RUNCO & S. PRITZKER (Eds) *Encyclopedia of Creativity* (San Diego, Academic Press) pp. 683–689.
- ROBINSON, K. (June, 2006) *Do schools kill creativity?* Talk at the TED. http://www.ted.com/index.php/talks/ken_robinson_says_schools_kill_creativity.html.
- RUBENSON, D. L. & RUNCO, M. A. (1992) The psychoeconomic approach to creativity, *New Ideas in Psychology*, 10, pp. 131–147.
- RUBENSON, D. L. & RUNCO, M. A. (1995) The psycho-economic view of creative work in groups and organizations, *Creativity Innovation Management*, 4, pp. 232–241.
- RUNCO, M. A. (2007) *Creativity. Theories and Themes: research, development and practice* (Amsterdam, Elsevier).
- SCHMIEMANN, M. (2009) Linking creativity and entrepreneurship: a description of the joint OECD/Eurostat Entrepreneurship Indicators Programme, in: E. VILLALBA (Ed) *Measuring Creativity* (Luxembourg, OPOCE), pp. 149–157.
- SIMONTON, D. K. (1999) Creativity from a historimetric perspective, in: R. J. STERNBERG (Ed) *Handbook of Creativity* (London, Cambridge University Press) pp. 117–133.
- STERNBERG, R. J. (2006a) The nature of creativity, *Creativity Research Journal*, 18, pp. 87–98.
- STERNBERG, R. J. (2006b) Introduction, in: J. C. KAUFMAN & R. J. STERNBERG (Eds) *The International Handbook of Creativity* (New York, Cambridge University Press). pp. 1–10.

- STERNBERG, R. J. & LUBART, T. I. (1991) An investment theory of creativity and its development, *Human Development*, 34, pp. 1–32.
- STERNBERG, R. J. & LUBART, T. I. (1992) Buy low and sell high: An investment approach to creativity, *Current Directions in Psychological Science*, 1, pp. 1–5.
- STERNBERG, R. J. & LUBART, T. I. (1995) *Defying the crowd: Cultivating Creativity in a Culture of Conformity* (New York, Free Press).
- STERNBERG, R. J. & LUBART, T. I. (1996) Investing in creativity, *American Psychologist*, 51, pp. 677–688.
- STERNBERG, R. J. & LUBART, T. I. (1999) The concept of creativity: prospects and paradigms, in: R.J. STERNBERG (Ed) *Handbook of Creativity* (New York, Cambridge University Press), pp. 3–16.
- SVEIBY, K. E. (2001) A knowledge-based theory of the firm to guide strategy formulation, *Journal of Intellectual Capital*, 2, pp. 344–358.
- TIEMANN, T., DIRIENZO, C., & DAS, J. (2009) Tolerance, heterogeneity, creativity, and economic growth, in: E. VILLALBA (Ed) *Measuring Creativity* (Luxembourg, OPOCE) 185–191.
- VILLALBA, E. (2008a) Investigating the discourse on social cohesion through the vocabulary of European Commission communications on innovation policies, *European Educational Research Journal*, 7, pp. 358–370.
- VILLALBA, E. (2008b) *On Creativity: towards and understanding of creativity and its measurements*, *JRC Scientific and Technical Reports EUR23561* (Luxembourg, OPOCE).
- VILLALBA, E. (2009) Computer-based assessment and the measurement of creativity in education, in: F. SCHEUERMANN & J. BJÖRNSSON (Eds) *The Transition to Computer-based Assessment: new approaches to skills assessment and implications for large-scale testing* (Luxembourg, OPOCE) pp. 29–39.
- WEHNER, L., CSIKSZENTMIHALYI, M. & MAGYARI-BECK, I. (1991) Current approaches used in studying creativity: an exploratory investigation, *Creativity Research Journal*, 4, pp. 261–271.