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Knowledge Management through the Lens of Innovation and Labour Productivity in a Knowledge Based Economy

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Abstract: The 21st century brings along the recognition for the necessity to understand and measure the activity of knowledge management, for which reason organizations and system organizations, together with decisional governmental factors, do their best in order to develop policies that would promote these benefits. Knowledge management (KM) implies any activity regarding the capture and the diffusion of knowledge within the organization. In our study we analyze the impacts and dimensions of KM upon the innovation and labour productivity within the organization, and how KM affects the firm's innovative performance. A key component of knowledge management is to provide access to stored knowledge components to improve decision making and to facilitate knowledge acquisition by the user.

Keywords: knowledge-based economy, knowledge management, knowledge, explicit and implicit knowledge, innovation, productivity, diffusion of knowledge.

JEL Classification: A12, D24, L60, N0, O31, O32

1. Introduction

Innovation is built on collective knowledge sharing activities of, especially, tacit knowledge [Howells (1996); Nonaka *et al.* (1995, 2000); Gibbons (1994)]. Dialogue and frequent interaction between different individuals or groups forms the basis for knowledge recombination and creation of innovation. Due to this interaction, relationships and perspectives are shared between employees creating a cooperative atmosphere useful for the transfer of tacit knowledge [Gold *et al.* (2001)]. At this point, KM gains importance: it is seen as a managerial tool which can promote the knowledge creating and sharing processes essential for innovation. Theoretical approaches, as well as implementation strategies of KM, concentrate a lot on IT related issues [Swan *et al.* (1999); Nonaka *et al.* (2000, pp. 6), Alavi *et al.* (2001)]. However, knowledge sharing activities cannot be enhanced by IT networks alone. KM is rather an organizational device, a problem-solving tool, which increases knowledge exploration and knowledge exploitation success of firms [Swan *et al.* (1999, pp. 264)]. Hence, there is a need for a shift towards organizational and personnel issues in KM [Carter *et al.* (2001)].

2. The new model of the organization in a knowledge-based economy

In the past decades, there has been a (re)birth of the principles and practices related to education, development, and learning. With the advancement of technology and the increasing complexities of the marketplace, executives began to realize that learning no longer could be isolated to the classroom. A new *community of practice* merged to focus on the learning organization. Ray Sata (1987) and CEO of Analog Devices, in a *Sloan Management Review* article described the business implications: "... an organization's capacity to learn as their only sustainable competitive advantage – especially in knowledge-intensive industries". An entire new way to view the innovation process was born.

One way to show the relationship between these key elements of modern management is presented in Figure 1. Managers need to focus on *knowledge* as the evolution from data and information. This provides a way to describe the *content* that needs to be managed. The second focus is on *innovation* as the process. However, in this regard we are framing the process from the movement of ideas rather than the advance of technology *per se*. The *methodology*, which is the real-time *learning*, is the only way to increase the content level of knowledge and ensure business results through the full innovation process. The increasing spiral represents an

accumulation of value throughout the process if both domains (*i.e.* content and process) are managed simultaneously. Anything less is a suboptimal strategy.

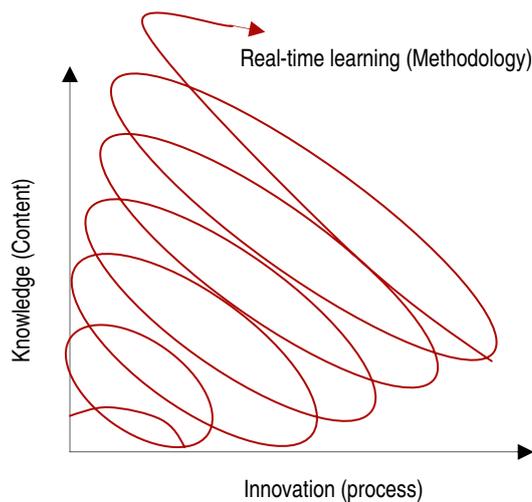


Figure no. 1. Integrated Focus: Knowledge and Innovation

Current market conditions are likely to intensify over the next decade. Organizations must develop new ways to incentivize, capture, and utilize new ideas expeditiously. The intangibles must become measurable in both qualitative and quantitative terms. The answers are unlikely to be found in current practice. In fact, the most superior benchmarking capabilities of best practices – even in knowledge management (KM) – can provide only signals of direction as companies try to gauge their proximity to the norms of best-in-class.

Internal knowledge of the firm refers to product and process specifications and capabilities, technology capabilities, inter-operability, reconfigurations, organisational culture, employee skill sets and leadership. The external knowledge refers to the knowledge of markets, competitors, technological trends, changing consumer preferences and others. It also refers to the knowledge present in other players in the marketplace and other collaboration mode acquires the knowledge for its own use [Ștefănescu and Ștefănescu (2008)].

The globalization appears when the companies, the regions, the nations and the continents are in the permanent competition in the attraction of investments, the thing that depends in a great measure on the conditions which influence the competition in the businesses. The competition in the businesses, at its turn, bases more and more on the capacity of answering promptly at the clients' needs. This thing means the control of a big volume of knowledge through the medium of the utilization of the information technology [Rodrigues (2002)]. Of course, the knowledge itself is not a new concept; it always is the base of the human activity. That what appears as the novelty is the rhythm in which it creates, it accumulates and it is diffused, in an economy and in a society based on a new scientific paradigm. The conditions of work and life were redefined, the markets and the institutions got a new form after the new rules and the possibilities of information exchange. More, the knowledge becomes not only the incomes source for the population, the businesses and the nations, but it also becomes a primary source of differentiation between these. In other words, although the knowledge is the key of the rising competition, it can also bear at a regress of the social cohesion and at a discrepancy more and more bigger between the regions, the countries and the continents.

And now the knowledge is the key source, the human factor, which materializes a big part from the knowledge, this gets a terrain more and more bigger. This thing does not lead towards a capital question: in what measure cans the well trained human source counter-balance with the European populations in the continuous process of ageing?

The European leaders already have recognized that the transition towards a knowledge-based economy also implies a fundamental exchange, and that all the provocations that Europe meets must be reformulated in the light of this terror.

3. Knowledge as strategic point

From the beginning of the 70s, the most advanced economies of the world passed through a process of structural exchange, passing from the industrial economy based on the work, with the capital resources and the creation, the diffusion and the exploitation of the new knowledge. One from the main features of this exchange is the structural intension of the research activities. In the rising *knowledge-based economy*, which is also named the *learning economy*, the economical increasing depends more on the investment in the information, what bears to the increasing of the production capacity, than the traditional factors of production [Lundvall and Jonhson (1994)]. With the other words, the knowledge brings with itself the other types of investments [Abramovitz and David (1996)]. Within the production function, where the knowledge becomes the basal factor, the human resources and the professional abilities play a more important role. The human factor is the key element in the creation of new knowledge and in the dissemination and their assimilation in the big sectors of the industrial, commercial and social life.

Process of generating information/ knowledge in the market

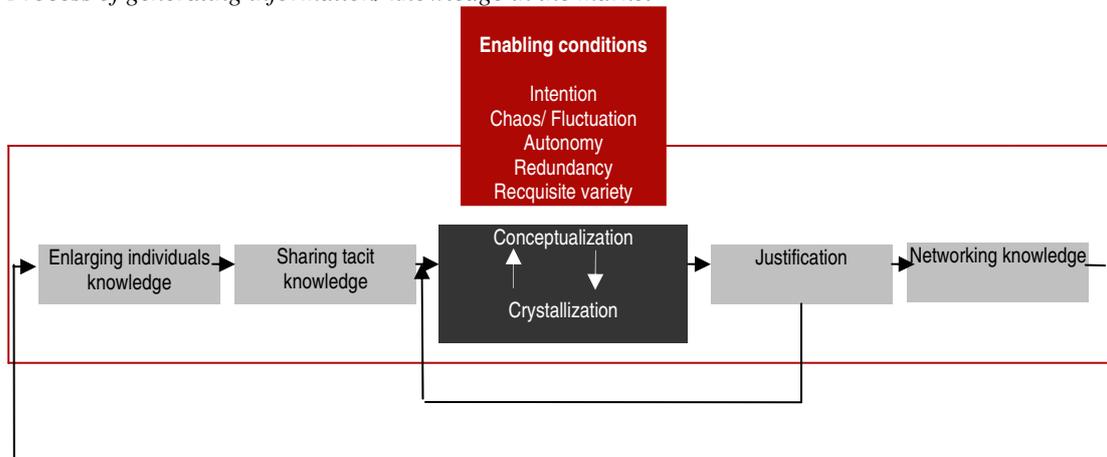


Figure no. 2. Organizational Knowledge Creation Process

Organizations play a critical role in mobilizing tacit knowledge held by individuals and provide the forum for a “spiral of knowledge” creation through socialization, combination, externalization, and internalization. As knowledge emerges as an ever more important feature of advanced industrial development, it is necessary to pay increased attention to the processes by which it is created and the assessment of its quality and value both to the organization and society.

The new elements of knowledge were however the source of the big economical progress in the past. The importance of the knowledge for the economical increasing was recognized in the speciality works from the last two centuries. The economists, as the historians always were conscious of the importance of the accumulation of the necessary knowledge for the rise on long term (see the classical operas Marx and Schumpeter). Abramovitz and David (1996) say that the importance of the intangible investment increased in a considerable way in the perspective. In the second half of the 19th century, the rise of the physical resources on the worked hour counted for the two thirds from the rise of the work productivity, and at the end of the 20th century represented only a fifth from this.

What is new is the movement of the production and of the knowledge dissemination. In the production process, in the accumulation in the infusion of the knowledge a fundamental exchange happens, and this thing had the more bigger implications than the technical or economical implications. Without being exhaustive, we could describe the **transition process towards a knowledge-based economy** from three points of view [Lundvall (2001), pp. 45 – 60; Rodrigues (2002), pp. 1 – 27; Soete (2002), pp. 28 – 53; Viginier (2002)]: the impact of the new key technologies on the process of creation, the diffusion and the exploitation of new knowledge and implicitly on the economical rise, the intensification in the production, the diffusion and in

the implementation of the technological organizational and institutional innovations; the rising impact on all the aspects of the society.

■ The impact of the new key technologies

The new technologies and their crowned of success diffusion had a decisive impact on the economy and on the society. The three new technologies are staying at the base of the transition process towards a knowledge-based economy now. Essentially, there are the Information Technologies and Communications (ITC), which remained still from the 80s. Recently, the biotechnology demonstrated that it has an increased potential and it had a recognized impact on many fields of the economical and social life. A third key technology of the 21st century is the nanotechnology. These key technologies have the revolutionary qualities. Technically, the key technologies are those which give rise to the new technologies and influence decisively those which already are existent; with the other words they have horizontal effects on many industrial sectors, with the consequences on all the economy. They can be a catalyst for the radical technological progress, which can bear not only at the exchanges in the innovation process of the firms, but they can also have a strong impact on the society. ITC, the bio- and nanotechnology seem to have all the features of the key technologies, namely they can influence strategically the new products, the processes and the employment. Really, ITC has already had an important role, as the basal mean, of collection, of stockage and diffusion of the codified knowledge. With its help the information exchange is made easier, without the temporary or partial compulsions. It increases the efficiency of the knowledge production and it hurries the accumulation of these.

The bio- and nanotechnologies have an horizontal impact on all the industries. They generate the technologies included in a larger gamut of products and of processes, as the semiconductors of nanoscale would be which will revolutionize the information technology.

More, these technologies seem to react more and more one with the other, creating the new fields and the applications as the bioinformation science (*e.g.* IT which helps at the study of the genetic chain) or the nanobiotechnology. Their use more and more often in the diverse technological borders, what makes that the distinction be made harder and the products and the processes be redefined. Therefore, the rising utilization of these technologies changed significantly the perception about the innovation process in the last decade. In fact, many authors classify the innovator capacity less in function of ability of discovering the new technological principles, but in function of ability of exploiting systematically the effects of the new combinations from the cadre of knowledge already existent [David and Foray (1995)]. The access at the knowledge of the already existent artistic works becomes more and more important and helps the innovators that they know the other innovators' work. In the knowledge-based economy, the scientific and technological system evolves towards a structure of the production of the more complex 'socially distributed' knowledge. After how Soete (2002) affirmed the ex system was more based 'on a simple dichotomy between, on the one hand, the wanted learning and the generation of the knowledge (the research labs- the development and the universities) and, on the other hand, between the activities of production and consumption, where the motivation of making was not the accumulation of new knowledge, but the getting of the contrary effects'. In the knowledge-based economy this dichotomy is somewhere destructive.

With the other words, there is a bigger diversity of 'the learning organizations', where the production and the knowledge assimilation become the basal objects [David and Foray (1995), pp. 16 – 38; Smith (2002)]. Moreover, Ștefănescu A. (2008) shows that organizations invest in information technology in an effort to more expeditiously gather and analyze information and to create and share knowledge that can be leveraged for improving performance.

The motivation of this paper is to draw attention to important issues of technology in capturing, codifying and disseminating knowledge throughout the organizations. It reflects the need to store not just different forms of knowledge, but different types of knowledge. However, it should be remembered that an overemphasis on technology might force an organization to concentrate on knowledge storage, rather than knowledge flow. New insights and opportunities

are available to organizations if they are able to integrate knowledge across shared and different contexts.

The Internet has enabled the creation of virtual communities, networked through technologies only available just a few years ago. As the Internet is becoming the standard form of collaboration between organizations, the trend of the e-knowledge network looks set to continue. While technology can greatly enhance an organization's knowledge management strategy, it does not necessarily ensure an organization is managing its resources and capabilities in the right way. However, technology is vital to enable the capturing, indexing, storing and distribution of knowledge across and with other organizations. Knowledge can be viewed in a number of other contexts, it is vital each is addressed if an organization is to improve performance.

a. Successful knowledge strategies depend on whether organizations can link their business strategy to their knowledge requirements. This articulation is vital to allocating resources and capabilities for explicating and leveraging knowledge.

b. The competitive value of knowledge must be addressed to assess areas of weakness. Strategic efforts should be made to close these knowledge gaps to ensure the organization remains competitive. The strategic value of knowledge should be addressed, focusing on the uniqueness of knowledge.

c. Finally, an organization should address the social aspects affecting knowledge initiatives, namely cultural, political and reward systems. Beyond the management roles proposed in the paper, the environment should promote co-operation, innovation and learning for those partaking in knowledge based roles.

Knowledge is more than a fad, it is now at the centre of an organization's strategic thinking. The essence of any knowledge management strategy can be summed up by the following quote, from Drucker [Drucker (1993)] "... *A company's key to success resides not so much in it's work and capital as in the capacity to treat knowledge, corporate knowledge, be it explicit or tacit.*"

■ **Technological, organizational and institutional innovations**

It is clear that the diffusion of a knowledge-based economy represents more than a temporary intensification in the production of technological innovations in some sectors.

A bigger exchange happens in all the sectors of activity, from the manufacture and the agriculture, under the influence of the new technologies. The technological innovations invade all the economical sectors and they change our lives. More, this exchange is not only technological, but includes the institutional and organizational basal innovations, because it reformulates the rules after that the economies, the businesses and the institutions works, because of the new possibilities of changing and of exploiting of the knowledge. The knowledge management becomes a key element of the strategical management, putting into service the relation between the marketing, the research and the production, and modifying the way in which the organization works. Beyond these organizational innovations, the diffusion, during the years 90, of the protection of the intellectual right for the new types of knowledge, was an essential innovation, because it made more attractive the instruments in the products and in the companies of high technology. During the 90s, the offices of European and American patent magnified the concept of invention which is protected by a patent, presenting the new field as the *life sciences*. From 1995, The *Patenting Office* approves inclusively the researches about the genetic chain. During the 90s it was recognized in USA and in a part of Europe, the author right at the software packet (the program of computer without the physical intervention). In the last years, the intellectual protection was extended by the businesses methods [Viginier (2002), pp. 148 – 152].

In USA, it helped and even it stimulated the industries of software and biotechnology, the market of the high-tech actions and the creation of pilot programs by the researchers. In this context, the development of a capital market in USA, which offers the supplementary resources for the investments in the creation and the accumulation of knowledge, became a basal

institutional innovation in the 90s, and it shows that the private financial sector is ready to invest in the new activities based on the knowledge.

The last ten-fifteen years were the witnesses of the exchanges of mark in the production process, as: the extensive use of the assisted production technologies on the computer, the advance in the information technologies and communication, the emergence of the new ideas concerning the organization of the firms, the exchanges in the requirements of the abilities which concern the work and in the workers' preferences for the conditions of more flexible work. Starting from this premise, of recent date, the numerous authors formulated a new paradigm of the firm. Some from these concentrated their attention on the technological exchanges, some of them found that the introduction of the new organizational practices represents the main feature of this paradigm of the exchange.

A third group concentrated, first of all, on the exchange which intervened, in the last 20 years, in the demand at the level of the firm for the force of highly qualified work and at same the time on the analysis of the factors which led at this exchange.

Milgrom and Roberts (1990) concentrated their attention on the manufactured, proclaiming the replacement of 'the production of mass by a vision of the flexible firm and by a multi-product vision which is characterized through the quality and the big speed of answer at the conditions of the market, while they use the equipments of advanced technologies and the implications of these for the efficiency and the performance of the firm and of the new form of organization'. The exchanges concerning the techniques of production and of the implication of these for the efficiency and the performance of the firm are the principal subjects of their theoretical analysis.

Lindbeck and Snower (2003) analyze the exchange starting from 'the taylorist organization (characterized by the charges specialization) at the holistic organization (the relation of the posts, the integration of the charges and the learning from the charges)'.

Bresnahan (2003) considers that the relative demand of force of highly qualified work being the departure point of the analysis, considering that the rising use of the complementary systems of the information technology, the placement of the force of highly qualified work within the organization and the innovative products are the motors of the technological exchanges. A central point in all the types of analysis and a common feature of these studies is the existence of the complementarity between the factors which bear at the mutual rise of their impact on the performance of the firm. From the variety of the realized investments in the knowledge field (the education, the software, the research-the development, the training, etc.), the knowledge management (KM) is the least known equally, quantitatively and qualitatively, but also that of the implied costs and of the balance of this in the profit of the organization. The motivation which stayed at the base of this study starts from the imperious need to know more about these new activities based on the knowledge, about the actual state of the KM as the organizational process between the diverse types of companies and sectors, the multitude of methods and instruments which also developed on the economical effects of the actual practices of the KM.

The denomination of knowledge-society is used in the entire world today. This denomination is a abbreviation of the term of knowledge-based society. The knowledge society supposes [Drăgănescu (2001)]: an extension and the thoroughness of the scientific knowledge and of the truth about the existence; the use and the KM which is existent under the form of the technological and organizational knowledge; the production of new technological knowledge through the innovation; a dissemination without the precedent of the knowledge to all the citizens through the new means, using prevalently the Internet and the electronical book and the use of the learning methods through the electronical procedures (e-learning), the knowledge society has a global character and it is a globalization factor; the knowledge society is fundamentally necessary for assuring a sustainable society ecologically ; the knowledge society represents a new economy in which the innovation process (the capacity to assimilate and to convert the new knowledge for creating the new services and products) becomes determinant.

The innovation, in the knowledge society, follows the improvement of the productivity, not only the classical productivities in rapport with the work and the capital, but also the new productivities in rapport with the energetic resources and the natural materials, with the protection of the environment. Because of that the new economy supposes the encouragement of the creation and of the development of the innovator enterprises with a structure of own knowledge. The alike enterprises can be born through the cooperation between the firms, the universities and the governmental or public institutes of research (inclusively the academic institutes).

There were defined two big classes of vectors of the knowledge society [Drăgănescu (2001)]: the technological vectors; the functional vectors. A vector of the knowledge society is an instrument which transforms the informational society in a knowledge society. For making the first steps in the knowledge society it is necessary the detent of a minimum number of alike vectors. The first alike vector is the creation of an developed Internet which is a technological vector, then the technology of the electronical book (the technological vector) and the knowledge management, (the functional vector with two valences, one for the economical and organizational working of an enterprise, of the corporations, of the multinationals or of the companies, the other for the moral use of the knowledge in the globalized society). But the number of these vectors of the knowledge society is much bigger, every new vector bringing a step before in the development of this society.

4. Knowledge management for enterprises, organizations, institutions, national and local administrations

One from the first studies of our country regarding the KM was published by Ștefan Iancu (2001). In this study the accent is put on the notion of intellectual capital and of economical, instructable and innovator organization. In the occidental literature [Thomas and Prusak (1998); Koulopoulos, Spinello and Toms (1997); Leonard-Barton (1955); Nonaka and Hirotaka (1995); Thomas (1997)] a series of dedicated volumes to the enterprises and to the knowledge appeared.

The problem of the management in rapport with the knowledge is looked in two ways: as the organization management which is preoccupied of the utilization and of the integration of the different types of knowledge; as the proper knowledge management. In fact, these aspects must normally joint in a general vision about the organization and the knowledge management.

The specialty literature abounds in the definitions of the KM [Earl and Scott (1999), pp. 29 – 38.]. The most referred definition of the KM is in our opinion the definition given by the Knowledge Management Practices Survey in accordance with which, ‘...the knowledge management implies any systematical activity regarding the capture and the diffusion of the knowledge by the organization...’ Another assimilated definition of the KM concept would be that this represents the conceptualization of an organization as integrated system of the knowledge, and the effective management of the organization uses the respective knowledge.

The information refers to the knowledge and the innovation processes and at the artifacts which tolerate them.

In this definition, the accent is put on the organization management which must in fact include KM, too. The anterior definition avoids, it is recognized, not only the KM, but especially the extremely delicate problem of the knowledge measurement. The diverse authors present the considerations about the different aspects of the KM in the largest meaning of the notion or only from one from the two mentioned points of view before. Thus, C. Grayson shows in every organization there are the hidden knowledge tanks which are not known and which must be knowledge minings, captured, organized and transferred for contributing at the rise of the value, of the profit and of the efficiency. Ravindranath Madhavan and Rajiv Grover (1998) give attention to the KM for the *development of new products* (DNP). The DNP management must put the accent on the processes of the cognitive groups and not on the social processes, for using the tacit knowledge of the members and for becoming interesting firstly for the members of the group. The group needs a leader who constitutes such a group. Lucy Marshall (1997) shows that

the KM refers to the control and the utilization of the intellectual capital in an organization. The author affirms clearly that not information, but the knowledge is the biggest asset of a institution. He recommends that an institution have a Chief Knowledge Officer. This must count on the intranet of the institution for assuring the discovery and the creation of knowledge in the institution.

For Romania, the phenomena and the processes which happen on the international plan, contouring the transition from the industrial society at a new type of society, represents a chance, that of the integration in the process of transition from the industrial society at the knowledge society, without running over all the preliminary stages. The Romanian reconstruction can determine the fundamental mutation which stays at the base of this transition: the mutation from the specific institutional centre of the industrial society (the enterprise) at the institutional centre of the knowledge society, the school and the research institutes, which does not act 'from outside' of the productive system, but as the endogenous factors of the production process.

5. Knowledge management and its role within the innovation and productivity

■ Innovation management (IM) and knowledge management (KM)

The consequence of the three big tendencies, the comprehensive analysis of the KM must take in consideration the KM importance for the innovation process. First of all, in an unquestionable way, the innovation capacity is the major precondition for resisting to the pressure of the competition, and the companies became more efficient, increasing the speed of propagation of the innovations and the maximization of the achievement of their innovative potential. Secondly, the knowledge economies relieve the importance that the knowledge has in these economies, as moreover the rising impact that the innovation has. As a consequence, the strategical management, and especially the operative management uses more and more the KM instruments. Thirdly, the companies become more and more limited when they must provide the input for the innovation, especially on the resulted innovation from the research and the own development. This fact led at the increasing of the demand and the absorption of the knowledge which are come from the external sources of the company and their integration in the company. These three tendencies make the connection with KM and IM, the sensible fields, if not the indispensable fields of the firms of the 21th century.

■ Knowledge management and innovation

Our general presumption is that KM increases knowledge work performance and by this the innovative success of firms. This consideration is based on the *resource-based view* (RBV) of the firm (Barney, 1991; Wernerfelt, 1984, Rumelt, 1984). The RBV views idiosyncratic resources as main source of competitive advantage. Since firms are not equally able to generate valuable and embedded resources out of their assets, they perform heterogeneously. In his definition, Barney (1991) emphasizes organizational processes as a resource and particularly discusses information processing systems as factor of competitive advantage. Following this, we view KM as resource which directly increases the success of firm's innovative activities and by this causes heterogeneity amongst firms. This presumption is made explicit for the innovation success of firm *i* being dependent on her innovation resources, her innovation cooperations and her knowledge management.

Table 1. The enhanced exploitation of innovation through KM at organizational level

Hypothesis based on the empirical literature	Action at organizational level	Empirical studies and revised literature
Knowledge Management and Innovation		
InnoSuccess _{<i>i</i>} = f (InnoResources _{<i>i</i>} , InnoCooperation _{<i>i</i>} , KnowledgeManagement _{<i>i</i>})	<i>KM directly improves the innovation success of firms</i>	Recent empirical work treating KM as resource in the sense of the RBV sustains the direct impact of KM on firms' innovation success. This positive impact is shown by Liao <i>et al.</i> (2006) who suppose that KM makes firms more receptive to innovation opportunities. Huergo (2006), by using a

Hypothesis based on the empirical literature	Action at organizational level	Empirical studies and revised literature
<p>production function model, hints to the positive influence of technology management on the generation of both product and process innovation in Spanish manufacturing firms. In a qualitative study Gold <i>et al.</i> (2001) find evidence for the organizational effectiveness of different KM tools. Due to an OECD initiative several countries conducted surveys on KM, amongst them Germany [Edler, (2003)], France [Kremp <i>et al.</i> (2003)] and Canada [Earl <i>et al.</i> (2003)]. They find similar positive impact of KM on innovation propensity.</p>		
<p>Knowledge Management and internal innovation assets</p>		
<p>InnoSuccess_i = f(InnoResources_i x KnowledgeManagement_i, InnoCooperation_i)</p>	<p><i>KM improves the exploitation of existing internal resources leading to an increased innovation success.</i></p>	<p>If we want to know, which impact KM has on the firm, how it enhances innovation in detail, there is a need to look closer on the firm assets involved in the knowledge recombination process and especially addressed by KM. We suppose to discover KM impact in the successful exploitation of a firm's innovation resources. Hence, we expect KM to act as "meta-resource" behind a firms' resources. We define meta-resources as idiosyncratic organizational resources of a firm, which yield the inherent potential to increase the effectiveness of use of existing resources in a firm. This view can be related to the discussion of dynamic capabilities of firms [Eisenhardt <i>et al.</i> (2002)], defined by Teece <i>et al.</i> (1997) as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments."</p> <p>By calling the capabilities dynamic Teece <i>et al.</i> (1997, pp. 515) refer to the ability to renew competences in order to adapt to changing business developments. These facilities are labelled capabilities because "... the term emphasizes the key role of strategic management in appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences to match the requirements of a changing environment".</p> <p>The pure accumulation of technology assets alone does not make the market successor, since there may still be a lack of useful capabilities. The key is to implement a management that coordinates and deploys internal and external competencies effectively (Teece <i>et al.</i>, 1997). Ray <i>et al.</i> (2004) claim that resources per se can only be source of competitive advantage if they are applied, if "something is done with them". The resources have to be exploited through business processes in order to be used more efficiently. This, however, is to be seen only as possibility, because not all assets can become valuable scarce resources by exploitation [Ray <i>et al.</i> (2004); Porter (1991)]. Hence, KM can be seen as firm process improving capability or as meta-resource. Drawing on the notion of KM as part of a meta-structure behind all valuable, rare and hard-to-imitate resources, we assume that KM affects the assets deployed in the innovation process itself. We assume KM to leverage the internal innovation assets of firms</p>
<p>Knowledge Management, absorptive capacity, and external innovation assets</p>		
<p>InnoSuccess_i = f(InnoCooperation_i x KnowledgeManagement_i, InnoResources_i)</p>	<p><i>KM improves the absorptive capacity of firms leading to an increased innovation success.</i></p>	<p>Since Cohen <i>et al.</i> (1990) the firms' capacity to value external information, to assimilate and commercialize it, is labelled absorptive capacity. In order to achieve an effective integration of external knowledge there is a need for an advanced system of knowledge processing. The conception of such a system, called absorptive organizational capacity [Cohen <i>et al.</i> (1990)], has gained increased attention and has inspired studies on knowledge management [see for example</p>

Hypothesis based on the empirical literature	Action at organizational level	Empirical studies and revised literature
		<p>Coombs <i>et al.</i> (1998); Caloghirou <i>et al.</i> (2004); Lenox <i>et al.</i> (2004); Yang (2005)]. Different studies following Cohen <i>et al.</i> (1990) consider those organizational aspects of absorptive capacity. Kogut <i>et al.</i> (1992) propose that the existing knowledge stock cannot be regarded separately from its level of organization, or the firm's combination capabilities. Van den Bosch <i>et al.</i> (1999) suggest organizational aspects as vital determinants of absorptive capacity. They consider the organizational form and the combination capability as important elements of a firms' absorptive capacity, which itself is viewed as co-evolving with the knowledge environment [Van den Bosch <i>et al.</i> (1999)]. Regarding the special case of interfirm R&D cooperation, Schmidt (2005), by using data from the "Mannheim Innovation Panel", finds evidence for the relevance of knowledge management to improve absorption of external knowledge. An elaborated human resource and knowledge management is confirmed to improve a firm's absorptive capacity, counted as realized R&D cooperations of firms. R&D cooperation contributes to a large extent to the innovative success of firms [Barringer <i>et al.</i> (2000); Hakansson <i>et al.</i> (1988); Powell <i>et al.</i> (1996)].</p> <p>To successfully exploit R&D cooperation, there is a need for organizational capabilities especially addressing the leveraging of interfirm relationships [Lorenzoni <i>et al.</i> (1999)]. The ability to organize R&D cooperation, to prevent of "inventing the wheel twice" or to successfully integrate external knowledge affects also the benefit out of R&D cooperation.</p>

Thus, a firm undertaking R&D cooperation faces two challenges: first, to recognize the needed valuable external knowledge out of R&D cooperation and second, to successfully manage, integrate and commercialize R&D cooperation and new ideas developed. Taking into account that firms with KM capabilities can better organize such cooperation, we hereof expect a positive effect on innovation success.

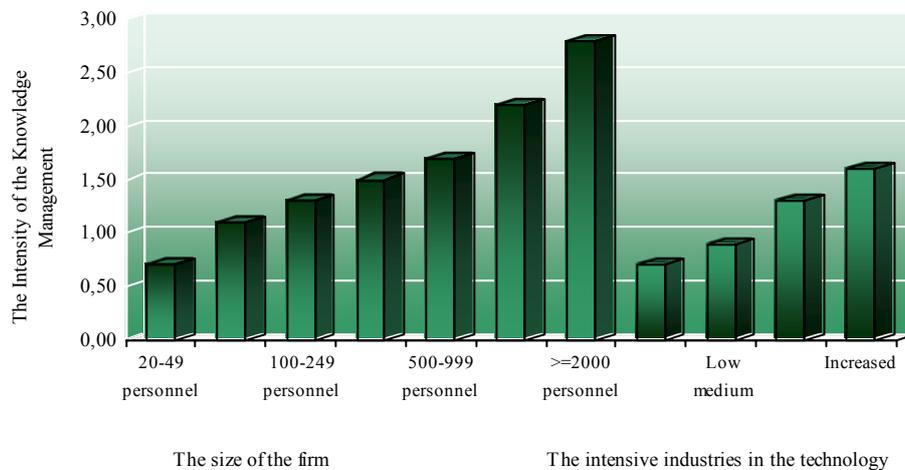
As the international statistics show, the diffusion of the KM practices are far to be complete in the range of the innovation firms or of the firms which have the patents, which moreover are more advanced than the non-innovative or non-patented firms (see the table 2) [Brelade (2002)]. This fact makes us to try to estimate the specific impact of the introduction of the KM practices in the performance of the innovative firm, observing the factors and the features of the firm. For evaluating the innovative performance, we can use four variables: the inclination towards the innovation, the intensity of the innovation (of the product), the inclination towards the patent and the intensity of the patent. The first two indicators show if the firm 'introduced in the period submitted to the analysis the new or significant improved products', and if yes, 'the part of profit which comes from the new or significant improved products from the total of the firm profit from the current year.' The other two variables, defined in a similar way show if the firm 'has the valid patented products at the end of the current year', and if yes, 'the part of profit protected by the patents in the obtained profit total in the current year'. The medium inclination towards the innovation and the medium inclination towards the patent are 35 % and respectively 20%, while the medium intensity of the innovation (of the product) is 15%, for the innovative firms, and the medium intensity of the patent of 30% for the firms which have the patents from the EU countries.

Table 2. The diffusion of the KM practices, in accordance with the adaptation of the new management methods at the research-the development and the innovations in the main firms of the European Union, in the year 2004.

Firms	% firms	% from the firms which					KM Intensity
		diffused the knowledge culture	adopted the policies for keeping the personnel	made the alliances for the acquisitions in the knowledge field	adopted the policies in the KM field	adopted at least one from the four policies	
Firms Total		28	27	23	17	45	0,9
Firms which make the research-the development	30%	45	42	39	28	71	1,6
Firms which do not make the research-the development	70%	20	20	15	12	34	0,7
Firms which adopt the innovations	34%	41	42	38	26	68	1,5
Firms which do not adopt the innovations	66%	19	19	14	12	34	0,7
Firms which have the patents	20%	40	39	35	26	62	1,4
Firms which do not have the patents	80%	25	24	20	15	41	0,8
Firms which adopt the new management methods	21%	51	47	42	29	76	1,7
Firms which did not adopt the new management methods	79%	21	21	17	14	37	0,7
Innovative Firms from which:							
- they use the Internet and TIC for distributing the information	28%	62	56	51	39	82	2,1
- they do not use the Internet and TIC for distributing the information	68%	37	36	34	21	63	1,3

Source: SESSI, CIS3 Survey.

Figure no. 3. The KM intensity, after the size and the intensive industries in the technology in the EU countries, in the year 2005



The KM intensity is equal with zero when the firm does not implement either one from the four practices of the KM, and 1,2,3 or respectively 4, when the firm implements at least one, two, three and respectively all the four practices of the KM. The classification of the industry from the point of view of the technology intensity bases principally on the report between the research - the development and the industrial production. For the firms with over 2.000 wage workers, the KM intensity is 2,7; The firms which have the highly intensive industries have a KM intensity of 1,6.

Source: SESSI, CIS3 Survey.

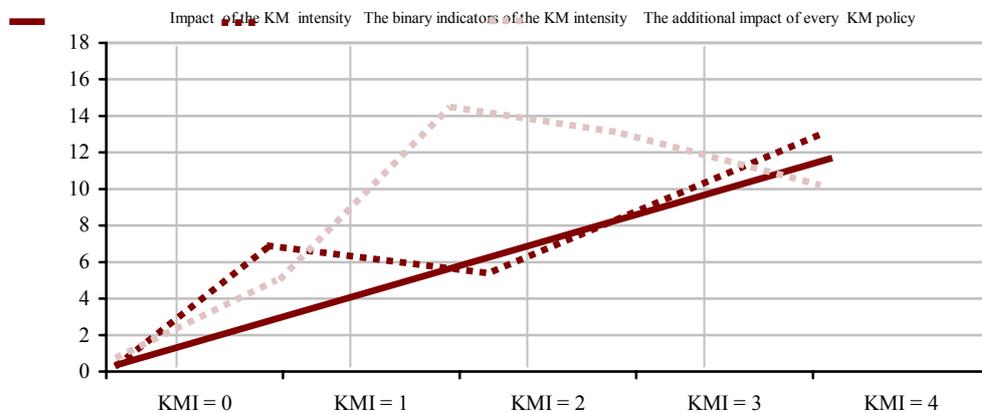
The fact that the variables the patents intensity and the innovation can be known only by the innovative firms and by the firms which have the patents constitute a selection source, which result in the estimations, if we estimated separately the intensity of the relations, from the relations which result from the inclination towards the innovation and the inclination towards the patents. These estimated impacts of the KM policies on the firm performance are important, and the more since these are cumulative. These do not have a overwhelming importance of weather that we can conclude that they are a necessary evil (*“ils sont trop beaux pour être vrais”*), having to be overvalued and the unspecified model. A duplication of the medium expenses with the

research-the development at the rate of the wages, which is 1,7% for the innovative firms and 2% for those which have the patents, they will increase the innovation intensity at only 1,2%. A potential cause for these estimations, with the more reduced amplitude can be that in the place of the size of the flux of the expenses with the research-the development. The estimated impacts of the implementation of the new management methods are statistically significant and equally substantial, having the same impacts as those of evidence field that the firms which belong to a group aspire to have more and more patents, while the lower firms aspire to become more and more innovative, not founding a specific impact in the utilization of the Internet and of the Information Technology and Communication (ITC) for the acquisition and the diffusion of the information. As there was to expect, the impact of the firm and particularly, concerning the impact of the size on the inclination towards the patent and on the intensity.

■ Knowledge management and productivity

Also, concentrating on the innovative performances of the firm, it is important that we investigate if the adaptation of the KM practices has a specific impact, equally a statistic and economical impact, on the work productivity. Proceeding in this way, we use practically the same models as in the case of the innovations and of the patents, but with two differences. The first difference consists in the fact that we can bet on the specification of the linear regression. This regression can appear as a simple extension of the production function, which is currently used in the econometric studies of the productivity of the research-the development. The second difference consists in the fact that we introduce the physical wage capital as the control variable, this being a variable which measures the productivity differences between the firms. The estimation results and the tests for the productivity are represented graphically in the Figure no. 4. The tests of the four models correspond to the different ways of introduction of the knowledge management in the productivity equation, on the innovation and the patents.

Figure no. 4. The impacts of the KM practices on the work productivity



The figure no. 4. illustrated the estimated impacts on the adaptation of the KM practices, where: The line which represents the impact of the KM intensity corresponds to a regression which uses the KM as variable, varying from 0 to 4; The line which represents the binary indicators of the KM intensity corresponds to a regression which uses the four binary indicators of the KM intensity, varying sequentially from 0 to 1; The line which represents the additional impact of every KM policy corresponds to the regression which uses the four indicators of the KM varying from 0 to 1 in the following order (irrelevant, moreover): the KM culture (C), the retention policy of the KM (R), the alliance policy of the KM (A), the KM policy (W).

Source: SESSI, CIS3 Survey

It is clear that the four policies of the KM do not appear as changeable and they remain only partially cumulative. All these policies being equal, the work productivity is more increased, with 10% for the firms which implement a policy of keeping of the personnel and of the managers (R) towards the firms which do not adopt the such practices and with 5% bigger in the firms which promote a culture of the knowledge diffusion (C) towards the firms which do not practice the such methods. At the opposite pole, in the same equality conditions of the four

policies, the work productivity is not statistically different within the firms which declare that they adopted or not an establishment policy of alliances for the knowledge acquisition (A) and a knowledge policy (W).

The estimated elasticities of the intensity of the physical capital and of the research-development intensity, although they have the low levels, are however considered consistent towards the level of the work productivity. Contrarily, towards the innovation of the new productivity methods are insignificant, if not negative.

The diffusion of the four KM policies is much stronger in the big firms and in the intensive industries in the technology, and although these practices appear as being complementary, the firms aspire to adopt them together. The impacts of the KM practices on the firm performance are generally statistical and economical, significant and more and less cumulative, even the industry and the other important factors as the research –development intensity and the intensity of the physical capital. Less to desire it is the situation in which the four specific practices of the KM are not cumulative, but interchangeable in the appearance, in the case of the innovative performance. In this case, the model on the KM intensity, varying from 0 to 4, for the implemented practices by the firms, represents statistically one from the four individual indicators of the KM. An explanation can be found in the colinearity (or the big correlation) of these indicators reflected by the complementarity of the KM practices, but also by the subjective nature of such linear indicators, which are the sources of measurement of the errors. Also, the finding of the estimated impacts of the implementation of the new management methods constitutes a problem, which in the large sense they are as big as the impacts of the KM practices on the innovative performances of the firm while the work productivity can be negative, in contrast with the positive significant impacts of the wage workers' retention and of the culture of the diffusion of the KM culture (R and C).

6. Conclusions

In the modern knowledge-based economies, the firms increased the individual and collective knowledge as the major factor of the economical performance. The firms were bigger and their relations with the intensive industries in the technology were stronger, they were in measure to implement the KM policies, as they promoted the culture for the information and the diffusion of the knowledge, motivating the personnel and the managers that they remain in the company, making the partnerships and the fusions for the acquisition of the knowledge, implementing the KM rules. The micro-econometric analysis of the firms from the EU countries confirms that KM contributes significantly at the innovative performance of the firm and at its productivity. The impacts of the adaptation of the four practices if the KM at the performances of the productivity and of the firm innovation do not depend obligatorily on the firm dimension, the industry, the made efforts in the research-the development or the other factors, but they persist at a considerable extension after the observation of these four factors. These four practices are strongly complementary, in the sense that the firms aspire to adopt them, but in the sense that their impacts on the firm performance aspire to be cumulative. The specific impacts of the individual practices are not statistically different of the innovative performance of the firm, measured in the terms of the inclination and of the innovation intensity and of the patents. What seems to count is the number of the different practices of knowledge management that the firms implement, and that we can interpret as the Intensity of the Knowledge Management.

For the work productivity, the adaptation of the incentive policies for the keeping of the personnel and of the managers becomes surely a priority, and the promotion of a culture of the knowledge diffusion, becomes a second priority, while the estimated impacts from the other two policies are not statistically significant.

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