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CONSIDERATIONS ON THE INTELLECTUAL POTENTIAL CREATIVITY

SIMION CERTAN¹, ION CERTAN²

Abstract: *The functionality of the new economic system of Republic of Moldavia, based on market relations and opened to world, frequently marked by dynamism, often by uncertainty and risk, sometimes even hostility, depends, crucially, on the innovation activity. Innovation activity, formation of innovation potential is definitely influenced by motivational politics and the reward system. The article reflects on the evolution of innovative activity, formation of innovation potential, motivational system and proposes some measures that would boost the intellectual property.*

Key words: *education, innovation, intellect, motivation, performance, rewards, research*

INTRODUCTION

To qualify the transition to the market economy is mentioned in the Moldavian Parliament decision of 26 July 1990, as a model of management and the main measure of economic recovery of the country. The functionality of the new economic system of our country, frequently marked by dynamism, often by uncertainty and risk, sometimes even hostility depends, crucially, on the creative people, the intellectual potential. Creativity is influenced by a large number of factors, including staff motivation intellectually, what determines the actuality of this material.

STAGE OF KNOWLEDGE THE PROBLEM

Aspects of both the study of the development of innovative activity and motivational appearance is found in the national and international research. However, even these have been discussed in various official meetings in our country, approached at scientific sessions, presented in various national and international publications, the innovation activity, forming and development of innovation potential remains a current and important investigation for our country.

MATERIAL AND METHOD

Of the materials used in research, monographs and other specific publications that helped us to understand and explain the phenomena that occur in the work of innovation and motivation system are part. Quantitative analysis is performed on data selected and processed by the authors based on statistical yearbooks of the National Bureau of Statistics. The study of empirical information, the analysis of the links provided us relevant meanings and explanations in relation to the phenomena and processes of formation of the intellectual potential that occur in our country.

Results and meditations

For any country or business that intends to improve the competitive position against rival bidders is needed to encourage the research and development activity. Quantitatively this activity can be assessed by the number of invention patents or patents for plant varieties issued, by the number of drawings / industrial models and trade mark protection titles released.

A. Products of creativity and innovation activity

The number of applications for invention patent has a clear trend of reduction from 401 in 2005 (Table 1) to 108 in 2011, or 3,7 times. The situation is identical for the national applicants' requests.

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Table 1. The evolution of applications filed for protection of inventions, plant varieties, utility models, drawings / industrial models and marks

	1995	2000	2005	2006	2007	2008	2009	2010	2011
Applications filed for inventions patent	299	246	401	289	353	292	141	143	108
inclusive national applicants	270	240	390	281	335	272	136	139	97
Patent for plant varieties	-	12	22	7	13	32	10	18	18
inclusive national applicants	-	11	22	5	11	30	10	18	16
Invention patents were issued	227	234	269	288	268	250	290	132	63
inclusive national applicants	124	200	261	287	262	247	280	125	61
Patent for plant varieties	-	-	3	4	3	12	17	25	15
inclusive national applicants	-	-	2	4	3	12	13	25	15
Titles of valid invention patents	266	1316	1108	1196	1033	1049	1139	1018	799
Titles of patents for plant varieties	-	-	13	17	24	32	49	74	86
Drawings / Industrial models issued	1383	1735	1469	1689	1305	1463	1171	1167	1114
Titles of mark protection issued	3827	3289	4742	4925	5330	5797	5017	4487	4451

Source: Statistical Yearbook of Republic of Moldavia, Statistica Publishing House, Chişinău, 2012, p.186-188

Although the share of patent applications for plant varieties increases from 2.4% in 2006 to 18.5% in 2011, their number remains unacceptably low for an agricultural country like Moldavia. The same downward trend both of share of patents issued from 67.1% and the number from 269 in 2005 to 58.3% and 63 respectively in 2011. It is normal that the total number of patent titles had reduced from 1316 in 2000 to 799 in 2011 or with about 40 percent.

The total patent titles for plant varieties increased from 13 in 2005 to 86 in 2011, or by 6.6 times, but remains far too insufficient, constituting only 10.7% of the total number of patent titles in our country. The categorical decline of patents of invention correlates perfectly with the situation in the national economy.

Slower, from 1735 in 2000 to 1114, or with about one-third had reduced the number of drawings / industrial models issued. Number of titles issued for trademark protection has increased from 3827 in 1995 to 5797 in 2008 or by 1.5 times and then reduced to 4451 in 2011, or with about 22 percent compared with 2008. The large number of titles issued for trademark protection in relation to the number of drawings / industrial models issued is due to the increasing of small and medium businesses who want to distinguish themselves on the market.

The level of development of creative thinking, allowing new and unusual ideas development is influenced, first, by the environment in which the person activates. Such environment can be both whole range of institutions (juridical persons) and individuals who seek protection for inventions and utility models.

The total number of legal persons requesting protection of inventions and utility models (Table 2) ranges from 128 in 2000 and 232 in 2005. The requests of the academic institutions to protect inventions and utility models increased from 29 in 2000 and 32 in 1995 to 100 in 2007, then decreases by about 16 percent in 2011. If in 1995 the applicants for protection of inventions and utility models of branch institutions were 2.06 times more than those required by the academic institutions and in 2011 were 3.82 times less.

Table 2. The evolution of national categories of applicants

	1995	2000	2005	2006	2007	2008	2009	2010	2011
Total legal persons	191	128	232	176	217	196	195	218	166
Of which: academic institutions	32	29	64	48	100	87	95	82	84
Branch research institutions	66	26	38	27	35	25	32	41	22
Institutions of higher education	71	51	104	89	73	74	61	91	53
Enterprises and organizations	22	22	26	12	9	10	7	4	7
Individuals	85	126	184	121	145	138	135	121	109

Source: Statistical Yearbook of Republic of Moldavia, Statistica Publishing House, Chişinău, 2012, p.187

Most of requests (104) for protection of inventions and utility models from higher education institutions were in 2005, decreasing practically continuously to 53 in 2011. The requests for

protection of inventions and utility models from companies and organizations are reduced from 22 - 26 in 1995-2005 to 4-7 in 2009-2011, which clearly demonstrates their interest decreased for creativity, for inventions.

Even the interest for developing creative thinking that enables development of new and unusual ideas ranges from 184 in 2005 to 85 in 1995 and 109 in 2011, their relationship to the legal entities has been of 79.3 %, 44.5 % and 65.6 percent in 2011. Creative thinking is the product of innate predispositions, developed by environment and grafting knowledge and skills, in other words by learning and training.

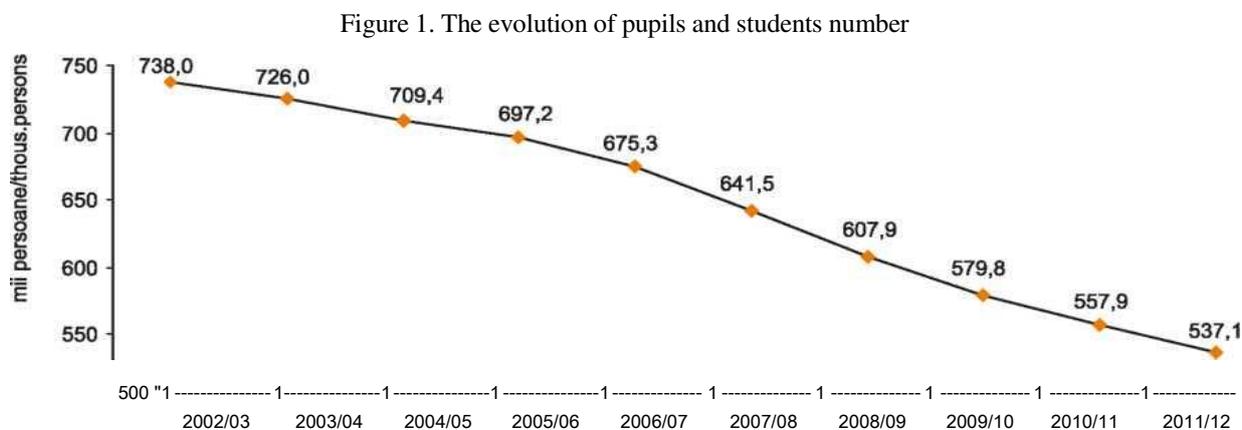
B. The education system of the creative potential

Given the increasingly competitive economy, people do not ask if they need to make changes, but want to know *how* to do. To make changes, the creative potential is required to be taught.

Learning, as Petington affirms, quoted by Daniela Tatiana Corodeanu [4, p.122], is "***the process by which skills, knowledge, attitudes and behavior are formed and developed***". Learning cycle, after Richard Pettinger [5, p.46], includes: concrete experience - observation and reaction - conceptualization and reaction - testing ideas and concepts in new situations.

Learning aims to achieve a personal growth. Those involved in this process can learn things they did not know before and whose knowledge and application can handle both the current problems and the next day's, can ensure greater efficiency in the economy both now and in the future. Number of pupils and students learning has a clear tendency to decrease.

Thus, as follows in Figure 1, the number of pupils and students in academic year 2011/2012 constitutes 72.8% of those studying in the academic year 2002/2003. Total number of pupils decreased from 605 200 in the academic year 2002/2003 to 381 400 in the school year 2011/2012, or with about 37 percent.

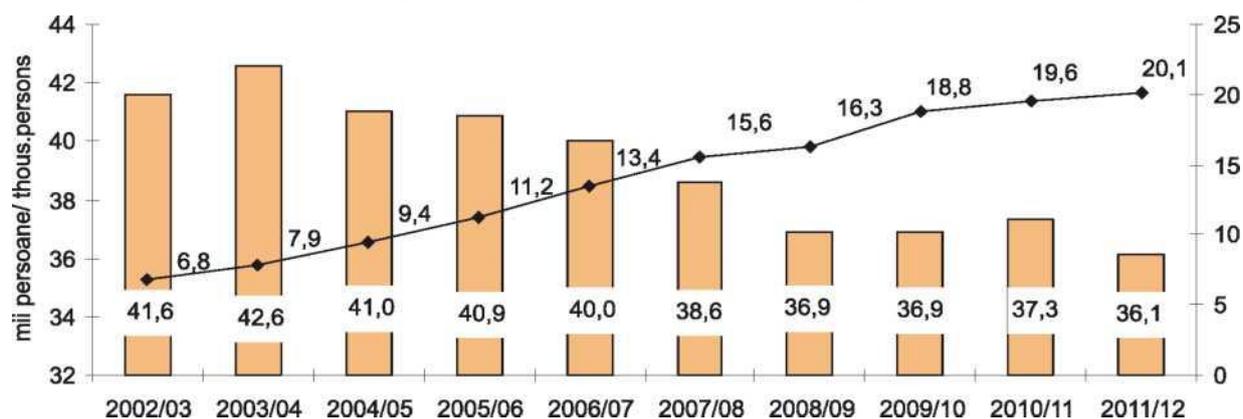


Source: Education in Republic of Moldavia, Statistical publication, 2011/2012

The number of pupils per 10,000 inhabitants decreases from 1671 to 1071 or with about 36 percents. Decline in the number of pupils was caused by the demographic situation in the country and partly by the fact that increasingly more pupils prefer to study in other countries.

The total teaching staff in schools has decreased from 41 700 in the school year 2002/2003 (Figure 2) to 36 200 in the school year 2011/2012, or with about 13.2 percents. Decreasing the number of teachers working in day schools, gymnasiums and lyceums is accompanied by another phenomenon - increasing the average age of teachers. The share of teachers at retirement age increased from 6.8 % in the school year 2002/2003 to 20.1 % in the school year 2011/2012. The fact that every fifth teacher is of retirement age should cause public authorities to develop contingency measures would change for better the situation.

Figure 2. The share of teachers at retirement age



=I teachers in day schools, gymnasiums and lyceums < -◆- teachers at retirement age

Source: Educația în Republica Moldova, Publicație statistică, 2011/2012

After the accession of the Republic of Moldavia, in 20 May 2005, in the "Project Bologna", which aims to improve the European education system so as to ensure the transformation of the European Union economy into one of the most competitive and dynamic global economy based on knowledge, the system education in our country has undergone major changes.

Under that draft, the national superior education is structured in three cycles: first - undergraduate, second - master, as research or professional and third - PhD.

If the number of students increased from 77 312 in the study year 1999/2000 to 114 552 in the study year 2004/2005, or with about 48 percent, then decreased to 103 956 in the study year 2011/2012, or with 9.3 percents. Even our country joined the "Bologna Project" in 2005, it closed the cycle in the study year 2009/2010.

The total number of students enrolled in the 2009-2011 rose slightly by 4.3 percents (Table 3), but the number of those enrolled in the first cycle (Bachelor) fell to 0.44 thousand and those enrolled in the second cycle (Master's degree) increased by 27 percents. Even in 2011 the ration of bachelor students and those who do master studies, being 2.7 to 1, does not meet the recommendations of "Project Bologna". And higher (4.3 to 1) is the gap of first and second cycle graduates.

Table 3. Evolution of student's number, thousand

	Graduates			Enrolled			Number of students		
	2009	2010	2011	2009	2010	2011	09/10	10/11	11/12
Total	26.61	28.41	27.79	27.08	27.90	28.26	109.9	107.8	103.9
First cycle (Bachelor)	18.16	21.99	21.95	20.53	20.40	20.09	93.40	90.70	85.34
Second cycle (Master's degree)	-	4.54	5.10	5.83	6.74	7.42	10.97	12.86	14.44

Given the fierce economic competition cannot be applied only the solutions crystallized in textbooks, monographs and other publications. Conditions generated by the economy based on market relations causes the necessity of performance investigations to ensure consistency of assumptions, phenomenon analysis and conclusions on which would propose concrete actions appropriate to the today realities.

Each graduate of the master can create the future by focusing on the synthesis of accumulated knowledge and the development of concepts which provide opportunities for innovation. Those who want to be creative are called to build researcher competencies, to gain experience on the formation and development of knowledge and skills on observation, conceptualization and generalization processes and phenomena that occur, testing ideas and concepts in new situations arising from the competitive economy.

In other words, those who want to be creative have to be equipped with skills to conduct scientific research that represents the oriented search of explanations and solutions to problems caused by phenomena and processes based on economy to market relations. Researcher skills formation takes place in the third cycle - doctoral, which lasts 3-4 years and is organized by day education or part-time education.

Scientific research concludes with the presentation of the thesis of doctor in sciences/habilitate doctor, which is an original scientific paper, prepared on the basis of the own scientific research published, contains new theoretical and practical results nationally and globally, illustrates the importance of the author contribution in science and is perfected in order to obtain scientific degree of doctor / habilitate doctor. According to the requirements of CNAA, the doctor / habilitate doctor thesis must be a product of innovation.

The number of PhD students in the years 2000-2006 (Table 4) increased by about a third, then oscillates, forming in 2011 just over 92 percent from 2006. In the years 2005-2011 the number of PhD students increases (by 8.3%) in the research institutions, but decreases (10.8%) in higher education institutions. The number of post-PhD students varies from 28 in 2005 to 59 in 2009, including research institutions from 4 in 2005 to 30 in 2009 and the higher education institutions from 24 in 2005 to 31 in 2008.

Table 4. Evolution of PhD students and post-PhD students' number

	2000	2005	2006	2007	2008	2009	2010	2011
PhD students number	1248	1667	1685	1610	1574	1601	1550	1556
Of which: -research institutions		359	367	354	345	378	359	389
- higher education institutions		1308	1318	1256	1229	1223	1191	1167
PhD students graduated	261	311	361	366	446	335	422	318
Of which: - research institutions		83	76	86	99	66	104	72
- higher education institutions		228	285	280	347	269	316	246
Of graduated, those who presented thesis	22	9	18	24	12	26	14	10
Post-PhD students number		28	41	52	48	59	51	40
Of which: -research institutions		4	14	23	17	30	23	13
- higher education institutions		24	27	29	31	29	28	27
Post-PhD students graduated		4	12	13	18	13	25	30
including - research institutions		1	3	2	8	7	12	17
Of which presented thesis		-	1	-	1	-	-	-
- higher education institutions		3	9	11	10	6	13	13
Of which presented thesis		1	1	1	4	1	3	1

Source: Statistical Yearbook of Republic of Moldavia, Statistica Publishing House, Chişinău, 2012, p.187

If the number of PhD graduates in the years 2005-2011 was 2559, the number of those who presented thesis amounted 113, which form only 4.4% of PhD graduates. Number of postdoctoral studies graduates in the years 2005-2011 was 115 of which 14, in those years, presented the thesis of habilitate doctor, meaning 12.17% of the graduates.

Number of employees in research and development (Table 5) in 2006 constituted 76.5% of those who were working in 2000, then rise to 5216 in 2011, or 15.8 percent. The share of researchers in total number of employees in research - development activity amounted 69.6% in 2000, 55.6% in 2006 and 64.6% in 2011.

Table 5. Employees in research and development

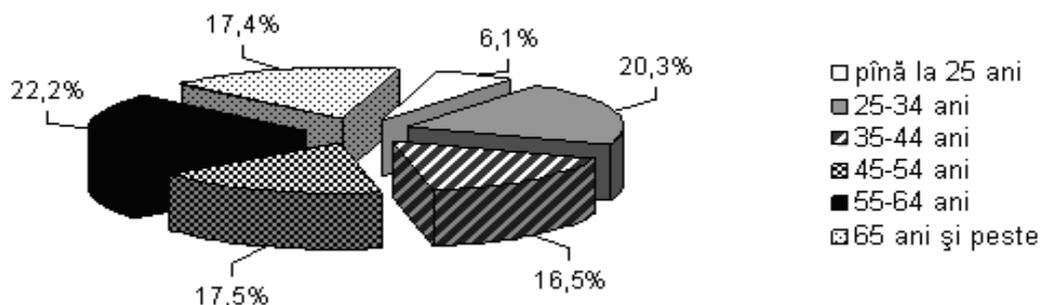
	2000	2005	2006	2007	2008	2009	2010	2011
Employees in research and development, total	5889	4672	4505	4587	5315	5424	5114	5216
Including researchers	4101	2583	2507	2592	3471	3561	3267	3372
Of total - doctors in sciences	2043	932	927	983	1311	1374	1288	1359
- habilitate doctors	501	256	259	271	367	382	378	393

Source: Statistical Yearbook of Republic of Moldavia, Statistica Publishing House, Chişinău

In 2011, in the total number of researcher, were 1618 women, or about 48 percents. PhD share of total researchers formed 49.8% in 2000, 36.98% - in 2006 and 40.3% in 2011 and habilitated doctors - respectively 12.2, 10.3 and 11.6 percents.

In 2011, the older researchers dominated. Thus, researchers under the age of 25 years made up 6.1% of the total (Figure 3), 25-34 years -20.3%, 35-44 years - 16.5%, 45-54 years -17.5%, 55-64 years 22.2%, 65 and over - 17.4%. Comments are superfluous.

Figure 2. Share of teachers at retirement age



Source: Education in Republic of Moldavia, Statistical publication, 2011/2012

Teaching and scientific potential of higher education institutions (Table 6) increased from 5058 in the study year 1999 / 2000 to 6571 in the study year 2006/2007, or by 29.9%, and then decreases until 6147 in the study year 2011 / 2012 or with about 6.5 percents.

Table 6. Evolution of teaching and scientific potential of higher education institutions

	1999/ 2000	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012
Teaching and scientific staff of higher education institutions	5058	5909	6221	6571	6447	6415	6413	6493	6147
of total: - habilitated doctors, %	6	6	6	6	6	6	7	7	7
- doctors in sciences, %	37	37	37	35	35	36	36	36	39

Source: Statistical Yearbook of Republic of Moldavia, Statistica Publishing House, Chișinău

Basically, during the period indicated in Table 6 doctors in sciences and habilitated doctors share is maintained at 41-46%. If the ration of doctors in sciences and habilitated doctors was 4.1 to 1 in 2000, 3.6 to 1 in 2006 and 3.46 to 1 in 2011, then in similar years, in the university institutions this report was 6.1 to 1, 6.1 to 1 and 5.6 to 1.

The above situation on the formation and development of creative potential and innovation activity is the consequence of a large number of factors, among which the motivation system is highlighted.

C. Motivation of the intellectual potential creative activity

Motivation is the "force" which determines a certain behavior. Motivations designates those formal or informal, economic or moral-spiritual elements, which are given to those involved in innovation activity, satisfying certain individual and group needs, to determine that, by their attitudes, efforts, decisions, actions and behavior contribute to the objectives achievements.

Motivation can be effective and / or efficient if it is oriented toward mobilization of a collective or group, including the one made up of intellectuals. The staff and / or trained in research and development can be mobilized first by providing the financial resources necessary to carry out the work.

The internal expenses from the research and development activity in our country, even if they increased in last three years by 5 percent (Table 7), remain far too weak. Moreover, the share of domestic expenditures in R & D in GDP decreases from 0.52% in 2009 to 0.4% in 2011.

Table 7. Categories of domestic expenditures in the research and development activity, million lei

	2009	2010	2011
Gross domestic product	60430	71885	82174
Internal expenses in the research and development activity, total	317.6	316.2	333.5
Of which current domestic expenditures	281.8	291.8	312.8
including: -labour remuneration	174.2	170.5	174.8
- Mandatory expenses for social insurance and healthcare	43.4	43.2	44.4
Material expenses	45.3	51.3	62.6
Other current expenses	19.0	26.9	31.0
Internal capital expenses	35.8	24.3	20.6
Of which equipments	25.4	17.2	16.2

Source: Statistical Yearbook of Republic of Moldavia, Statistica Publishing House, Chişinău

Capital expenditures were reduced, in the reference years, by 42.5 percents, accounted in 2011 only 6.17 % of all internal expenses from the research and development activity. Material expenses in 2011 were formed about 18.8 % and for equipment - 4.8 % of total domestic expenditures in research and development activity.

Creativity of those involved in innovation activity is influenced definitely by way of "encouraging." Recognition from superiors encourages getting great results and increases the desire to achieve good performance in the future. Everyone, including those creative, reacts positively to praise, either orally or in the form of certificates or other distinctions. However, those creative are rarely mentioned. So, for example, the TV channel "PUBLIKA" recently achieved the project "10 for Moldova", according to which have been selected and specified personalities from various fields, but the representatives of science are not found.

The creative activity, especially of the individual, is influenced by rewards. A balanced system of rewards will have a positive impact on morale and satisfaction and will motivate employees engaged in research and development to be effective. The reward system must give employees the possibility to satisfy basic needs (in terms used by Maslow, the first two levels).

An important part of the reward expected by employees is money. The average monthly income per household member, even if the last three years increased by 23.9 percent (Table 8) does not cover subsistence. It is significant that the average monthly income of a household member was 42.4% in 2009, 42.8% in 2010 and 47.5% in 2011 in nominal average monthly earnings of the employee in the economy.

Table 8. Average nominal monthly earnings lei

	2009	2010	2011
Disposable income of population (monthly average on a household member)	1166.1	1273.7	1444.7
Minimum for existence (monthly average on a person)	1187.8	1373.4	1503.0
Disposable income ration with minimum of existence, %	98.2	92.7	96.1
Average nominal monthly wage of the employee in the economy	2747.6	2971.7	3042.0
Including: -agriculture, hunting economy and forestry	1468.9	1636.6	1831.8
- industry	3135.6	3430.9	3393.5
- financial activities	5637.7	6368.2	6047.1
- public administration	3209.0	3204.8	3457.3
- education	2135.6	2361.0	2755.8
% compared to average wage on economy	77.7	79.4	87.8
- research-development	3210.7	3333.3	3352.0
% compared to average wage on economy	116.8	112.1	110.2

Source: Statistical Yearbook of Republic of Moldavia, Statistica Publishing House, Chişinău

People in any organization are willing to compare their rewards with others both within their organization and with workers from elsewhere. For this reason, the perception of fairness plays an important role.

Average earnings of employees in education is inferior to average on economy and those in R & D even if it is a slightly higher, has a clear trend of reduction this difference. Significantly is that in agriculture and industry (goods sectors), in education and research and development (areas that ensure economic prosperity) average monthly nominal wage of the employee is less than those from public administration.

Finally, we consider imperative to develop a reward system that would ensure fairness to employees and motivate employees work in any field, including science and education, areas that provide functionality of the new economic system of our country.

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