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University as ‘Agent-Based Social Systems Sciences’

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ABSTRACT

The last fifty years have been a period of continuous acceleration of technological innovation.

Our duty today is to accompany the entry of our enterprises and our universities into this knowledge society, a society where the creation of value goes through innovation, creativity, participation and competitiveness on a worldwide scale. Furthermore, competitiveness in terms of innovation supposes research that ensures quality knowledge, education and training, which may guarantee the competences and the quality of the intellectual stock needed by the enterprises.

We may consider as a new function of the university the construction of the “agent-based social systems sciences”, not only through what it transmits, but also through a possible organisation, such as: professor (individual) and university (organisation).

It requires enhanced adaptability, flexibility, and mobility, complex cooperation and coordination systems with an extended network of partners, clients, suppliers, “coopetition”, and lifelong learning.

The universities have to reflect upon the past, to ensure the research capable of inventing the rules of an economy of the intangible, and to integrate “human capital”. If, from a utilitarian angle, the knowledge society may be defined as: “Bring me the information I need, when I need it, and if possible, even if I don’t ask for it”, the role of the university could be defined as: providing the knowledge that ‘clients’ need, when they need it, anticipating the evolution of demand for knowledge and competences and, if possible, providing it in everybody’s home or office.

Keywords: Knowledge Management, Knowledge Society, agent-based social systems sciences, entrepreneurial university, knowledge economy.

1. TECHNOLOGICAL INNOVATION

The last fifty years have been a period of continuous acceleration of technological innovation, with consequences in terms of:

- adopting new organisational models, based on information flow;
- emerging of new industries, new actors, and new intermediary professions;
- development of a knowledge society capitalizing on intangible assets, such as human competence;
- accession of new territories and advent of a new form of citizen mobilisation;
- the role of higher education and new functions of universities.

Globalization and the undergoing process of the creation of knowledge society challenge both universities and undertakings. This requires for both of the structures mentioned the *enhancement of their capacity to adapt and to properly respond to the fast changes occurred in the social and economic climate*. Analyzed in an historical perspective, the progress of the human society is definitely dependent on the production of new knowledge, knowledge dissemination and management. “*The ability to invent and innovate, that is to create new knowledge and new ideas which are then embodied in products, processes and organizations, has always served to fuel development*” (Davis Paul & Dominique Foray, 2001) [1].

2. THE PHILOSOPHY OF COMPETITIVE KNOWLEDGE BASED ECONOMY

Knowledge, innovation and competitiveness are the key elements for any organization and policy makers in Europe for addressing this goal. Peter Drucker stated that “*knowledge is not only a new resource added to the traditional factors of production – labour, land, capital – but the only resource which has real significance today*” [2]. In this process knowledge based economy, innovation becomes the most important tool for enhancing competitiveness at macro and micro levels. Innovation overcomes the scope of research. Learning

becomes important since it provides the human capital with knowledge, abilities, competences which, once added to the creativity and the intellectual potential, become valuable inputs for knowledge production and innovation. New knowledge will be assimilated through learning. Education and training ensure proper conditions for knowledge dissemination.

3. THE NEED FOR UNIVERSITY-INDUSTRY INTERACTION

The *knowledge based economy* cannot exist unless the production of knowledge and the valorization/use of knowledge into economic process are interconnected. Thus, it is not the stock of knowledge which will trigger the knowledge based economy, but its availability, its efficient use into economic processes. Therefore economic system will not become more competitive unless the knowledge producers, academic system, are able to convert the new knowledge into inputs for economic processes. The new knowledge produced should be absorbed, at a very high rate, by the economy. In this respect, the knowledge producers' responsiveness to economy needs should be fostered.

Taking into consideration the following logical chain (fig. 1) [3]:

- Knowledge is the outcome of the research system,
- Transmission of knowledge is possible throughout education and training activities,
- Innovation depends on the quality of the intellectual stock and competences available within an university system and economy system and the capacity to exploit knowledge,
- Competences needed for the production and competitive use of the knowledge are the outcome of the education and training activities developed within university system,
- Innovation is gearing competitiveness,
- Competitiveness is the key element of the philosophy of the European knowledge based economy,

it becomes obvious *education, training and research are strategic tools for building the knowledge based economy. These activities are performed within European universities which remain the cornerstone of the knowledge production, transmission and diffusion like "agent-based social systems science"*[4]. Thus, university becomes the key institutional resource of the European knowledge based economy. In Europe, the universities continue to remain the main producer of knowledge and competences. Universities should not perform their tasks in a narrow, limited manner. Since progress and competitiveness are geared by the production of knowledge and by its efficient use, the

knowledge produced in universities should be transferred to its users. Industry is the user system of the new knowledge and competences produced by the university.

The production of knowledge and competences is not sufficient by itself. Thus, the quality and *relevance of the knowledge/competences to industry needs becomes critical elements for increasing the absorption rate of the knowledge and competences into the economy.*

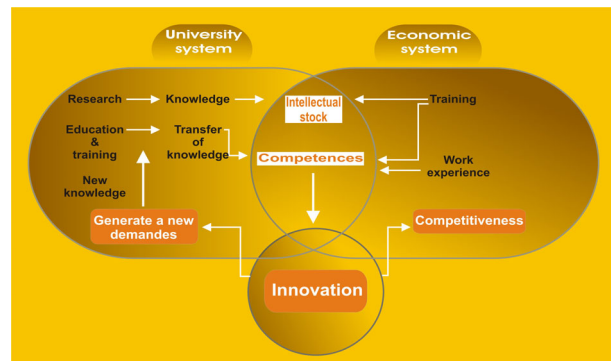


Fig. 1

Universities should preserve their fundamental missions, but they should behave, at some extent with new function like *"agent-based social systems sciences"*: there are providing competences and knowledge. *If these competences and knowledge are not relevant for industry needs, they cannot be fully exploited/valorized and cannot gear competitiveness.* The university system should interact with industry system. The university-industry interaction becomes the key pillar in this respect. Through mutual competition, coordination and the cooperation of agents it is possible to explore the two systems and to analyze the construction it provides information about the industry needs (valuable inputs for planning its research and education activities and for making the outcomes relevant and tradable on the market), it facilitates the transmission of the new knowledge and the common definition of various joint activities by human agents as important players in this process. Thus, university responsiveness to industry increases. *Industry should not be seen only as the user of the outcomes, but also as a stakeholder in the university activities.*

The student acts like a real evolutive human agent based social systems sciences by his professional career. Now he is student and act in university systems and some years after will become employee of industry system and act with the knowledge and expertise of the academic system in the new one. He plays the role of the *common human agent-based social system.*

The *teachers and research people* can also act like human agent based social system sciences. They work in academic system and have the expertise and the competences and abilities specific for this system and in parallel they can act *like human agents in business system by joint university-entrepreneurial structures or projects*.

University-industry interaction is gearing innovation: it provides incentives for university not only to produce new knowledge but also to develop processes, concepts and tools for implementing it. Innovation overcomes the scope of research activities. Since university continues to remain the main producers of knowledge and industry remains the main user of knowledge, the transmission and valorization of knowledge is a prerequisite for increasing competitiveness. More than this, the big companies created corporation universities for their specific needs in training for new and focused competences. The enterprises with the support of universities must practice a dual management of the creative knowledge (fig. 2) [5].

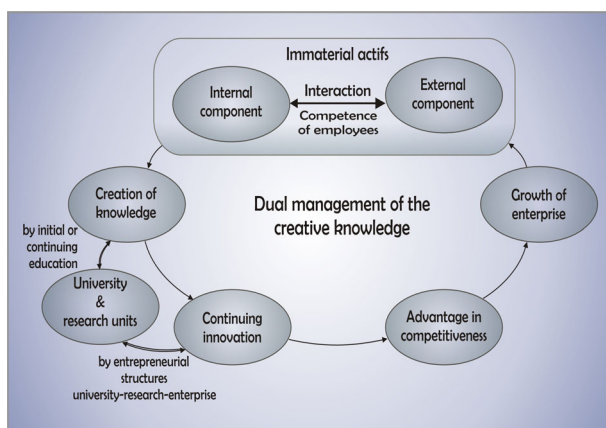


Fig. 2

Generally, universities target their resources towards research (knowledge production), education (knowledge transmission), but pay less attention to innovation (use/valorization of its products in society). It is indispensable to propagate knowledge from academic science system to industry system. In the process of knowledge diffusion, the university-industry interaction becomes crucial. This interaction should be a twofold interaction. *In other words, industry should not be judged exclusively as the end user of the university outcomes, but also as a provider of valuable inputs to be used by university in the planning of its activities.*

The traditional university-industry cooperation should be replaced; it should shift from a unidirectional relation (university produces knowledge and competences, while industry uses them) to a bidirectional system relation of

continuing interaction. University and industry should interact with each other in all innovation phases. The redefinition means that university and industry relation is not a knowledge provider – knowledge user relation, but rather, industry and university are acting as system partners in their activities (fig. 3) [6]. Their interaction should not be limited to research production and diffusion, but should also touch training and education. The *competitive knowledge based economy* requires investments in training (continuing training) to develop new IT like e-learning, e-university or e-library.

The university training and education should be relevant for industry needs. Also knowledge society asks to industry to invest in human capital. These investments can be in continuing training. Universities should redesign their continuing education and training in the sense of taking into account industry needs and of providing to the trainees/students a knowledge base to which knowledge/inputs from various other fields could be added and accumulated. Relevance, creative/adaptive education and training, university-industry interaction are the key words for redesigning university function the construction of the agent-based social systems sciences.

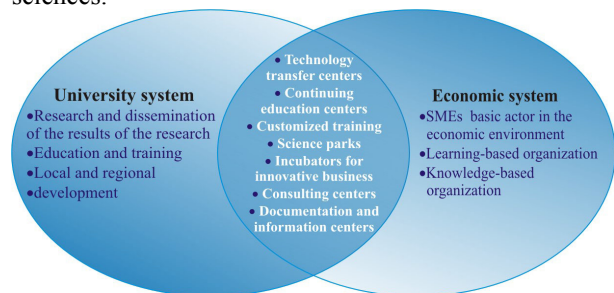


Fig. 3

The universities have to reflect upon the past, to ensure the research capable of inventing the rules of an economy of the intangible, and to integrate ‘human capital’. If, from a utilitarian angle, the knowledge society may be defined as: ‘Bring me the information I need, when I need it, and if possible, even if I don’t ask for it’ [4], the role of the university could be defined as: providing the knowledge that ‘clients’ need, when they need it, anticipating the evolution of demand for knowledge and competences and, if possible, providing it in everybody’s home or office.

And this is not impossible, as IT networks, communications without borders, and specialised researchers have already made it possible to pursue in Romania the master studies of an Australian, or even Japanese, university. The problem that may remain is to ensure systemic integration and quality.

4. ENTERPRISES AND UNIVERSITIES IN KNOWLEDGE SOCIETY

Capital, labour and land are no longer the most important resources for progress but *intelligence, innovation, information and knowledge* (intangible capital): “*nowadays disparities in the productivity and growth of different countries have far less to do with their abundance or lack of natural resources, than with the capacity to improve the quality of human capital and factors of production, in other words to create new knowledge and ideas and to incorporate them in equipment and people*” (Davis Paul & Dominique Foray, 2001).

Knowledge society is challenging both enterprises and universities in several modes [7]:

- ♦ There is a need for *redefining the competitiveness and its measurement*. The traditional measures of competitiveness are no longer relevant and need to be replaced by specific indicators quantifying the impact of *intangible capital*;
- ♦ The high pace of scientific and technological progress reflects the *high speed at which knowledge is produced*. Such an evolution raises the problem of the fast depreciation (in terms of relevance for economy/society and in terms of value) of the existing stock of knowledge;
- ♦ The *need to innovate* becomes a leit motif of the knowledge society. In knowledge society there is a strong pressure for a *higher speed and intensity of innovating*. Both the formal system of research (existing network of university research centers and specialized research institutes) and enterprises (through their own R&D departments) generate knowledge and innovation. Thus partnerships between universities need further enhancement in order to avoid fragmentation of research and duplication of its outcomes. Also, it is not enough to encourage research, but also to increase its relevance for the economic process; in other words links between formal research and university on the one hand and enterprises on the other hand gain in importance in knowledge society. Under these circumstances, rather than competing with the other producers of knowledge, *universities should encourage and strengthen the university-enterprises partnerships*. It is important for universities to understand that, in case of knowledge society, they are no longer the unique producers of knowledge: in this new society knowledge production is widely distributed across various hosts and actors;
- ♦ In knowledge society, *learning becomes an important instrument of supporting innovation and the production of new knowledge*. Practice-based learning

environments can become an important form of knowledge production in many domains and professions and generates greater possibilities for knowledge creation. The high rate of producing new knowledge requires permanent improvement of the quality of human resources through *continuing learning*, and thus continuing update of information. Universities, as providers of learning, grow in importance in this equation;

- ♦ Due to the high speed of producing knowledge and fast depreciation of the economic value of new knowledge, one of the leading issues of the knowledge society consists in *identifying the most efficient ways of disseminating and transferring knowledge*;
- ♦ *Knowledge needs to be codified and transformed into information in order to be transmitted to its users*. Nowadays, information technologies have the advantage of ensuring both codification of knowledge and information and its fast dissemination to various places and users;
- ♦ In knowledge society, *information technologies become one of the most important assets*: they permit the dissemination of knowledge just in time all over the world; they provide a useful mean of acquiring knowledge. In other words, information technologies are one of the most valuable assets in knowledge society because they enable remote and fast access to information and learning.

The building of the knowledge society requires to conventional organizations to adapt to the challenges it raises and to prepare for the new reality of the knowledge society. A new type of organization adapted to the needs of knowledge society emerged, the so called knowledge-based organization. These knowledge based organization/communities consist of a “*network of individuals striving, first and foremost to produce and circulate new knowledge and working for different, even rival organizations*” (Davis Paul & Dominique Foray, 2001). The concept of competitiveness of enterprises, as well as of any other type of conventional organization, is challenged. The traditional methods of measuring the competitiveness of an enterprise are no longer relevant for the realities of knowledge society and knowledge based economy. Enterprises tend to measure their competitiveness through the efficiency of their intangible capital [7].

Knowledge society does not mean exclusively knowledge production, but it assumes the existence of a high quality *knowledge management*. Therefore, the concept of knowledge management is essential to enterprises. It means that the classical Taylor system should be replaced by the project-based system. Also it

implies the need to permanently identify and evaluate the stock of the knowledge created/produced within the company. Thus, in knowledge society, the enterprises will not increase their competitiveness, unless they produce new knowledge and tend to become *innovative enterprises*. Knowledge gives to its possessors the capacity for physical or intellectual action. This suggests that *knowledge is mainly an issue of cognitive capability*. This assessment has at least two implications for organizations. First, it underlines the importance of the human resources who have the cognitive capabilities needed to generate and use knowledge. Second, in an organizational the information becomes relevant in relation with the knowledge; information becomes a set of structures data which remain passive unless it is used by the persons possessing the knowledge to process the information. This approach reveals that knowledge management is an issue of great importance for organizations, either universities or enterprises. Knowledge management should not be seen as an end by itself, but it rather a mean to enhance the ability of an organization to develop and enhance its competitiveness.

In an organizational context, *knowledge management* means the capture, retention, and reuse of the information and knowledge for developing an understanding of how all these fit together and how to convey them meaningfully to some other person. The value of the knowledge management resides in the effectiveness with which the knowledge allows to the members of a organization to understand the evolutions recorded in the present, to deal with them, to properly predict future trends and to effectively shape the future of their organization, business, activity etc.

Another issue relevant for both the enterprises and universities is that the *knowledge society requires continuous update of knowledge through the use of ICT* and continuing acquiring of knowledge and competencies (continuing training and education). The former breakage between universities and enterprises should no longer exist in knowledge society.

These tasks require further adaptation and better knowledge management to universities. First of all universities need to assure high quality of knowledge produced. Secondly, universities need to adapt their existing structure in order to transfer the knowledge produced to its users. Thus, in knowledge society, the organizational design of a university gravitates around the structures for technology transfer and learning; the traditional university tends to be replaced by the *entrepreneurial university* [9].

Changes and transformations produce at a high speed. Both organizations are confronted with a *more instable environment*. Enterprises are acting in a more unpredictable and heterogeneous. They need to adapt to this permanent changing environment. In both cases, the so called “*mental and organizational Taylorism*” (Belet Daniel, 2003), based on rigid hierarchical structures, limiting entrepreneurship and ability to adapt to changing circumstances, needs to be replaced by *more flexible structures*, such as project based structures. Knowledge cannot be produced and properly managed within Taylorist structures that indicate exactly the type of activities (standardized activities) to be carried on at various levels within organizations.

Learning will become the watch word of the two organizations. Both universities and enterprises need to focus on *organizational learning* for developing and increasing the capacity of the organization to adapt to changing environment. In case of the new university operating in knowledge society, their activities will not rely exclusively on teaching but *will diversify and include knowledge production and dissemination to enterprises*. Also learning needs to be redefined in the sense of promoting learning in practice-based environments and person-based learning. Learning provided by new universities should also mean the possibility of acquiring the “know how” and should encourage and develop the creativity of the trainee. Learning will not be treated as a process of replicating information and knowledge, but it will be organized more as a system of reproducing knowledge which implies at first the development of certain cognitive capabilities of the trainees. The proliferation of the master-apprentice system of learning promoted by old universities will limit the opportunities for development of the trainees and their ability to produce and manage knowledge. This kind of learning should be provided by universities for properly answer to the needs manifested by their partners, the enterprises. Learning will be an imperative also for enterprises. For properly managing the changes and transformations produced in the knowledge society, enterprises need not only well educated/trained employees, but also, the *acquiring of knowledge have to be a continuing process assuring the permanent update and improvement of capabilities of the employees of the enterprises*. Since *intellectual capital* (part of the intangible capital) *becomes the most valuable asset of an organization in knowledge society, the assurance of the quality and the continuing improvement of the human resources become a key factor for its competitiveness*.

Both universities and enterprises learn from each other. *Universities may provide to enterprises not only a*

qualification for the personnel of enterprises, but also technical assistance for new enterprises. Also universities may provide to enterprises both the knowledge as such, as well as knowledge adapted to the specific needs of enterprises (innovation). In other words, universities may offer to the enterprises the scientific support and assistance for improving their competitiveness. Universities, namely the new entrepreneurial university, can learn from their partner enterprises how to set their activities on entrepreneurial basis [10].

The university is changing and becomes an entrepreneurial university by “borrowing” the economic system management. The enterprises begin to apply the lifelong learning philosophy and become by this creative and learning organizational institutions – “knowledge enterprises”.

In this way, academic and business systems are similar by their actions and management methods, as well by the already mentioned challenges. Meanwhile, the two systems are fundamental different by their missions.

In the table 1 we present the main resemblances and differences between academic and business systems in respect of the knowledge society challenges mentioned before.

5. UNIVERSITY IN THE KNOWLEDGE SOCIETY

Our duty today is to accompany the entry of our enterprises and our universities into this knowledge society, a society where the creation of value goes through innovation, creativity, participation, and competitiveness on a worldwide scale. Furthermore, competitiveness in terms of innovation supposes research that ensures quality knowledge, education and training, which may guarantee the competences and the quality of the intellectual stock needed by the enterprises [11].

The knowledge society imposes a logic of permanent change and innovation; culture and technology come together, connected at the core of global networks, most of which elude the capabilities of previous years.

It requires enhanced adaptability, flexibility, and mobility, complex cooperation and coordination systems with an extended network of partners, clients, suppliers, ‘coopetition’ [4], and lifelong learning.

All this requires rather an education of youth to meet such requirements, to get used to overnight change, to the idea of system, to make connections, and integrate their knowledge. They have to be deeply specialised, but at the same time think in an integrating way. This new education has to be ensured by the universities, which must change their educational offer and their way of conveying knowledge. They must not only speak, but also work on the concept of ‘agent-based social systems sciences’ (ABSSS), be an example of a system which integrates knowledge and competences of professors, researchers, students, and economy and society specialists. Universities have to face, and even to build, a society that appeals to new ways of piloting ‘as it goes’, where mobilisation, participation, and social cohesion matter more than specifications and procedures.

In order to build a model of the second generation entrepreneurial university, one has to take into account the following:

- ♦ The dynamic competitive advantage, i.e., the capacity of an enterprise to use knowledge as an acceleration factor of its own development;
- ♦ The knowledge-based organisations have a synergic feature: everywhere people talk about extended enterprises, learning and networking enterprises, participative management, innovation based on cross-fertilisation, professional communities, etc;
- ♦ Managers no longer hold the keys to power by mere status or by privileged access to knowledge; they must absolutely change their leadership method: from the little authoritarian supervisor, promoting secrecy and division, the manager becomes coach, tutor, animator, communicator, giving sense to action;
- ♦ In a knowledge economy, competitiveness is being played, first and foremost, at the innovation level.

6. THE SECOND GENERATION KNOWLEDGE MANAGEMENT

The first generation of KM projects suffered from a bad segmentation. A new typology of KM projects has to be established. The first criterion is purpose. This is the answer to the question, ‘Why do you want to do KM?’. The second criterion is the nature of the exchange communities.

Consequently, the main characteristics of the second generation KM approach could be [12]:

- a. A systemic approach integrating four inseparable dimensions:
 - a strategic dimension (how to connect KM to the business);

Table 1 – Academic-business system comparative view

<i>Knowledge society challenges</i>	<i>Academic system</i>	<i>Business system</i>
1. Increased instability of the economic environment	<ul style="list-style-type: none"> • Loss of stability in case of higher education: <ul style="list-style-type: none"> - new demands - new tools; • Innovative university 	<ul style="list-style-type: none"> • Increasing instability and heterogeneity of the economic environment; • Creative enterprises
2. Increased demand for higher education and postgraduate training	<ul style="list-style-type: none"> • Increased number of enrolments in higher education; • Increased demand for lifelong learning and training 	<ul style="list-style-type: none"> • Training of HR and production of knowledge – features of the learning enterprise; • Enterprises – valuable partners for universities in developing programs for lifelong learning
3. Internationalization of the education, research and economy	European universities create the European Area of Research and the European Area of Higher Education	Emergence of the “network-economy” and “network-research”
	<ul style="list-style-type: none"> • In case of research and production of knowledge universities compete both with other universities as well as with other institutions such as: public research laboratories, R&D departments of large enterprises etc; • A major weakness of the European universities refers to the limited success in attracting fewer researchers than US universities 	
4. New expectations	<ul style="list-style-type: none"> • New demands for universities should comply with: <ul style="list-style-type: none"> - transversal competences, - lifelong learning; • Involvement in the life of the community; • Development of horizontal structures in addition to the existing vertical structures: <ul style="list-style-type: none"> - specific departments; - specific programs 	<ul style="list-style-type: none"> • Enterprises should respond to the needs of their customers and should promote quality of their production and in their activities; • Expansion of the SMEs using new knowledge and processes. Strong point: high flexibility; • Expansion of the knowledge and innovation produced in the R&D departments of the large enterprises. Strong point: potential for knowledge production.
	Flexible and interdependent networks sharing knowledge and know how	
5. Increased number and diversification of the organizations producing knowledge	<ul style="list-style-type: none"> • Joint university-enterprises research programs; • Connecting basic and applied research; • Necessity to promote research adapted to the interdisciplinary feature of the society etc. 	<ul style="list-style-type: none"> • Emergence of a new type of enterprise, the so called “knowledge-based organization”; • Its employees are highly qualified “knowledge employees”
	Common evolutions driven by the law of “action and reaction”	
6. Need for developing University – Enterprises partnership	<ul style="list-style-type: none"> • Strengthening the cooperation between universities and business system at regional and national level; • Focus on innovation and creation of new enterprises. Better targeting and managing the transfer and dissemination of knowledge 	

- an organisational dimension (which labour organisations, which communities?);
 - an instrumental dimension (which technological platform);
 - a human dimension (the role of intermediary management, behavioural aspect).
- b. An approach segmenting KM projects according to a two-dimensional matrix:
- the purpose (answering the question 'why?');
 - the community concerned (answering the question 'for whom?', analysis of communities, interculturality).
- c. An approach of the behaviour of change, seen in a 'think global, act local' type of philosophy.

An approach restoring Knowledge Management to a logic of social connection and hence completely revisiting the management methods and the question of confidence.

7. CONCLUSIONS

University-industry systems interaction triggers mutual learning and generates added value to both entities. To industry system, the knowledge and competences absorbed into their activities gear the economic competitiveness. For university system, the interaction provides with new management tools and values and transforms its organizational behaviour. Since the competition between knowledge producers is continuously increasing, more an university interacts with industry, more its activities will be relevant to industry, the higher will be the demand for its outputs, more the university will borrow/adopt elements of the industry management. Thus, due to this interaction, the traditional roles of the university and industry change.

Hence the strategic role of the universities in ensuring a new area of trans-disciplinary research required in order to build the knowledge economy.

We may consider as a new function of the university the construction of the 'agent-based social systems sciences', not only through what it transmits, but also through a possible organisation, such as: professor (individual) and university (organisation).

Industry will no longer use and manage the knowledge produced by universities, but will become more involved in research and education planning. Consequently more involved in knowledge and competences production, university remains the main knowledge producer. University becomes a more active participant to the knowledge management since it

interacts with industry for transforming the outcomes of its activities into products and processes to be used in economic processes. Thus, the university-industry interaction provides added value to both partners.

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