

ASPECTS OF INNOVATION WITHIN ROMANIAN ENTERPRISES, COMPARED TO OTHER EUROPEAN COUNTRIES

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Abstract

The article approaches a key topic of the European economy, namely the issue of innovative enterprises, aiming to provide a more objective picture of the place occupied by our country in the European context in terms of innovative performance, the prevalence of innovation in Romanian companies, the typology of these innovations and these companies compared to other EU states. Emphasis will be placed on the characteristics of innovation in Romanian enterprises, on the differences in the degree of innovation among the developing regions of our country, but also on the difficulties local enterprises face in trying to innovate. Our paper will rely on a secondary analysis of data from multiple databases, reports, studies developed by European and Romanian institutions.

Keywords: *innovative enterprises, innovation performance, types of innovation, cooperation, barriers to innovation*

JEL Classification: O₃₁

Introduction

The present article brings forward the issue of innovation within Romanian enterprises, compared with other EU27 countries, focusing especially on their innovative performances, but also on other dimensions, such as the percentage of innovative enterprises, types of achieved innovation, the size of the innovative enterprises, the objectives that led to it, sources of information, barriers to innovation and the degree of innovation of Romanian development regions.

Innovation is a key-topic of today and of all the possible and desirable means of conceiving the future, being considered on EU level an essential issue for the development of the knowledge society. A knowledge society cannot be anything else but a society of innovation, and especially driven through innovation, as by its very nature, knowledge is constantly developing, and thus requires innovation. Inside the EU, there are often debates on the necessity of developing an innovative culture, which would lead to a reduction of the present gap between the US and the EU – attributed by many specialists to the more open-to-risk American culture; another disadvantage experienced by the EU is the gap in innovative performances, experienced at the heart of the EU between the EU15 old members and the new

members of EU27. The main “weapon” used by competitor leaders on globalized markets is innovation. To this, the other countries respond with other policies of innovation in order to reduce the recorded gap. Innovation becomes thus the common behaviour in the fight for survival, based on the principle “innovate or die” (European Commission, 2002, 6). This new positioning of innovation with respect to competitiveness results directly from the process of transition towards a knowledge society.

In this regard, the aim of the present paper is to present the current situation of innovation in national enterprises, compared with European ones, but also the status of the overall innovation performances in Romania, in an European context, highlighting the specific difficulties experienced by Romanian enterprises in their attempts to innovate, to become and maintain themselves competitive. Consequently, the present paper shall use a secondary analysis of data from various data bases, reports, and studies, elaborated by Romanian and European institutions.

Literature review

Joseph Schumpeter defined innovation in 1939 as representing “the commercial exploitation of an invention”, emphasizing its character of “creative destruction” (replacing what is old-fashioned by creating something new and better) (Hoffman, Glodeanu, 2006). Thus, innovation can be regarded in general as a process of diffusion, assimilation and usage of inventions in various domains of society (Hoffman, Glodeanu, Leovaridis, Nicolaescu et al., 2009, 52)

Throughout time, various authors have approached innovation and its role in society: four innovation strategies have been introduced, taking into account the manner in which the knowledge process has been taking place (through transfer or one’s own forces) and the field of knowledge (already existent or new), resulting in the strategies of leverage, expansion, assimilation and experimentation (Krough, 2004, 367). Peter Drucker presented different ways of achieving innovative products (Drucker, 1993, 159-163): the changing of product values and characteristics, so that “strategy itself is an innovation”; the innovation in the price system; the innovation in the product-generated services; introduction of maintainance costs, consultancy and installation of products based on the selling price; innovation with regard to new value-criteria taken into consideration in the designing and implementaion of a product. Tom Peters is the one who introduced the analysis of innovation cycles (2000): the author presents a conceptual scheme regarding the basic principles in the conception and production of innovation – the meaning of the cycle is of a morally-philosophical nature. A proper analysis of the “innovation cycle” will take into consideration “the technological discontinuity the user is confronted with, during a time in which the new technology (and its associated options) are competing with the old technology”: “the innovation cycle” is directly related with the “technological cycle”, so that each phase of a technological cycle is associated with various challenges and innovation types (Tushman, Anderson, 2004, 33-36).

Both in the case of the typology of innovation, as in the case of the operational definition of enterprises based on the innovation criterium, a fundamental role is played by the distinction between various types of innovation, as elements that can be found either in the technological reality, or in the non-technological one, acting separately or together. Most of the approaches to this topic (more or less theoretical) identify “four types of innovation: product, process, organizational and marketing innovation” (OECD, 2005, 47). The minimum condition that a product, a process or a marketing, management, organizational method need to fulfil in order to be considered innovative, is for the respective process, product or method to be new in the company or renewed in a significant manner. Another paper (*Harvard...*: 2003, 3) draws a difference between incremental innovation, which exploits already existing technologies, reconfiguring them, and the radical one (or the *discontinuous, breakthrough innovation*) which brings something new, totally different from existing things, in some cases even creating new markets.

Lundvall and Nielsen (2007, 65) approached innovation from the perspective of the social dimension, the relationship that management has with the employees of the innovative company, as a process of creating knowledge, in which the speed and the direction of creating knowledge reflects the company’s organizational features, and implicitly, the involvement of employees in various forms of direct or indirect participation to decision-making, as well as the investment in increasing the competences of its employees. Social cohesion, this time on a national and even international level, has been approached also by Cantwell (2011, 544), who considers that achieving competitiveness through innovation has become a noteworthy objective of national policies, and the role of innovation has increased in the present knowledge-based economy, even though and especially if it is the case of less developed countries or regions which are looking forward to catching from behind the more developed countries. This justifies the need for more successful players being involved in the competition game, who would cooperate with each other in the innovation process, instead of creating obstacles. The European Union has often highlighted the need of strengthening social cohesion, which, from the point of view of stimulating innovation involves the existence, within the inevitable competition, of certain cooperation practices (“a win-win competition”).

Comparative statistical data regarding innovation in European countries

The latest data, of 2008, referring to the European innovative enterprises, shows that Germany has registered the highest percentage of innovative enterprises (79.9% of the total number of enterprises), followed by Luxemburg (64.7%); the lowest percentage has been registered in Latvia (24.3%), Poland (27.9%) and Hungary (28.9%), with an EU-27 average around 51.6%. Estonia, Cyprus and the Czech Republic are the only states that became EU members in 2004 and which have shown a more innovative capacity than the EU-27 average (Eurostat, 2012a, 590).

Table 1

**The share of innovative enterprises of the total number
of enterprises, in EU27**

EU-27	51.6
Germany	79.9
Luxembourg	64.7
Belgium	58.1
Portugal	57.8
Ireland	56.5
Estonia	56.4
Austria	56.2
Cyprus	56.1
Czech Republic	56.0
Sweden	53.7
Italy	53.2
Finland	52.2
Denmark	51.9
Slovenia	50.3
France	50.2
Great Britain	45.6
Netherlands	44.9
Spain	43.5
Malta	37.4
Slovakia	36.1
Romania	33.3
Bulgaria	30.8
Lithuania	30.3
Hungary	28.9
Poland	27.9
Latvia	24.3

Source: Eurostat, *Innovation: tables and figures*. Excel Database available at http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Innovation_statistic, Figure 13.3.1, accessed at 1.03.2013.

Large enterprises have brought on the market a larger product innovation percentage than the medium or small enterprises: this pattern can be observed in 2008 in all EU-27 member states, excepting Latvia (where small enterprises generated to a larger extent product innovation). The same differentiation based on the size of the enterprises is to be noted also in the case of process innovation – the large enterprises dominate, with a few exceptions: in Romania, Poland, Portugal and Finland, small enterprises have become noteworthy through process innovation to a larger extent than the larger ones, while in Italy and Slovenia the medium ones have reached that status. Overall, taking into account both types of innovation, one can notice the tendency manifested by large European enterprises to innovate more, compared with SMEs (Eurostat, 2012b, 178).

In most countries, in 2008, the percentage of innovative enterprises was in general higher for the industry rather than the services' sector – the exceptions were Luxemburg, Hungary and Portugal. A third of the innovative enterprises of EU-27 have cooperated with other enterprises, universities or public research institutes, while the rest of two thirds had relied only on their own resources. The largest percentage of enterprises that have been innovating through cooperation is in Denmark (56.8%), Cyprus (51.4%), Belgium (48.8%) and Estonia (48.6%), while the lowest percentage in this regard is in Romania (13.8%), Italy (16.2%), Bulgaria and Latvia (16.6% for each). In addition to this, except for Cyprus, European innovative enterprises have more likely used internal research and development, rather than the external one (Eurostat, 2011, 81).

Regarding the objectives that lead to innovation, more than half of the innovative enterprises of EU-27 mentioned an improvement in the quality of products and services (56.6%) and a diversification in products and services (52.2%); moreover, in a decreasing order of frequency, 42.4% of them indicated as reason the raise of the market share, and 39.6% – the entry on new markets. Of the Romanian innovative enterprises, just as in the case of the EU-27, most of them indicated an improvement in the quality of offered products and services (55.5%), a diversification of products and services (50.0%), followed by the entry on new markets (35.5%), the replacement of old products and processes (34.4%) and an increase in their market share (34.1%) (Eurostat, 2011, 90).

The situation of Romania, compared with that of other European countries, has been highlighted also by other studies of the European Union, of which the most referential one for the present topic, due to the analysed indicators, is the *Innovation Union Scoreboard* series, initiated in 2001 and published annually ever since. The aim of these studies is to compare the level of member states, from the point of view of the transition towards a knowledge society; from 2002, this research has been including Romania also. The last edition of 2011 is grouping the European countries based on the values of the indicators referring to innovative performances, into four main groups (MERIT, 2012, 12):

- *innovation leaders*, whose performances are above the average of the EU27: Denmark, Finland, Germany and Sweden;

- *innovation followers*, whose performances are closer to the EU27 average: Austria, Belgium, Cyprus, Estonia, France, Ireland, Luxembourg, Holland, Slovenia and Great Britain;

- *moderate innovators*, whose performances are under the average of the EU27: the Czech Republic, Greece, Hungary, Italy, Malta, Poland, Portugal, Slovakia and Spain;

- *modest innovators*, whose performances are under the EU27 average: Bulgaria, Latvia, Lithuania and Romania.

In 2011, *Innovation Union Scoreboard* has been organized based on a methodology comprising 25 indicators, grouped in 8 dimensions (human resources, open, excellent and attractive research systems, finance and support; firm investments, linkages and entrepreneurship, intellectual assets; innovators,

economic effects). These dimensions are also grouped in three main types of indicators (*enablers*, *firm activities* and *outputs*) (MERIT, 2012, 6).

In this last edition of the study, Romania is situated on the 24th place among 27 member states, according to its innovative performances (measured overall). After Romania there are only Lithuania, Bulgaria and Latvia left. According to this study (MERIT, 2012, 16), Romania's strengths are highlighted for the indicators grouped in the "firm investments" and "economic effects" dimensions; while the weaknesses are grouped in the following dimensions: "human resources", "open, excellent and attractive research systems", "linkages & entrepreneurship", "intellectual assets" and "innovators".

Table 2

Romanian innovative performances, compared to EU27, in 2011

		UE27	Romania
1. Enablers			
1.1.	Human resources (Romania is situated on the 26 th place among 27 states)		
1.1.1	New doctorate graduates per 1000 population aged 25-34	1.5	1.3
1.1.2.	Percentage population aged 30-34 having completed tertiary education	33.6	18.1
1.1.3.	Percentage youth aged 20-24 having attained at least upper secondary education	79.0	78.2
1.2.	Open, excellent and attractive research systems (Romania is situated on the 25 th place among 27 states)		
1.2.1	International scientific co-publications per million population	301	140
1.2.2.	Scientific publications among the top-10% most cited publications worldwide as % of total scientific publications of the country	10.73	4.22
1.2.3	Non-EU doctorate students as a % of all doctorate holders	19.19	2.06
1.3	Finance and support (Romania is situated on the 22 nd place among 27 states)		
1.3.1	R&D expenditure in the public sector (% of GDP)	0.76	0.29
1.3.2	Venture capital (% of GDP)	0.095	0.041
2. Firm activities			
2.1.	Firm investments (Romania is situated on the 12 th place among 27 states)		
2.1.1.	R&D expenditure in the business sector (% of GDP)	1.23	0.18
2.1.2.	Non-R&D innovation expenditures (% of turnover)	0.71	1.36
2.2.	Linkages & entrepreneurship (Romania is situated on the 25 th place among 27 states)		
2.2.1.	SMEs innovating in-house (% of SMEs)	30.31	16.66
2.2.2	Innovative SMEs collaborating with others (% of SMEs)	11.16	2.27
2.2.3.	Public-private co-publications per million population	36.2	6.3
2.3	Intellectual assets (Romania is situated on the 27 th place among 27 states)		
2.3.1	PCT patent applications per billion GDP	3.78	0.15
2.3.2	PCT patent applications in societal challenges per billion GDP	0.64	0.01

2.3.3	Community trademarks per billion GDP	5.59	1.60
2.3.4	Community designs per billion GDP	4.77	0.42
3. Outputs			
3.1.	Innovators (Romania is situated on the 23 rd place among 27 states)		
3.1.1.	SMEs introducing product or process innovations (% of SMEs)	34.18	18.03
3.1.2	SMEs introducing marketing or organizational innovations (% of SMEs)	39.09	25.80
3.2	Economic Effects (Romania is situated on the 15 th place among 27 states)		
3.2.1	Employment in knowledge-intensive activities as % of total employment	13.50	6.00
3.2.2	Medium and high-tech product as % of total product exports	48.23	50.72
3.2.3	Knowledge-intensive services exports as % of total services exports	48.13	48.35
3.2.4	Sales of new-to-market and new-to-firm innovations as % of turnover	13.26	14.87
3.2.5	License and patent revenues from abroad as % of GDP	0.51	0.28

Source: (MERIT), *Innovation Union Scoreboard 2011*, Belgium, 2012, pp. 63-64.

The situation of Romanian innovative enterprises

In the Romanian case, the data offered by the National Statistics Institute show that the percentage of innovative enterprises, of the total industrial and service enterprises, has been growing in a constant manner, going from 17% in 2000 to 30.8% in 2010 (with intermediate values of 19.9% in 2004, 21.1% in 2006 and 33.3% in 2008). The percentage of enterprises experiencing only technological innovation (product and/or process) dropped from 6.5% in 2008 to 4.3 % in 2010, while the percentage of those experiencing only non-technological innovation (organizational and/or marketing) increased on the same temporal interval from 13.6% to 16.5% – this was possible due to the more reduced costs in the case of introducing non-technological innovation (INS, 2013, Table 4.1).

Based on the size criterion, between 2002 and 2010, small enterprises dominated as percentages the total of innovative enterprises, which can be explained by the fact that these are a majority in the total number of Romanian enterprises; in addition to this, their percentage within the total number of innovative enterprises increased throughout the interval (from 53.6% in 2002 to 69.2% in 2010), to the detriment of large enterprises (from 16.7% in 2002 to 7.7% in 2010) and the medium ones (from 29.7% in 2002 to 23.1% in 2010) (INS, 2013, Table 4.2).

Regarding the most important source of innovation (INS, 2013, Table 4.4), the most often mentioned by enterprises, from the total number of those experiencing technological innovation, is internal innovation (from inside the enterprises or the enterprises group – 43.4%), followed by clients and buyers

(33.5%) and equipment, materials, components or software suppliers (33.4%). Other sources have received less credit: competitors or other enterprises from the same field of activity (23%), conferences, fairs, exhibitions (14%), scientific journals and commercial/technical publications (11%), consultants, commercial labs or private research and development institutes (7,5%), industrial and professional associations (5%), universities or higher education institutions (3.7%), government or public research institutions (2.5%). It is a fact that higher education institutions or public research ones are the last sources of innovation mentioned, based on frequency, which confirms once more the lack of connection between the former and production – a connection that should be visible in the transfer of knowledge from the first to enterprises.

The lack of cooperation in general, which could lie at the basis of innovation, as well as stimulate it, is demonstrated also by the fact that less than a quarter of the total number of Romanian innovative enterprises with technological innovation, in 2010, have innovated through cooperation (INS, 2013, Table 4.6): of these, the majority have Romanian partners (20.6%) while the foreign ones are a mere exception (0.1% European partners and 0.2% US or other country partners).

The innovation expenses of innovative enterprises (INS, 2013, Table 4.7) have been directed in 2010, especially towards buying machinery, equipment and software (69.1%), followed by other more reduced expenses: internal research and development activities (18.3%), external research and development activities (11.1%) and the buying of other external knowledge (1.5%).

Among the non-technological innovative enterprises (within the total number of innovative enterprises) (INS, 2013, Table 4.5), 18.4% have developed organizational organization, while a similar percentage, 19.2% – marketing innovation: of these, within the small enterprises the marketing innovation is highlighted in 2010 (17.7% compared with 15.1%), while in the case of the medium and large enterprises, the organizational innovation is to be highlighted (of the medium-sized, 26.7% experienced organizational innovation, compared with 22.6% with marketing innovation; respectively for the large ones, 42.1% experience organizational innovation compared with 31.5% – marketing innovation).

In 2011, the *Inobarometer Report. A Report on Barriers to Innovation*, has been completed in Romania (the first edition dates back to 2008), which is a study about innovation in various development regions, analysing and putting into a hierarchy, the capacity of regions to generate and maintain a proper environment which can support innovation in the case of economic operators. The study was elaborated by a consortium of 16 entities (Commerce Chambers, research institutes, universities, innovation centres) from the National Network of Innovation and Technological Transfer, coordinated by the Romanian Institute of Socio-Economic Research and Survey – IRECSON. The report shows that from the point of view of the overall degree of innovation of development regions, the first place is taken by the Bucharest-Ilfov Region, followed at a greater distance by the North-Eastern, Centre, Southern, South-Eastern, South-Western, North-Western and Western regions (Autoritatea Națională pentru Cercetare Științifică, 2011, 13).

In order to achieve this general classification, five innovation factors have been taken into account, each of them composed of several other sub-factors, as follows:

- the innovation driving potential (formal and non-formal education; personnel involved in technological research and development activities –TRD; personnel involved in the process of promotion, marketing, prognosis and surveillance of the economic environment; the degree of innovation support from the local public authorities);
- the knowledge creation potential (public; private);
- the capacity to innovate and integrate in a relational system (capacity to innovate; cooperation and collaboration);
- the performance of innovation activities (development of products/technologies or new/modern services on the market or the implementation of new/modern technologies within the organization; TRD activities; consultancy activities – services; promotion, marketing and distribution activities);
- intellectual property (technical and economic documentations – documentations of the production of goods/services, feasibility studies, market studies, business plans, economical and technical projects etc.; patents; protected industrial patterns and drawings; other – copyright, trademarks, recipes, geographical directions, animal and plant species etc.).

Based on these factors and sub-factors, a certain comparison has been drawn over the development regions, which is presented in the following table.

Table 3

The general comparative situation according to innovation factors

Development region	General ranking	Ranking according to innovation factors				
		Innovation driving potential	Knowledge creation potential	Capacity to innovate and integrate in a relational system	Performance of innovation activities	Intellectual property
Bucharest-Ilfov	1	1	1	1	1	1
North-East	2	2	4	2	7	6
Centre	3	7	8	3	3	2
South	4	5	2	5	6	3
South-East	5	6	7	4	2	7
South-West	6	3	6	8	4	8
North-West	7	4	3	7	8	4
West	8	8	5	6	5	5

Source: Autoritatea Națională pentru Cercetare Științifică (ed.), *Raportul Inobarometru. Raport Bariere în Calea Inovării*, București, 2011, p. 19.

Another aim of the survey conducted on enterprises was to highlight the factors and their importance in the blockage of innovative activities, projects etc., or over the decision not to innovate. The factors are the following (Autoritatea Națională pentru Cercetare Științifică, 2011, 53):

- cost factors: lack of funds within the unit; lack of outside financing; too-high innovation costs;
- factors regarding the accumulation of knowledge: lack of qualified personnel; difficulties in finding cooperation partners for innovation; lack of information on technology and on the specific market requirements;
- market factors: the market is dominated by other consecrated enterprises; fluctuating demand of innovative goods and services;
- reasons not to innovate: no need because there are no such demands for innovations or because of previous innovations.

Furthermore, a regional analysis of the importance of these factors has shown that as far as cost factors are concerned, the lack of unit funds has contributed to a large extent to the blockage of innovative activities for 36% of enterprises. Most enterprises that have confronted with these problems are from the following regions: Bucharest-Ilfov (19%), North-Western (15%), South-Eastern (14%) and Southern (14%). The lack of outside funds has contributed to a great extent to the blockage of innovative activities for 28% of enterprises. Most enterprises which have been confronted with this issue are from the following regions: Bucharest-Ilfov (19%), North-Western (15%), South-Eastern (14%) and Southern (13%). Too-high innovation costs have contributed to a large extent to the blockage of innovative activities for 30% of enterprises, which come from the following regions: Bucharest-Ilfov (17%), North-Western (15%), South-Eastern (14%) and Southern (14%).

With respect to the factors regarding the assimilation of knowledge, the lack of qualified personnel has contributed to a large extent to the blockage of innovative activities for 12% of enterprises. Most of the enterprises which have been confronted with this matter are from the following regions: North-Western (18%), Western (16%), Bucharest-Ilfov (15%). The difficulties in finding cooperation partners for innovation have also contributed to the blockage of innovative activities for 12% of the enterprises, grouped in the following regions: North-Western (25%), Bucharest-Ilfov (19%), North-Eastern (13%) and Southern (12%).

As far as market factors are concerned, the existence of consecrated enterprises that dominate the specific market has also contributed largely to the blockage of innovative activities for 19% of enterprises. Most of them come from the following regions: Bucharest-Ilfov (17%), Southern (17%), North-Western (16%) and South-Eastern (14%). The fluctuating demand of innovative goods and services has also contributed to such blockage for 12% of enterprises in the following regions: North-Western (20%), Southern (18%), Bucharest-Ilfov (17%) and North-Eastern (14%).

Finally, from the point of view of the reasons not to innovate, the lack of demand for innovation from the specific market has blocked the innovative

activities for 10% of enterprises, especially from the regions Bucharest-Ilfov (28%), North-Western (15%), Southern (14%) and South-Eastern (12%) (Autoritatea Națională pentru Cercetare Științifică, 2011, 53-54).

Conclusions

Although in our country, the share of innovative enterprises in all enterprises increased steadily over the past 10 years, the proportion of those with technological innovation decreased, increasing of those with non-technological innovation, more accessible and cheaper. The collaborative innovation is insufficient widespread, especially one based on linkages with institutions of higher education and research, which is more an exception. The main barriers to innovation in Romanian enterprises are lack of internal funds and external financing sources under conditions of innovation costs too high, a market dominated by established enterprises, difficulties in finding cooperation partners for innovation, lack of demand for innovation on specific market.

These characteristics of innovation situation in Romanian companies do that, unfortunately, our country currently reside in 24th place out of 27 EU countries in terms of overall innovation performance, placing in the last value group (modest innovators) of the four groups in which European countries are grouped according to this criterion.

Lack of emphasis on research in our country strategies and of sources of funding to encourage the transfer of knowledge from research and higher education to productive enterprises makes key indicators reflecting the transposition of innovation results in the economy to place Romania far behind the EU27 average. In Romania there are premises for innovation, because of highly qualified and creative human resources, but the mechanisms and infrastructure to encourage innovation creation and especially for the dissemination of its results are still in early development.

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