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## Article

# Academic research – a catalyst for the innovation process within companies in Romania

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## **ACADEMIC RESEARCH – A CATALYST FOR THE INNOVATION PROCESS WITHIN COMPANIES IN ROMANIA**

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### **Abstract**

Current economic developments make the use of scientific resources, especially academic research, to be no longer just an option for companies wanting to remain competitive, but a necessity. This statement is based on the research conducted by the authors during the last three years on the companies' performance in Romania regarding the results of the innovation process and capitalization on scientific resources in order to improve this vital process. To achieve this, a mechanism should be created, through which key players in the market - companies, universities, research institutes and government - could work together towards the common goal of economic growth. This mechanism would help companies move beyond incremental innovation by using knowledge generated by universities or research institutes.

This can be achieved with the support of the governmental environment, by adopting policies and creating a general favourable climate for research and by fostering its integration among companies.

This paper presents an analysis of the degree to which companies in Romania use the results of academic research when developing new products or services. Among the identified issues we include the Romanian companies' tendency to perform individual research and development projects, though their frequency is quite low given the difficulties in successfully delivering them to the market. The research shows the importance of using academic research when moving beyond incremental improvements and developing the innovation processes within the company. The prospect of a future model of the university as a knowledge and innovation hub of can significantly contribute to the capitalization of academic research by companies in order to develop sustainable businesses.

**Keywords:** academic research, innovation, research and development, companies

**JEL Classification:** I23, O32, M10.

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### **Introduction**

Previous studies conducted by the authors on the innovation process within companies in Romania found the lack of connection between the development needs of companies and the research conducted by universities and research institutes, as the latter aren't concerned

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with the marketing and usefulness of the research results. Although the interest of companies for research conducted by universities and research institutes is low, academic research can help companies move from an incremental innovation process, based largely on the knowledge obtained from consumers, to a radical innovation process, developed on the basis of solid scientific results. Thus, companies can capitalize on academic research, in order to boost their internal research and development (R&D) process, by creating partnerships with universities and research institutes.

For this purpose we performed a literature review, focusing on the interaction and collaboration between business and academia, which was the basis for the formulation of objectives and research hypotheses regarding the use of academic research by companies to improve innovation outcomes. Following the statistical survey, data collected through the questionnaire was analysed, conclusions were formulated and new directions for research were proposed.

### **1. Literature review**

Although important and valuable for multiple parties, the benefits of pure academic research are difficult to quantify. This feature puts them in the position to be more often the target of budget cuts, especially in the case of fundamental sciences research, as governments consider that the economic benefits of these are insufficient (Vincett, 2010). This reason is one of the major arguments why universities engage in collaborations with the private sector.

There are different perspectives on the role of universities in supporting innovation in businesses. Massa and Testa (2008) discuss two of these approaches. In the first approach, universities are positioned on a superior level than companies, as universities consider themselves as a knowledge centre that disseminates ideas, information and scientific knowledge. In the second one, the role of universities is that of an assistant to companies, giving them advice and training according to their needs. Another way of understanding the role of universities is as links between various organizations, which connect and appeal to them to get their help in accessing specialized knowledge that would otherwise be perceived as coded information by the untrained (Yusuf, 2008).

There are various types of interaction between academia and businesses (Gallego, Rubalcaba and Suárez, 2013; Reveiu and Darda, 2013). Perkmann et al. (2013) describe “academic engagement” and “commercialization” by assessing the major differences between them. “Academic engagement” is an inter-organizational collaboration developed through personal interaction between members of the universities and other organizations or entities, particularly companies. In this case, a financial reward for the university is optional and in some cases the university’s benefit is only the access to the company’s resources or database. “Commercialization” is a transfer of technologies, through which patented innovations, expertise and know-how resulted from research conducted in universities are used for financial gain through companies set up for this purpose. Here we can include spin-off companies, an identity that also comprises companies drawn from the public research (Lawton Smith and Ho, 2006). An example for this is Oxford University, the largest generator of such companies in its region, a position established since 1950 and emphasized both by the development of national policies in the field and the entrepreneurial culture developed in the universities and laboratories of that region.

Results from research conducted in joint partnerships between academia and companies differ from those of purely academic research in what regards the decisions of results dissemination. Thus, according to Simeth and D. Raffo (2013), companies who had benefited from the public science base have a greater openness to make their own results available to those interested. At the same time, one must consider also the researchers' situation, namely to what extent the research and consultancy activities in partnerships with private companies are advantageous for them. A five years study on this subject (Rentocchini, D'Este, Manjarrés-Henríquez and Grimaldi, 2014) shows that the number of published ISI scientific papers declined in the fields of exact and natural sciences as well as engineering, but not in the field of social sciences and humanities.

Proximity to the business environment, both through various types of interaction and by enhancing entrepreneurial education - introduced and promoted in many universities in Europe after the adoption of the Bologna education system (Romero, Petrescu and Balalia, 2011) - had repercussions on academic members. Studying the development of entrepreneurial intentions among those who form the academia, Prodan and Drnovsek (2010) found that, regardless of the cultural context in which researchers are located, a series of links have been identified between their entrepreneurial intentions and a number of issues such as: confidence in their entrepreneurial skills, type of research they carried out, their role models, number of years spent in an academic institution and patents (generated as a method of capitalization on the results of their own research).

The transition to the knowledge economy forces companies to a continued growth and diversification of the sources of information used in the innovation process, as intangible assets have become important sources of competitiveness. Intellectual property rights, knowledge of certain technologies, participation in clusters and specialized networks, the skills and knowledge of employees are all considered intangible assets to be integrated into the business model to ensure its competitiveness (Rogo, Cricelli and Grimaldi, 2014). All these changes encourage companies to work together and to seek external partners such as universities or research institutes in order to attract and stimulate the best specialists and the research results in order to achieve innovation.

## 2. Research objectives

Considering the importance of research carried out by universities and research institutes in generating radical innovation, this paper studies the degree of collaboration and use of these scientific resources by companies in Romania when taking the necessary steps towards innovation. To this point, the first objective was the evaluation of the R&D process in companies, specifically the one performed internally with their own resources, in order to understand the need for using research resources generated by universities or research institutes. The second objective of this study is to assess the current level of use of resources resulting from research by the companies in Romania and what are the improvements that could be done to stimulate this essential activity for the generation of radical innovation.

The following hypotheses were formulated to substantiate the conducted research:

*I<sub>1</sub>: The R&D process within companies in Romania has no continuity or homogenous organization.*

*I<sub>2</sub>: When innovating, companies in Romania focus on the development and improvement of new services.*

*I<sub>3</sub>: The main type of innovation preferred by companies is incremental innovation that involves minor improvements to existing products and services.*

*I<sub>4</sub>: Companies in Romania only use the results of academic research moderately and thus a model for improving the collaboration between academia and the private sector is required.*

### 3. Research methodology

To identify the degree to which scientific resources are used and to evaluate the R&D process within companies in Romania a research was conducted among 87 companies from October 2012 to February 2013.

The survey method used in the statistical research was the controlled survey; given the heterogeneous community, a stratified selection process was used to ensure the sample includes companies of different sizes (SMEs and large companies), from Bucharest - Ilfov area and other counties. Taking into account these two aspects of stratification, four layers were obtained. Therefore, the sampling technique used was voluntary sample, taking into account only those companies that completed the questionnaire. A total number of 1,500 questionnaires were sent out, with a response rate of 5.8%, representing a sample of 87 companies. The questionnaire was sent to all targeted companies via e-mail and from those who responded the completed questionnaire was collected in physical format. The sampling base was a list of companies in Romania, the selection being made based on the layers mentioned above and within them the choice was made randomly.

This process involved completing the questionnaire by the sample thus formed. The questionnaires forms were completed by people with job positions relevant to the selected company. The research also aims to show how companies exploit external resources in order to improve their innovation performance, how they choose to work with external partners to obtain the necessary resources or improve the knowledge and skills they need to innovate.

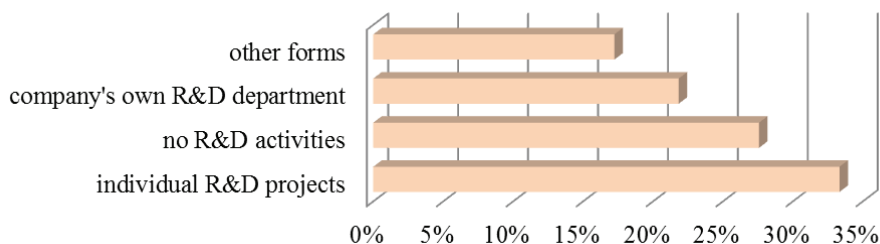
By “companies in Romania” it is understood all those companies with Romanian, foreign or mixed capital, operating in Romania.

The investigative approach of this research focused on a major set of questions and sought to find answers for these. As identified in Rogo, Cricelli and Grimaldi (2014) and in the study by Lawton Smith and Ho (2006) the ability of firms to develop R&D processes proves significant in capitalizing on intangible resources and boosting innovation. To identify this phenomenon in the case of companies in Romania the following questions are useful: *How is the R&D process organized in companies in Romania? What is the frequency of the R&D activities in companies in Romania? What are the outcomes of the R&D process of companies in Romania? What types of innovation are practiced by companies in Romania?*

As in Massa and Testa (2008) there is a certain perception on the collaboration between the universities and companies being relevant to see *to what extent Romanian companies use specific academic research activities when developing R&D projects?*

#### 4. Results and discussion

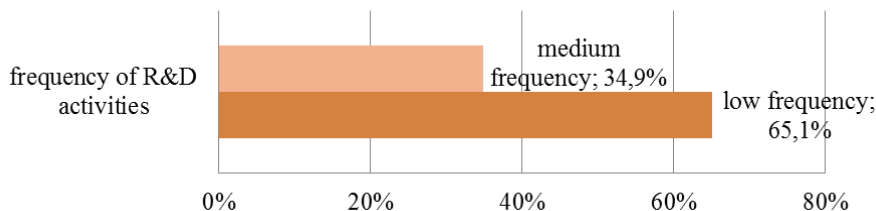
The analysis of responses received from the companies revealed that in terms of organizing the R&D processes, 27.6% of them do not carry out any R&D activities, 21.8% have their own R&D department, while 33.3% only carry out individual R&D projects (Figure no. 1). Other forms of R&D activities include the answers from companies that assign the research activity to a distinct department, separated from its development activity, and the situations where such R&D activities are outsourced. This result shows that the R&D activity is mostly a one-time-only activity, carried out when the situation requires it. The R&D activity is only a constant component in the companies' activities portfolio in a little more than one fifth of companies.



**Figure no. 1: Organization of the R&D process within companies in Romania**

*Source: Data analysis using SPSS*

Innovation activities within companies in Romania are rare, as a percentage of 65.1% of respondents stated that their R&D activities have a low frequency as shown in Figure no. 2. A reason for this is that some projects were either abandoned or failed to be developed to reach the market and achieve the ultimate goal for which they were created. 65.5% of companies admit that they were in this situation, however, only 20.7% of them agreed to transfer the uncompleted projects to third parties.



**Figure no. 2: The frequency of R&D activities within companies in Romania**

*Source: Data analysis using SPSS*

By analysing the answers to the first two questions in this study on the organization and frequency of R&D activities in companies in Romania the first hypothesis is confirmed:

*I<sub>1</sub>: The R&D process within companies in Romania has no continuity or homogenous organization.*

Sungjoo et al. (2010) notes that the possibilities for innovation are mainly influenced by the size of the company. Therefore, this process is more likely to be successful in large companies rather than in small ones, given the adverse conditions faced by the latter, such as: the lack of resources, the low capacity for R&D, manufacturing, distribution and marketing, all of which are essential in turning an invention into a successful product, service or process. A possible solution would be stimulating the mechanisms of cooperation between companies of different sizes and improving their interaction with other entities in order to increase innovation results. Also observed is the need for companies to capitalize on the research conducted by universities or research institutes in order to enhance the innovation process.

An investigation of the outcomes of the innovation process is necessary, given the weak performance of R&D. Thus, by innovating, companies were able to obtain new services, products or processes as shown in Figure 3.

<i>Type of outcome</i>	<i>Percentage</i>
innovative services	59.8%
innovative products	56.3%
innovative processes	41.4%

**Figure no. 3: The structure of innovation outcomes within companies in Romania in the period 2007-2012**

*Source: Data analysis using SPSS*

These results are also emphasized by the effect of the economic crisis on the investments made by companies in Romania, as most of them chose innovation in services as a first option in response to the diminishing funds available for business activities, this being the type of innovation usually involving the lowest costs and low risks. The opposite is process innovation as it involves the allocation of significant resources, although it will help diminish future costs and improve product quality and customer service.

The second hypothesis is confirmed:

*I<sub>2</sub>: When innovating, companies in Romania focus on the development and improvement of new services.*

Depending on the degree of novelty of innovation results and the technologies involved, the research showed that basic innovation is the most frequent, as shown in Figure no. 4.

<i>Type of innovation</i>	<i>Percentage</i>
incremental innovation	54%
radical innovation	18,4%
no innovation	27,6%

**Figure no. 4: Types of innovation within companies in Romania in the period 2007-2012**

*Source: Data analysis using SPSS*

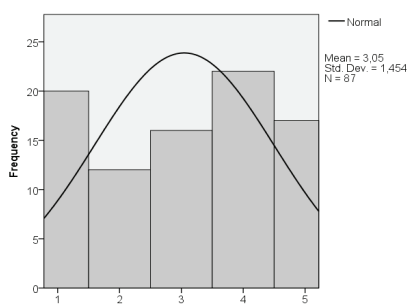
As shown by these types of innovation, radical innovation has a very low weight, although this type of innovation is the one bringing significant gains for companies that achieve such performance. Following these results the third hypothesis is confirmed:

*I<sub>3</sub>: The main type of innovation preferred by companies is incremental innovation that involves minor improvements to existing products and services.*

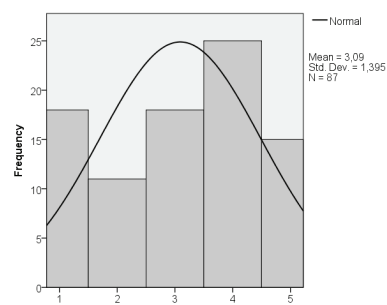
The research emphasizes the need for creating mechanisms stimulating the cooperation between companies and universities or research institutes, whose scientific results can be a main source of radical innovation for companies.

In analysing the use of academic research results by companies in Romania, the tested variables were measured using a 5-point Likert scale, 1 representing the absence of their use and 5 reflecting a very high frequency of their use.

At the present, we are witnessing an average interest in knowledge accumulation and the intention of using scientific research results in innovation activities in companies, as shown in Fig. 5 and Fig. 6. Thus, 63.2% of companies participating in the survey used scientific literature and 65.5% participated in conferences with experts in their field of knowledge in order to gain the necessary knowledge for increasing innovation. This activity is useful for updating information on the latest techniques, processes or technologies used in the industry in order to better meet consumer requirements.



**Figure no. 5: Degree of using scientific literature**



**Figure no. 6: Participation in conferences with experts**

Source: Data analysis using SPSS

A more extensive descriptive statistical analysis of the Skewness asymmetry coefficient, Kurtosis vaulting coefficient is required as well as testing the normality of the distribution.

**Table no. 1: Descriptive statistics**

Variable	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
using scientific literature	3.05	1.454	-.151	.258	-1.348	.511
participation in conferences with experts	3.09	1.395	-.247	.258	-1.208	.511
involvement in professional networks	3.57	1.419	-.654	.258	-.912	.511

Source: Data analysis using SPSS

As shown in the descriptive statistics (Table no. 1), the first two variables have a mean of 3.05 for *using scientific literature* and 3.09 for *participation in conferences with experts*, where 5 is the maximum, showing a moderate use of such academic research results. Other important values are the Skewness coefficient (-.151 for *using scientific literature* and -.247



for *participating in conferences with experts*) and the Kurtosis coefficient (-1.348 when *using scientific literature* and -1.208 for *participating in conferences with experts*) that show an asymmetrical distribution towards the right, flat with few categories distant from the mean for these first two variables.

Applying the two Kolmogorov-Smirnov and Shapiro-Wilk tests (Table no. 2), Sig <0.05 confirms that for all three variables the deviations are significant and the distribution is not normal.

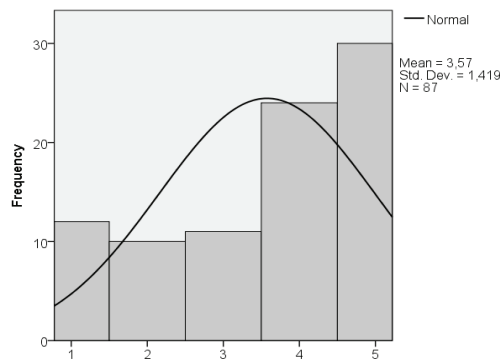
**Table no. 2: Testing for normality**

Variable	Kolmogorov-Smirnov <sup>a</sup>		Shapiro-Wilk	
	Statistic	Sig	Statistic	Sig
using scientific literature	,192	,000	,874	,000
participation in conferences with experts	,202	,000	,881	,000
involvement in professional networks	,238	,000	,874	,000

a. Lilliefors Significance Correction

Source: Data analysis using SPSS

The next stage in using knowledge in order to innovate is *the involvement in professional networks* in the purpose of collaborating with external partners to expand the knowledge base and attracting the necessary resources for this process. In this regard, 71.3% of respondents claimed that they use *involvement in professional networks* as a source of information for their R&D activities. As can be seen in Figure 7, the frequency of using this type of documentation is higher than in the case of the previous two types.



**Figure no. 7: Involvement in professional networks**

Source: Data analysis using SPSS

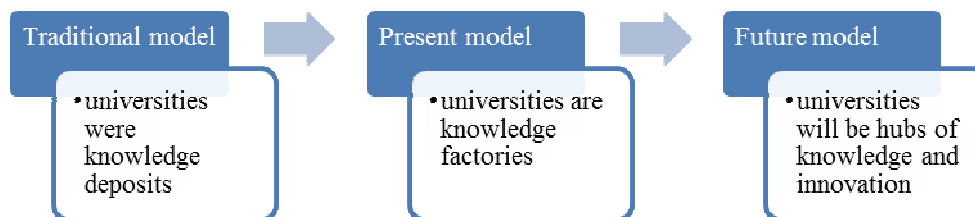
The variable measuring the companies' involvement in professional networks recorded a mean of 3.57, where 5 is the maximum, thus showing a greater interest in this type of knowledge resource than the other two previously recorded. Skewness coefficient values (-.654) and Kurtosis coefficient (-.912) highlight an asymmetric distribution to the right, flat with few categories distant from the mean.

Based on previous results the last hypothesis is confirmed:

*I<sub>4</sub>: Companies in Romania only use the results of academic research moderately and thus a model for improving the collaboration between academia and the private sector is required.*

This research showed that the best method suitable for companies in Romania would be the development of professional networks with companies of different sizes, universities and research institutes, for an optimal exchange of information and resources that will contribute to the companies' innovation process. The companies' interest in using research results needs to increase in order to carry out innovation processes, and this can best be achieved by transitioning to the "university as a knowledge and innovation hub" model (Youtie and Shapira, 2008).

In this context the view that universities should move from doing conventional research and providing educational services to being a hub of knowledge promoting innovation proves to be useful (Youtie and Shapira, 2008). Figure 8 is relevant to this theory.



**Figure no. 8: The evolution of the model adopted by universities**

*Source: Adapted from Youtie and Shapira, 2008, p.1190*

As highlighted in this study on the companies' use of R&D activities and academic research, Romanian universities fall in *the present model*, where they transform students and discoveries/ research into employees and scientific publications, thereby assuming the role of knowledge manufacturing plant. To enable the transition to *the future model* of universities as knowledge and innovation hub, the adoption of measures such as the following is required:

- building clusters, strategic alliances and partnerships between companies, universities and government to support innovation process by properly creating and capitalizing on knowledge generated by each party;
- linking the creation and implementation/ commercialization of research results through the creation of business incubators allowing for the creation of start-ups and joint ventures;
- more companies adopting the principles of open innovation and understanding the importance of capitalization on external sources of innovation, including research activities carried out by universities and research institutes;
- encouraging companies to fund R&D projects developed in universities by providing incentives and creating programs to form the environment for developing these initiatives.

These activities are a necessary first step to be made in the transition to the future model of university – as a hub of knowledge and innovation, contributing to technological progress and economic development. Universities should assume the role of knowledge mediator between companies and market, carrying out such research projects that will find utility in the market and thereby generate innovation.

## Conclusions

In the context of the current economy, academic research is once again viewed as a profitable activity both in terms of benefits derived directly from it, and in terms of the perception of academic members of the growing need to relate to the market as to attract partners from the business environment.

Considering the results obtained from this study on the use of academic research in the companies' innovation process, the need for a transition to a system that will improve the collaboration between universities, research institutes and companies is clear. This is due to the fact that R&D processes within companies in Romania have no continuity and are not homogeneously organized, companies innovating mainly focusing on the development and improvement of new services. The current low frequency of R&D activities of companies, with a preference for individual projects, is justified by the fact that R&D activities are perceived as a necessary reaction to a situation required by the market and not a step to be made naturally in order to meet the needs of consumers.

Companies in Romania could capitalize on academic research and thus move beyond incremental innovation and also progressing in terms of product and process innovation, without limiting themselves to the creation of innovative services. This paper shows that the results of academic research are used only to a moderate degree by companies in Romania, a model for improving the collaboration between academia and the private sector being required.

The transition to the model of universities as a knowledge and innovation hub would encourage companies to capitalize on academic research. To this point it is necessary to develop clusters and strategic alliances and partnerships between universities, companies and government, to increase the awareness of capitalization on academic research results obtained by universities, to encourage the companies' adoption of open innovation principles, and encourage companies to finance research projects in universities and research institutes through state policies and facilities.

Some limitations of this research include the lack of relevant statistical data regarding the process of using academic research results in companies, the lack of a comparison unit in terms of innovation performance for companies in Romania and the companies' low rate of response in the provision of information regarding R&D.

A future development direction of this paper can be an in-depth research of the universities perception on the use of academic research results by companies and a comparison of the two perspectives. Thus, it will be possible to identify the issues that need to be resolved in order for academic research conducted by universities to contribute substantially to the innovation process in companies.

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