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Promoting Innovation and Creativity: The Case of Human Factor in Romanian SMEs

CRISTINA FENISER[1], GHEORGHE BURZ[2], KEN BROWN[3] and ARIK SADEH[4]

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ABSTRACT

Innovation has become the central engine of economic well-being, competitiveness, employment and long-term income growth for most economies. As the European Union Innovation Scoreboard shows, Romania is part of the modest innovators group. The situation of innovation in Romania has worsened so much that since 2015 it occupies the last place in the EU. The deterioration of the innovation condition in Romania is confirmed by The Global Competitiveness Report. There is a direct link between state measures and performance in innovation, as shown by the "Contributors and Detractors: Ranking Countries' Impact on Global Innovation" report. The process of innovation itself involves a concerted effort of economic agents and the state, the latter having the role of facilitating, consolidating and supporting innovative activities. The innovative potential of an enterprise can be strengthened by the human factor through the use of creative methods and techniques.

INTRODUCTION

Innovation is the product of complex national systems and strategies designed to coordinate a number of disparate policies that influence the capacity and ability of private and public actors to innovate effectively. These include policies related to scientific research, technology transfer, investments in information and communications technologies (ICTs), education and skills development, taxation, trade, intellectual property (IP), public acquisitions and competition and regulatory policies.

Innovation is particularly important for economies as they approach the frontiers of knowledge and the possibility of generating more value only through integrating and adapting exogenous technologies tends to disappear. In these economies, companies need to design and develop top-level products and processes

[1]Technical University of Cluj-Napoca, 28 Memorandumului Street, 400114, Cluj Napoca, Romania
[2]Technical University of Cluj-Napoca, 28 Memorandumului Street, 400114, Cluj Napoca, Romania
[3]Letterkenny Institute of Technology, Port Road, Letterkenny, Co. Denegal, F92FC93, Ireland
[4]Holon Institute of Technology, 52 Golomb Street, 5810201, Holon, Israel

in order to maintain a competitive edge and move towards more valuable activities. This development requires a favorable environment for innovative work, an environment backed by both the public and the private sectors, notably through sufficient R & D investments, the presence of high quality scientific research institutions that can generate basic knowledge for the development of new technologies, an extended collaboration in technological research and development between universities and the industry and the protection of intellectual property [1].

One of the explanations for the economic gap between the Western and Eastern European countries, including Romania, is the late engagement of the Eastern countries in modernizing their economies. On the other hand, a number of medium or small countries, such as South Korea, Taiwan, Singapore, Hong Kong from Asia and Ireland in Europe, engaged later than Romania in this process. They have achieved, over a period of around a quarter of a century, results that have been described as true economic miracles. Specific to Eastern European countries is the fact that the process of modernizing their economies was marked, after the Second World War, by the change, externally imposed, of the capitalist paradigm of development, with results that proved to be disastrous, making it so that half a century later they returned to the original paradigm. A quarter of a century after this return, i.e. precisely the period required for the aforementioned countries to achieve true miracles, the Romanian economy is still, with the exception of isolated cases, performing poorly.

Although national institutions and dynamics vary, small countries can generally obtain resources to develop innovation by joining regional organizations or they can develop potential industries through effective local industrial policies. The economic development trajectories of Ireland and Taiwan are similar: both small countries have transformed their traditional farming economies into regional technology centers.

In terms of Porter's theory of the competitive advantage, Taiwan's major advantage lies in the power of its clusters, while Ireland [2] has made effective use of foreign direct investments for its economic growth.

For Taiwan, it is difficult to get resources from international organizations to boost economic development because of its complicated political relations with China. Under these circumstances, Taiwan must rely primarily on its own industrial policy, which supports the potential of local industries to a large extent through the success of industrial clusters. On the other hand, Ireland obtains resources for its economic development from regional economic integration organizations, such as the European Union, and improves its economic and industrial performance through its presence on the common European market. Going from the examples of Taiwan and Ireland, other small economies can adapt their national innovation policies to specific needs and structures [3].

INNOVATION IN ROMANIA

The European Union Innovation Scoreboard provides an annual comparative evaluation of research and innovation performance in EU Member States, as well as the strengths and weaknesses of their research and innovation systems in order to help Member States assess areas where they need to focus their efforts to boost

innovation performance. Starting from the average innovation performance, Member States fall into four different performance groups:

1. Leaders, with an innovation performance well above the EU average;
2. Followers, with an innovation performance above or close to the EU average;
3. Moderate innovators with a performance below the EU average;
4. Modest innovators, with an innovation performance below 50% of the EU average.

Since its accession to the EU in 2007, Romania has been a constant member of the modest innovation group, along with Bulgaria and Latvia. Other countries were part of this "club" over the years, other countries such as Lithuania, Poland, Hungary, Malta, Slovakia, etc., but they managed to overcome this condition.

Starting with 2015, Romania's situation is getting worse, falling into the last place in the EU [4]. For the third year in a row, 2017 finds Romania in the last place regarding innovation in the European Union, with small and medium enterprises (SMEs) in Romania reducing the performance average in this sector, for the community bloc. In contrast, Ireland, "a latecomer country" as well as Romania, is the European leader of innovation in SMEs. What's even worse, compared to the year 2010, Romania has lost 14 percent in relation to the EU average [5].

The Global Competitiveness Report developed by the World Economic Forum defines competitiveness as a set of institutions, policies and factors that determine the level of productivity of a country and whose components are grouped into 12 pillars. In one of the pillar indicators (12) Innovation, namely "Availability of scientists and engineers" in 2014, Romania ranks 72th out of 144, and in 2017 80th out of 137 [6].

The report, "Contributors and Detractors: Ranking Countries' Impact on Global Innovation", evaluates 56 countries - accounting for nearly 90% of the global economy - by 27 factors reflecting the extent to which their economic and trade policies contribute to or affect global innovation, with a direct link between state measures and innovation performance [7].

1. One of the indicators that show how much innovation and intellectual property matters for a country is the investment in education per each student. For example, in Norway, the state spends $ 18.218$ per student, with similar figures in Switzerland, Singapore, Denmark and Sweden. Romania spends, according to the report, 2.476$ per student, occupying the last place in this chapter among the European countries mentioned in the report.
2. In Romania, the number of science graduates is low, with 0.66 per 1,000 inhabitants, behind Lithuania (0.67), Slovenia (070), Estonia (0.75), Czech Republic (0.94) Slovakia (1.01) and Poland (1.08). The highest rated country in this indicator is New Zealand with 1.67 graduates per 1,000 inhabitants, followed by the United Kingdom (1.43) and Ireland (1.37).
3. The number of higher education graduates who go on to work in scientific fields is only 5%, behind Romania being just Chile and Colombia.
4. Romania ranks 43 out of 51 in the number of high-performing universities: 4 in the top 800.
5. Romania has 0.90 researchers per 1,000 inhabitants, Estonia 3.48, Bulgaria 1.65, Israel 6.06 and Finland 7.41.

6. Romania ranks last in the European Union regarding spending on research and development, with 301$ per capita, while Finland spends $ 1.893$ and outside the EU, Israel spends 1.991 $.
7. Romania spends for university research 8$ per capita, Latvia 156$, Lithuania 215$, Finland 227$, Austria 257$, Singapore 382$. Among the countries covered by the report, below Romania we can find The Philippines and Vietnam.

THE ROLE OF KNOWLEDGE AND KNOWLEDGE WORKERS IN THE INNOVATION PROCESS

Even as early as 1980s, John Naisbitt has argued that in an information economy the value increases primarily through knowledge [8]. When countries compete by strengthening innovation in their societies they produce, among other things, new knowledge. Since its modern conceptualization through the work of Nonaka & Takeuchi (1995), knowledge management has been considered as a set of methods for collecting, combining and transferring knowledge and, more importantly, for creating new knowledge, by making use of what is available [9].

Figure 1 illustrates how individuals (numbered 1, 2, 3, 4, k, n) collaborating in an organization collect, acquire, create and share knowledge and information.

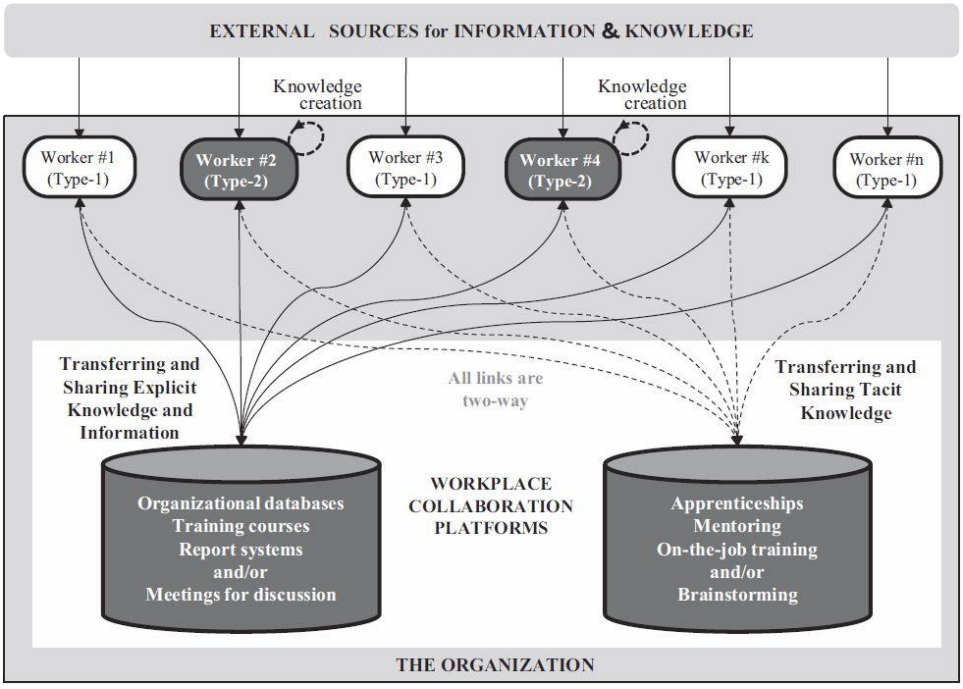

Figure 1. Type 1 and Type 2 workers in an organization [10].

Type 1 workers acquire knowledge almost exclusively through learning, they can be good actors, but they cannot be good innovators. Type 2 workers have extensive experience in creating or re-creating knowledge and possess a substantial amount of self-created knowledge, in addition to the knowledge they have learned. Whenever they face a situation where existing knowledge is not enough to solve a problem, they naturally try to find a solution using their own thinking. Therefore,

even if their knowledge is limited, they can increase their knowledge by creating or re-creating knowledge. Successful businesses are typically run by Type 2 workers, who are more innovative. In order to increase corporate innovation capacity, management should strive to transform existing Type 1 workers into Type 2 workers. Such a transformation is possible by placing Type 1 workers in situations where their skills for knowledge creation are constantly stimulated [10].

An organization is not just an information processing machine; it is also an entity that creates knowledge through actions and interactions. Knowledge workers combine and exchange shared knowledge to create new knowledge through dialog, reflection and brainstorming [11].

CREATIVITY METHODS AND TECHNIQUES

The key answer to the need to achieve significant innovations has always been creativity. To support innovation, various creative methods and techniques (MTC) have been developed and refined, so that over time there has been a great variety of such methods, coming from multiple media environments that have constituted or are still constituting real schools of creativity. The innovative potential of an enterprise can be enhanced by using MTC, with the following benefits: (1) creativity can be learned, (2) most problems can be resolved through creativity, (3) creativity is an inexhaustible resource, (4) return on investment creativity and innovation is better than in any other capacity.

The pressure to launch the best possible product on a ruthless market is always high, and failure in design decisions can be very costly. 5 inventions of value resulting from 250 current inventions are needed for an industrial success. So, in order to achieve high-value inventions leading to industrial and economic success, a rapid increase in the number of registered and patented inventions is necessary, as there can be no quality without quantity in the technical creation field [12].

If the entire creative process is considered, in order to obtain a single successful product, it is necessary to generate about 3.000 ideas [13]. Under these circumstances, the fundamental problem of contemporary economic progress is the substantial increase in the productivity of the activities of generating/searching for technical, commercial or organizational solutions.

Contrary to widespread belief, the practice of innovation is not a mystery. Innovation skills can be studied and learned. Therefore, creating new products, services and customer experiences is more a science than an art. From this point of view, innovation can be planned, after transposing planning into practice the results can be quantified and analyzed and, from the feed-back, subsequent plans can be improved to achieve excellence. As a science, innovation benefits from a set of practical and rigorous methods, as well as tools and action models. This allows the articulation of a vision through which reliable and repeatable results are obtained in order to encourage innovation within organizations. However, there are no recipes for innovation, which is why innovation management in turn requires a lot of vision and creativity to create an environment that fosters individual and collective creativity, innovation and risk-taking.

The use of creativity methods and techniques in SMEs in the Centre Region of Romania.

In order to obtain information on the use of methods and techniques of creativity (MTC) in SMEs, a survey was conducted, the target population of the survey being an SME from the Central Region of Romania [14]. From the results of this survey, we chose to report in this article the ones referring to the human factor.

1. Almost half (48.2%) of the SMEs responding to the questionnaire have no employees fully involved in R & D, and more than a quarter (28.6%) have no employees involved at least in research and development activities.
2. One third of respondents (33.3%) indicate brainstorming as the only known technique of creativity. Brainstorming together with the input-output technique (19.6%) and value engineering/analysis (17.6%) accounted for 70.5% of the responses. "Methods 6-3-5" and "Zwicky-Moles Morphological Matrix Methods" were not mentioned among the known methods. The source of knowledge about MTC in almost half of cases (44.7%) is self-training. No case was registered in the "Others" category. Therefore, we can affirm that MTCs are little known and, when they are known, the main source of their knowledge is self-training.
3. A surprisingly small percentage of respondents (4.9%) agree with the statement that "creativity can be learned". Almost half (46.9%) consider that creativity and innovation are competitive advantages, and almost a quarter (22.2%) believe that creativity is an inexhaustible. On a scale of 1-totally disagree to 5- totally agree, over a quarter of respondents (27.8%) fully agree with the statement that MTC are too important to be used exclusively by people in R & D, so everyone should use them, and almost a third (35.2%) have a neutral position. So it can be said that the potential of MTC is not sufficiently known.
4. Nearly half of respondents (42.3%) consider that the most important cause for which MTC are very little used or not even used at all is that they are not known. 80.4% of respondents did not participate in continuous or improvement training in the use of creative techniques and techniques (MTC).
5. In the respondents' view, the most important 8 internal factors that could increase the potential for innovation are between 16.2% and 9.0%. Among them, the "Training programs in the field of creativity methods and techniques (MTC)" factor was indicated in 11.7% of cases, ranking fourth as percentage. The category other factors only recorded 0.9% of cases (Table 1).

Table 1. Internal factors that lead to increased innovation potential.

No.	Factor	Percent
1	Regular employee performance evaluations	16.2%
2	Freedom to work in areas of great interest	10.8%
3	Wide contacts with colleagues with creative / stimulating potential	12.6%
4	Training Programs in the field of creativity methods and techniques (MTC)	11.7%
5	Encouraging risk taking	10.8%
6	Increase in innovation spending	9.0%
7	Tolerance of non-conformism	2.7%
8	Tolerance of diversity	10.8%
9	The opportunity to work in a team	14.4%
10	Other	0.9%
11	Total	100.0%

By cumulating the responses appreciating that training in the field of creative methods and techniques is not required at all, little or responses adopting a neutral attitude, almost two-thirds (63.5%) of cases are obtained. 25.0% appreciate it as highly needed and 11.5% to a very large extent, these two categories cumulating a little over a third (36.5%) of the cases. Therefore, the fact that in order to efficiently use MTC there is a need for professional training is not realized enough.

CONCLUSIONS

Following the descriptive analysis of the research survey's results on the methods and techniques of creativity used in the Center region of Romania, the following conclusions can be drawn:

1. SMEs from the Central Region of Romania carry out low intensity research and development activities
2. MTC are little known
3. As far as MTC are known, they are little used in SMEs
4. The MTC potential is poorly known
5. MTC's potential is underutilized
6. MTC's contribution to innovation in SMEs is reduced
7. The use of MTC is not sufficiently supported by SME management
8. To make effective use of the MTC, training is needed, but SMEs are less aware of this.

Lack of concern for the knowledge and efficient use of the MTC is just one of the barriers to innovation in Romania's SMEs, and we must add to this the low absorption rate of funds made available by the European Union and other resources made available through regional economic integration.

On the other hand, the state's action in the field of innovation is crucial because the process of innovation itself involves a concerted effort of economic agents and the state, the latter having the role of facilitating, consolidating and supporting innovative activities. The action of the Romanian state in the field of staff training needed to support innovation is not, at present, likely to turn this sector into a performing one.

REFERENCES

1. Schwab, K. 2017. The Global Competitiveness Report 2017-2018, World Economic Forum.
2. OECD. 2017. Ireland: Trade and Investment Statistical Note. http://www.oecd.org/investment/IRELAND-trade-investment-statistical-country-note.pdf
3. Lin, G. T. R., Shen, Y.-C., and Chou, J. 2010. National innovation policy and performance: Comparing the small island countries of Taiwan and Ireland, Technol. Soc. 32:161-172.
4. European Commission. 2015. European Union Innovation Scoreboard, 2015. Downloaded December 28, 2017 from https://www.kowi.de/Portaldata/2/Resources/fp/2015-Innovation-Union-Scoreboard-Report.pdf
5. European Commission. 2017. European Innovation Scoreboard 2017. Downloaded December 28, 2017 from http://ec.europa.eu/DocsRoom/documents/24829
6. Schwab, K. 2014. The Global Competitiveness Report 2014-2015, World Economic Forum.
7. Ezell, S. J., Nager, A., and Atkinson, R. D. 2016. Contributors and Detractors: Ranking Countries' Impact on Global Innovation, Information Technology & Innovation Foundation, January 2016.
8. Naisbitt, J. 1982. Megatrends: Ten New Directions Transforming Our Lives, Warner Books.
9. Bandera, C., et al. 2017. Knowledge Management and the Entrepreneur: Insights from Ikujiro Nonaka's Dynamic Knowledge Creation model (SECI), IJIS 1:163-174.
10. Maruta, R. 2014. The Creation and Management of Organizational Knowledge, Knowl.-Based Syst. 67:26–34.
11. Huang, Jih-Jeng 2009. The Evolutionary Perspective of Knowledge Creation – A Mathematical Representation, Knowl.-Based Syst. 22:430–438.
12. Belousov, V., Doncean, G. 2010. Curs de Creativitate Tehnică, Editura Performantica, Iaşi,
13. Stevens, G. A., Burley, J., and Divine R. 1999. Creativity + Business Discipline = Higher Profits Faster from New Product Development, J. Prod. Inov. Manag. 16(5):55-468.
14. Burz, G., and Marian, L. 2014. Research on the Innovation Methods Used in the SMEs in Romania's Center Development Region, RMEE, 13(2):52.