

## **SCIENTIFIC RESEARCH AND INNOVATION - DECISIVE FACTORS OF BUSINESS PERFORMANCE**

**Spiridon Cosmin Alexandru Ph. D Student**  
**University of Craiova**  
**Faculty of Economics and Business Administration**  
**Craiova, Romania**

**Abstract:** Knowledge, science and information have become powerful driving force that stimulates human and material potential. Therefore creating a society with an economy based on high performance knowledge and ensuring sustainable human development is inconceivable without the contribution of these important subsystems of human capital. Research and Development like autonomous activity, but interdependent with activities from society, represents a systematic and creative activity to increase the amount of knowledge, including knowledge of man, culture and use this knowledge for new applications. According to the methodology set out in the OECD Frascati Manual, performance areas of research and development activities are presented as follows: government performance area; higher education performance area and the non-profit performance area. It will be present an analysis of the: main indicators of research and development units in Romania in the period 1990-2009; total expenses of research and development, by areas of performance and funding sources and research and development expenditures from external sources.

**JEL classification: M20, M21, M29**

**Key words: knowledge, economy, performance, research, development, innovation, total expenditure**

### **1. INTRODUCTION**

Knowledge, science and information have become powerful driving force that stimulates human and material potential. Therefore creating a society based on knowledge economy and provide high performance sustainable human development is inconceivable without the contribution of these important subsisteme of human capital.<sup>1</sup>

The research and development activity is autonomous, but interdependent activities in society, is a systematic and creative activity starting to increase the volume of knowledge, including knowledge of man, culture and use this knowledge for new applications. It has its own internal structure and specific results that take the form, which requires to be understood in a broader vision with the magnitude of the economy. Consumer material and financial resources, especially human resources, science and living science materialized, existing labor workers, research and development process the more intense, and so produce more creative with science and its practical applicability. Any improvement in the technology economy of any area of social life, with the help of science erected a new beginning for science, general requirements imposed by the development.

---

<sup>1</sup> Băleanu M., Moldoveanu Adriana, „Sănătatea populației, capitalul uman și dezvoltarea umană durabilă în România”, Editura Universitară, Craiova, 2004, p.165.

## 2. OBJECTIVES

Research and development as a complex activity consists of three types:

- Fundamental research - experimental or theoretical initial activity primarily for accumulation of new knowledge on fundamental aspects of phenomena and observable facts, not consider a particular or specific application;

- Applied research - original investigation is the activity of acquiring new knowledge to be directed primarily towards a practical aim or objective, specific;

- Experimental development, systematic activity, making use of existing knowledge, accumulated from research and / or practical experience to launch the production of new materials and device products, introducing new processes, systems and services or substantial improvement of the existing ones.

Through its forms is scientific research on one hand as a product of human capital, previously created, and on the other hand, as a resource for future growth of human capital<sup>2</sup> as a means of achieving the performance and economic competitiveness.

Within its research and development includes specialized units (main activity) in the field of economic and social units that have collective research and development, resorts and research institutes and agricultural production, higher education institutions and university clinics have structures research and development, nonprofit organizations engaged in research and development.

## 3. METHODOLOGY

According to the methodology set out in the OECD Frascati Manual, 2002 edition, following the model of the system of national accounts, sector performance of research and development activities is as follows:

- the performance of the company that includes business units of the national economy which are principally engaged in research and development or secondary and usually operate under contracts with the beneficiaries. This includes all businesses, organizations and institutions which are principally engaged the production of goods and services for sale at a significant economic cost. Core of this sector consists of private companies gain or profit. Among these companies are companies for which research and development is the main activity (research and development institutions and commercial laboratories).

- the government performance includes units that provide public services, the research and development with central government, local, or government and national research institutes and development, including non-profit institution funded directly from government, other than those in higher education.

- higher education sector performance, which includes all universities, colleges and other educational institutes of higher education, regardless of funding sources, legal status, plus specialized units engaged in organized research and development (research institutions, experimental stations and clinics under the direct supervision or administered in association with higher education institutions).

- the non-profit performance that includes unions, foundations, centers, associations, organizations, unions, political parties and research and development activities that provide collective and individual usually free or at a price totally insignificant.

---

<sup>2</sup> Galbraith J.K., „Societatea perfectă. La ordinea zilei: binele omului”, Editura Eurosong et Book, București, 1997, p.67.

In Schumpeter's view the main features of the innovation process, features that remain the heart subsequent theoretical deepening are:<sup>3</sup>

- "entrepreneur" has a central role, he assumes the risk of turning a new idea, an invention or a scientific principle result in a commercially viable;
- importance of inciting factors for the enterprise as a business innovation brings enter a position and is a source of superprofit monopoltemporar, enjoyed the time that has property rights protection and there is potential imitators;
- special nature of the innovation diffusion process, which describes "the process of creative destruction" mechanism by which novelty spreads the economic system.

#### 4. ANALYSES

Until 1990, research and development aimed at achieving major objectives of the economy such as the development of raw materials and energy, creating new products and technologies, design and implementation of modern tools of labor, goods and services diversification, the introduction intensive technologies in agriculture, environment, finding new ways for health care, increase research in natural sciences, economics and society.<sup>4</sup> After 1990 research and development was reorganized in the complex process of transition to market economy.

**Table no. 1**

**Main indicators of research and development units 1990-2009**

| Explanations  | 1990    | 1995      | 2000    | 2005      | 2009      |
|---|---------|-----------|---------|-----------|-----------|
| No. employees   | 147.513 | 105.195   | 62.572  | 41.035    | 42.420    |
| Total expenditure<br>(million current prices)<br>of which   | 15.552  | 1.283.702 | 296.205 | 1.183.659 | 2.356.907 |
| - Current expenses  | 14.446  | 1.224.428 | 264.768 | 1.040.367 | 2.077.224 |
| - Capital expenses  | 1.106   | 59.274    | 31.437  | 143.292   | 279.683   |
| Share of spend. total<br>research and<br>development in GDP | -       | 0,71      | 0,37    | 0,41      | 0,47      |
| Patents registered  | 3.081   | 2.316     | 1.248   | 1.100     | 1.091     |
| Patents issued  | 1.428   | 1.860     | 657     | 790       | 646       |

*Source: Romanian Statistical Yearbook 2001, p. 228, 244, Romanian Statistical Yearbook 2010, p. 382, 395.*

The total number of employees decreased by 105 093 during 1990-2009, and is only 28.75% compared to 1990. Declines were due to business sector and government sector, and increases in the higher education sector could not mitigate the reduction of employees in other sectors. Concern is reducing the number of employees with higher education in research and development, from 59,670 persons in 1989 to 36,240 people in 2009. The number of people who have a Ph.D. in science fell from 5917 in 1995-

3 J. Schumpeter, „The Theory of Economic Development”, Harvard University Press, Cambridge, Mass., 1934, p. 66.

4 J. Schumpeter, „Capitalism, Socialism and Democracy”, Harper & Row, New York, 1942, p. 84.

5166 in 2000, then a significant increase: 14 916 8746 2005 and 2009. On the reverse path instead joined the invention patent activity from 3081 and 1428 patent claims to patents granted in 1990, it was 1091 patent applications and issued 646 patents in 2009. Positive is that the increased number of applications and patents issued abroad as the number of scientific papers published.

#### 4.1 Critical

In Romania in 2002-2004 the research and development spending in one year, made both in public and private sectors have generally been relatively stable, but that did not exceed 0.40% of GDP, but in 2005-2007 were exceeded in 2009 reaching 0.40% to 0.47%.

Table no. 2

#### Total expenses of research and development, by sector of performance and funding

|   | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|------|------|------|------|------|------|
| Share of total expenditure on research and development performance secoare in gross domestic product (GDP) -% - of which: | 0,39 | 0,41 | 0,45 | 0,52 | 0,58 | 0,47 |
| Enterprise sector -% of GDP   | 0,21 | 0,20 | 0,22 | 0,22 | 0,17 | 0,19 |
| Government sector -% of GDP   | 0,13 | 0,14 | 0,15 | 0,18 | 0,24 | 0,16 |
| Higher education sector -% of GDP   | 0,04 | 0,06 | 0,08 | 0,12 | 0,17 | 0,12 |
| Share of total expenditure on research and development funding sources in gross domestic product (GDP)%                   | 0,39 | 0,41 | 0,45 | 0,52 | 0,58 | 0,47 |
| -Enterprise -% of GDP   | 0,17 | 0,15 | 0,14 | 0,14 | 0,13 | 0,16 |
| -Public Funds -% of GDP   | 0,18 | 0,20 | 0,27 | 0,31 | 0,30 | 0,18 |
| Units of Higher Education -% GDP  | 0,01 | 0,02 | 0,01 | 0,01 | 0,02 | 0,09 |
| Funds from abroad -% of GDP   | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,04 |

Source: Romanian Statistical Yearbook 2010, p. 395.

There is a decreasing trend for research and development spending by businesses (from 0.2% of PIB in 1999 to 0.16% of GDP in 2002), with a slight increase in 2003 (0.18% ), then in 2004 started to decrease (0.17 in 2004, 0.15 in 2005 and in 2006 and 2007 their share was 0.14%, 0.13% in 2008 and 0.16% in of GDP in 2009). It is clear, however, that in 1999-2001, expenditure of funds businesses had a higher share than in government funding for research and development, then decreased in recent years and represents 22% -33% of the total expenditure . On the other hand there is a small share of funds spent on economic and development research carried out by public institutions of research and development. The same conclusion is drawn from the investigation of innovation in the sense that the share of expenses for business operators own research and development is much larger than research and development activities carried out by specialized institutions.

Total expenditure for research and development in 2009 amounted to 2356.9 million, representing a 0.47% share of gross domestic product, compared to 0.46% in 2006. In 2009, concern continued to equip units who carry out research and development, the share of total capital spending was 13.5% in total and is 195.2% compared to 2005. Of total expenditure and current for research and development in the same proportion, ie about 42% are for research with fundamental character, 50% for applied research and experimental development 7%. After total funding sources of research and development expenditures in 2009, hold the largest share of public funds (55% vs. 49% in 2004) followed by sources of business (34% versus 43%). Public funds received the largest amount of the governmental units, followed by the higher education sector units and units in industry. Research intensity (the ratio between total research and development spending to gross domestic product) in 2009, registered a share of 0.47%, compared to 0.39% in 2004. Expenditure from public funds have a low share in GDP throughout the period. Apart from national funds (funds from the national budget for research and development funds attracted from businesses, etc..) Receive the financial benefits due to connection to the European Union research and development system, namely the association Euratom Framework Programmes and Programme CDI and other CDI programs carried out in Europe.<sup>5</sup>

**Table no. 3**

**Total expenses of research and development, by sector of performance and funding**

| Research and development expenditures from external sources | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|------|------|------|------|------|------|------|------|
| % Of total research and development expenses                | 7,0% | 5,5% | 5,5% | 5,2% | 4,0% | 4,5% | 3,9% | 8,0% |

*Source: Romanian Statistical Yearbook, 2008, p.552, Romanian Statistical Yearbook, 2010, p.394*

In terms of cost structure of CD there is a small portion allocated to investment, particularly for purchases of equipment and devices, namely 11.8% of total in 2009.

## 5. CONCLUSIONS

Level of funding from external sources of research and development activities had increased, significantly in 2002, followed by decrease in the coming years, after which there is a significant increase in 2009.

Destinations in terms of research and development spending on socio-economic objectives is found that the major share of production and industrial technologies is followed by basic research, which means that however, the economy, there is demand for research-oriented development to products, technologies and industrial equipment.

In conclusion there is a small share of funds spent on economic and development research carried out by public institutions of research and development. The same conclusion is drawn from the investigation of innovation in the sense that the share of expenses for business operators own research and development is much larger than research and development activities carried out by specialized institutions.

---

5 L. Winner, „Autonomous Technology”, M.I.T. Press, Cambridge, Mass., 1977, p. 344.

## REFERENCES

1. Băleanu M., Moldoveanu A., „Sănătatea populației, capitalul uman și dezvoltarea umană durabilă în România”, Editura Universitaria, Craiova, 2004, p.165.
2. Galbraith J.K., „Societatea perfectă. La ordinea zilei: binele omului”, Editura Eurosong et Book, București, 1997, p.67.
3. Nobel D., „America by Design”, Alfred A. Knopf, New York, 1997, p. 165.
4. Schumpeter, J. „Capitalism, Socialism and Democracy”, Harper & Row, New York, 1942, p. 84.
5. Schumpeter, J. „The Theory of Economic Development”, Harvard University Press, Cambridge, Mass., 1934, p. 66.
6. Winner, L. „Autonomous Technology”, M.I.T. Press, Cambridge, Mass., 1977, p. 344.
7. \*\*\* Romanian Statistical Yearbook 2010, p. 382, p. 394, p. 395.
8. \*\*\* Romanian Statistical Yearbook, 2008, p. 552.
9. \*\*\* Romanian Statistical Yearbook 2001, p. 228, 244.