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Industrial Property as a Stimulator of Scientific Creation and Innovation

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INDUSTRIAL PROPERTY AS A STIMULATOR OF SCIENTIFIC CREATION AND INNOVATION[*)]

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In modern times, when progress is made through knowledge and knowledge is predominantly produced/used, industrial property rights, their protection and related specialized institutions play a stimulating role. Therefore, this paper presents first the requirements for stimulating scientific and technological creation and innovation in the European Research Area, in close relation to industrial property rights. In this context, we assess the size of scientific research and innovation in Romania in relation to industrial property rights. Considering the requirements for stimulating scientific and technological creation and innovation, we deal with issues on adapting and maintaining dynamism in law and institutional regulations, in order to achieve convergence, in general, and convergence in the industrial property field, in particular.

Key words: *adaptation, convergence, research&development, innovation, statistical indicators, industrial property, stimulation.*

JEL: O34, K29, P48

1. Introduction

Similarly to investments, research, development and innovation or rather their outcome have a strong driving effect both within national economies and within the global economy. As a consequence, industrial property rights occur during the production of science, and the protection of these rights, determined by the special nature of information dissemination, increases the role of innovative agents in ensuring economic growth and their innovation motivation.

The idea that "investing means betting on the future"[1] has its most suitable area of application in the fields of research&development and education, and, indirectly, in industrial property protection, viewed as a stimulator of innovation.

Considering the above-mentioned requirements, it is natural that issues concerning the achievement of convergence should focus (besides other traditional factors) on the action of intangible factors (institutional structures, economic-financial mechanisms, stimulation of knowledge production, etc.).

Based on one of Paul Krugman's important ideas, according to which economic analysis does not and should not provide a set of rules to be followed, irrespective of circumstances, but it must be rather a way of thinking, so that it

[*)] A study within the CEEX Programme – Project: "Economic Convergence and the Role of Knowledge in the Context of EU Integration", No. 220/2006. The Romanian version has been published in *Studii Economice*, Institutul Național de Cercetări Economice, 2009.

[1] Michel Didier, 1992, *Economie: Les régles du jeu*, Editura Economică, Paris.

should find new solutions to changing concrete situations[2], this paper is aimed at investigating the state of the process of adapting the industrial property regulations and institutions to requirements for scientific and technological creation and innovation, but mainly to maintaining their dynamism for achiving convergence, that is "catching up" with rich countries.

The research presented in this paper evolves to conclusions that make us look realistically at the possibilities of the Romanian economy and society in the field of scientific and technological creation and innovation and in the field of industrial property rights, but carefully when major gaps with developed countries occur.

Analysing industrial property, we find out that it is not enough to harmonize juridical and institutional regulations of the countries with regulations and institutions functioning in Europe and in the world. To ensure economic growth, we need results in the field of scientific and technological creation and innovation, to which harmonized regulations regarding industrial property should be applied.

2. Requirements for Stimulating Scientific and Technological Creation and Innovation in the European Research Area and Industrial Property

Economic growth is based, to a great extent, on effects produced by technical and scientific progress, scientific research, and innovation.

Economic literature does not hesitate to rigorously analyse the role of these phenomena in the economic evolution of the contemporary society, as these phenomena are not only interdependent, but also convergent in their action and purpose. Thus, the expansion of research is the main source of development of science, scientific knowledge, cultural level, which, in turn, constitute the basis and the source of technology and innovation, having favourable effects on productive activity[3].

According to the standard view, development and innovation are considered an activity of production, of innovation, that is, codified information, a public good[4], and K. Arrow was the first to deduce the consequences of the fact that technology is endogenous in relation to scientific research and development[5].

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[2] Paul Krugman, 1999, *The return of Depression Economics*, New York, Norton.

[3] For example: Robert Solow, "Sources and Outlook for Growth", in P.A. Samuelson, ed., *Readings in economics*, six edition, Mc. Graw-Hill Book Co., New York, 1970; B.R Williams, "Research and Economic Growth - What We Espect?", in E. Shils, Moss, ed., *Criteria for Scientific Development, Public Policy and National Goals*, The M.I.T. Press, Cambridge, 1968; N. Georgescu-Roegen, *The Entropy Law*, Harvard University Press, Cambridge, Mass., 1971; M. Drăgănescu, *Convergenţa cercetării ştiinţifice în condiţiile revoluţiei ştiinţifice şi tehnice*, Editura Politică, Bucureşti, 1975; Aurel Iancu, *Cunoaştere şi inovare, o abordare economică*, Editura Academiei Române, Bucureşti, 2006; etc.

[4] Aurel Iancu, *Dezvoltarea intensivă şi specializarea naţiunilor*, Editura Economică, Bucureşti, 2003.

[5] K. Arrow, "Economic welfare and the allocation of resources for invention", in Nelson R., ed., *The Rate and Direction of Inventive Activity*, Princeton University Press, 1962.

No doubt that, generically, human society runs after new knowledge to satisfy its needs and to develop the human nature. At present, the knowledge-based society, as an expression of the global society, tries to harmonize the ever greater and increasingly diverse needs of the people with the needs for regenerating the human nature, and suggests ways of development for branches consuming undepletable resources, first of all, the resource represented by human intelligence, knowledge, propensity for innovation, entrepreneurial capacity, creative association capacity, etc.[6]

In this context, we consider the presentation and the argumentation of the role of scientific and technological creation, new approaches to the innovation process, to the stimulation of these phenomena in the European Research Area and, at the same time, the determination of the relations of convergence/divergence causality with the industrial property rights and their protection.

2.1. The Role of Scientific Research in Economic Growth

The role of the scientific progress and, especially, of research&development is analysed by economic literature in relation to the nations' economic growth and development. To sustain this statement, we have to answer the question of ensuring the commensuration of the contribution (effects) of investments in R&D.

It is worth mentioning that quantitative studies are less accurate as regards the assessment of the contribution of investments in industrial R&D to productivity improvement. The difficulties in determining this contribution are mainly caused by the absence of direct measurements of the research outcome[7]. Very often, indirect and approximate measures of determination (monographs, case studies) that mainly consider "the successful factors". Containing a high coefficient of subjectivity, these determinations cannot be rigorously generalized. It is the patents that reflected to a greater extent the role of research, development and innovation and allow us to present the rate and the trend of inventive activity, as well as the effects of the economic factors.

Statistical data on patents enable us to represent the economic factors in relation to the trends in research, development and innovation. For example, the evolution of the applications for patents in each technical field in accordance with the international patent classification reveals these trends (Table 1).

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[6] Marin Dinu, "Societatea cunoaşterii. O perspectivă postreferenţială asupra resurselor", in *Societatea cunoaşterii*, Editura Economică, Bucureşti, 2006.

[7] Z. Griliches.1979, Issues in Assessing the Contribution of Research and Development to Productivity Growth, Bell J. Econ. Spring 1979.

Table 1

The evolution of international applications for patents by technical field in accordance with the international patent classification (IPC)

No.	Technical field	Number of international patent applications in:					Increase in number of patents in 2006 as against 2005 - % -
		2002	2003	2004	2005	2006	
I.	Electronics						
1.	Electronic components	6.973	7.365	7.569	8.774	9.847	12
2.	Audiovisual	5.391	6.057	6.075	6.718	7.322	9
3.	Telecommunications	11.167	10.821	10.441	11.674	13.478	15
4.	Computer science	11.096	9.916	9.535	11.026	13.428	22
5.	Semiconductors	3.612	4.051	4.109	4.727	6.034	28
II.	Instruments						
6.	Optical	2.408	2.616	2.562	3.216	3.725	16
7.	Analysis-measurement-control	10.767	11.449	10.869	11.881	12.780	8
8.	Medical engineering	7.360	8.601	8.878	9.568	11.009	15
9.	Nuclear technical equipment	448	517	496	499	561	12
III.	Chemicals-pharmaceuticals						
10.	Organic chemistry	4.537	5.225	5.653	6.116	6.236	2
11.	Macromolecular chemistry	3.894	3.984	4.002	4.534	5.390	19
12.	Pharmaceuticals-cosmetics	9.654	9.976	9.437	11.101	13.470	21
13.	Biotechnology	9.001	8.601	7.611	7.320	7.026	-4
14.	Agricultural products and food	1.522	1.660	1.839	1.950	2.290	17
15.	Basic chemistry	3.646	3.879	3.703	4.264	4.739	11
16.	Surface treatment	2.912	3.293	3.327	3.649	4.297	18
17.	Metallurgical materials	2.909	3.037	3.032	3.256	3.764	16
IV.	Industrial procedures						
18.	Technical procedures	4.767	5.365	4.908	4.917	5.567	13
19.	Material processing	4.159	4.780	4.284	4.764	5.406	13
20.	Storehouse-printing	3.947	4.540	4.556	5.406	6.120	13
21.	Agricultural and food apparatuses	1.133	1.274	1.334	1.525	1.479	-3
22.	Environment-pollution	1.230	1.314	1.250	1.383	1.541	11
V.	Machines-mechanics-transport						
23.	Machines-equipment	2.369	2.485	2.324	2.774	2.963	7
24.	Motors-pumps-turbines	2.583	2.820	2.975	3.205	3.666	14
25.	Thermal procedures	1.390	1.580	1.542	1.825	2.031	11
26.	Mechanical components	3.229	3.567	3.720	4.113	4.657	13
27.	Transport	3.944	4.597	4.881	5.545	6.012	8
28.	Space-weapons	448	494	436	536	498	-7
VI.	Household consumption – BPT						
29.	Household consumption	4.952	5.757	6.040	7.244	8.182	13
30.	BTP	3.132	3.461	3.848	3.914	4.362	11

Source: PCT, International Patent System, 2006, PCT Annual Journal, Statistical Database, WIPO.

The evolution of statistical data regarding the patent applications shows increases in almost all fields owing to research, development and innovation. We should note the strong rising trend in top fields of science and technique (computer science, telecommunications, analysis and control instruments, medical engineering, etc.).

Irrespective of the economic value of each patent, by implementing the research outcome, an addition of technological knowledge capital takes place, which has impact on productivity. Equally important are R&D spillovers, that is, the consequences of the R&D activity carried out by a producer on the performance of one producer or more, or "knowledge spillovers" which manifest themselves as dissipation (transfer) of knowledge among companies or sectors.

While a long time scientific and technological knowledge was considered a production factor in the form of progress with an important role in economic growth (e.g., Marx and, later, Solow, Denison), in the last decades developed economies have reached a stage characterized by a prevalence of generation, dissipation in real time, and application of knowledge to all fields[8].

It is a known fact that in this stage of generalisation of new knowledge generated by research, development and innovation in all economic and social fields, famous economists (Schumpeter, Drucker, Lucas, etc.) dealt with this issue and, studying deeply these phenomena, they approached the realities and present requirements of the knowledge-based economy.

Undoubtedly, when using concepts such as technological competence, learning, generation, transfer, and codified and tacit knowledge market, etc.[9], they are directly or indirectly incidental to industrial property rights.

Therefore, the question is to what extent industrial property rights and their protection stimulate innovation.

2.2. Industrial Property Rights and Innovation Stimulation

The capitalisation of scientific and technological knowledge and its inclusion into market relations require knowledge codification. Therefore, they become public goods.

The internalisation of the processes of knowledge production and utilisation creates a direct relation between the knowledge producer and the knowledge user that benefits the former. At the same time, the internalisation of these products is an obstacle to information dissipation. The industrial property rights tend to remove these obstacles and equally to stimulate knowledge production and to aim at a continuous stimulation of innovation.

By ordering the main characteristics of innovation, Joseph Schumpeter stresses the importance of the factors that stimulate an enterprise to innovate.

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[8] Aurel Iancu, *Cunoaştere şi inovare, o abordare economică*, Editura Academiei Române, Bucureşti, 2006.

[9] Aurel Iancu, *op.cit*.

Thus, invention offers the enterprise, which holds and applies it, a temporary monopolistic status, as a source of overprofit. Of course, an enterprise's motivation depends very much on industrial property rights and their protection in relation to potential imitators.

A higher stimulation of research, development and innovation requires the following:

– a legal tool aimed at protecting industrial property rights;

– public intervention for replacing (at least partially) private initiative when it fails.

On the other hand, specialized literature deals with and stresses that the need for public intervention found the justification of the justification of the states' intervention in the form of big research programmes (e.g., in the nuclear field, space field, etc.) that generate positive spillovers.

According to contemporary approaches[10], innovation is considered a learning process, characterized by irreversibility and dependence on the selected direction. Also, the institutional and legal framework in which creation and dissemination take place determines and constitutes the factor of dependence for the novelty emergence and dissipation.

We should note the idea that economic growth requires an interaction between technology and economic life: technological progress changes the economic system and makes it create itself as well[11].

Within this framework, the following four factors favouring innovation are pointed out[12]:

- competition for innovation; in its extreme form, it is "creative destruction", according to Schumpeter[13];
- *ex ante* competition on the goods market; by innovation, enterprises try to win the competition between similar goods[14];
- dissemination of knowledge created by previous innovations, equally possible;
- the limitation of *ex post* competition on goods markets that precedes innovation; the prospect for a protected market is more attractive for innovation than the prospect for a competitive market.

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[10] Nelson R.; Winter S., *An Evolutionary Theory of Technical Change*, Harvard University Press, 1982; Kline S.Y., Rosenberg N., "Innovation: An overview", in Landau R. & Rosenberg N., ed., *The Positive Sum Strategy*, National Academy Press, 1986.

[11] Philippe Aghion, Peter Howitt, *Endoge nous growth theory*, M.I.T. Press, Cambridge, Mass., 1998.

[12] Schumpeter, J., *The theory of economic development*, Harvard University Press, Cambridge, Mass., 1934.

[13] The effects of a solidary competition on the goods market is analysed both theoretically and empirically by Aghion, P., C. Harris, P. Howitt and J. Vickess (2001), Aghion, P., N. Bloom, R. Blundell, R. Griffith and P. Howitt (2001), Nickell, S. (1996).

[14] Cloude Henry, "Propriété intellectuelle et développement ou comment imposer au mon système perverti", Ecole Polytechnique, Centre National de la Recherche Scientifique, Laboratoire d'econometrie, cahier no. 2004-031, 2004, Paris.

The analysis of the above-mentioned principles shows that this *ex post* competition after an innovation stage becomes *ex ante* competition for the next innovation stage.

Nevertheless, a certain constraint is imposed by means of industrial property protection tools. Schumpeter strongly supported the limitation of the monopoly to the benefit of the inventors. Thus, he envisaged a strong influence on sales of products owing to the research results (which are private goods), and not on knowledge attached to innovation (which is a public good).

In general, a monopoly is harmful to a consumer, but it is a static disadvantage, which Schumpeter is ready to accept to the benefit of the innovation dynamics. For example, in the invention field, patent granting to inventors seems to be an imperfect means of stimulating innovation and making necessary investments, since it hinders further innovation because it monopolizes the knowledge attached to the accomplished innovation.

However, considering other mechanisms of stimulation and other possible funding sources and carefully comparing advantages and costs, this phenomenon should not be analysed in relation to the disadvantage caused by the monopoly. Of course, it is important to freely place knowledge at the entire society's disposal. Also, legal and institutional provisions could set high costs for agents rigorously involved in research, since they limit the safe elements of creative thinking.

Things do not stand still, in spite of constraints and opportunities occurring during the process of research, development and innovation, since progress is cumulative and located. As regards industrial property, they are proved, among others, by the number of patent applications as well as by the number of granted patents, which continuously grow, as shown in Table 2.

Table 2

The evolution of patent applications in the world (per cent, as against the previous year)

Explanation		**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Total number of patent applications from residents	No.	705.496	702.495	719.651	744.90	777.657	860.545	876.023	874.796	908.047	939.372
	%	100	99.57	102.44	103.51	104.39	110.66	101.80	99.86	103.80	103.45
Total number of direct patent deposits for non-residents[x)]	No.	257.619	267.971	269.164	298.304	291.828	318.141	345.718	331.168	349.992	348.292
	%	100	104.02	100.45	110.82	98.16	109.02	108.67	95.79	105.68	99.51
Entries at the national stage according to PCT.[xx)]	No.	90.391	104.886	160.509	168.032	206.562	230.520	269.476	289.010	283.572	311.311
	%	100	116.04	153.03	104.69	122.93	111.60	116.90	107.25	98.12	109.78
Submitted international applications according to PCT.	No.	40.006	48.218	57.064	67.061	76.358	93.237	108.227	110.392	115.199	122.633
	%	100	120.52	118.35	117.52	113.86	122.11	116.08	102.00	104.35	106.45

Table 2 (continued)

Total number of patents granted to residents	No.	254.421	349.928	315.027	338.710	349.662	307.943	317.704	330.051	357.025	361.657
	%	100	137.54	90.03	107.20	103.23	88.07	103.17	103.89	108.17	101.30
Total number of patents granted to non-residents	No.	169.658	175.070	180.832	202.968	213.598	202.593	208.016	211.454	246.323	241.372
	%	100	103.19	103.29	112.24	105.24	94.85	102.68	101.65	116.49	97.99

[x)] Direct patent deposits.
[xx)] Patent Cooperation Treaty.

Source: Computation based on statistical data from *Patent Report 2006* of the World Intellectual Property Organisation (WIPO).

The same growing trend is also shown by an analysis of international patent applications according to the PCT. More exactly, this trend is relevant even if we only analyse data on fifteen leading countries of origin (Table 3).

Table 3

The evolution of international patent applications according to PCT for 15 leading countries of origin

Country	MU	2003	2004	2005	2006	2007	The weight of countries in the total of international patent applications, 2007 %
USA	**No.**	41.030	43.350	46.803	50.941	52.280	33.49
	%	100.00	105.65	107.97	108.84	102.63	-
Japan	**No.**	17.414	20.264	24.869	27.033	27.731	17.76
	%	100.00	116.37	122.73	108.70	102.58	-
Germany	**No.**	14.662	15.214	15.984	16.732	18.134	11.62
	%	100.00	103.76	105.06	104.68	108.38	-
Korea, Republic of	**No.**	2.949	3.558	4.688	5.944	7.061	4.52
	%	100.00	120.65	131.76	126.79	118.79	-
France	**No.**	5.171	5.184	.5.748	6.242	6.370	4.08
	%	100.00	100.25	105.67	108.59	102.05	-
United Kingdom	**No.**	5.206	5.027	5.084	5.090	5.553	3.56
	%	100.00	96.56	101.13	100.12	109.10	-
China	**No.**	1.295	1.706	2.503	3.951	5.456	3.50
	%	100.00	131.73	146.72	157.85	138.09	-
Netherlands	**No.**	4.479	4.284	4.500	4.529	4.186	2.68
	%	100.00	95.65	105.04	100.64	92.43	-
Switzerland	**No.**	2.861	2.898	3.290	3.577	3.674	2.35
	%	100.00	101.29	113.53	108.72	102.71	-
Sweden	**No.**	2.612	2.851	2.883	3.316	3.533	2.26
	%	100.00	109.15	101.12	115.02	106.54	-
Italy	**No.**	2.163	2.189	2.349	2.716	2.927	1.88
	%	100.00	101.20	107.31	115.62	107.77	-
Canada	**No.**	2.271	2.104	2.318	2.566	2.707	1.73
	%	100.00	92.65	110.17	110.70	105.49	-

Table 3 (continued)

Australia	**No.**	1.680	1.837	1.996	2.001	2.054	1.32
	%	100.00	109.35	108.66	100.25	102.65	-
Finland	**No.**	1.557	1.672	1.893	1.845	1.952	1.25
	%	100.00	107.39	113.22	97.46	105.80	-
Israel	**No.**	1.129	1.227	1.454	1.589	1.683	1.08
	%	100.00	108.68	118.50	109.28	105.92	-
Other countries	**No.**	8.715	9.245	10.326	11.084	10.800	6.92
	%	100.00	106.08	111.69	107.34	97.44	-
TOTAL	**No.**	115.194	122.610	136.688	149.156	156.100	100
	%	100.00	106.44	111.48	109.12	104.66	-

Source: Computation based on statistical data published by the World Intellectual Property Organisation in the Report on "The Unprecedented Number of International Patent Applications submitted in 2007", *News and Events*, 21st February 2008, Geneva.

Also this way, we find out that R&D stimulation, viewed from the perspective of industrial property rights, shows the highest intensity in the developed countries.

It is obvious that acquiring knowledge thorough research, development and innovation is not for good; on the contrary, it is a complex interactive process and requires steady efforts, and for this reason, equal human and financial resources are used.

Synthetically, the stimulation of research, development and innovation as well as the clear representation of the effects of the economic factors on this process is also shown by indicators resulted from the ratio of the number of patent applications from residents to:

a) the population of each country (total number of residents);
b) Gross Domestic Product of each country;
c) Total gross expenditure on R&D (either public or corporate).

All these indicators are correlated with the R&D intensity, which is represented by the share of R&D expenditures in GDP.

Table 4

Indicators regarding the intensity of patenting and R&D in European countries and some large world countries, 2004

	Share of expenditures on R&D in GDP		**No. of patent applications from residents to 1 million people**	**No. of patent applications from residents to 1 million dollars of GDP**	**No. of patent applications from residents to 1 million dollars spent on R&D**
	2003	**2004**			
European countries: Belgium	1.92	1.93	51.82	1.81	0.08
Czech Republic	1.26	1.28	60.98	3.42	0.27
Denmark	2.59	2.63[ix]	347.30	11.84	0.45
Germany	2.52	2.49	587.13	22.57	0.90
Estonia	0.82	0.91[ix]	20.01	1.50	0.18

Table 4 (continued)

Greece	0.62(x	0,58(x	44.05	2.16	0.26
Spain	1.05	1.07	67.25	2.92	0.26
France	2.18	2.16	235.67	8.75	0.40
Ireland	1.16	1.20	193.45	5.42	0.52
Italy	1.14	-	109.43	4.23	0.37
Cyprus	0.35	0.37(x	10.90	0.52	0.18
Latvia	0.38	0.42	46.70	4.36	1.14
Lithuania	0.68	0.76	20.37	1.69	0.25
Luxembourg	1.78	-	44.12	0.69	0.03
Hungary	0.95	0.89	74.01	4.79	0.51
Malta	0.27	0.29x(	-	-	-
Netherlands	1.76	1.77x(	-	-	-
Austria	2.19	2.26	240.42	8.10	0.42
Poland	0.56	0.58	62.36	5.23	0.93
Portugal	0.78	-	11.71	0.65	0.07
Slovenia	1.54	1.61x(	163.75	8.51	0.55
Slovakia	0.58	0.53	30.94	2.97	0.51
Finland	3.48	3.51	384.65	13.97	0.40
Sweden	3.98	3.74	307.83	11.34	0.28
United Kingdom	1.88	-	320.34	11.31	0.60
Iceland	2.97	3.01	239.65	7.89	0.26
Norway	1.75	-	326.72	9.24	0.54
Switzerland	-	-	216.52	7.13	0.29
Bulgaria	0.50	0.51	33.89	4.56	0.91
Croatia	1.14	-	86.67	7.74	0.68
Romania	0.39xx(	0.39xx(	43.21	5.54	1.38
Turkey	0.66	-	7.11	1.00	0.13
China	1.31	-	50.75	9.37	0.71
Japan	3,15	-	2.883.56	107.26	3.41
Russia	1.29	1.17	159.78	17.56	1.37
USA	2.59x(	-	645.44	17.70	0.68

Source: Eurostat, Statistical Packetbook, Science and technology in Europe, 1990-2004 data, 2006 edition; Rapport de l'OMPI sur les brevets, Statistiques sur l'activité – brevets dans le monde – 2006. (x) Provisional data; xx) Revised data)

The indicators regarding the intensity of patenting allow for useful comparisons between countries, thus revealing the stimulation of innovation.

2.3. Innovation Stimulation, Industrial Property Rights and Innovation Convergence in the European Area

Subordinating the innovation, the stimulation of innovation and the implications of the industrial property to the Lisbon Strategy, the European Commission initiated and created an instrument, the European Innovation Scoreboard (EIS), for ensuring a comparative assessment of innovative performance of the EU member states.

It is worth mentioning that, for determining and comparing the innovation performance of the twenty-seven EU member states and other countries (Croatia, Turkey, Iceland, Norway, Japan, the USA, Australia, Canada and Israel), we consider 25 indicators of innovation, which cover five dimensions, regarding various aspects of innovation, including those related to industrial property, such as:

- *innovation drivers*: innovation incentives regarding the dimension of the structural conditions for growing the innovative potential;
- *knowledge creation*: it concerns especially the size of investments in R&D;
- *innovation & entrepreneurship*: the size of the efforts for innovation at company level;
- *application*: it concerns the size of performance, expressed in terms of labour and business as well as their value added in innovative sectors;
- *intellectual property*: the size of consequences between the limits of the success based on know-how.

Based on innovation indicators and trends resulted from the analysis, EIS 2007 indicates a clustering process. Taking into account the innovation performance, the countries considered for this scoreboard are grouped as follows:

Table 5

The groups of countries by the innovation performance index in 2007

Innovation leaders		**Followers**		**Catching-up countries**		**Trailing countries**	
Country	**Innovation index**	**Country**	**Innovation index**	**Country**	**Innovation index**	**Country**	**Innovation index**
Sweden	0.73	Luxembourg	0.53	Estonia	0.37	Malta	0.29
Switzerland	0.67	Iceland	0.50	Australia	0.36	Lithuania	0.27
Finland	0.64	Ireland	0.49	Norway	0.36	Hungary	0.26
Israel	0.62	Austria	0.48	Czech R.	0.36	Greece	0.26
Denmark	0.61	Netherlands	0.48	Slovenia	0.35	Portugal	0.25
Japan	0.60	France	0.47	Italy	0.33	Slovakia	0.25
Germany	0.59	Belgium	0.47	Cyprus	0.33	Poland	0.24
United Kingdom	0.57	Canada	0.44	Spain	0.31	Croatia	0.23
USA	0.55					Bulgaria	0.23
						Latvia	0.19
						Romania	0.18
						Turkey	0.08

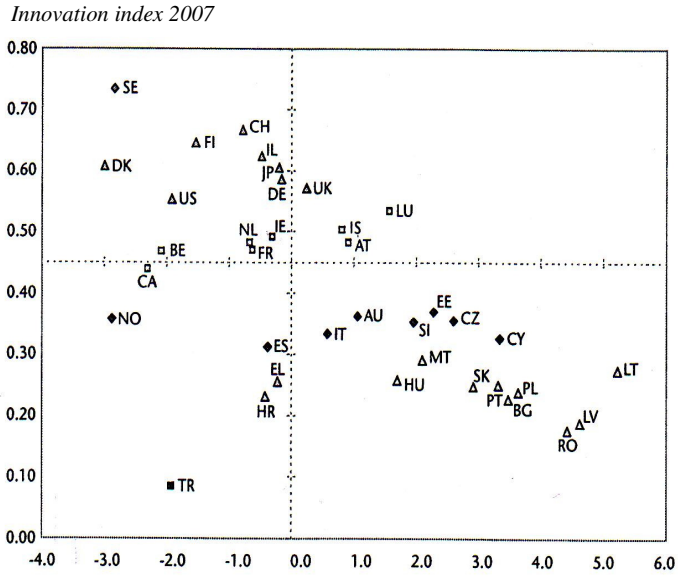
Source: Based on statistical data from EIS 2007, *Comparative analyses of innovation performance,* February 2007.

In spite of the clustering process, there still is a convergence process both in the innovation performance field and in the industrial property field. The question

is how these processes evolve, if we take into account the interdependence and, especially, the fact that both processes have the same origin (the level of economic development, the social will and the policy of every state).

Knowing that the average innovation performance index in the European Union is 0.45, it results that:

- As regards the innovation performance in Europe, most of the EU member countries are characterized by a lower performance average, but a rising trend;
- Many of the catching-up countries and the trailing countries show a tendency of filling the gap with the EU average and the innovation leaders as well as the followers;
- There are some exceptions: Luxembourg (combines a moderate performance level with a high rate of the innovation index), Spain, Greece and Croatia (having a relatively low level of the innovation index), Norway and Turkey (having a very low innovation index).



◊ Sweden; △ Innovation leaders; □ Followers; ♦ Catching-up; ▲ Trailing; ■ Turkey; Dotted lines show the EU performance.

Figure 1. The convergence of the innovation performance in the EU (Source: European Innovation Scoreboard 2007).

Analysing the changes taking place between 2003–2007 both within the groups of countries and at the level of the groups of countries, we conclude the following:

- The number of members of the groups (as they were mentioned) are highly stable;
- Luxembourg is in a significant process of movement towards the group of the innovation leaders;
- Cyprus and Malta moved from the trailing countries to the group of the catching-up countries;
- Latvia and Romania belong, together with Turkey, to the cluster of the trailing countries.

A clear picture of our findings in shown in Figure 2:

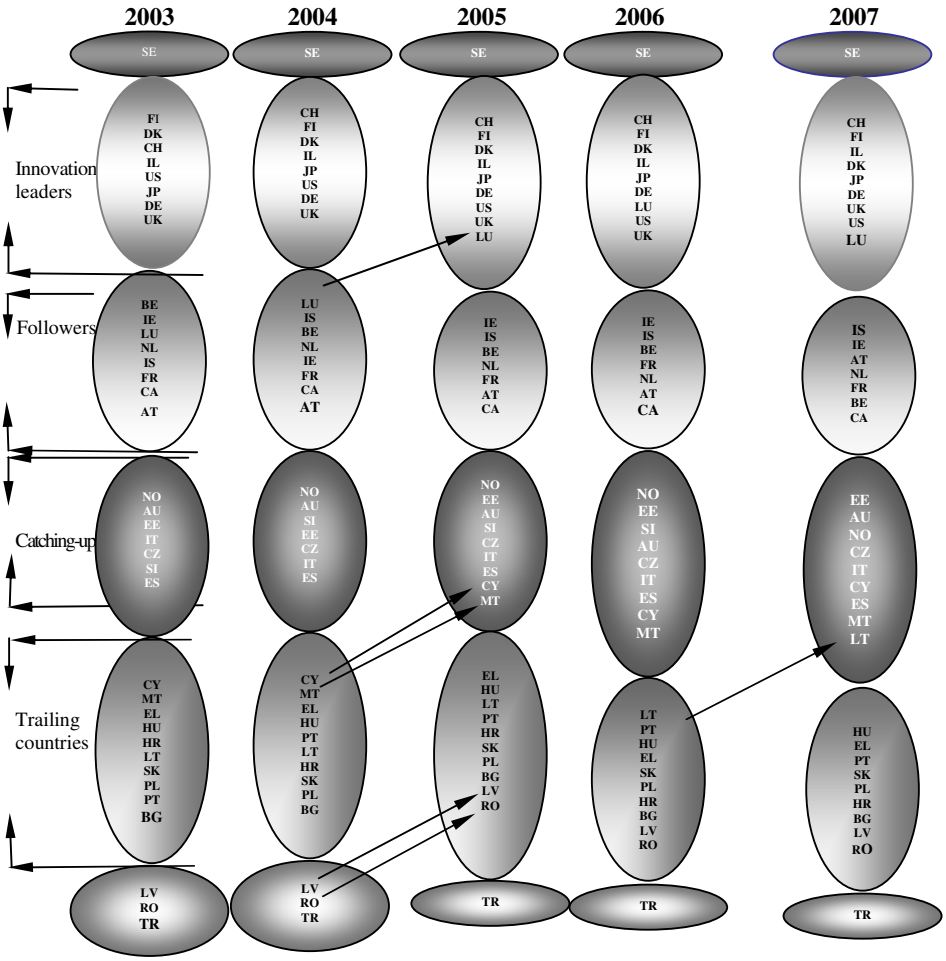


Figure 2. – Groups of countries by innovation performance, 2003–2007
(Source: European Innovation Scoreboard 2007).

In spite of the general processes caused by convergence, the innovation clusters are generally stable in time. This is shown by the evolution of the innovation performance index (Table 6).

Table 6

The innovation performance index for five years (2003–2007)

Clusters			2003	2004	2005	2006	2007
Innovation leaders	**European Union**	**UE 27**	**0.45**	**0.45**	**0.45**	**0.45**	**0.45**
	Sweden	SE	0.82	0.80	0.78	0.76	0.73
	Switzerland	CH	0.68	0.69	0.68	0.67	0.67
	Finland	FI	0.69	0.68	0.65	0.67	0.64
	Israel	IL	0.63	0.63	0.64	0.63	0.62
	Denmark	DK	0.68	0.66	0.65	0.64	0.61
	Japan	JP	0.60	0.61	0.61	0.60	0.60
	Germany	DE	0.59	0.59	0.59	0.59	0.59
	United Kingdom	UK	0.57	0.57	0.56	0.55	0.57
	USA	US	0.60	0.59	0.57	0.55	0.55
Followers	Luxembourg	LU	0.50	0.50	0.53	0.57	0.53
	Iceland	IS	0.49	0.50	0.49	0.49	0.50
	Ireland	IE	0.50	0.49	0.50	0.49	0.49
	Austria	AT	0.47	0.46	0.48	0.48	0.48
	Netherlands	NL	0.50	0.49	0.49	0.48	0.48
	France	FR	0.48	0.48	0.48	0.48	0.47
	Belgium	BE	0.51	0.49	0.49	0.48	0.47
	Canada	CA	0.48	0.48	0.45	0.44	0.44
Catching-up countries	Estonia	EE	0.35	0.34	0.35	0.37	0.37
	Australia	AU	0.35	0.35	0.35	0.35	0.36
	Norway	NO	0.40	0.39	0.38	0.37	0.36
	Czech Republic	CZ	0.32	0.33	0.33	0.34	0.36
	Slovenia	SI	0.32	0.34	0.34	0.36	0.35
	Italy	IT	0.32	0.33	0.33	0.33	0.33
	Cyprus	CY	0.29	0.29	0.30	0.32	0.33
	Spain	ES	0.32	0.31	0.32	0.32	0.31
Trailing countries	Malta	MT	0.27	0.27	0.28	0.29	0.29
	Lithuania	LT	0.23	0.24	0.24	0.26	0.27
	Hungary	HU	0.24	0.25	0.25	0.25	0.26
	Greece	EL	0.26	0.26	0.26	0.25	0.26
	Portugal	PT	0.21	0.24	0.23	0.25	0.25
	Slovakia	SK	0.23	0.22	0.23	0.24	0.25
	Poland	PL	0.21	0.21	0.22	0.23	0.24
	Croatia	HR	0..24	0.23	0.23	0.23	0.23
	Bulgaria	BG	0.20	0.21	0.20	0.22	0.23
	Latvia	LV	0.16	0.16	0.17	0.18	0.19
	Romania	RO	0.16	0.15	0.16	0.17	0.18
–	Turkey	TR	0.09	0.09	0.08	0.08	0.09

Source: European Innovation Scoreboard 2007.

Analysing the evolution of the scoreboard by the innovation performance index of various clusters, we get the following results:

- The relative growth in the innovation performance in trailing countries and catching-up countries, the relatively stable performance of the followers and the relative decline in the innovation performance of the leading countries;
- The lower half of the innovation scoreboard, where, in time, the differences between clusters show convergence;
- A strong process of convergence occurs between the innovation leaders, the followers and the catching-up innovators;
- There is some convergence between the trailing countries and the catching-up countries.

Given the gaps between clusters, as regards the innovation performance, the question is what time is required to achieve convergence.

Based on linear extrapolation of the trends regarding the growth rates of the innovation performance, the European Innovation Scoreboard (2007) shows that a possible convergence in this field can be achieved as follows:

– up to 10 years (Estonia, Czech Republic, Lithuania, Cyprus);
– up to 18 years (Slovakia, Poland, Portugal);
– up to 22 years (Lithuania, Bulgaria, Slovakia, Malta, Romania).

On the other hand, it is estimated that countries such as Bulgaria, France, the Netherlands and Denmark show an average innovation index above the EU average, but they might regress towards it in 5 to 10 years.

Finally, according to these analyses, we estimate that some countries might stay outside the process of convergence. The following countries are in a changing process:

a) Spain, Greece, Croatia, Norway and Turkey, in a negative direction;
b) The United Kingdom, Iceland, Austria and Luxembourg, in a positive direction.

Considering these findings, we shall deal with the problem of the stimulation of scientific creation and innovation in the European Area in correlation with industrial property issues and phenomenology.

2.4. Requirements for the Stimulation of Scientific Creation and Innovation in Order to Build up an Innovative and Modern Europe

Since the success of the Lisbon Strategy is significantly based on the progress made in scientific creation and innovation, the European Union undertakes to build a really innovative and modern Europe[15].

[15] See the 2006 Report on the EU's activity, Brussels-Luxembourg, The European Commission, 2007.

This target and the stimulation of a possible considerable growth in Europe's capacity of scientific creation and innovation are based on the following measures adopted by the European Commission:

- Establishing the leading role in future strategical technologies (nanoelectronics, innovative medicines, aeronautics, etc.), especially through "joint technological initiative", based on specialized partnerships (namely, the public sector-private sector);
- Establishing stronger relations among universities, researchers and the business community;
- Improving the framework conditions for innovation (a really integrated single market, especially for services; funding; industrial property policy; faster procedures of setting open and inter-operating European standards; specific sectoral measures).

3. The Dimension of Scientific Research and Innovation in Romania in the context of the Integration into the EU and Industrial Property

The previous section points out that, at present and in the next years, the "prevalent trend" in economic theory and practice aims at achieving the "European knowledge-based society". In this context, economic growth and welfare are to be ensured by knowledge-based industries and services.

Therefore, the European Union must lay the stress on all sides of knowledge such as education, research and innovation and pay also attention to the protection of industrial property rights.

Given this problem and, especially, the fact that, both on national level and on international level, the research, development and innovation fields cannot be neglected by either science producers or research and innovation managers[16], and, equally, those in charge of the industrial property rights protection, the question is: What is Romania's position in the European Union with regard to this aspect and what is to be done?

3.1. The Efficiency of Romanian Research and Innovation, Industrial Property Rights and Their Protection

Scientific production and innovation, like any other intellectual activity, require material and financial resources, but mainly creative work. Thus, the

[16] I. Haiduc, "Vizibilitatea internaţională a cercetării din România – 2004*",* paper presented at the Roundtable organized by UNESCO-CEPES and the Romanian Academy – M. H. Elias Foundation on "Noi politici în domeniul învăţământului superior şi cercetării ştiinţifice din România", Bucharest, 22 March 2005.

following question seems reasonable: What is the efficiency of research, development and innovation and how is it quantified in relation to industrial property rights protection?

Simplifying the matter, the efficiency of the R&D activity in relation to industrial property rights materializes in the contribution to economic growth, although, for example, quantitative studies seem to be less accurate when it comes to the measurement of the contribution of investments in R&D to productivity improvement. The problems regarding the estimation of this contribution are mainly caused by the absence of direct and adequate measurement of the research outcome[17].

As regards the measurement of propagated effects, determined by research, development and innovation activities, the specialized literature identifies a few approaches, as follows:

- data on patents, which provide a clearer representation of the effects of economic factors on the intensity, pace and trend of the invention activity;
- the classical production function clarified by the phenomenon of addition of accumulated R&D capital (capital of technological knowledge);
- case studies, monographs that target high private and public rates of return.

As regards the assessment of the rate of return on R&D activities at present, we notice the following directions:

- the return on fundamental research, which has obvious effects on productivity improvement, if compared to industrial research and development, which cannot by easily quantifiable[18];
- the measurement of spillovers produced by R&D, that is the assembly of consequences of an R&D activity carried on by a producer on the performance of one or more producers.

Moreover, the transition from an economy predominantly based on physical resources to an economy predominantly based on knowledge[19] shows that, in the future, the power and the welfare will mainly result from intangible industrial resources and from knowledge capital.

Among the distinctive features of the knowledge-based economy, the industrial property holds a significant share in the continuously growing national wealth, and the boundaries between the industrial property and the classical property tend to vanish because of changes taking place in the structure of the production factors. In a mature knowledge-based economy, industrial property holds a majority share[20].

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[17] Z. Griliches, *op. cit.*

[18] Z. Griliches, *op. cit.*

[19] A.B. Jones, "Knowledge Capitalism – Business, Work and Learning", in *The New Economy*, Oxford, Oxford University Press.

[20] Luminiţa Nicolescu, Ovidiu Nicolescu, "Noua economie – economia bazată pe cunoştinţe", in *Societatea cunoaşterii,* Bucureşti, Editura Economică, 2006.

Generally, the R&D results are considered positive spillovers especially to the benefit of the economic agents, as a consequence of accumulation and general development of scientific and technical knowledge, in compliance, among others, with their location.

As shown above, the quantification of the propagated R&D effects is difficult to make. Anyhow, one of the criteria for the assessment of scientific research is innovation, as an essential factor of internal and international competition. The measurement of the innovation outcome consists in assessing *the number of patents* and that is way the improvement of their juridical and institutional regimes, as well as of the whole system of industrial property rights and their protection is a great concern of the interested governments.

Analysing the Romanian research, development and innovation with regard to industrial property rights and creativeness, we find out that the situation is not good at all. Statistical data are relevant in this respect. They reflect the consequences of a long period of low funding and malfunctioning of the system (see Table 7).

Table 7

Patent applications and grants in Romania 2001–2006

	2001	2002	2003	2004	2005	2006
1. Total number of patent applications	5.687	6.567	5.955	5.120	1.365	1.097
• Romanian applicants	1.128	1.477	881	937	916	814
– enterprises	189	208	189	189	166	156
– research and education units	114	143	104	146	133	175
– natural persons	825	1.126	588	602	617	483
• Foreign applicants	281	205	165	164	68	62
• Applications for European patent extension	4.278	4.885	4.909	4.019	381	221
2. Total number of granted patents, of which:	832	1.183	1.521	1.292	1.547	1.831
– Romanian holders	478	496	431	435	423	369
– foreign holders	251	190	217	170	113	133
– validated European patents	103	497	873	677	961	1.329

Source: Statistical Yearbook 2007. Data provided by the State Invention and Trademark Office (SITO).

Statistical data on invention patents in Romania reveal the following:

- a lowering trend of patent applications from Romanian applicants (a diminution by 27.83% in 2006 as against 2001);
- a lowering trend in number of invention patents granted to Romanian holders (a diminution by 22.8% in 2006 as against 2001);
- a low number of patent applications from Romanian applicants represented by enterprises, research and education units.

We find the same situation in the world: the patenting of the Romanian innovation results is extremely reduced. For example, in 2007, in the world 156,100 international patent applications were filed, while in Romania there were only 23, according to PCT (Table 8).

Table 8

International patent applications, according to PCT

Country of origin	2003	2004	2005	2006	2007 (estimate)
Total, of which:	115,194	122,610	136,688	149,156	156,100
Japan	17,414	20,264	24,869	27,033	27,731
USA	41,030	43,350	46,804	50,941	52,280
Germany	14,662	15,214	15,984	16,732	18,134
Sweden	2,612	2,851	2,883	3,316	3,553
Hungary	114	136	160	145	160
Bulgaria	45	24	21	24	27
Romania	16	18	15	26	23

Source: World Industrial Property Organisation, An unprecedented number of international patent applications filed in 2007, Geneva, 21st February 2008, PR/2008/536.

The arguments and data presented above reveal the necessity to adopt and develop further the economic, institutional and legislative framework in order to stimulate innovation and protection of industrial property rights within all scientific research units, universities and enterprises.

3.2. Industrial Property Rights and Innovation Stimulation According to the 2007–2013 National Strategy

The stimulation of entities working in the RDI field to innovate is determined by the following:

- the risk to change a scientific principle, an invention, etc. into a commercially viable result or a result useful to progress, in general;
- the fact that innovation ensures an overprofit source due to its status of temporary monopoly;
- the industrial property rights which an economic agent might hold;
- the protection level of industrial property rights against possible imitators or piracy.

Considering these characteristics, in this section we analyse and define the state of scientific research and innovation in Romania and results; from this we deduce that for almost two decades the Romanian system of research, development and innovation has faced major problems with equal consequences, which have hindered the correlation with world trends in science and technology, except for isolated cases. Synthetically speaking, the state of the Romanian scientific research and innovation after 1989 could fit the following picture: underfunding and late restructuring; a fragmented R&D system; low demand of the Romanian enterprises for innovation; severe diminution in number of researchers; Romanian researchers' emigration; difficulties in attracting highly performant young researchers; late institutional reform in the R&D field; low quality of the RDI infrastructure; the lack of an assessment system able to stimulate performance.

All these shortcomings produced insignificant results such as: a small number articles in scientific publications; a small number of citations of scientific results published by Romanian authors; low interest in protecting industrial property; a very small number of applications for patents both from residents and from non-residents; a low level of the innovation culture.

The data regarding innovation carried on by Romanian enterprises, based on statistical research results (for 2002–2004) and harmonized with CIS4 (Community Innovation Survey) of a sample consisting of 11,542 enterprises are shown in the table below[21]:

Results of statistical innovation research in Romania between 2002 and 2004 show that:	**The main results point out the necessity to further develop an economic-legislative framework for stimulating innovation in all enterprises in Romania**
■ One enterprise out of five innovated products and/or processes	● The proportion of innovative enterprises was 20% in the period 2002-2004 as against 17% in the period 2000-2002; this growth shows an improvement of the economic environment in our country ● Among the innovators, 67% made both product innovations and process innovations, 9% were only product innovators and 24% were only process innovators
■ There are more innovative enterprises in industry than in the service sector	● Out of the total number of enterprises in industry, 22% were innovative, while in the service sector 17% were innovative ● In the period 2000-2002, 19% of the innovative enterprises belonged to industry and only 13% to the service sector
■ Large enterprises are more innovative than the small and medium ones	● The proportion of large innovative enterprises was 42% of the total number, as against only 16% small enterprises and 25% medium-sized enterprises
■ In total expenditures on innovation, the highest share is held by expenditure for purchasing machinery, equipment and software	● The total expenditure on innovation amounted to 4,589,077 thousand lei (RON) in 2009
■ Of the total number of innovative enterprises 19% declared that they made innovations through cooperation	● The cooperation for innovation requires active participation in research&development or innovation projects together with other domestic or foreign enterprises or organisations ● By the partner's nature, the cooperation with domestic companies represented 60%, with European countries 32%, and with the USA and other countries 8%
■ The main effect of innovation is an improvement in quality of goods and services	● 37% of the innovative enterprises mentioned that the main effect was the improvement in quality of goods and services, 32% mentioned a growing production capacity and only 18% mentioned a diminishing negative impact on environment and health and a growing degree of labour security
■ The cost factors hindered innovation	● As regards the innovative enterprises, 31% mentioned the scarce funding as a blocking factor of innovation, and 30% mentioned high costs of innovation ● As regards the non-innovative factors, 26% mentioned high costs of innovation as a blocking factor
■ The highest proportion of innovative enterprises are found in the Bucharest-Ilfov Region	● The proportion of innovative enterprises in all enterprises of the sample at the Development Region level in the period 2002-2004 was as follows: South-West Region of Oltenia – 4%, West Region – 7%, South Region of Muntenia – 9%, North-East Region – 13%, Centre Region – 14%, South-East Region – 18%, Bucharest-Ilfov Region – 22%

[21] See "Inovarea în întreprinderile din România*", Tribuna economică*, nr. 32, Bucureşti, 2006.

Both the shortcomings and the need for a stronger correlation of the Romanian RDI system with European and world orientations and trends in the field determined the Government to take a political decision on working out and adopting a strategy according to which Romanian intended to develop a knowledge-based society open to international values and competition.

We know that economic growth and improvement of the quality of life are supported by the stimulation of creativeness and technological or organisational performance through research, development and innovation along with more attention paid to industrial property rights and, especially, their protection.

That is why, in the next five years, the strategic objectives of the Romanian RDI system[22] for the stimulation of innovation and performance and the achievement of convergence are the following:

- achieving top scientific and technological results, competitive in the world, in order to increase the contribution of the Romanian RDI system to the world stock of knowledge, and to improve the international visibility and the transfer of results to the economy and the society;
- improving the competitiveness of the Romanian economy through innovation, which will have impact on economic agents by transferring knowledge to economic practice;
- improving social quality by solutions, including technological ones, able to produce direct benefits to the society. This category includes solutions to local, regional and national problems regarding social cohesion and dynamics, improvement of policy effectiveness as well as problems concerning the health, the environment, the infrastructure, the territory planning and the capitalisation of national resources.

Once the strategy is worked out and adopted, what also matters is the obligation of the factors in charge of mobilizing financial, material and human resources to create and drive mechanisms required for attaining the objectives of the RDI system.

Within the presented framework, the stimulation of innovation, the assessment of the commercial potential of some ideas, the protection and licensing of industrial property rights, in general, and of industrial property rights, in particular, are all closely linked to the adaptation of the institution and the juridical regulations to requirements and trends in the world economy and, especially, the European economy.

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[22] See the Romanian Government's Decision No. 217/2007 regarding the approval of the National Strategy for Research, Development and Innovation for the period 2007–2013, published in *The Official Gazette of Romania*, Part I, No. 214 of 29 March 2007.

4. The Adaption of Regulations and Institutions Concerning the Industrial Property to Requirements for Stimulating the Scientific and Technological Creation and Innovation

In this section we discuss the question of adapting the regulations and the institutions functioning within the industrial property system to requirements for the stimulation of innovation in order to close the gaps in development.

4.1. Industrial Property Institutions and Their Adaptation

Economically, property, in general, but, especially, industrial property, analysed in relation to rare goods, arouse some interest. And since the recognized results of research and innovation are "scarce goods", and scarcity gives reason to economic efficiency, which consists in producing maximum value from available resources, the question is how to manage best the industrial property rights and to find ways of institutional and legislative adaptation for stimulating innovation and convergence. Moreover, property requires a prudent management of innovation[23]. Since property creates "social order", it settles disputes as concurrent utilisations[24] of goods produced by RDI are occurring.

A maxim of common law reads: "a right that cannot be protected is not actually a right". The core of this maxim is also applicable to processes of establishing and protecting the industrial property rights. These processes are carried out by institutions belonging to the industrial property system[25].

The system of industrial property rights interacts with the society through specific institutions having responsibilities for the confirmation, management and protection of these rights. Considered a sub-system of the system of industrial property rights, the specific institutions include:

a) industrial property offices as institutions specialized in this field;
b) governmental agencies in charge of health, security, taxes, relations with consumers, and external relations;
c) trial courts;
d) scientific research institutions;
e) education institutions;
f) agencies for the consolidation of rights.

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[23] Lepage, H., *Pourquoi la propriété,* Paris, Hachette, 1985.

[24] Demestez H., "Towards a theory of property rights*",* in *American Economic Review*, vol. 57, 1967.

[25] Anghel Ion E., Iancu Victor, "Gradul de convergenţă/divergenţă a reglementărilor şi instituţiilor privind drepturile de proprietate industrială (Uniunea Europeană, SUA şi România)", Bucureşti, *Oeconomica*, nr. 1, 2008.

The institutional sub-system of property rights should be viewed as a dynamic mechanism that "influences the enterpriser's behaviour regarding the stimulation of innovators, the innovation application, the application to the economy and the product trading in a creative and innovative way"[26].

To meet the RDI requirements, the institutions of the system of industrial property rights should adapt and focus on mechanisms, practices and procedures converging with the evolutions, the trends and the specific features of each activity.

Generally, institutional changes and adaptations are determined by both exogenous factors and endogenous factors. Among the endogenous factors of institutional adaptation or change mentioned by specialists we find the following:

- the introduction of new technologies ("competence destroying" technologies and "competence stimulating" technologies)[27];
- management innovations (e.g., total quality management)[28];
- changes in political programmes, including changes in industry regulations[29] and in employment rules[30];
- major social unrest (e.g., wars, revolutions, etc.)[31];
- the movement for social reform (e.g., the movement for civil rights)[32];
- economic crises, moments of social unrest[33];
- changes in practices and cultural beliefs (e.g., changes in the views on environment)[34].

We do not hesitate to assert that these factors, in their concrete and accidental action, influence directly or indirectly institutions (national, regional or global) involved in the industrial property field, and determine them to take measures for adapting and changing the functioning mechanisms.

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[26] Rushing, F.W., M.A. Thompson, "Intellectual Property Protection, Entrepreneurship and Economic Growth", *Journal of Enterprising Culture 4*, No. 3, September 1996.

[27] Tushman, Michael L., Philip Anderson, "Technological Discontinuities and Organizational Environments*", Administrative Science Quaterly 31*, 439 – 65, 1986.

[28] Cole, Robert E., Managing Quality Fads: How American Business Learned to Play the Quality Game, New York, Oxford University Press, 1999.

[29] Flingstein, Neil, *The transformation of corporate control,* Cambridge, Harvard University Press, 1990.

[30] Baron, James N., Frank R. Dobbin, P. Deveraux Jennings, "War and Peace: The Evolution of Modern Personal Administration in US Industry*", American Journal of Sociology*, 350-83, 1986.

[31] Carrol, Glenn R., Jacques Delacroix, Jerry Goodstein, "The Political Environments of Organizations: An Ecological View*",* 350-92 in *Research in Organizational Behavior,* (vol. 10), edited de Barry M. Staw and L. L. Cummings Gree Vich; JAI Press, 1988.

[32] Mc Adam, Doug, Political Process and the Development of Black Insurgency, 1930-1970, Chicago, University of Chicago Press, 1982.

[33] Stark, David, "Recombinant Property in East European Capitalism*", American Journal of Sociology*, 101, 993-1027, 1996.

[34] Frank, D.J., A. Hironaka, J.W. Meyer, E. Schofer & N.B. Tuma, "The Rationalization and Organization of Nature in World Culture", in *Constructing World Culture: International Nongovernmental Organizations since 1875*, Stanford, Stanford University Press, 1999.

Since institutions, in general, including the economic ones, and, consequently, those involved in the industrial property field are defined in terms of constraints (opportunity costs), a decisive role in their modelling is played by the evaluative economic environment and the cultural-educational environment.

Knowing that innovations are vital to every company in the competitive environment of a market economy [35], a success in innovative projects depends on the features of the organisations that stimulate innovation. Here are some of these features:

- a free flow of information, which allows us to find ideas in unexpected places and determines the combination of information fragments;
- close and frequent relations among departments, focused on lateral and vertical relations, which ensure resources, information and support;
- the tradition of team work and sharing of merits;
- chief executive officers' confidence in innovation and availability of necessary resources;
- managers able and wishful to find opportunities and time for innovations[36].

Considering the features of the industrial property, we find (for example) the ways of contribution to technological innovation stimulation, based on the invention patent:

- granting exclusive rights for a limited period and, in this way, determining the competition to act legally;
- protecting corporate holders and inventors against unfair competition of those unwilling to take financial risk;
- providing the most efficient framework for collecting, classifying, publishing and disseminating technological information in the world[37].

In conclusion, to meet these requirements, the following measures and ways of action should be considered by institutions working in the industrial property field pertaining to the national, regional and global systems:

- continuously revising and improving the legal infrastructure in compliance with the market, technology and legislation evolution;
- simplifying and improving the procedures and harmonizing national legislations in order to create an industrial property system that can be easily used in correlation with the present systems of global protection (The Patent Cooperation Treaty, the Madrid System, etc.)[38];

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[35] Armstrong, Michael, How to Be a Better Manager – A Complete A–Z of Proven Techniques and Essential Skills, sixth edition, 2004.

[36] Armstrong, Michael, *op. cit.*

[37] See Ion Vasilescu, "Managementul activităţii de protecţie şi de valorificare a invenţiilor brevetabile", in *Protecţia invenţiilor prin brevet şi modul de utilitate*, Bucureşti, Editura OSIM, 2006.

[38] These systems are more attractive, more simple and less expensive to creators; they are more effective in implementing technologies of information on the study of the technique (inside the World Intellectual Property Organisation).

- continuously improving cooperation and solving any problem occurring during activities taking place within institutions pertaining to the industrial property field;
- extensively using and disseminating high technologies of information (e.g., electronic recording of applications within the Patent Cooperation Treaty, development of applications within the Patent Cooperation Treaty, development of OMPINET for supporting the Industrial Property Offices of the member states in order to promote their products and services);
- improving the quality of human capital in the industrial property field by continuous training of the personnel involved (government officials, experts, professionals, users of industrial property systems, etc.);
- creating and promoting on a large scale a culture of industrial property and pleading for using industrial property as an instrument for stimulating innovation and economic growth.

The industrial property system should be based on the legislative component, the adaptation of which is necessary for stimulating innovation.

4.2. Adapting the Industrial Property Regulations

The legislative framework is one of the basic elements of most economic activities. The activity fields require "rules of the game" for organizing certain actions and establishing the limits within which they may take place. Scientific and technological creation and innovation represent a field that require a stimulating, available and easily understandable regulation framework.

4.2.1. The Role of Regulations in Scientific and Technological Creation and Innovation

Although the concept of "innovation" is not compatible with the existence of "barriers" to knowledge, the question of recognizing certain rights on intellectual creation and their results in creating monopoly rights was and still is a widely debated issue, on which no unitary conclusion has been drawn. Generally, a holder of a property right on a material good may immediately exclude third parties from using that good. By comparison, a holder of an industrial property right benefits by much more limited means of exclusion.

We know that a certain activity can produce *ex ante* monopoly profit if access to that activity is hindered by certain barriers. If access is free, irrespective of the juridical regime of the property, it lasts until no profit is gained. The above-mentioned are also applicable to the creation of industrial property, which produces *ex ante* profit in excess, if that activity is protected by entry barriers. Although we

can imagine such barriers for specific activities, we can hardly believe that the penetration of all innovative fields producing industrial property can be limited in this way[39].

An aspect of the industrial property rights that makes them different from the property rights on material goods (existing physically) is the difficulty to limit the use of the former. For example, an information, once perceived and received, cannot be deleted from the receiver's memory. This characteristic can be compared to the loss of control on a physical good, once it is traded, and questions an easy transfer of industrial property, which makes trading much more difficult, since revealing the nature of industrial creation for trading could be equal to transferring that creation to potential buyers without making a transaction.

A system of industrial property rights provides the stakeholders on a market economy with necessary means of recovering investments from the creative activity as well as making profit of it. The latter opportunity is, moreover, the basic motivation of the creative effort.

There are at least three key elements that an effective legislative system of industrial property rights should include:

- recognizing the rights: a legal framework for establishing the property rights on intellectual creation and the beneficiaries of the rights;
- exerting the rights: a system allowing to exert these rights;
- trading: means for trading/transferring rights without high costs or barriers of any kind.

Each of the above elements is essential if we want that industrial property rights should guarantee that every person involved in scientific and technological creation and innovation could earn a profit from his creative activity. The recognition and the regulation of industrial property rights ensure that creators could exert control over results or trade these results, while the establishment of the framework for exercising these rights ensures that the rights are protected and those who violate rights are punished. Not in the last place, the possibility to transfer or to contract ensures that the holder has several options for trading.

Although most market economies have created systems for protecting the industrial property rights, the creation and the maintenance of a functional system face problems associated to the three above-mentioned elements:

- **Regulation problems**. These problems are caused especially by the so-called *non-rival nature* of the industrial property rights. A good characterized as non-rival is a good that can be simultaneously consumed by several persons so that its consumption should not diminish in any way the quantity consumed by each one[40].

For example, in case of an idea, once it is revealed and used, it is very difficult or even impossible to withdraw and isolate it to prevent a future use. This

[39] Gans, Joshua S., Williams Philip L, Briggs David, *Intellectual Property Rights: A Grant of Monopoly or an Aid to Competition?*, 5 December 2002.

[40] Platis, Magdalena, "Economia sectorului public", www.ebooks.unibuc.ro;

problem does not exist in the case of material goods, which have a so-called rival nature. It is much easier to condition the purchase and use of a material good on payment and to exclude non-payers from utilisation. But it is such more difficult to establish rights on intellectual creations, since it is much more difficult to exclude non-payers. This problem became more serious with the development and dissemination of the communication technology, such as the Internet or e-mail, which facilitate the transfer of industrial property at very low costs.

In this context, it is essential hat the regulations and institutions in this field create and maintain an efficient mechanism of adaptation to new realities.

- **Problems in exercising industrial property rights**. Given the nature of the industrial property, which can be easily reproduced and transmitted, the detection of violations of industrial property rights causes much trouble to those who enforce the law. It is possible that even the holders cannot detect a violation of their rights when it does not directly affect their own use.

Considering the very high costs of monitoring and protecting the industrial property rights, the only viable solution is improving the activities of the institutions fulfilling the protection function. Therefore, *the creation of a strong regulation system and the creation of an efficient judicial system are two important requirements in this field.*

- **Trading/transfer problems.** An example of problem in transferring industrial property rights is the problem of exposure. It occurs when the pricing of a certain industrial right (an invention, a design, etc.) is intended, since this process requires an exchange of information (the creation exposure), which diminishes its value from the very beginning. On the above matter and on the necessity to ensure an efficient regulation framework, K. J. Arrow expressed an interesting opinion: „*In absence of a special legal protection an owner cannot simply sell a piece of information on the market. Any buyer can destroy his monopoly, as he can reproduce that information at no or low cost. Thus, the only efficient monopoly could be the use of the information by its original owner*"[41].

Also, the value of a certain industrial property right depends on factors such as market demand or the existence of similar creations, which makes contract negotiations very difficult. In the same context, another problem is the assessment of the industrial property rights, which often determines the paid price to be non-stimulating for whom is involved in innovation or scientific-technological creation.

In presenting the unavoidable problems of a system of industrial property rights, one may notice that a property right on an intellectual creation is an asset that can hardly be held or controlled. It is not easy to exclude third users from an industrial property right, and the option for secrecy is given up when a transfer or trading is intended.

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[41] Arrow, K. J., *Economic Welfare and the Allocation of Resources for Invention* , *The Rate and Direction of Inventive Activity*, Princeton University Press, 1962.

Considering the above-mentioned problem, we can easily understand the necessity and the role of he regulations in this field. The old debate concerning the creation of "a legal monopoly" is no longer useful, when the stress is essentially laid on the protection of a properly right, which is stipulated in the legislation of most democratic countries. The only comments to be added are those regarding the regulation level in this field, that is, how far the protection and exercise of the rights can go.

An efficient regulation framework in the industrial property rights field facilitates also the intellectual creation transfer, that is, the producers of industrial property are no longer required to reach the final customer directly for making profit from their creative activity. Thus, the industrial property may be "sold" to intermediaries, who, in turn, could trade it by adding value. Such a structure could not exist unless there are strict regulations for clearly defining the role of each one.[42]

Also, recognizing and exercising the IPRs offer an opportunity for specializing the process of industrial property creation, which determines the creation of a distinct market, on which new regulation requirement naturally occur.

4.2.2. The Necessity for Convergence and Adaptation of the Regulations Concerning the Industrial Property Rights in the EU

The globalisation pressure made of innovation a key element for improving productivity and supporting industrial competitiveness. The new orientations in this field, such as open innovation, led to a network-type innovation system, which requires new stimulation and support policies. The innovation policy is of major interest both at global level and at national level, but the European Union is facing specific challenges. The negative indicators, such as cumulated economic growth and productivity improvement, lagging far behind the US achievements, are frequently associated with unsatisfactory performance in the innovation field[43].

The far-reaching programme within the Lisbon Strategy for turning the European Union into the most competitive and dynamic knowledge-based economy in the world by 2010 places innovation in the foreground. The 2005 redefinition of the Strategy did not change the importance of innovation and its stimulation, but it even focused more on the necessity of complementary efforts made by all member states and the European Commission; one of the proposed policy measures was "knowledge and innovation for economic growth". The Commission recognizes that an important part of its policy for stimulating innovation in the European Union is represented by a harmonized system of industrial property rights, which could be effectively used to protect the new

[42] Gans, Joshua S., Williams Philip L, Briggs David, *Intellectual Property Rights: A Grant of Monopoly or an Aid to Competition?*, 5 December 2002.

[43] Georghiou Luke, "Effective innovation policies for Europe – the missing demand-side", *Globalisation Challenges for Europe and Finland*, 20 September 2006.

products and technologies. It is obvious that the role of the industrial property rights in a knowledge-based economy is crucial, since it gives exclusive rights that can be used to prevent the "copying" of technological innovations by third parties, as well as free use of the research results.

Innovation needs a predictable legislative environment that should allow and even stimulate new developments of ideas and services, protect the industrial property and provide inter-operable, visible standards. The regulations should also maintain the consumer's high confidence by ensuring that the existing protection measures are effectively applied in order to stimulate the creation of new products and technologies.

The impact of the regulations on innovation and technological-scientific creation, in general, should be permanently analysed. The legislation should be flexible, simple and effective. According to the European Commission, the regulations mostly focused on policy and less on a technical solution through which the policy accomplishes its purpose, ensures an adequate innovation basis, laying the stress first on performance.

The protection of industrial property rights is another *sine qua non* condition for stimulating innovation. Without adequate protection of intellectual creations, there is no motivation to invest in them. Establishing certain procedures for balancing the costs with quality and juridical certainty, beside an adequate system for the settlement of disputes, efficient in relation to costs, should be a priority.

As regards the convergence of the regulations concerning the industrial property rights in the European Union, progress has been made, but some chapters are still pending.

Particularly, with regard to trademarks, designs and models, the legislation was harmonized in EU 27 by means of a single system administered by the Office for Harmonisation in Internal Market, subordinate to the European Commission. The two systems, the Community trademark and the Community design (real "successful stories", as Charlie McCreevy, Commissioner for International Market, said in 2006), succeeded in simplifying the registration procedures, in providing a unitary protection of the owners throughout the EU and in reducing the related costs. Now, by means of one application, one registration fee and one procedure it is possible to receive Community protection.

During the accession to the EU, Romania harmonized the internal legislation and recognized the responsibilities of the Office for Harmonisation in Internal Market and the registration procedures for the Community trademark and design.

The most difficult problem to be solved by the European officers at present is the creation of a Community patent system, which should clarify (similarly to the Community trademark system) also the thorny matters concerning the patenting costs as well as the expenditures on the harmonisation of judicial procedures. The present institution that grants "European patents" does not belong to the European Union, and the protection titles have no unitary character and, consequently, do not ensure protection throughout the Community.

The creation of a Community patent is needed for several reasons, as follows:

- the present system does not ensure immediate protection in all member countries;
- cost are very high;
- there is no single jurisdiction for settling the disputes on European patents;
- the European patent is not a Community institution.

The attempts at creating a "Community patent" have not been successful so far for various reasons, but the European Commission decided to carry on this action, since an improved patenting system is crucial if Europe intends to improve its innovation potential. Meanwhile, it was suggested to make this system effective by ratifying the London Protocol and making progress in the European Patent Litigation Agreement (EPLA) and ensuring the compatibility with the European legislation[44].

Research and innovation on the European level urgently needs a predictable and favourable legislative framework for attracting private investments and stimulating the transfer of new ideas to the market. The policies in these areas should consider the specific features of each activity sector, the needs of the SMEs, as well as the role of the public institutions involved in the research activity, contributing, at the same time, to the fulfilment of the purpose of EU policies in various fields such as environment, health or transport.

Many of the legislative practices in research and innovation are assumed by the member states. Nevertheless, the EU regulation institutions play a role in establishing effective policies and regulations with the highest possible addressability. Thus, all policies at the EU level and the national level should be focused on support for research and innovation. They should promote excellence in research and equally allow companies to produce, change and use technologies, knowledge and funding sources necessary to enter new markets[45].

The role of the governments of the member states in achieving convergence and in adapting regulations for the stimulation of innovation and scientific and technological creation is a well-known fact. However, in spite of many administrative and regulation efforts, in many activity fields at the EU level, we still find 27 distinct markets, either because of a poor harmonisation at national level, or because the local variants or the complementary rules and practices hinder us to derive benefits from harmonisation.

As regards the regulations in the research and innovation field, we should also consider the fact that the legislation could be an important support and an

[44] Communication from the Commission to the Council, European Parliament, The European Economic and Social Committee and the Committee of the Regions, *Putting knowledge into practice: A broad-based innovation strategy for the EU*, 2006.

[45] Communication from the Commission to the Council, European Parliament, The European Economic and Social Committee and the Committee of the Regions, *More Research and Innovation - Investing for Growth and Employment: A Common Approach*, 2005.

essential impetus, but it could also be an obstacle. The way in which the considered fields are influenced depends on the mode of adopting the legislation, including the impact on the commercial risk and the juridical certainty, the time of enforcement, as well as whether it allow for alternative technical solutions. A recent study on the relation between legislation and innovation shows the role of regulations in defining new markets, but it also shows that, from the companies' point of view, regulations have both a positive impact (quality improvement) and a negative one (slower entry into the market) with regard to the creation of new products and services. This study also reveals that there is a strong consensus between companies on the European level, that is, regulations are perceived as being too numerous, inflexible and non-transparent[46].

Seeking to reach a certain degree of convergence of regulations concerning the industrial property rights, the legislator, either at the EU level or at the national level, should consider an anticipative approach and identify the areas where the existing legislation or the absence of legislation hinder the development and implementation of new technologies as well as the entry into new markets. On the other hand, when planning research and innovation activities, those involved in these fields should also consider the regulations to be adopted.

The business environment equally depends on the quality of regulations and on their effective enforcement. It means transposing the Community legislation into the national legislation without adding bureaucratic burden to national regulations, as well as the adoption of administrative practices consistent with innovation. As regards the innovation policies and the legislative reforms could affect innovation *indirectly*, since they influence the funds available for investments, as well as the market structure and size, and, *directly*, since they have impact on the profitability of certain areas of development.

With a view to innovation stimulation, a study ordered by the European Commission identified several aspects that must be considered for a reform in the legislative field, as follows:

- the content of the regulations (e.g., market liberalisation);
- relief from the legislative burden;
- more flexible juridical approaches;
- innovation in the regulation policy itself.

In conclusion, we may say that, in general terms, the adaptation of the legislative system should be quick for making the system more active; that is, a system based on foresight, as well other modern ways to anticipate technological development and to stimulate the integration of new products and services by means of flexible and harmonized legislative regimes. This requirement could be met first by permanent consultations between regulatory bodies and those directly involved in the innovation process.

[46] Louis Lengrand and Associates, „Innovation tomorrow – Innovation policy and the regulatory framework: Making innovation an integral part of the broader structural agenda", Directorate General for Enterprise Innovation Papers No. 28, EUR 17052, PREST and ANRT, 2003.

5. Conclusions

As regards the juridical regulations and institutions, the Romanian system for the industrial property rights protection is a modern one, harmonized with European rules. But this is not enough. It is important to maintain the dynamic pace of these adaptations in order to intensify innovation.

It is highly important to Romania to establish and implement sectoral priorities and ways of action in the following fields: top industries, education and research & development, computer science, telecommunications, etc.; besides, these ways of action are also found in the national strategy for research & development and innovation for 2007–2013.

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