A STUDY ON THE RELATIONSHIP BETWEEN THE ACADEMIC RESEARCH AND THE BUSINESS ENVIRONMENT. CASE STUDY: IBM ROMANIA R&D PARTNERSHIPS

Popescu Alina Irina
Academy of Economic Studies, Faculty of International Business and Economics Bucharest, Romania alina.popescu@rei.ase.ro
Grigore Liliana
Academy of Economic Studies, Faculty of International Business and Economics Bucharest, Romania liliana.grigore@yahoo.com
Popescu Leonica
Romanian – American University, Faculty of Management – Marketing Bucharest, Romania popescu.leon.m@gmail.com

An important support mechanism for the realization of the knowledge-based economy is strong university-business environment co-operation. This allows for the rapid conversion of scientific knowledge into commercial innovations with strong social and economic benefits. Scientific and technological collaborations between industry and universities enrich the academic experiences of faculty and students and facilitate economic growth. This is why a very strong relationship between the academic research and the business environment should develop in each country. An exploratory research study was conducted to identify which are the most important aspects that determine the cooperation between academic environment and business environment regarding research activities in Romania.

Keywords: academic research, business environment, R&D

The article's JEL code: I23

1. Introduction

There are two main knowledge-creating sectors in an innovation system: universities and the business environment. By studying thoroughly the research activities they are involved in, we discover the complementary nature of their actions, and how they can support one another for the development of the society.

While universities play a more pregnant role in basic research, the business environment plays an important role in developing and delivering new products and new processes to the market. Therefore, the challenge for policymakers and industry managers is to discover ways in which a nation can use the science and technology capabilities of the two knowledge creating sectors to increase the science and technology capability for innovation. Through research activities, a university transforms knowledge into wealth, but is the major role of the business environment to transform knowledge, including scientific knowledge, into utility for society.

There is a vast literature regarding various aspects of the relationship between academic research and industrial research and innovation activities. The largest number of these studies is represented by small case-studies with focus at the university level (Cohen, et al., 1998). According to Cohen et al. (1998) few cross-sectional studies have been reported in the literature.

Some studies focus on the characteristics of universities as generators of knowledge flows of great interest for business environment's activities of innovation and R&D (Shane, 2002). Also, Kondo (2004) identifies **three ways** in which universities can contribute to industry innovation: knowledge transfer from universities to industry; joint creation of knowledge by university and industry researchers; and formation of a new company based on university knowledge.

There are authors questioning the ability of companies to utilise knowledge flows from universities. The issue of "relevance" of academic research for the business environment is largely debated. For example, Moody (2000) defines relevant research as that which "addresses a practical need", and goes on to state that relevance and utility can only be evaluated by practitioners. Hanseth & Monteiro (1996) assert that "the relevance of ISD research is intrinsically connected to influencing [i.e. improving] the practice of ISD", while Saunders (1998) also defines relevance in terms of usefulness to professionals: *"When research is relevant, managers can use its results to successfully solve critical problems with which they are faced and to use information technology to reshape the environments in which their organizations operate.*"

Other authors have placed more emphasis on the **channels** through which the knowledge flows from universities to industry, as for instance:

-Participation in conferences and presentations (Cohen, et al., 1998; Shane, 2002).
-Personal networks of academic and industrial researchers (Hanseth & Monteiro, 1996)
-Spin-offs of new firms from universities (Shane, 2002)
-Flows of fresh graduates to industry (Varga, 2000).

Most studies have concentrated on the **one-directional effect from university R&D to industrial R&D** and the outputs of industrial R&D in most cases measured in terms of the *number of patents* and *neglected the possible mutual interaction*. However, if there is a mutual interaction between university and industry R&D, and if there are

knowledge externalities involved, then we can develop a dynamic explanation to the clustering of innovative activities based on positive feedback loops.

There are many important reasons for industrial firms and universities to work together. **Benefits to a firm** include *access to highly trained students*, *facilities, and faculty* as well as an *enhanced image when collaborating with a prominent academic institution*. **Benefits to universities** are related to funding issues - *additional funds, particularly for research*, *exposing students and faculty to practical problems*, *creating employment opportunities for their graduates*, and *gaining access to applied technological areas*. As a result of the complementary nature of industry-university relationships, some of these collaborative activities have been instrumental in helping firms advance knowledge and propel new technologies in many areas, e.g., in biotechnology, pharmaceuticals and manufacturing.

The **set of functions and outputs** of a modern university as a research centre include:

1. The creation of new basic knowledge though research;
2. The creation of human capital through teaching (i.e., knowledge transfer from faculty to students);
3. The transfer of existing know-how (technology) to businesses, governmental agencies, and other organisations;
4. The application of knowledge to the creation and commercialisation of new products and processes, or the improvement of existing ones (i.e., technological innovation);
5. Capital investments in the built form, and in equity in private businesses;
6. Leadership in addressing critical local problems;
7. Co-production (with other R&D organisations) of a regional knowledge infrastructure;
8. The creation of a certain kind of regional milieu favourable to innovation.

2. Knowledge Typologies

In identifying the role of universities and business environment in the creation of knowledge, it seems useful for our purpose to distinguish between the following **two knowledge concepts**: the **scientific knowledge** and the **technological knowledge**.

Scientific knowledge represents the form of basic scientific principles that can form a basis for the development of technological knowledge, while ***technological knowledge*** is the form of technical solutions or inventions that either materialise in new products or can be readily used in the production of goods and services. Usually, scientific knowledge functions as a background to or platform for technological knowledge in the innovation process.

According to Stokes (1997), research is categorized into **three types** (Figure 2.1.): ***pure basic research*** (exemplified by the work of Niels Bohr, early 20th century atomic physicist), ***pure applied research*** (exemplified by the work of Thomas Edison, inventor), and ***use-inspired pure basic research*** (Pasteur's quadrant). Louis Pasteur's method bridges the gap between "basic" and "applied" research. Pasteur-type research has been growing in importance because innovation has become more science-based. Thus, the importance of scientific knowledge created in the university sector and of university-industry partnership has grown.

As shown in the following figure, scientific research can be classified by whether it advances human knowledge by seeking a fundamental understanding of nature, or whether it is primarily motivated by the need to solve immediate problems.

Figure 2.1. Applied and Basic research ("Pasteur's Quadrant")

Quest for fundamental understanding?			
	Yes	Pure basic research (**Bohr-type**)	Use-inspired basic research (**Pasteur-type**)
	No	--	Pure applied research (**Edison-type**)
		No	**Yes**
		Considerations of use?	

Source: Modified from diagram of Donald E. Stokes, Pasteur's Quadrant: Basic Science and Technological Innovation, Washington, D.C.: Brookings Institution Press, 1997.

In the process of exchanging knowledge between universities and the business environment there exist costs and fundamental difficulties. This explains why markets for exchange of knowledge are rare. The buyer's and the seller's transaction information is intrinsically asymmetric. Potential buyers may question the value of the knowledge, and sellers have a concern to show the value without revealing the specific knowledge.

3. Forms of University-Business Environment Partnerships

Firms and university research centres work together in a variety of ways. Successful innovation partly depends on the ability of companies to acquire scientific and technological knowledge from external sources and to integrate effectively this knowledge in their innovation activities. This is done by various types of partnerships between the universities and the business environment.

Three main ways to utilize the science and technology capability of the university sector for industrial innovation capture our attention, based on Kondo (2004):
A. jointly creating knowledge between university researchers and industry researchers
B. transferring university knowledge to the industry
C. establishing new companies based on university knowledge.
For each way there are some **forms of university-industry partnership**.
A. Joint knowledge creation can be done through*: joint research*, *contract research* (also has some aspects of joint knowledge creation since research themes are given from the industry at the beginning of research and some feedbacks are provided during the research), and *academic donation* (a weak form of joint knowledge creation as the business environment is slightly interested in the outcome of the scientific research). Lately, a new form of partnership has appeared: the *comprehensive collaboration agreement*, covering a wide range of collaboration areas such as: joint research, joint research grant applications, information exchanges, personnel exchanges, and joint human resource development. This agreement can be concluded in relations varying from one-to-one (one university - one company), to one-to-many (one university - many companies), or many-to-many (many universities - many companies).
Facility and equipment usage is another form of partnership. If the facilities are extremely expensive, this type of partnership is important. For small-and-medium-size companies, university facilities and equipment can be useful.
B. The dissemination of knowledge from university research centres to the business environment is done mainly through: journal papers and books, the Internet, and conference presentations. More targeted forms of knowledge transfer include consulting by professors and patent licensing. Also, students can be good media for knowledge transfer as they internships while they are still studying, jobs in the industry after graduation, and when a company sends its employees to study at a university.
C. Another way to create a research partnership between universities and the business environment is represented by the creation of start-ups that will commercialize university research results for industrial innovation. In some cases, university knowledge is transferred through technology licensing or via other forms. In other cases, university knowledge is transferred through the involvement of university researchers or students in the management of start-ups.
Specifically, university – business environment relationships usually encompass four major interrelated components: *research support*, *cooperative research*, *knowledge transfer*, and *technology transfer*.
Research support is the least interactive component, referring to financial and equipment contributions, which can consist of unrestricted gifts or endowment trust funds that the university uses to upgrade laboratories, provide fellowships to graduate students, or provide seed money for promising new projects.
Cooperative research relationships are more interactive than research support and include contract research with individual investigators, consulting by faculty, and certain group arrangements specifically for addressing immediate industry problems (NSF, 1982).
Knowledge transfer refers to a much broader array of highly interactive activities that include on-going formal and informal personal interactions, cooperative education, curriculum development, and personnel exchanges (Reams, 1986). Examples of knowledge transfer mechanisms are industry-university research consortia, trade associations, and the co-authoring of research papers by university and industrial firm members (NSF, 1982). Other forms are the recruitment of recent university graduates and employing student interns, and cooperative education programs which encourage information exchanges and on-the-job training experiences for undergraduate and graduate students .
Technology transfer occurs in many ways such as through technological consulting arrangements, the firm's use of centre sponsored extension services, and jointly owned or operated ventures. Joint ventures usually represent large-scale commitments by both the firm and university to transfer technologies and are often based on successful prior relationships between the firm and the university research centre.

4. Landscape of the RDI system in Romania &
the stimulation of university – business environment research partnerships

The system of governance for R&D and innovation in Romania currently accords primary responsibility for both to the Ministry for Education and Research (MER) and primary responsibility for industrial development to the Ministry for Economy and Commerce (MEC), with various other bodies such as the Inter-Ministerial Council for Science, Technology and Innovation responsible for ensuring the compatibility of policies in different areas. The R&D activity is undertaken by the Higher Education Institutions as well as by public - private Research Institutes.
The National Authority for Scientific Research (ANCS) within the Ministry of Education, Research and Youth is main responsible for the formulating, monitoring, implementation and assessment of R&D and Innovation policies. NASR implements the R&D strategy by coordinating the programs carried out through projects. The projects are realized by national organizations directly or by active participation at international programs.
The national programs are financed in most cases by public funds, but also by private ones (co-financing), depending on the type of program and organization. The international programs are financed by means of Romanian contributions from public funds to the programs of the international organizations or by applying the

international co-operation agreements settled at Governmental or institutional level. As now Romania is part of EU, a new type of program is financed by structural funds, in order to reach the community goal of increasing national competitiveness at the European development strategy level.
The National Research, Development and Innovation Plan for the period 2007-2013, hereinafter National Plan II (NP II), is the main instrument used by the National Agency for Scientific Research (ANCS) to implement the National RDI Strategy. Through its National Development Plan, Romania has introduced a series of national development priorities, the most important of which is its **strategy to boost competitiveness**. One major development objective in this strategy is reaching the threshold in research and development expenditure of 3% of GDP by the year 2015 in line with Treaty of Lisbon targets.
The Higher education sector includes 74 accredited universities, out of which 58 public universities and 18 private ones. According to the national education law, the teaching staff from universities has 25% of working time dedicated to the research activities. The research activity from universities is financed through the research projects selected based on the national competition. Apart from this, taking into consideration the quality of their research activity, the universities can receive supplementary budget from the Ministry of Education, Research and Youth.

5. Case study: IBM R&D Partnerships

Through the **Academic Initiative**, IBM provides faculty around the world with a broad range of resources and support to help educate students in the skills they need to compete in the fast-paced, ever-changing information technology (IT) workplace. The Academic Initiative is structured on the following levels: Country Project, Faculty Award, Shared University Research, Innovation Award, PhD Fellowship.
Through the programs designed to universities, IBM Romania participated in the update of the educational curricula, in the modernization, restructuring and in the creation of new courses of study and higher education programs. IBM's priority is represented by the involvement in the update of university curricula so as to create specialists with multi-disciplinary training in information technology, in software applications' development, networks, business models, collaborative innovation and social networking. This requirement of modern training is promoted through new scientific, engineering and service management (SSME) programs.
At the same time, IBM Romania established ***centres of excellence and laboratories for education and research purposes*** through partnerships with most prestigious Romanian universities (University "Politehnica" Bucharest, The Technical University of Cluj-Napoca, University "Politehnica" Timişoara).
In February 2009, IBM Romania and the Academy of Economic Studies (ASE) have concluded a partnership with educational and research purposes, aiming at:
- increasing the competencies of ASE's graduates in the field of software and informational technologies and of their use in economic applications, so as to train a highly qualifies work force, adapted to current needs;
- providing free training of teachers;
- providing recruitment support for employment of graduates skilled in IT industry;
- establishment of joint research activities IBM – ASE;
- promoting innovation in higher education and academic research;
- consolidating the relationship between two important sectors, the IT and the economic sectors.

Another important component of IBM Romania's Academic Initiative is represented by the promotion of the open-source technologies among students. Annually trainings are offered by IT specialists to students on the following topics: Linux, Java & Eclipse.
IBM Romania organizes The Annual National Student Contest "Best Linux Application", through which students are encouraged to innovate by using Linux, or to improve the performances and the utility of an existing Linux application. Also, IBM is the main sponsor of the International Contest of ACM Programming at world level; the South-Eastern European section of this contest is organized in Bucharest, with a tradition of 11 years.

Conclusions

Partnerships in scientific research between universities and the business environment work in their mutual benefit, and in the benefit of society as a whole. In Romania, The National Research, Development and Innovation Plan for the period 2007-2013 aims at encouraging partnerships between universities and the business environment. In this respect, the most important role was played by PNCDI – Program 4 "Partnerships in Fields of Priority".
So far, institutions of higher education have concluded partnerships with private companies in granting scholarships in high level domains, internship protocols or research contracts. These partnerships have forwarded the development of research laboratories in State universities, improving the training conditions for students or PhD candidates. Most of these partnerships have rather small scale applicability, while partnerships with large implications on the society are now starting to be shaped, as shown by the case of IBM Romania.
Acknowledgements: This article is a result of the contract no 91-058 coordinated by The Academy of Economic Studies Bucharest: "The development of interdisciplinary academic research aimed at boosting Romanian universities' competitiveness on a world scale", financed by CNMP.

References:

1. Cohen, D.W., et al. (1998), Innovation and Learning: The Two Faces of R&D, *The Economic Journal 99*, 569-596.
2. Hanseth, O., Monteiro, E. (1996), Navigating future research: Judging the relevance of information systems development research. Accounting, Management and Information Technology, 6(1-2), 77-85.
3. Kondo, M. (2004), Policy Innovation in Science and Technology in Japan—from S&T Policy to Innovation Policy, *Journal of Science Policy and Research Management* 19(3/4), 132-140.
4. Moody, D. L. (2000), Building links between IS research and professional practice: Improving the relevance and imp act of is research, in *Proceedings of International Conference on Information Systems* (ICIS 2000),
5. Brisbane, Australia, December 10-13, 2000, pp. 351-360.
6. National Authority for Scientific Research (ANCS), http://www.ancs.ro/
7. National Center for Programs Management (CNMP), www.cnmp.ro
8. National Science Foundation (1982), University-Industry Research Relationships: Myths, Realities, and Potentials, *Fourteenth Annual Report*, Washington, DC, Government Printing Office.
9. Reams, R. (1986), University-Industry Research Partnerships, Westport, Conn: Quorum Books.
10. Saunders, C. (1998), The role of business in IT research, *Information Resources Management Journal. 11*(1), 4-6.
11. Shane, S. (2002), Selling University Technology: Patterns from MIT, *Management Science 48*, 122-137.
12. Stokes, D.E. (1997), Pasteur's Quadrant: Basic Science and Technological Innovation, Washington, D.C., Brookings Institution Press, 1997.
13. Varga, A. (2000), Local Academic Knowledge Transfers and the Concentration of Economic Activity, *Journal of Regional Science 40*, 289-309.
14. IBM website: www.ibm.com/academicinitiative