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INNOVATION AND SKILLS GENERATED BY THE EXPLOITATION OF KNOWLEDGE

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Abstract:
Innovations / inventions are necessary for the future in the so-called knowledge society; they integrate both dimensions of the creative process and transform known / new ideas into viable products required by individuals to ensure sustainable growth [18]. *Beyond the various classifications, definitions or delimitations, both the countries of the world and the organizations within them have different strategies in the production and dissemination of knowledge, respectively in supporting the technical and social innovation processes. These strategies remain closely dependent, closely correlated with the degree of education of individuals available to countries / organizations involved in the global crisis (without the workforce with some skills or competencies it is illusory for firms to propose overnight to process knowledge and to obtain inventions and other knowledge). Therefore, companies need to organize their research and development activity on the basis of Drucker's principle of systematic searching of novelty elements about processes, products or markets; companies must also have human resources with certain skills and competencies.*

Key words: innovations, inventions, knowledge

JEL classification: D83

1. AN ECONOMIC PERSPECTIVE ON THE PRODUCTION AND USE OF KNOWLEDGE

There are two major concepts that emerge from an economic perspective when we discuss the issue of innovation and the results of knowledge as a process, namely "knowledge creation" and "knowledge production". When using the two concepts of "knowledge creation" and "knowledge production", most of the authors are referring to technological knowledge and technical innovation as outputs of the process [1]- [2]. In the new theory of economic growth, outputs from the R & D sector (innovations / inventions) are seen as a model / sketch for a more efficient new production process; when is patented, innovation leads to the granting of a patent / patent to its author; this patent may or may not be subsequently commercially exploited [3].

However, from the same economic perspective, the theory discusses inventions / social innovations that do not necessarily involve technical elements. Sometimes, as Peter Drucker argues, extremely pertinently, social innovation may amount to a major leap in the evolution of humanity's progress (eg. textbook, modern university) [4] - [5].

An extremely important feature of knowledge production, whether technical or social forms, embodied in innovations / inventions, is that, if viewed in terms of skills and competences, knowledge is the most important "input" and "output", alike. This is somewhat similar to an economy based on the production of wheat (where wheat produces wheat).

However, there is a difference; while the wheat used to produce wheat is consumed during the process, human abilities and skills are improved / regenerated by use (this is what we previously called the ability to self-regenerate knowledge in exploitation and dissemination processes). In essence, the more skills and competencies we use, the more they tend to grow; this remark is particularly true when we discuss about the human-specific skills / competences, as it is known that only about 10% of brain capacity is commonly exploited.

The invoked aspects demonstrate that knowledge production, as a common part of the production process, ultimately results in innovation. But in this case, innovation is a result of the process of learning and skills improvement, which is optimized over time.

We have already put forward some preliminary notions regarding the issue that we have reserved for this article (knowledge as the source of innovation), which is why some notional clarifications are appropriate. Thus, through innovation, we understand an element of novelty brought about or attributed to a particular aspect of human activity, to the previous stage of knowledge.

Similarly, by invention we understand a novelty of greater scope, which marks a new qualitative leap / step on various aspects of human activity; this element is "a plus of knowledge" to the previous stage of knowledge and may or may not be registered and patented for copyright (as a rule, patenting of the invention requires that the novelty item has not been previously published and has not a commercial exploitation). Both concepts invoked, namely innovations and / or inventions, mainly refer to technical or technological issues, but they can also be of a social nature. The issues described briefly by us about innovation, invention, knowledge creation, production of knowledge and their implications, as we see them, for the new type of economy are graphically schematized in Figure no. 1.

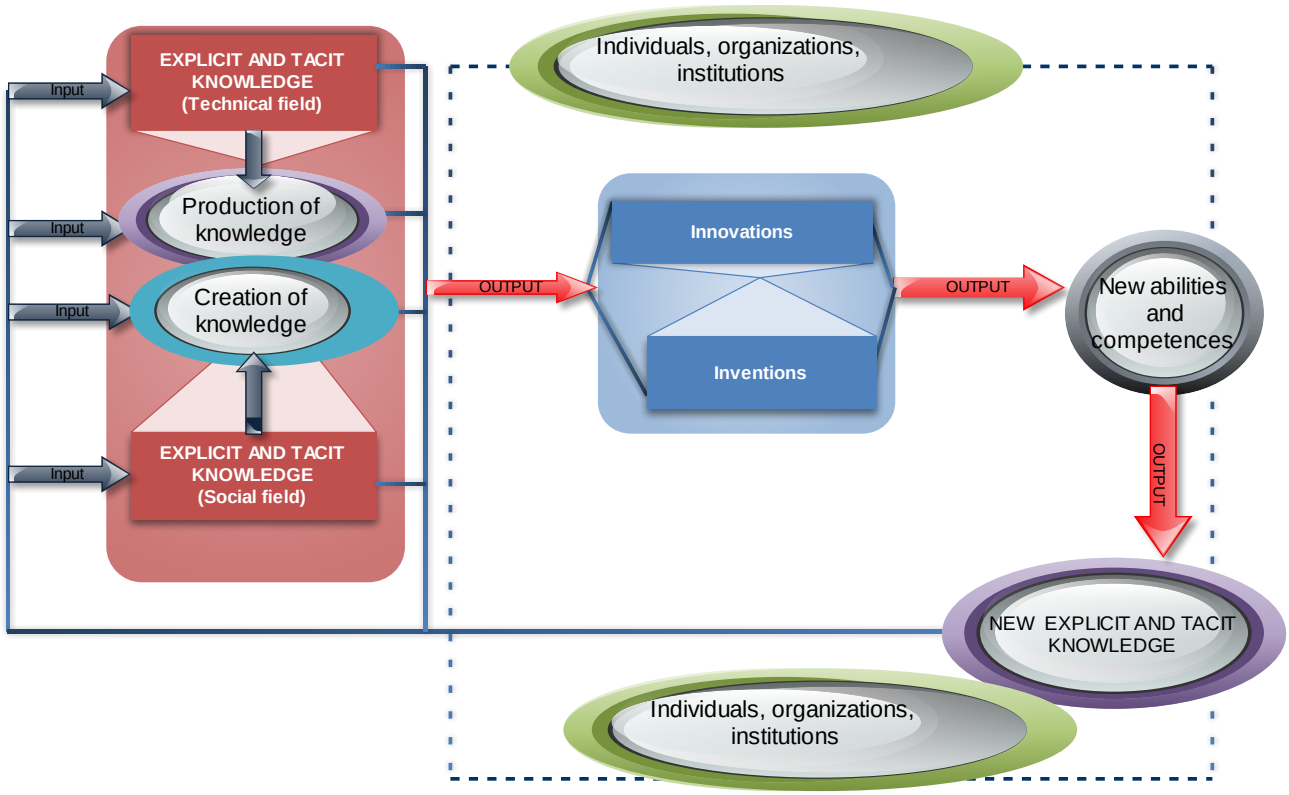

Figure no. 1. "Conversion" of knowledge into abilities, skills and vice versa

Source: Buta, S., *Human Capital and Knowledge Emergence. Induced Effects of the Global Crisis on Human capital and Innovation*, The Romanian Economic Journal (REJ), Issue 54 (Year XVII), 2014

Therefore, we consider that innovation / invention is necessary for the future in the so-called knowledge society; they integrate both dimensions of the creative process and transform known / new ideas into viable products required by individuals to ensure sustainable growth. Undoubtedly, we emphasize once again the essential position of explicit and tacit knowledge in the mechanism described by us in figure no. 1.; the two classes of knowledge become the core of any step towards social progress and will subsequently influence the allocation of technological, financial or other capital to countries or organizations. Thus, we appreciate that the quality and volume of explicit and tacit knowledge is the "key" of innovative processes that lead to prosperity in the lives of countries and organizations around the world (which means that technology, capital and other traditional resources now have a subsidiary position among the factors on which relies on economic growth) [18].

We will not insist on the mechanism described succinctly in figure no. 1, but it is fair to show that they are based on a simple analogy, starting from the Nonaka model of knowledge conversion process; This model discusses the conversion of knowledge between the two classes and the simultaneous distribution process between individuals, groups and organizations. Similarly, in the mechanism schematized by us we discuss the conversion of a stock of explicit and silent knowledge into output in the form of inventions and innovations with applicability in the technical and social field alike; but it is obvious that this output at a given moment by organizations and countries binds or even "forces" human capital to develop new skills and competences, thus generating a new absolutely specific output associated. Continuing the invoked analogy, it is obvious that the new output, which sums up "new skills and competences of human capital", becomes a type of input that in the context of acute global competition and crisis will quickly generate another exceptional output, ie new explicit knowledge silent. This conversion process suggested by us later resumes as a spiral of progress in both technical and social terms [18].

2. INNOVATION AND INVENTION, AS RESULTS OF KNOWLEDGE PRODUCTION

There are various reasons that make us consider innovation / invention as an input and output of both knowledge production. Firstly, as mentioned above, innovation is - by definition - something new and consequently adds to existing knowledge. Second, innovation is - again, by definition - knowledge that usually has to cover in social demand (a knowledge based on the necessity of the process). Innovation is also an improvement in a process, product, technology, service or any other aspect of human asset-producing activity; we notice a rather deep interdependence between the innovation seen as a process and the growing stock of knowledge existing at one time. In addition, it is obvious that in the structure of the relationship that is born between the innovation processes accumulated at a given moment and the increase of the knowledge volume in society, human capital emerges as a unique valorizing factor in the production of knowledge. The idea invoked by us, which has a wide spread in the social customs of the Anglo-Saxon countries, can be synthesized as in figure no. 2.

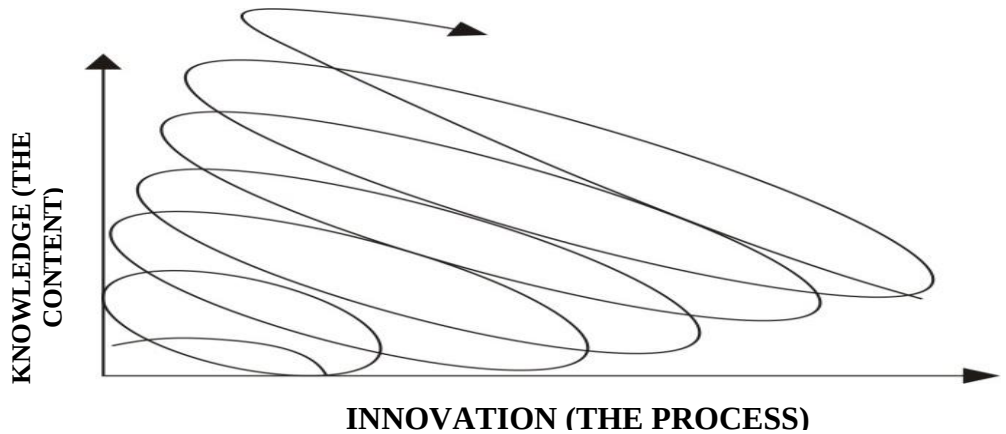

Figure no 2. Knowledge and innovation

Source: adapted from Constantinescu M., *Knowledge management through the lens of innovation and labour productivity in a knowledge based economy*, Journal Applied Economic Science, vol. III, 2008

The theory addresses the syntax of innovation and / or invention from several perspectives (we admit that we can not always clearly distinguish between innovation and invention, which is why some appreciations are also summed up only at the level of innovation and associated innovative processes, although they may involve, after case, and what we call the invention). On the one hand, it is important to keep in mind that innovation, as Schumpeter argues, is part of a process

of "creative destruction" in the sense that innovation can open new markets and create the basis for new companies and jobs ; at the same time, innovation will inevitably close the old markets so that some companies and jobs will cease to exist (so we can discuss the advantages and disadvantages of innovation and creative destruction). Of course, these consequences of innovation will also be reflected in the stock / knowledge bag used in the real economy as well as in the society as a whole, as the case may be. On the other hand, we are talking about the moral depreciation of intellectual capital, with all the consequences deriving in the economy and society from this process (for example, the "know-how" and the skills needed to produce mechanical office equipment have become obsolete when computers and other more advanced equipment were introduced).

Thus, the term innovation / invention refers in particular to the technical and technological field without, however, excluding the social one, as we have already said, by understanding a novelty element that improves the knowledge or practice of the previous stage (usually that novelty element takes the form of a product, service or "something else" recognized by the market, however, the history of science records hundreds of situations where technical inventions that have been patented and recognized as novelty at a certain time but have not had commercial applicability simultaneous mode).

Typically, as shown above, we associate the notion of innovation / invention, so novelty / improvement, with what is happening in the technical field [6].; Drucker argues, however, that innovation is more a social term than a technical one; innovation must not necessarily be technical and must not be concretized "in one thing"; social innovations such as the newspaper, insurance, buy-in, schools and universities, civil service, banks, labor relations, etc., Drucker says, have fundamentally changed the economy and modern society [7].

As it is known, the effects of the IT revolution on productivity were far more radical than expected in the theoretical plan (the so-called "Solow Paradox"). An important reason for explaining the gap between expected and achieved IT is that changes in organizational structures of companies / institutions have not kept pace with technological change; there have been a series of "discrepancies" that have negatively affected productivity growth [8]; Despite these "discrepancies," the cumulative IT-induced effect on productivity was a very favorable one.

In the process of creating and disseminating innovations / inventions, there are "discrepancies" or "gaps" in the production of knowledge, the perception of the markets, the reaction of private sector companies and society as a whole; it is not very easy to manage such discrepancies at the macroeconomic level, although this is mainly the responsibility of the governments; including the cultural matrix of the country and what we have previously referred to as social capital, may or may not favor the process of disseminating innovations (this diffusion will have implications for future innovation processes, implicitly on the stock of silent and explicit knowledge of the future).

Keith Pavitt [9] in 1984 has made an important effort to study and understand these systematic "discrepancies" that occur in the process of creating and disseminating innovations / inventions by analyzing 2,000 major technical innovations in the UK. In order to achieve its goal, Pavitt has defined four categories of companies and sectors; Starting from the conclusion reached by this analyst, it appears that certain specificities are emerging on economic sectors. First of all, there are dominant supply sectors (eg clothing, furniture, etc.) where companies develop some important innovations on their own, but also get some from competing firms. Secondly, there are intensive scale sectors (eg food, cement, oil, gas, etc.) that focus on supporting innovation processes on their own technological process; In such economic sectors the diffusion of novelty elements brought by the invention is made more difficult because patents are protected by law. Thirdly, there are economic sectors focused on innovation processes (eg engineering, software) that often focus on innovation on the product or service offered; Companies in this sector often work very closely with customers to make improvements. Finally, there are manufacturers that systematically focus on technologies, products and customer requirements alike (eg chemical, biotechnology, electronics, etc.); these companies develop new products and processes in close collaboration with universities, research institutes, and investments in their own research laboratories. For a long time it has been

considered that knowledge production through innovation processes comes largely from the fourth category of economic sectors; there is still no clear opinion on this issue, as statistical data are not relevant to the four economic sectors. The invoked assertion comes in combination with the linear innovation model that believes that new scientific results are the first step in the innovation process, technological invention is the second step and the introduction of innovations as new processes or products the third step. However, there are a number of empirical works [10] - [11] -[12] demonstrating that this succession is the exception, rather than the rule. Of all the scientific advances, very few are immediately transformed into innovations / inventions and vice versa, the concrete innovations at a given moment rarely reflect recent scientific discoveries. Beyond the aspects shown, it is widely agreed that the production of knowledge and the innovation processes associated with this type of production are facilitated by science, in different ways.

Kline şi Rosenberg [13] (1986) revised the complex interactions between science and technology throughout the innovation process, but reached notable conclusions from the differences between Pavitt on the four economic sectors.

More recent innovation models underline that knowledge production and innovation are interactive processes in which firms interact with customers, suppliers, knowledge-processing institutions, markets and other interested entities. Empirical analyzes have shown that companies rarely innovate alone; they focus on innovation when the market, technological needs, major changes in the sector or other similar factors induce the necessity of novelty elements; the context of novelty may favor a systemic approach to knowledge at the level of companies. Innovative systems are made up of 'actors' involved in innovation and the many interdependencies that arise within this system. The actors involved can be firms, technology institutes, universities, training centers and joint ventures, together creating the optimal framework for producing knowledge and innovation.

Strategic alliances vary according to sectors, regions and nations. Literature in this field [14]- [15]- [16] increasingly mentions the policy of "alliances" between research and technology companies, both at national and international level. According to commonly used classifications, there are several major ways of cooperation, namely: joint venture and research corporations; common park in R & D and understanding in development activity; technology sharing, common use of technologies and joint licensing; direct investment; sales-purchase relationships, research and development contracts, co-production; unidirectional technology flows, licensing, common sources of funding. Among the modalities invoked for scientific cooperation, direct investment and sales-buying relationships are a priority in disseminating technical knowledge and know-how between firms. The number of agreements varies from one country to another and from one field of science to another but with a higher frequency they occur in the USA, Japan and Western European countries, particularly in information technology, biotechnology and new materials (for example, the US, Japan and the EU countries have the largest number of licensed active population in the world, which means that these employees have the necessary skills to produce inventions and exploit new knowledge, again, we get to the quality of capital necessary to support innovative processes and knowledge creation).

Another distinction between economic sectors - with an important role in the analysis of education as a factor of influence in the production of knowledge on various activities - is the extent to which knowledge is well structured, processed, exploited and disseminated in society. There are large differences between the public and private sectors in the production, exploitation and diffusion of knowledge in various environments.

3. CONCLUSIONS

So, from the points raised so far, we understand that anyway we would approach innovation / invention, it historically constituted a formidable factor of progress in the evolution of humanity; In addition, it remains indissolubly linked to the individual's creativity.

In our opinion, innovation / invention based on new, scientific and non-scientific knowledge needs a longer time for application in society; the major crises in the economy, such as the current global crisis we are experiencing, determine the shortening of the period of application of a new idea that takes the form of a technical or social innovation [17].. As Drucker sees, a feature of some innovations is that they are never based on a single factor, but on the convergence of more knowledge, not all scientific or technological; of ten patents, seven or eight belong to genius-based innovations, and which, in order to be successfully applied, requires systematic work over several years. We deduce that beyond the various classifications, definitions or delimitations, both the countries of the world and the organizations within them have different strategies in the production and dissemination of knowledge, respectively in supporting the technical and social innovation processes. These strategies remain closely dependent, closely correlated with the degree of education of individuals available to countries / organizations involved in the global crisis (without the workforce with some skills or competencies it is illusory for firms to propose overnight to process knowledge and to obtain inventions and other knowledge). Therefore, companies need to organize their research and development activity on the basis of Drucker's principle of systematic searching of novelty elements about processes, products or markets; companies must also have human resources with certain skills and competencies.

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