INNOVATION ISSUES ON THE UNIVERSITIES - BUSINESSES COLLABORATION

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Abstract: *This paper aims to evolve the importance of innovation in the collaboration activities between colleges, universities and business entities. Creating and transferring knowledge in a win-win situation between these two entities can be evaluated, measured and serve as a longtime basis for innovation. Although it is considered easier using input and output measures for the evaluation of universities - businesses cooperation, the focus should be on the economic impact of the collaboration. This would lead to measuring the level of innovation, competitiveness, growth and furthermore, to the development of private and public policies. Governments and development agencies in local and national level, invest distinguished budgets to promote innovation in the enterprises and improve their innovation management practices in order to make them expand the issues of innovation. Whatsoever, there is no evidence on the effects these issues have on a college, university or business' outcome over a long period of time. However, using a methodical system for measuring innovation's impact, the revenue, profit or productivity can be evaluated.*

Key words*:* universities - businesses collaboration; innovation; evaluation; methodical system.

JEL Classification Codes: O31, O32, O38.

1. INTRODUCTION

The industrial and economic development is linked to innovation processes and mindset. That's why we live in the capitalist world order. Due to great progress in the field, the political agendas in developed and other countries have been moderated in order to support innovation' capabilities and trends. On the other side, in order to fulfill their mission, the universities try to be engaged in innovation processes and projects. During time, these two entities have discovered the synergy resulting from joining forces. Porter (1980) pointed out that the competitiveness of nations depended on the ability of an industry to innovate and improve, and that companies achieve competitive advantage through innovation. With the time passing, it is proved that this innovation is very important at the company or entity level as well as on a national level. Tidd (2006) found that over the last few decades the impact of innovation management on performance however, have brought only a few conclusive results, especially at the single-company level. In most advanced economies and states, the political agenda includes programs aimed to improve innovation capabilities of companies. As a result, different products and services are created. Since the year 1934, Schumpeter pointed at the importance of innovation as a driver for economic growth.

The theoretical link between innovation and company competitiveness from a long-term point of view, can be traced back to the early definition of strategic adaptation. The process of strategy is considered a dynamic process, with adaptation being the key aspect needed to achieve competitive advantage in a long-term perspective (Miles & Snow, 1978; Floyd & Lane, 2000;

Child, 1997). The process of adaptation is not seen as an uncontrolled phenomenon, but rather as the result of complex interactions that consider the changes in the external environment on one side, and on the other side, the internal environment (existing resources, organizational structure and managers' profiles of the company, company characteristics, size, patrimonial structure). Finally, the process of adaptation is affected by previous decisions on strategic positioning. This "systemic" approach tries to reconcile contingency theory and strategic positioning thinking, and distinguishes between two integral and dynamic parts: an internal structuring (internal actions addressed to adapt organizational agents to new environmental conditions) and an external structuring (actions that modify the business' relationship with its environment, such as launching new products or changing suppliers).

In the field of Innovation Management, the same concepts have been approached from what is related to perspective. Hult et al. (2004), for instance, defines innovation as "The way to change the organization, as a response to external or internal changes or as a proactive attempt to change this environment." Hult further states that, "As the environment is changing, firms must adopt innovations along the time, and what is more important, innovations are those activities that let the company gain competitive advantages, contributing thus to its effectiveness and business success." Hence, innovation is considered one of the key strategic "processes" that may help companies adapt both internally and externally. Damanpour (1991), Henard & Szymaski (2001) and Grant (2005) arrived at similar conclusions. Nevertheless, the conceptual link between innovation practices and strategic alignment is not yet well understood, as the different terminologies and models make it difficult to establish the relationship between different concepts (Adams et al, 2006).

Moreover, the ability to innovate has been widely considered one key success factor of business survival and performance (Schumpeter, 1934; Burns & Stalker, 1961; Porter, 1990). As such, different measures have been proposed and tested empirically to assess the degree of a company's innovative ability (Barclay, 1992; Kim and Oh, 2002), and the relationship between innovative ability and business performance has been widely analyzed at the industry level (Huff, 1990; Cooper and Kleinschmidt, 1991; Sorescu, Chandy, and Prabhu, 2003; Guan et al., 2009). This stream of research, however, has mainly focused on measuring innovative ability as the monetary input to a process (R&D spending alike) or as the immediate output or results (like number of new products, new products' percentage of sales, number of patents approved). This approach focuses only on technological aspects, however, and neglects the actual processes that turn spending into results. Hence, it does not explicitly consider the medium-and-long term effects of innovation. In particular, it neglects the processes that are derived from internal capabilities and good innovation management practices (project management practices). These innovation processes are multidimensional and complex and as such, there are several ways to measure the innovation capacities of a company.

Since the beginning of the 21st century innovation has been one of the fundamental aspects of industrial and economic development policies in many countries. In part, this institutional trend has been encouraged by the traditional academic support of innovation as a key capability for the long-term sustainability of companies.

2. LITTERATURE OVERVIEW

2.1 HISTORICAL OVERVIEW

According to Drucker (1985), since the mid-seventies, such slogans as "the no-growth economy," the "deindustrialization of America," have become very popular. What has really happened, starting from the United States, is something like a shift from a "managerial" to an

"entrepreneurial" economy. The number of people in paid jobs have grown and the labor force growth was fastest till 80' years. Governments employed fewer people than they did before, because the trend of entrepreneurship was going higher and better. All the new jobs must have been created by small and medium-sized institutions, most of them small and medium-sized businesses, and a great many of them, if not the majority, new businesses that did not even exist before. According to The Economist, new businesses have been started every year; about seven times as many as were started in each of the boom years. Economic dynamics centered in institutions that were already big and were getting bigger, like governments, whether federal, state, or local; the large and super-large universities; the large consolidated high school and the large and growing hospitals. But, in every recession during this period, job loss and unemployment occurred predominantly in small institutions, mainly in small businesses.

As for Europe, changes have happened a little bit later, but they still do go on. Knowledge transfer, defined as the process concerned with the effective exchange of research related findings, is the gateway for the transfer of knowledge between donating and receiving entities. It can be considered as a generic term describing the allotment of knowledge through human beings. This perspective focuses on characteristics of communication between experts with the same level of knowledge, even though they might have different points of view, on a variety of issues. The importance of identifying and removing the possible barriers and on the other side, the improvement of knowledge transfer, are seen as the main leader factor of economic growth.

It is interesting that comparing to the United States (EU Commission, 2007), an average university in Europe generates far fewer inventions and patents, and that this is "largely due to a less systematic and professional management of knowledge and intellectual property" at European universities.

Due to increasing importance of knowledge, a close relationship between science and technology became more important for the two entities: universities and businesses. By experience, we can testify that the increased competition on a global scale led to an increasing rate of technology changes, shorter product life cycles and increasing product quality. The findings and utilizations of advanced knowledge and new technologies are more than ever crucial for the survival and prosperity of any company.

2.2 EXPERIENCES ON ORGANIZATIONAL MATTERS

Many large enterprises have created and have made functional their own scientific department. This being able to conduct research is an important advantage for large enterprises. Even though, they have difficulties to rely exclusively on internal knowledge production or technology. Therefore, the importance of knowledge's distribution created by public entities has become more important. The entities that benefit directly, are small and medium enterprises that cannot afford the cost of research and depend on external knowledge adaption to improve their products or production processes. In this framework, the existence and activity of the research centers of colleges and universities, are considered important for the survival of these entities in the European market. For a successful knowledge transfer from any knowledge donor to a small or medium enterprise, it is not sufficient to provide knowledge or technology, considering their limited possibilities, also the financial support of them is necessary to make the implementation of new technology possible (Carayannis, Popescu, Sipp, & Stewart, 2006).

The European Union classifies as small and medium-sized enterprises (SMEs) the companies that meet two conditions:

- the number of their employees does not exceed 250;

- they are independent from large companies.

In addition, their annual turnover may not be beyond fifty million Euro. SMEs are divided into three subcategories: micro-enterprises with 10 or less employees, small enterprises with 10-49 employees and medium enterprises with 50-249 employees (EU Commission, 2005).

2.3 VIEWS OF DIFFERENT AUTHORS

The focus of knowledge transfer to SMEs, is on the distribution of knowledge created at universities, which is mostly described as being largely underexploited. However, recent studies indicate a positive trend in universities - businesses interaction (Arias-Aranda & Romerosa-Martınez, 2010; Bramwell & Wolfe, 2008; Dowling & Helm, 2006). The reasons for this improvement are changes in public policies and institutional environment and a strong encouragement of commercialization of scientific discoveries. Prior to this improvement, scientific discoveries arose directly from the "ivory tower" of science, and there was no specific aim to utilize and commercialize them. At present, academic research is more focused on future industrialization and exploitation of their discoveries (Braun and Hadwiger, 2010; Hussler, Picard, & Tang, 2010; Sorlin, 2005).

There are many advantages for enterprises and university to collaborate. The enterprise can benefit from the highly trained staff of these institutions, and can also improve their corporate image due to this joint venture. The universities can benefit from additional fund for research, the opportunities to research close to the market and an increased opportunity of employment for students and graduates (Braun and Hadwiger, 2010).

The cooperation of entities like universities and private enterprises can work in a variety of ways. The most common way is to support research, mostly by financial contributions. In the past, funding was often unspecific and unrestricted but nowadays, it is bound to specific research areas and activities that presumably will benefit the financer by bringing in new knowledge and technology. Another possibility of collaboration is cooperative research. This requires close teamwork when conducting the research. The research teams from the public and the private partner have to work together to maximize efficiency and prevent interference of research fields (Braun and Hadwiger, 2010).

There is also a possibility of direct knowledge or technology transfer in both directions. With this method both teams need also to have a broad understanding of the particular research field and full insight in each other's work. However, the implementation of new technology has to be conducted with full support of the donating partner (Braun and Hadwiger, 2010).

The formerly low levels of knowledge distribution from universities to businesses' partners were attributed to a lack of knowledge structures at the enterprise side and a lack of gratification for the distribution of scientific knowledge by the academic side. Different approaches have been tried to eliminate this problem. In the last few years, universities have accumulated a lot of experience in transferring technologies, and public organizations which focus on the distribution and transfer of knowledge between science and industry have been founded (Braun and Hadwiger, 2010; Quillien & Vidal, 2003; Sorlin, 2005).

3. THE STANDARDS OF COLLABORATION UNIVERSITIES – BUSINESSES

The role of universities has been the one of a kind, apart from the society and with the focus on preserving culture and knowledge. With time passing the interaction with institutions outside universities has increased substantially. The forms and intensity of interaction have changed, although the mission is to provide skilled and professional specialists for society. The

universities started to focus more on research since the 19th century. Nowadays they try to find the appropriate balance between teaching, basic and applied research, and entrepreneurship.

There are four types of university - business relationships based on research processes support which, in return, provide knowledge and new technologies to businesses. These results can be forms of endowment trust funds that the universities use to upgrade laboratories, provide internships to students, or provide extra money for promising new projects. Nowadays, the research process for universities is focused and specialized toward specific projects. This specialization includes the contract research made with individual consultants and then, certain group arrangements specifically addressed to immediate problems. In the case of consultancy there is usually only one faculty member involved who is working with a single firm on a targeted research project. For the group arrangements instead, they include more than just one faculty member and more than just industrial firm. Cooperative research includes contract research with individual investigators, consulting by faculty. Knowledge transfer encompasses highly interactive activities that include on-going formal and informal personal interactions, cooperative education, curriculum development, and personnel exchanges. Knowledge transfer mechanisms are the recruitment of recent university graduates and employing student interns, co-authoring of research papers by university and industrial firm members, industry-university cooperation and also trade associations. Technology transfer also involves highly interactive activities. The focus here is on addressing immediate and more specific industry issues compared to knowledge. In technology transfer the university-driven research and industry expertise make complementary contributions into commercialized technologies needed by market. Often the university provides basic and technical knowledge along with technology patent of licensing services. Industry members provide knowledge in a specific applied area along with a clear problem statement related to market demand. Technology transfer takes place through technological consulting arrangements, the firm’s use of university’s extension services, jointly owned or operated ventures.

3.1 THE CONCEPT OF KNOWLEDGE TRANSFER

Gardner et al. (2010) indicated that the broader concept of knowledge transfer specifies the movement of knowledge, ideas, concepts and techniques from a location, generally institutions of advanced education, out to all areas of the social and economic environment. Knowledge transfer between universities and businesses can be considered the most important aim and also the measure of results in universities - businesses cooperation.

The following channels of knowledge have been considered:

a) collaborative research, contract research and technology-related consulting,

b) staff mobility between firms and public science institutions,

c) cooperation in the education of graduate students,

d) vocational training for employees,

e) use of intellectual property rights (IPR) by public scientific organizations,

f) spin-offs,

g) informal contacts and personal networks.

It is interesting how the universities – businesses cooperation has an impact on curricula development of study programs, in order to assure lifelong learning, student mobility, academic mobility, commercialization of R&D results, collaboration in R&D, entrepreneurship, and

governance. The following scheme demonstrates universities - businesses cooperation related to the missions of university and needs of businesses.

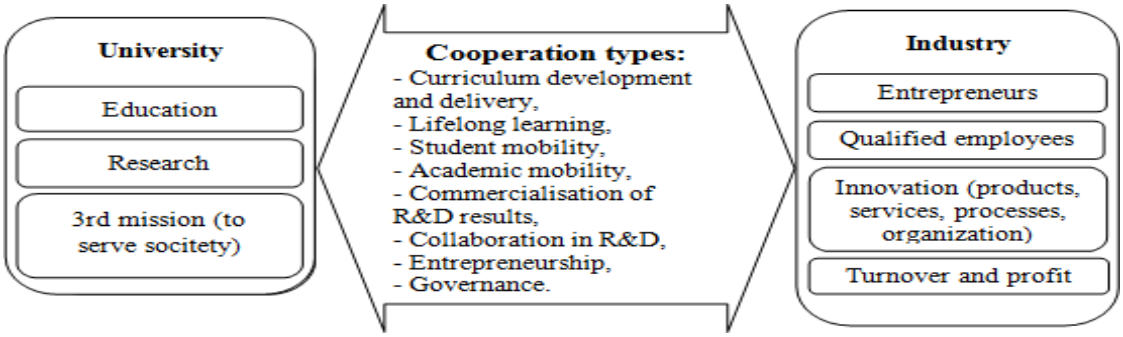

Figure 1. University-industry cooperation related to the missions of universities and needs of industry

The mission of university is teaching and educating skilled professionals, who after graduation start to work in society. Curriculum development instead is one type of universities - businesses cooperation, which aim is to develop human resources relevant to modern society. Lifelong learning is also one way of developing human resources, but here the students are adults, who acquire additional skills, knowledge or attitudes.

Student mobility is the temporary or permanent movement of students to enterprises. Academic mobility encompasses temporary or permanent movement of universities' researchers or lecturers to firms, and the movement of industry researchers to universities. (Davey et al. 2011) Knowledge transfer in the very direct sense takes place through this kind of cooperation, which is especially suitable for the transfer of knowledge. The knowledge intensity in industry has grown over time. In addition to the supply of knowledge, the demand of knowledge from the industry's side has also increased. Therefore, the need for universities' knowledge transfer and commercialization has also increased. The universities can commercialize the research results with enterprises through spin-offs, licenses or patenting. Universities - businesses collaboration in research and development includes all the joint research activities, contract research, consulting, informal networks, joint publications, joint supervision of theses, and different student projects carried on together (Davey et al. 2011). The research and their results are important for industry for producing new products or services, improving processes and through all of that, achieving improved performance and larger profits.

Universities are becoming more entrepreneurial themselves and also take in to some degree the role of business (Etzkowitz, 2003). In the frame of entrepreneurship, the universities are creating new ventures with enterprises or developing an entrepreneurial culture within university in cooperation with enterprises. Cooperation in governance means that the businesses and universities are cooperating at management level (like business leaders that are sitting on the boards of universities or that are involved in decision-making, academics are sitting on the board of enterprises) (Davey et al. 2011).

The interaction and cooperation between universities and industry is not only in the interest of the two institutional partners involved. In an environment where international competition is constantly increasing and development of technology is very rapid, governments are also interested in good cooperation between universities and businesses, in order to improve the effectiveness of innovation and with that, also to improve the economic development of the country (Barnes et al. 2002). Through laws, policies and incentive systems, the government is able to influence the cooperation between universities and industries. This means that the

governments are also interested in measuring and evaluating the links between universities and industry for estimating the possible impact of their past actions and making strategies for the future.

For universities and enterprises there is a growing need for collaboration in order to survive in a highly competitive marketplace. The traditional culture of universities is evolving, not only with the development of universities but also because of the growing number of universities taking on entrepreneurial tasks and therefore becoming more industry-like. The linkages between universities and industry are very diverse and this should also be taken into account in defining the indicators of universities - business cooperation.

3.2 INDICATORS FOR EVALUATING UNIVERSITY – INDUSTRY COOPERATION

Usually, the local government establish the indicators measuring university - industry cooperation in order to measure the responsiveness of the knowledge transfer activities to the needs of the economy and public sector. The indicators are used to track performance of the universities and enterprises over time to see the effects of policies and collaboration. In the cooperation between universities and enterprises, apart from the cooperation itself being important, also the outcomes of this cooperation are important. The outcomes are the results of cooperation, which create an opportunity for a company, but the research outcome has only incidental importance for companies as it has little or no impact on the company's productivity or competitiveness.

At the macro level the impact should be measured in the areas of well-being (like health, care and quality of life, working life, living environment); economic; knowledge, education and culture; and environment (like climate change) (Luoma et al. 2011). This kind of impact can also be considered a long-term outcome. This process is described in figure 2 below.

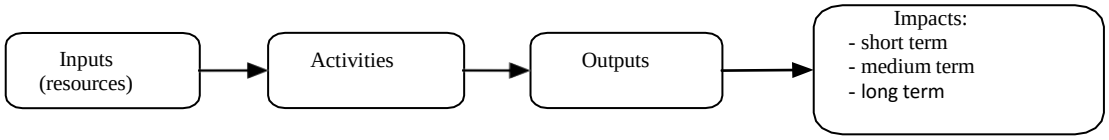

Figure 2. The input-output-impact process

Performance measurement indicators can be divided into the same categories: inputs, activities, outputs and impacts. The input indicators are foremost suitable for evaluating the intent of a desired output, but do not guarantee it (Langford et al. 2006). Output and impact indicators deal with results of the cooperation, but it is important to make the distinction that the outputs are the outcomes which are the direct results of the cooperation. Often the activity indicators are also considered as outputs. The impact refers to direct or indirect effects that cooperation has on the different parties.

Perkmann et al. (2011) distinguishes three major input factors – resources, researchers' capabilities and researchers' motivation. The number of researchers involved in collaboration with enterprises can also be considered as an input and the increase of this number also allows assuming the increase in the amounts of universities - businesses cooperation.

Universities – businesses cooperation can usually gain additional leverage benefiting from the public funding. The contributions from government granting agencies, businesses, individuals and foundations can be input indicators for the universities research system. The

financial support and benefits are important for universities and make it possible to establish and also maintain the relationships with industry (Davey et al. 2011).

The problem with estimating the researchers' outcome by the number of publications and citations is that the aim of universities - businesses cooperation is often not a publication, but the applied science. When defining the indicators concerning the measurement of researchers' capabilities, the aim of the cooperation should be taken into account. For encouraging scientists to do cooperation with enterprises, the stimulation system and career model in universities, is very important and should be updated. The attitude of the universities or departments can also be estimated by the existence of documented strategies that determine universities - businesses cooperation and implementation (like dedication of resources to support cooperation, provision of incentives for academics, considering the cooperation with enterprises in the assessment of work performance, existence of cooperation supporting stimulation system).

In the same way as evaluating the capabilities and motivation of researchers in universities, the industry's side should be taken into account. Research has shown that there are certain characteristics of a business that influence its ability to utilize externally generated scientific knowledge, and thus the knowledge transferred from universities (Agrawal, 2001). The absorptive capacity and technological competence of the company show the capabilities of the company as an input in the universities - businesses cooperation. Additionally, the quality of staff can be considered as firm capabilities, although it is hard to measure it objectively. The indicators of capabilities might be quality certificates (ISO certificates), number of previous projects with universities, membership in some research group or collaborative network, number of scientists, education of employees, and the involvement of staff in the activities of universities.

The universities – businesses collaboration can be measured by the number of patents in their respective ownership and furthermore, the use of this patents in the long-term period. Some universities – businesses alliances use explicit 'open science' rules that determine that all knowledge generated should flow into the public domain with no restrictions. The joint research publications focus on longer-term perspectives while applied research are focused on a short or medium-term period. This second type leads to the commercialization of goods. In the table below, the categories of universities - businesses cooperation are shown.

Table 1. Universities - business cooperation categories

Categories	Indicators
Inputs	**Resources:** R&D expenditure; universities governmental income; non-government donations, grants and contracts; businesses sponsorship of universities research; scholarships; number of researchers. **Researchers' capabilities:** number of publications, citations, projects, reports or patents done in the past. **Researchers' motivation:** number of previous businesses contracts in the departments / universities; number of strategies concerning universities - businesses cooperation; resources dedicated to support cooperation in universities; perception of researcher about the benefits from the cooperation with businesses. **Firms' capabilities:** quality certificates (ISO); previous collaboration with universities; membership of some association or research group; number of scientists; structure of employees by occupation and education. **Businesses' motivation:** number of previous contracts with universities; involvement with universities; perception of the firm about the benefits from the cooperation with universities.

Categories	Indicators
Outputs	Patent applications; patents; license revenues; publications; joint publications; postdoctoral or doctoral positions offered within alliances; use of researchers; intensity of collaboration; spin-offs; meetings; seminars; workshops.
Impact	GDP per capita; total factor productivity; number and share of high growth enterprises; share of inward FDI per GDP; success of spin-off companies; productivity growth; turnover growth, export growth, the increase of exports created by new inventions; employment growth; recruitment of graduates; science citation index and its involvement.

Source : Barnes et al. 2002, Bercovitz, Feldman 2008, Perkmann et al. 2011, Langford et al. 2006, Iqbal et al. 2011, Tijssen et al. 2009, Luoma et al. 2011

4. CONCLUSION

A plurality of different cooperation types between universities and businesses are already known. Apart from the universities oldest mission of educating, the universities have become more and more entrepreneurial today. Their knowledge is about to be set to practice and the joining forces with industry facilitate to do so.

There is a need to distinguish what is the aim which should be achieved. The measurement of different state policies is done via input – output - impact cycle and mostly quantitative input metrics are being used because it is easiest to get data about those indicators. The importance of different performance indicators and their usage to measure the inputs, outputs and impact of universities - businesses collaboration is already grown. That is why the policies for universities - businesses collaboration should pay attention to measuring the possible effects of the created policies. Also, universities and enterprises themselves should do the appropriate appraisal of the cooperation and knowledge transfer between the entities.

The proposed indicators for measuring universities - businesses cooperation derive from previous studies and substantial results.

The field of study is vast and yet different forms of collaborations in different states are to be taken under consideration. It is important to undertake research investigations in longer term issues and possibly collected from specialized surveys. This would lead to more specialized research depending on the role of specific sectors. The policies may help a lot to realize it.

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