

SYNERGY AMONG KNOWLEDGE, CREATIVITY, RESEARCH, INNOVATION AND EDUCATION

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Abstract: *The synergy among knowledge, creativity, research, innovation and education represents the crucial point of the knowledge based society, representing the main priority of the competitive development. Taking into account the globalisation, the fast technological development, and the increasing demand on information and knowledge, the education should play a major part in redefining the chain knowledge-creativity-research-innovation. The new European strategic framework 2014-2020 focuses on the smart, sustainable and inclusive growth. In this context, the role of the education system, in general and of the tertiary education in particular, is crucial from both perspectives: supporting the development of the learning society and contributing to the research and innovation activities. The education system has the major contribution in developing the new profile of the global citizen, i.e. new competences and skills: digital competences, capacity of learning to learn, abilities to manage the changes and the risk and to speed up innovation.*

Keywords: *knowledge society, creative society, learning society, global citizen profile.*

1. European policies for the development of the knowledge society

Information and knowledge stand for vital components of the society, their value being emphasised by the globalisation phenomenon and by the increased dynamics of the high-tech, especially the information and communication technologies, facilitating the accessibility to the resources and their sharing in the virtual space. In this context, the wide spread of knowledge and the creation of new knowledge represent a dynamic phenomenon with major consequences at the individual and social level. Knowledge society appeared due to the fact that the mix of the economic, social and cultural processes are more and more based on knowledge and, consequently, knowledge becomes a driver of the development and

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competitiveness, involving an equitable system of the distribution, access and creation of knowledge aiming at social development.

The European Union, in the context of the transition to the knowledge society, has established as main goal to create the framework for a smart, sustainable and inclusive growth.¹ The knowledge and innovation society is based on the integration of the new technological infrastructures with the research, development and innovation processes, as well as with the educational activities, contributing essentially to the development of the intellectual capital, as main resource of the actual society. Generating knowledge by stimulating the intellectual capital represents the key factor for increasing the competitiveness and for ensuring a sustainable and inclusive growth. In order to achieve these strategic objectives, the European Union has settled precise targets. For the research and innovation area, the targets for 2020 represent the investments of 3% from GDP for supporting this domain. For the educational area, the targets for 2020 are represented by reducing school drop-out rates below 10% and by increasing the number of persons with tertiary education completed, i.e. at least 40% of 30-34-year-olds with third level education or equivalent.

The EU strategy 2020 provides the better harnessing of the economic growth potential, having as main priorities: research, development and innovation, and the improvement of the education system. The specific programme for the research and innovation area (Horizon 2020) stipulates²:

- transforming EU in an Innovation Union;
- enhancing business-academia cooperation by creating "Knowledge Alliances";
- creating new partnerships among universities, research entities and business companies (Knowledge Innovation Communities);
- enhancing research and innovation systems, especially the private ones.

The strategic framework for research and innovation 2014-2020 has been correlated with the EU 2020 strategy, aiming at: ensuring excellence in the scientific area, supporting the industrial leadership (including the support for small and medium enterprises), providing an adequate response to the societal challenges³. In order to ensure the necessary funding for 2014-2020,

¹ European Strategy 2020.

² European Commission, (2011). *Progress report on the Europe 2020 strategy*. COM(2011) 815 final, vol. 2/5 - Annex I, p. 6-8.

³ European Commission, (2011), *Horizon 2020 - The Framework Programme for Research*

80 billion euro has been allocated for the implementation of the research and innovation policies, demonstrating their importance.

Besides the quick changes, the world faces an increased complexity from both perspectives: economic and socio-cultural. The new economic structures and processes rely on the management of information and knowledge, which has been implemented through complex technical infrastructures, based on the information and communication technology. In this context, the intellectual capital plays a major part, representing a significant rate in the capital of an organization or community.

2. Knowledge - Creativity - Research - Innovation

The knowledge society is a formal persons' association having common interests, trying to combine knowledge from specific interest areas, contributing to knowledge creation. Knowledge, as the result of the perception, learning and reasoning represents the most important component of the activities, in particular of the socio-economic processes. The activities from the economic, social, cultural areas and other human activities have a strong dependency on knowledge and information, these items representing the results and the raw material of these processes.

The society has always relied on knowledge, even if promoting it by empirical methods and means, such as observations and experiences leading to generalisations transferred from a generation to another. The mutations produced in the contemporary society consist in introducing the new technologies, breaking barriers related to space, transfer, storage and sharing information and knowledge, creating the adequate environment for the cross fertilisation of the ideas, leading to an increased potential of generating knowledge and its transformation in the most important capital of the actual society.

In the actual context the concept of the creative society is widely used, involving a reflection on creativity. Creativity is defined as the capacity of producing something new using especially the imagination, generating a new solution to a certain problem, a new method, a new artistic object or a new form of representing the reality, the ideas and the feelings. Thus there are various perspectives and debates on this topic, it is commonly agreed that this concept refers the rich meaning of the new ideas and the original way of thinking, feeling and reflecting these thoughts and feelings in

original shapes. The psychological studies revealed that there are no direct correlations between creativity and intelligence; the persons with creative skills are prone toward an apparent disorder, toward contradictions and imbalances perceived as challenges. Consequently, creativity represents a mental process of generating new ideas, concepts or new associations between existing ideas and concepts, being very popular George Kneller's approach, who has tried to formalise the complexity of the concept: "Creativity consists in rearranging what we know in order to find out what we do not know".⁴ Thus, „Men rearrange existing knowledge and experience, their one and others' into a new form or pattern".⁵

Creativity, perceived empirically as a simple phenomenon, has a high degree of complexity, creating difficulties in finding a consensus on the definition of this concept, taking into consideration that is not possible to operate always with standard techniques of evaluation and measurement. The studies cover wide areas, such as creativity as a daily phenomenon, creativity as a special phenomenon associated with the genius, creativity as a cognitive process or as process driven by a divine inspiration, creativity as a innate trait or as an education process precisely oriented in this direction, including even the artificial creativity. From a scientific perspective, the results of the creative thinking, referred as divergent reasoning, have been considered a combination of originality and specificity. Though the creativity has been associated with the art and literature, it represents the core of the innovation in the business, architecture, science and technology. Despite the ambiguities generated by the multi-dimensional nature of the creativity, it should be emphasised its role related to the development of new creative technologies, which have generated economic progress. From the economic perspective, creativity represents an important factor for recombining the elements in order to produce new technologies and products, contributing to the economic growth.⁶ Creativity has an important contribution to the capital growth (tangible and intangible), the creative products being protected by the intellectual property rights. In the actual context the creativity represents the driver of the modern economy. In the Richard Florida's view, the

⁴ George Kneller, *Art and science of creativity*, Holt, Rinehart and Winston, 1965, p.25.

⁵ Ibidem, p.12.

⁶ Romer, Paul, (1990), *Endogenous Technological Change*, Journal of Political Economy, Vol. 98, No. 5, Part 2: The Problem of Development: A Conference on the Institute for the Study of Free Enterprise Systems. p. 71-102.

economic development is based on the 3 Ts concept: Technology, Talent and Tolerance⁷.

Emphasising the role of the creativity, Daniel Pink states that a new era begins, when the right mental reasoning should be encouraged and improved, representing the advantages of the creativity and emotions related to the logic and analytical way of thinking⁸.

Despite the recognised benefits of the creativity for the development of the society, the social attitudes are still divided. The development of the creativity and of the creative techniques represents a process accepted and promoted as a necessity in the academic world. Another facet of the creativity is represented by the autonomy towards constraints and social responsibilities. Consequently, some organisations encourage the creativity as a free way of thinking, "think outside the box", which could be valorised. But the creative way of thinking is not always encouraged because it creates an inconvenient freedom degree, beyond the limits of the rules and procedures.

There are several attempts to develop an index for the creativity, similar with the intelligence quotient, but these attempts have not been successful, because of the high degree of subjectivity during the evaluation process.

Nickerson⁹, integrating both views of the academic and business areas, proposes several creative techniques:

1. Establishing the scope and the intentions;
2. Developing basic skills;
3. Encouraging the knowledge acquisition in a specific field;
4. Stimulating and rewarding curiosity and exploration;
5. Development of motivation, especially the intrinsic motivation;
6. Encouraging reliance and the capacity of managing the risk;
7. Orientation to self-confidence and to accept challenges;
8. Promoting the creativity;
9. Creating opportunities for discover and make choices;
10. Development of auto-management and meta-cognitive skills;

⁷ Florida, Richard (2002), *The Rise of the Creative Class: and how it's transforming work, leisure, community and everyday life*, Basic Books, p. 117.

⁸ Pink, Daniel (2005), *A Whole New Mind: Moving from the Information Age to the Conceptual Age*, Riverhead.

⁹ Nickerson, R. S. (1999). *Enhancing creativity*. In R. Sternberg (Ed.), *Handbook of creativity*, p. 392-430. Cambridge, MA: Cambridge University Press.

11. Using strategies and techniques for facilitating the creative performance;

12. Facilitating a balanced approach;

It is obvious that the educational system should implement intensively the creative techniques, at the secondary and tertiary level. It is not possible to measure the way of improving the creative capacity of the persons, but there are common views regarding inhibiting the creativity. There is no antithesis between creativity and discipline, however, exacerbation of structured activities lead to inhibition of creativity, with negative effects on students and teachers. In this context, the teachers show their concern about the standardized processes and tests, forcing the teachers to give priority to the facts and analytical skills, instead of creative processes. Creativity has a historical power: art and science transform people's ideas and the global perspectives, and technological innovation transforms the economic and social practices¹⁰. At the beginning of the XXI century the role of the innovation related to the economic growth is recognised, extending the concept to the non-technological innovation for improving the socio-economic processes (organisational and educational processes, social insertion processes etc.).

A conceptual issue is represented by making distinction between creativity and innovation. Innovation is defined as the process of implementing the creative ideas in a specific context. Often, within the organisation framework, innovation is perceived in a holistic way integrating the processes of generating new ideas, new approaches and actions with the processes of translating the novelty in products, services and good practices. Creativity becomes a necessary step of the innovation process, as suggested Amabile: „*Innovation begins with creative ideas, creativity representing a necessary but not sufficient condition for the innovation*”.¹¹

There are several approaches related to the innovation, such as:

1. a process of making improvements by introducing a novelty element;¹²

2. introducing a novelty element;¹³

¹⁰ Sternberg, Robert J., (1999), *Handbook of Creativity*. Cambridge, Eng: Cambridge University Press, p. 322.

¹¹ Collins, M. A., & Amabile, T. M. (1999). *Motivation and creativity*. In R. Sternberg (Ed.), *Handbook of creativity* (pp. 297-312). Cambridge, MA: Cambridge University Press.

¹² Center for Competiveness - Innovate.

<http://www.cforc.org/Services/Innovation/whatisinnovation.asp>

3. changes creating a new dimension of the performance;¹⁴
4. a materialised creative idea;¹⁵
5. capability of continuously realizing a desired future state.¹⁶

For the economic, administrative and social fields, innovation represents introducing a significant novelty in the area, not only a small insignificant change. The innovation concept refers to radical and incremental changes of the products, processes, services and paradigms. Consequently, innovation stands for an important subject for the economic, business, social and technological areas, representing a success factor of the actual economy. Innovation has an important contribution for generating the value added, being directly connected with performance and improvement of the efficiency, quality and competitiveness. Innovation could have a destructive effect, due to the fact that changing old forms and practices could generate quite high risks. A key factor in the innovation process is represented by the balanced approach of the innovation at the process and product level, where the innovation of the process involves a business model aiming at increasing the shareholders' satisfaction, by increasing the efficiency, meanwhile the innovation at the product level has as goal to increase the clients' satisfaction contributing in an indirect way to increase the profit. It should be taken into consideration, that the product innovation involves significant costs, especially research and innovation costs, being possible to reduce the profit and consequently the shareholders' satisfaction.

It should be stressed that within the cycle of generating new ideas, the research integrates all the activities involving a systemic search and formalization of the findings. For the socio-economic field, the novelty emerges as a result of various research processes based on a logic approach, experimental or accidental results. Research represents a creative process, which involves, besides the activities carried out, an original way of thinking and reacting in relation with various challenges. The practical implementation of the research results leads to innovation, representing the harnessing of the new ideas and solutions emerged within the research process. In this way, it has been identified a cycle beginning with the search of new ideas/solutions for responding to the

¹³ Webster online, *www.merriam-webster.com/*

¹⁴ Drucker, Peter (2002), *Managing in the next society*, St. Martin's Press, 2002.

¹⁵ Johansson, Frans (2004), *The Medici effect: Breakthrough Insights at the Intersection of Ideas, Concepts and Cultures*, Harvard Business School Press, 2004.

¹⁶ John Kao, *The Innovation Manifesto*, 2005.

progress requirements of a specific field, meaning in fact the research process. The research results could not be always directly transposed into practice, a specific adaptation to the real context being necessary, this process representing the transfer of knowledge to the socio-economic context, where the new solution/technologies come to life, which in fact is innovation. The challenges of the real world generate successive cycles research-innovation designed as an ascending spiral.

3. Challenges of the knowledge society for the tertiary education system

In the context of the knowledge society, based on the intellectual capital and on its creative and innovative capacity, the tertiary education becomes a key factor with two important valences, i.e. the education of the specialists for the global knowledge economy and the active involvement in the research and innovation activities. Accordingly, the tertiary education system undergoes major changes being subject of a deep reform that would allow a closer relationship with socio-economic requirements, so that the graduates will have the profile corresponding to the specialist active in the knowledge global space. For harnessing the creative and research potential of the academic area, it is necessary to enhance the connectivity of the universities with the research organisations and with the business actors. Besides these challenges, the quality of the education system, especially of the tertiary education, represents another major direction for the nearest horizon. This process of fundamental transformations will take place in each country, according to the national specific conditions and traditions, within the framework of the wide cooperation among the member states for using the best practices and experiences, aiming at creating an efficient European educational space.

A deep knowledge on the actual state-of-the-art and of the existing trends represent a requirement for the adaptation of the education system to the requirements of the socio-economic environment. The European education system has been recognised worldwide, but should take into consideration the global academic competition, especially concerning the new technologies of the information and communication, the sciences and technologies. The transition to the digital knowledge economy creates a new reality, the education system should face and have a quick and adequate response.

The working environment and the competences required on the labour market are changing. The employees' skills should correspond to

the actual major changes, such as the increased demand of knowledge and technology embedded products, the extension of the services sector, especially of the digital services and also the organisational environment changes. These requirements involve a reform of the education system, articulated with the research processes will contribute to the development of the new competences required on the labour market. Due to the dynamics of the knowledge, it is necessary to extend the learning processes lifelong in a formal or informal framework. In this context, the tertiary education has the role to ensure the adaptability of the graduates to the new environment, representing the openness to the continuous learning and to the multicultural space, created in the context of the globalisation and of the increased mobility of the work force. For achieving these goals, the tertiary education has as main priorities the development of the auto-formative skills, the development of the motivation for enlarging the knowledge horizon, the development of a systemic and creative approach in solving the problems, as well as the development of the specific intercultural skills, for a better knowledge and understanding of the cultural diversity, characterising the global environment.

Another dimension of the education is represented by the holistic approach. Despite the fact that the complexity of the actual world induces the need of specialisation for ensuring the efficiency, the education system and especially the academic one should promote a holistic approach, integrating the technic, economic, ecologic and human aspects, creating a balanced view on the future evolution. The quick progress is accelerating the changes, without permitting the necessary analysis, interpretation and filtering of the results and side effects. A conclusive example illustrating the previous assertion is represented by the new technologies of information and communication, which have produced major changes in the last decades. The technical and economic results are obvious. But which are the effects on people and on the environment? The fields created by the use of satellites, antennas and wireless communication have important technical results, but the effects on men and environment could also have negative consequences, insufficiently tested and emphasized. In this context, the mission of the tertiary education consists in promoting performance in a sustainable and balanced approach and also in defining the value of the novelty solutions in a holistic perspective.

According to the new European strategic objectives, the ministers of the education of the member states have established concrete objectives for the education systems:

- increasing the quality and the effectiveness of the education systems within the European space;
- facilitating the access to education and to the professional development;
- opening the education systems at a worldwide scale.

Another important trend affecting the education system is represented by the demographic changes. The demographic structures are changing, and Europe especially faces the ageing population phenomenon in the context of an increased longevity and working period.

The challenges of these demographic changes on the education systems involve:

- the necessity to encourage people to continuously learn in a traditional education system or in an informal way (self-education, learning on the job, learning by doing etc.), for increasing the chances to better adapt to the socio-economic environment changes and consequently to have a better social insertion;
- the need to provide information and support for learning for a longer period of time.

The demographic trends have effects also on the teachers, as the statistics data reveal. In the tertiary education area, in the majority of the European countries, the professors over 50 years old represent more than 30% of the total professors active in the tertiary system (e.g. in 2009: Romania - 33,6%; Belgium - 34,4%; Bulgaria - 52,4%; Spain - 34,3%; France - 38,7%; Latvia - 48,8%; Hungary -45,1% etc)¹⁷. Taking into consideration the retirement of the professors on the nearest horizon, this could have serious implications on the whole system, existing difficulties related to the attraction of young professors with high competences in the tertiary education. The migration flows will contribute also to significant changes concerning the professors active in the tertiary education.

The tertiary system faces major changes: on one side it needs an increased volume of information, and on another side, the information has a high depreciation rate. Simultaneously, the tertiary education cycle is long, meaning that the graduates have to face the challenges of the socio-economic

¹⁷ Own data processing and analysis, using Eurostat information
(<http://epp.eurostat.ec.europa.eu/portal/page/portal/education/data/database>)

environment after the education period, meanwhile significant changes could occur. In order to solve this issue, the tertiary education should be focused on providing basic knowledge and principles for each domain, without excessive information, using only facts and data needed for demonstrating the theories presented. Another priority is represented by the need of updating the knowledge, so that the graduates should be the promoters of the new theories and concepts on the labour market, speeding up the process of the efficient valorisation of the new technologies and theories.

Placing emphasis on developing a free way of thinking and ensuring the synergy with the openness to new represent the premise for supporting creativity.

Taking into consideration the EU Strategy 2020 targets concerning the education, i.e. 40% of the population aged 30-34 should have completed tertiary or equivalent education, the European countries could be grouped in three categories. It should be noticed that some of the European countries have already achieved this objective (e.g.: Belgium - 44,4%; Denmark - 47%; Estonia - 40%; Ireland - 49,9%; Spain - 40,6%; Cyprus - 45,1%; Lithuania - 46,1%; Holland 41,4%; Great Britain - 43%), and for the horizon 2020 will be at a higher level than the target. The second group of countries will achieve values near the target. The third group of countries estimates that will be bellow the target set in 2020. (e.g.: Italy - 26%; Hungary - 30,3%; Romania - 26,7%; Czech Republic - 32%; Greece - 32% etc.) . In this situation is also Romania, with values in 2010 of 18,1% of the population aged 30-34 should have completed tertiary or equivalent education, and in 2020 the indicator is estimated at 26,7%, Romania being on the last positions in the European space, as it is illustrated in the figure 1.

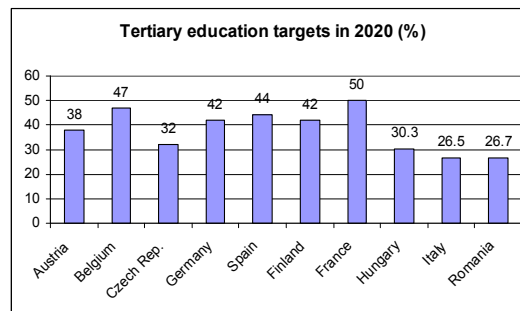


Figure 1. Tertiary education targets in 2020

Another indicator for the tertiary education illustrates the number of the graduates from science and technologies, representing a fields with an

important potential related to research and innovation. From this perspective, our country is better positioned within the European space, the value of this indicator in 2009 has been over the European average (14,3%), Romania being placed on the second position after France (France - 20,2%, Romania - 20%)¹⁸.

Beyond the quantitative aspects revealed, the qualitative approach should be emphasised, such as: the interdisciplinary and intercultural perspective in the process of generating knowledge and creativity, which should represent a horizontal component of the tertiary education.

4. Conclusions

As the main conclusion of the study, the knowledge society development depends on the synergy among the knowledge processes and the processes of stimulating the creativity, the research and the innovation. According to this goal, the intellectual capital with its innovative, relational and motivational valences stands for the core of the knowledge economy.

The increased level of knowledge, competences and abilities to generate the new depend directly on the education and lifelong learning system, which supports the development of the new global knowledge citizen. These challenges lead to major mutations at the micro- and macro-economic level, ensuring the transition to the knowledge society, characterised by a value added and competitiveness correlated with the level of knowledge and the capacity to generate the new.

The role of the tertiary education has increased as it is emphasised in the European strategic documents, implying a stronger targeting academics to research and innovation, but also a rethinking of the educational process that can create the skills and competencies that graduates need for social integration in terms of the global knowledge society. So, the education system becomes a driver for the transition to the knowledge economy, which is in fact a learning society. In addition, the difficulties generated by the financial crisis require quick and adequate solutions, which could be developed only in a wide partnership, harnessing the most advanced knowledge and the results of the research activities.

¹⁸ Data source: Eurostat / Science and technology graduates - Total.

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