

THE INFLUENCE OF DIFFERENT INNOVATION TYPES UPON THE INNOVATIVE PERFORMANCE – EVIDENCE FROM EUROPEAN COUNTRIES

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Abstract:

Innovation represents a widely debated topic in the context of current economy, being an opportunity to achieve corporate competitiveness within an environment of uncertainty. The main purpose of this paper is to analyze the impact of different innovation types on the innovative performance in the case of 31 European countries, using the simple and the multiple linear regressions across countries. In this regard we have considered different types of innovation, such as product, process, marketing and organizational innovation, while the innovative performance was synthetically expressed by Summary Innovation Index 2013. The main result of our study is that in order to achieve high innovative performance it is necessarily to implement product and process innovation simultaneously with organizational and marketing innovation. Thus, the findings of this paper can represent a guidance for companies to identify the most appropriate types of innovation that have the greatest influence on achieving high innovative performance.

Keywords: *product/process innovation, organizational/marketing innovation, innovative performance, Summary Innovation Index*

1. Introduction

In the last decades, academics and practitioners have stated that innovation can represent an important opportunity for progress, especially in the current context which is characterized by prominent phenomena such as globalization or economic instability. Thus, innovation can represent a key factor in order to obtain competitive advantages, being vital to stimulate economic growth. In this regard, many authors have highlighted the importance of innovation for the process of increasing corporate performance. For instance, Bloch (2008) mentioned that knowledge, research and innovation represent

some of the crucial factors for the competitiveness of the modern economy, arguing that in this way can be reached a high standard of living and welfare. In the same time, Dovleac and Balasescu (2013, p. 157) mentioned that innovation represents an important challenge for any company, but also it can be the key factor behind the creation of sustainable values. As well, Feimi and Kume (2014, p. 240) reminded that innovation, as a way to introduce new or considerable improved products, processes or methods, is necessary in order to drive growth and to improve living standards. In this context, Peters (2005) mentions that the process of quantifying the productivity

effects of innovation was one of the most challenging field in economics empirical research for a long period.

The quoted author mentions that companies which develop new products and processes are more efficient. Thus, the empirical results highlighted that some of the most important factors which stimulate product and process innovation are training employees to increase their knowledge capital and considering customers or suppliers as information sources (Peters, 2005, p. 20).

Innovation types are different and, certainly, they have a different impact on company's outcomes. Among these forms of innovation can be mentioned product innovation, process innovation, marketing innovation, organizational innovation. The various influences are given by the different characteristics of each type of innovation. For example, product innovation assumes the production of new products or services as well as bringing several significant improvements in existing products or services in order to create a new market for these new creations or to satisfy customers' needs. Managers use product innovation in aim of bringing efficiency for their business, but they must consider that this product is new both for customers and for firm. Some authors showed in an early paper (Ettlie & Reza, 1992) that developments of a new product are able to influence positively the business performances.

At the same time, process innovation helps the companies to improve the quality of the goods and to improve their efficiency. In fact, this type of innovation supposes considerable improvements regarding several aspects like equipments, technologies or delivery strategies and also may imply the costs reduction. More than this, organizational innovation represents the implementation of new business practices and approaches. Therefore, organizational innovation

assumes new ways and visions for routine activities in order to reduce production costs and to obtain a higher level of efficiency. As well, marketing innovation represents new methods in product's design, package, promotion or placement in the shop and it doesn't imply technological innovation or progress. Thus, comparing with the others types of innovation, marketing innovation is characterized by significant changes in product packing or in its design, in its distribution or pricing policy and the main goal is to increase company's market share and its sales.

Considering market orientation as a culture of the company that put the customers' satisfaction in the center of business activity, Erdil *et al.* (2005) found that implementation of such a strategy is important for those companies that want to gain competitive advantages. Thus, the quoted authors found that market orientation of the company can improve innovation capacity and performance.

In addition at all that we have already presented, we would like to mention that in this field of research there are a bunch of papers which analyze innovation linkages with other economic variables, but most of them examine innovation through the influence that it has in stimulating corporate performance. In spite of this, some researchers (Ul Hassan, Shaukat *et al.*, 2013) showed that, in case of manufacturing sector from Pakistan, all of these four types of innovation that we already presented are associated and they have a positive impact both on innovation performance and on companies' performance. The quoted paper revealed that organizational innovation is able to explain a larger proportion of innovative performance and it is followed by process innovation, marketing innovation and product innovation. Another paper (Gunday, Ulusoy *et al.*, 2011) analyzed the

Turkish manufacturing sector and revealed that there are various linkages between these four innovation types. As well, the authors observed that for the analyzed sector the organizational innovation represents a key factor in order to stimulate innovative performance, being also positive and significantly associated with the corporate performance.

In our opinion, it is important to find out which aspects are able to improve company's performance and, as a result, to increase the innovative performance of a country. Feimi and Kume (2014, p. 243) mention that in the literature there are some empirical papers which show that firms focused only on process innovation had weaker performances than companies which developed both process and product innovation. In this regard, we consider that it is important to emphasize not only which are the most relevant determinants of innovation, but also to point out which types of innovation have a higher impact in order to stimulate the innovative performance.

2. Data and methodology

Some authors (Amza and Bratianu, 2008, p. 145) mentioned that for a highly competitive market – for instance, such as the European market – innovation represents the main impulse of economic competition. Thus, in this study it was analyzed the impact of different types of innovations carried out in companies from European countries on innovative performance of those countries. The main hypothesis underlying the study is that the development of different types of innovation in companies has a different impact on innovative performance of the country. In the study there were considered the following types of innovation: product / process innovation; marketing innovation, product / process innovations and organizational / marketing innovation.

Also, regarding marketing innovation there were considered the following types: introduction of significant changes to the aesthetic design or packaging, introduction of new media or techniques for product promotion, introduction of new methods for product placement, introduction of new methods of pricing goods or services.

The research methodology used is based on highlighting the correlations between the percentage of innovative companies that have developed different types of innovation and the innovative performance of European countries in which these companies act, using the simple and the multiple linear regression across countries. The main indicators used in the econometric analysis by simple linear regression are the Correlation Coefficient, the Significance F of Fisher test and the Regression Coefficients of the linear function (Table1). The method used to estimate the regression coefficients is Least Square Method (Berenson, Levine et al., 2012).

The selection of different types of innovations included in the analyzed model is based on their recognition in the literature as having an important role in the development of companies.

Within the model, the information on data regarding the percentage of innovative companies that have developed different types of innovation are provided by Eurostat for the period 2008-2010, based on the Seventh Community Innovation Survey (CIS 2010), as "Proportion of innovative enterprises by type of innovation, 2008-2010".

The information were collected for all countries for which they were available, summing up a total of 31 European countries. Among these, the EU 28 countries are summarized (excepting Greece) and yet another 4 non EU countries (Iceland, Norway, Serbia and Turkey).

Table 1.**The main results of linear regression**

<i>No.</i>	<i>Types of innovations carried out in companies</i>	<i>Indicators</i>	<i>Summary Innovation Index 2013</i>
1.	Achieving product/process innovation	Correlation Significance F Regression Coefficient	0,122 0,512 0,003379
2.	Achieving marketing innovation	Correlation Significance F Regression Coefficient	0,554 0,001 0,012025
3.	Achieving product/process innovation AND organisational/marketing innovation	Correlation Significance F Regression Coefficient	0,599 0,0003 0,010658

Source: Own calculations based on Eurostat data

The innovative performance of the analyzed European countries is synthetically expressed by Summary Innovation Index 2013 (further referred to as SII 2013). The information regarding the values of this complex index for each of the analyzed countries are provided by the European Commission as the Innovation Union Scoreboard - IUS 2014. Innovation Union Scoreboard 2014 is at the 13th edition (taking into account that it is the successor of the previous editions of the European Innovation Scoreboard). It is presenting a comparative analysis of the innovative performance of the EU countries and of other non-EU European countries.

According to IUS 2014, the Summary Innovation Index is a composite indicator obtained by aggregating 25 different indicators, grouped into three major categories (Enablers, Firm activities and Outputs) and 8 dimensions of innovation (Human resources, Open, excellent research systems, Finance and support, Firm Investments, Linkages &

entrepreneurship, Intellectual Assets, Innovators, Economic effects) (Innovation Union Scoreboard 2014, pp 4, 8).

IUS 2014 is using the latest data provided by Eurostat and other internationally recognized sources. Thus, because of the gap in the data availability, according to IUS 2014, among the 25 indicators taken into consideration for Summary Innovation Index 2013 composition, 11 indicators refer to data from 2012, 4 indicators refer to data in 2011, nine indicators relate to 2010, and one indicator refers to data from 2009 (Innovation Union Scoreboard 2014, p 7). Summary Innovation Index 2013 is expressing an average level of innovative performance of each country, obtained by quantifying the performance expressed by the 25 different indicators, equally weighted.

Considering the innovative performance of the analyzed countries, synthetically expressed by SII 2013, in Innovation Union Scoreboard 2014 countries are classified into four categories:

- innovation leaders – are countries whose innovation performance is well above the EU average;
- innovation followers – are countries whose innovation performance is above or close to that of the EU average;
- moderate innovators – are countries whose innovation performance is below that of the EU average;
- modest innovators – are countries whose innovation performance is well below that of the EU average.

3. Findings

During the study, in order to highlight the different impact of various types of innovation carried out in companies from studied European countries upon the countries' innovative performance, it have been formulated the following hypothesis:

H1: In order to obtain high innovative performance carrying out only of product / process innovation within companies is sufficient;

H2: Carrying out of marketing innovation in companies is able to determine achieving high innovative performance;

H3: Simultaneous development of different types of marketing innovation has an influence on achieving high innovative performance;

H4: Carrying out of product/process innovation simultaneously with

organizational/marketing innovation within companies has a major impact on achieving high innovative performance.

Based on the described research methodology and following the above mentioned research hypotheses, the study revealed that there are some correlation between the percentage of innovative companies that have carried out certain types of innovation and the innovative performance of European countries in which these companies operate, confirming some of the four stated hypotheses.

Thus, the correlation between the percentage of innovative companies that have carried out only product / process innovation and Summary Innovation Index 2013, taking into account all the surveyed European countries is shown in Figure 1. The legend of colours used in all charts presented in the study is as following: green for innovation leaders, blue for innovation followers, yellow for moderate innovators and orange for modest innovators.

It is noted that the lowest proportion of innovative companies that have carried out only product / process innovation was recorded in a country with high innovative performance (Luxembourg), while the highest proportion of innovative companies that have developed product / process innovation was registered in Bulgaria, the country with the most modest innovative performance of all European surveyed countries.

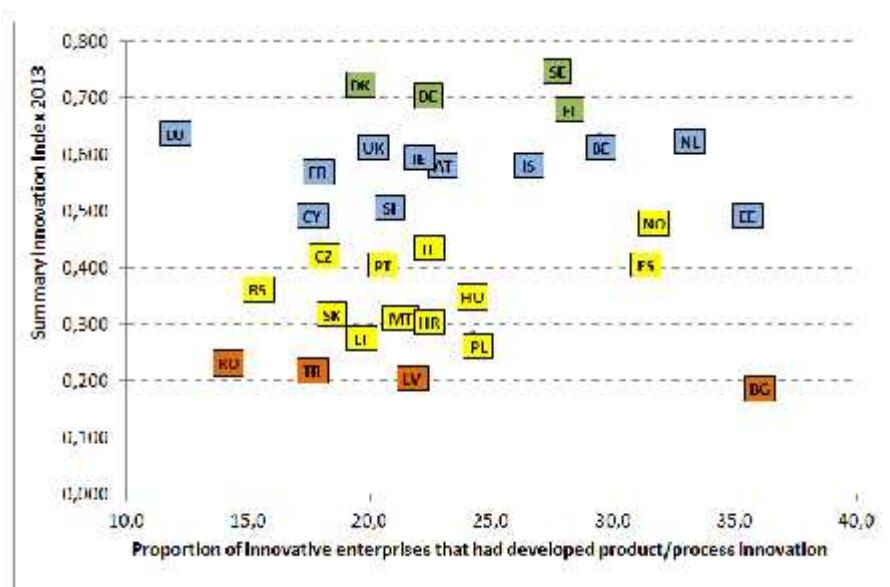


Figure 1. Correlation between the proportion of innovative companies that have carried out only product / process innovation and innovative performance

Moreover, in countries with the highest innovative performance (Sweden, Denmark, Germany and Finland) product / process innovation were carried out at a rate between 19.6% and 28.2% of all innovative companies, but a similar percentage was recorded also in the companies belonging to some innovation followers countries (UK, Ireland, Austria, Iceland, Slovenia) and to countries with moderate innovative performance (Italy, Portugal, Hungary, Malta, Croatia, Lithuania and Poland) or to modest innovator countries (Latvia).

Considering that similar proportions of innovative companies belonging to countries with very different innovative performance have carried out product / process innovation, results that it cannot be established a statistically significant correlation between the proportion of innovative companies that have carried out product / process innovation and the innovative performance of that country. The correlation coefficient between the two variables is 0.122, which supports the

previous statement and also confirms that the only development of product / process innovation within companies is not sufficient to provide high innovative performance. Hypothesis 1 is not validated.

Figure 2 is highlighting the correlation between the percentage of innovative companies that have carried out any type of marketing innovation and the innovative performance, taking into account all the surveyed European countries.

It is observed that the highest percentage of companies that have developed marketing innovation (45.7%) was registered in an innovation leader country (Germany), while the lowest proportion of companies that have developed marketing innovation (12.3%) was found in the country with the most modest innovative performance of all surveyed countries (Bulgaria).

At EU level, averagely 26.8% of companies have carried out marketing innovation. In all innovation leader countries, in most innovation followers

countries and also in some performing moderate innovators countries, the percentage of companies that have developed marketing innovation is well above the EU average. Meanwhile, in most modest innovator countries and in

some less performing moderate innovator countries, the percentage of companies that have carried out marketing innovation is lower than the EU average.

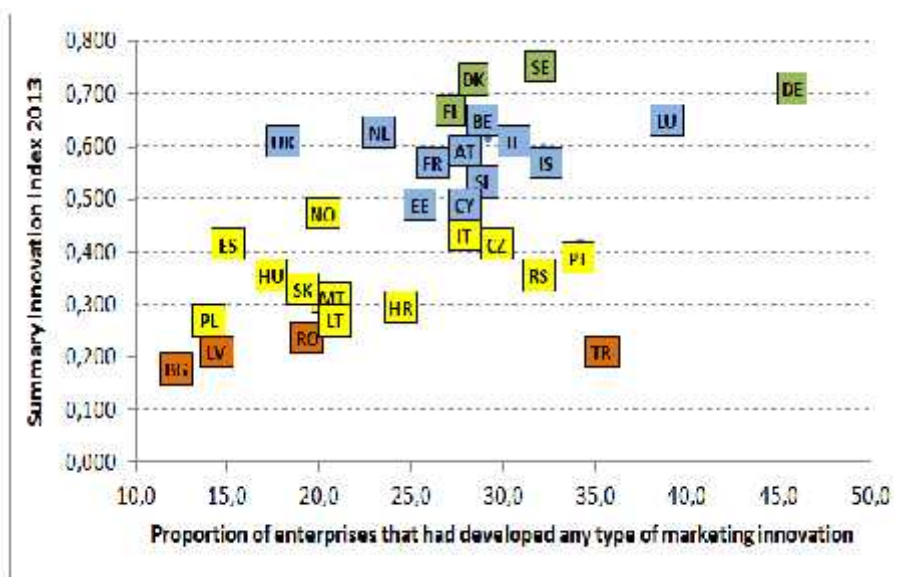


Figure 2. Correlation between the proportion of companies that have carried out any type of marketing innovation and the innovative performance

But there are some exceptions: Turkey, a country with modest innovative performance, is characterized by a much higher percentage of companies that have developed marketing innovation than that recorded for 3 of the 4 countries that are innovation leaders.

Based on the above arguments, taking into account the correlation coefficient of 0.554 between the proportion of companies that have developed any type of marketing innovation and the innovative performance of the countries in which they act, we consider that between the two variables there is a positive direct correlation. So, the higher the percentage of companies that have developed any type of marketing innovation, the higher innovative performance of that country will be.

These assessments are able to validate the second research hypothesis.

In order to study the influence of developing different types of marketing innovation in companies upon achieving highly innovative performance it was performed a multiple linear regression analysis across countries.

Based on data resulting from Statistics Regression (Table 2) it was revealed that the model as a whole is correct. The values of Multiple R and R Square are close to 1, highlighting that the influence of the simultaneous developing of these four types of marketing innovation upon the innovative performance is significant. The same is emphasized by the high value of the Fisher test, F, respectively by the very small value of Significance F.

Table 2.

Regression Statistics of correlation between developing different marketing innovation types and innovative performance

<i>Regression Statistics</i>	
Multiple R	0,958266
R Square	0,918275
Adjusted R Square	0,868467
Standard Error	0,148623

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	6,204777	1,551194	70,22556	0.000
Residual	25	0,552219	0,022089		
Total	29	6,756995			

Independent Variables	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Critical t</i>
<i>Introducing significant changes to the aesthetic design or packaging</i>	0,003661	0,003062	1,195633	0,243058	2.048
<i>Introducing new media or techniques for product promotion</i>	0,006596	0,00258	2,556274	0,017037	2.048
<i>Introducing new methods for product placement</i>	0,004012	0,003271	1,226764	0,231340	2.048
<i>Introducing new methods of pricing goods or services</i>	-0,00575	0,002031	2,829667	0,009056	2.048

But analyzing the individual impact of using each type of marketing innovation upon the innovative performance, it can be seen that their influence is different. Thus, comparing

the calculated values of The Student test (column *t Stat*) with the level of Critical *t* it can be observed that only introducing new media or techniques for product promotion in companies has a

significant and positive impact on the innovative performance.

Introducing new methods of pricing goods or services in companies has a significant impact on the innovative performance, but it is negative, which partially invalidates the hypothesis 3 concerning this factor. Regarding introducing significant changes to the aesthetic design or packaging and introducing new methods for product placement it cannot be revealed a statistically significant influence because t Stat values are below the Critical t.

Thus, it can be seen that the cumulative influence of carrying out these four types of marketing innovation

is significant, but with an emphasis on introducing new media or techniques for product promotion. The introduction of new media or techniques for product promotion is proved to be the way with the largest impact on the innovative performance. Hypothesis 3 was partially validated, only in terms of the impact of introducing new media or techniques for product promotion in companies upon the innovative performance.

The influence of carrying out in companies both product / process innovation and also organizational / marketing innovation upon the innovative performance is shown in Figure 3.

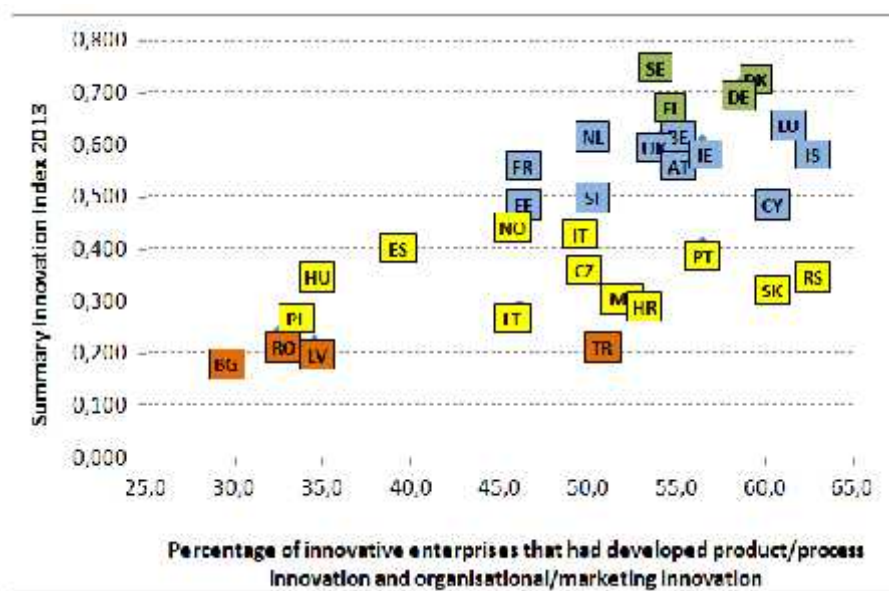


Figure 3. Correlation between the proportion of companies that have carried out both product / process innovation and also organizational / marketing innovation and the innovative performance

It is noticed that in all innovation leader countries, in the most of innovation follower countries, and also in some moderate innovator countries the percentage of companies that have developed both product / process innovation and also organizational / marketing innovation is much higher compared to the average percentage

recorded in the EU27¹ : 50.7%. Three of the countries with the most modest innovative performance between all the surveyed countries (Bulgaria, Romania and Latvia) and the least performing moderate innovator country (Poland)

¹ EU 28 excepting Greece

had the lowest percentages of companies that have developed both product / process innovation and also organizational / marketing innovation. In these countries the share of companies that have developed both product / process innovation and also organizational / marketing innovation was much lower compared to the average proportion of these companies in the EU 27.

There are also some exceptions. Turkey, a modest innovator country, is highlighted by a percentage of companies that have developed both product / process innovation and also organizational / marketing innovation slightly higher than the average proportion of these companies in EU 27. The highest percentage of companies that have developed both product / process innovation and also organizational / marketing innovation was recorded in Iceland (an innovation follower country), that has surpassed in this respect all the innovation leader countries. The surprise is however Serbia (a moderate innovator country, with innovative performance well below the EU27 average). The proportion of Serbian companies that have developed both product / process innovation and also organizational / marketing innovation is among the highest of all surveyed countries.

The correlation coefficient between the proportion of companies that have developed both product / process innovation and also organizational / marketing innovation and the innovative performance of the countries in which they operate is 0.599. It is highlighted the fact that there is a significant positive statistical correlation between the two variables. The higher the percentage of companies in a country that have developed both product / process innovation and also at the same time organizational/ marketing innovation, the higher the innovative

performance of that country will be. So hypothesis 4 is validated.

The intensity of this correlation is slightly higher than that of the correlation between the proportion of companies that have carried out any type of marketing innovation and the innovative performance. It points out that developing at the same time both product / process innovation and also organizational / marketing innovation in companies has a higher impact on innovative performance compared to cases where companies are solely developing marketing innovation.

4. Conclusions

The innovative performance of the surveyed European countries was influenced by the nature of innovative activity of companies that operate in those countries.

The study has revealed some correlations between the percentage of innovative companies that have carried out certain types of innovation and the innovative performance of European countries in which these companies operate. Thus, the greatest impact on achieving high innovative performance was highlighted for carrying out of product / process innovation simultaneously with organizational /marketing innovation in companies.

Carrying out of marketing innovation in companies has been shown to have a direct positive influence on achieving high innovative performances in countries where these innovative companies act. The intensity of this influence is, however, less than that for carrying out of product / process innovation simultaneously with organizational/ marketing innovation within companies, but it is also much higher than if developing only product / process innovation. Moreover, the study could not reveal a statistically significant correlation between the proportion of innovative companies that have carried out product / process innovation and the

innovative performance of that country. It follows that the only developing of product / process innovation within companies is not sufficient to obtain high innovative performance.

Regarding the four categories of marketing innovation studied it was shown that the influence of the simultaneously carrying out of these four types of marketing innovation on achieving high innovative performance is significant and positive. But in terms of the individual impact of carrying out of each type of marketing innovation itself on the innovative performance, their influence is different. Within the marketing innovation types studied, only introducing new media or techniques for product promotion in companies was proved to have a significant positive influence on the innovative performance. Regarding the influence of individually carrying out of two other types of marketing innovations (Introducing significant changes to the aesthetic design or packaging and Introducing new methods for product

placement) on the innovative performance, there was not proved a statistically significant influence, while solely Introducing new methods of pricing goods or services within companies has shown a significant impact on the innovative performance, but it was negative.

The findings of this study may be useful to companies' managers in choosing the types of innovation to carry out in companies that have the greatest impact on achieving high innovative performance. The results of this study points out that to achieve high innovative performance, only carrying out of product / process innovation within companies is important but it is not sufficient, and they must be carried out simultaneously with organizational/ marketing innovation. And within marketing innovation types, the highest positive impact upon the innovative performance is exerted by introducing new media or techniques for product promotion in companies.

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REFERENCES

- Amza, D. V., Bratianu, C. (2008), "Aspect regarding the dynamics of innovation in Romania", *Management & Marketing Journal*, Vol. VI, Issue 1/2008, available online at <http://www.mnmk.ro/documents/2008/2008-18.pdf> , accessed at 20.11.2014
- Berenson M.L., Levine D.M., Krehbiel T.C. (2012), *Basic Business Statistics. Concepts and Applications, 12th Edition*, New Jersey, USA: Prentice Hall
- Bloch, C. (2008), "Innovation indicators and performance – An analysis for Danish firms", *Dansk Center for Forskningsanalyse*, available online at https://www.researchgate.net/publication/228460520_Innovation_indicators_and_performance_An_analysis_for_Danish_firms, accessed at 21.09.2014
- Dovleac, L., Balasescu, M. (2013), "Particularities of marketing decisions for innovative companies from high-tech industry", *Management & Marketing*

- Journal*, Vol. XI, Issue 1/2013, available online at <http://www.mnmk.ro/documents/2013-01/13-12-1-13.pdf>, accessed at 20.11.2014
- Erdil, S., Erdil, O., Keskin, H. (2005), "The relationships between market orientation, firm innovativeness and innovation performance", *Journal of Global Business and Technology*, Vol. 1, available online at http://gbata.org/wp-content/uploads/2013/02/JGBAT_Vol1-1-p4.pdf, accessed at 20.11.2014
- Ettlie, J. E., Reza, E. M. (1992), "Organizational integration and process innovation", *Academy of Management Journal*, Vol. 35, No. 4, p. 795-827
- Feimi, D., Kume, V. (2014), "Innovation management: types, management and innovation performance in Albania", *European Scientific Journal*, Vol. 10, No. 7, ISSN: 1857 – 7881
- Gunday, G., Ulusoy, G., Kilic, K., Alpkan, L. (2011), "Effects of innovation types on firm performance", *International Journal of Production Economics*, Vol. 133, Issue 2, p. 662-676
- Peters, B. (2005), "The relationship between product and process innovations and firm performance: microeconomic evidence", available online at http://www.fep.up.pt/conferences/earie2005/cd_rom/session%20vi/vi.b/bettina-peters.pdf, accessed at 21.11.2014
- Ul Hassan, M., Shaukat, S., Nawaz, M. S., Naz, S. (2013), "Effects of innovation types on firm performance: an empirical study on Pakistan's manufacturing sector", *Pakistan Journal of Commerce and Social Science*, Vol. 7, No. 2, p. 243-262
- *** European Commission, *Innovation Union Scoreboard 2014*, available online at http://ec.europa.eu/enterprise/policies/innovation/files/ius/ius-2014_en.pdf, accessed at 15.07.2014
- *** Eurostat, *Proportion of innovative enterprises, 2008–2010*, available online at http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Innovation_statistics accessed at 16.06.2014
- *** Eurostat, *Proportion of marketing innovative enterprises by implementation type, 2008–2010*, available online at http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/File:Proportion_of_marketing_innovative_enterprises_by_implementation_type_2008%E2%80%932010_YB14.png, accessed at 16.06.2014