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ENTREPRENEURSHIP IN THE RESEARCH FIELD

Theoretical
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Abstract

The World is in a continuous change at the level of all its components including entrepreneurship, the most dynamic element of the business activity. Another direction of change comes from technologies called “key enabling technologies” and represents a revolution in using raw materials and shapes the entire industrial process, obtaining competitive advantages. This paper tries to find a realistic answer to the question: is it possible to follow the global trend of technologies and to foster them in Romania? A realistic picture supplied by statistical data correlated with elements of the national plan of research and development offers a more theoretical approach since practical examples are almost non-existent, but the potential to apply these ideas through entrepreneurship is promising. Meeting recommended goals from this paper, through cooperation between private companies, state and academies, creativity and innovation will boost new ideas for a better life in a healthier Romania.

1. Introduction

The World is in a continuous movement and change at the level of all its components including entrepreneurship, the most dynamic element of the business activity. Another direction of change comes from technologies used in the industrial process. The new technologies called “key enabling technologies” (KET’s) represent a fundamental change in using raw materials and shaping the entire industrial process to obtain new products.

KET’s are multidisciplinary, combining new discoveries of physics, electronics, photonics, chemistry, information technology.

Entrepreneurship has to adapt to the new changes in order to direct and organize them.

The research and development (R&D) activity is now close to the industrial process, making it a component of the production chain controlled by the entrepreneur, the one who is responsible for the entire process of investment, research, production and distribution.

In fact the responsibility is collective at the level of the team which is cooperating intensely to identify the competitive advantages.

Innovation and creativity are key elements of R&D to bring the KET’s into the final product in order to achieve higher performances. The transfer of information between the research team and the entrepreneurs is critical for obtaining an optimal industrial value chain, thus the entrepreneurs and researchers have to build a good communication. The management of an innovative activity supposes a new form of organizing system, bringing the right people to meet together and exchange ideas.

Enabling KET’s into the Romanian industrial landscape it is the best way to take advantage of the innovation capacity and creativity of the Romanian labour and to obtain a prosperous life.

This paper focuses on the importance of entrepreneurship in the R&D activity and the possibility to implement KET’s in Romania. As methodology there were used statistical data correlated with elements from the national plan of R&D. The approach is more theoretical since practical examples are almost non-existent, but the potential to apply these ideas is promising.

The paper has three main parts: the first one presents a literature review about concepts as entrepreneurship, technologies and KET’s, management of innovation activities, importance of using KET’s to obtain competitive advantages; the second part focuses on implementing KET’s in Romania; the third part reflects some conclusions of this paper.

2. How can KET’s help entrepreneurship?

The World Economic Forum (2014, pp.10-15) defines entrepreneurship as a way to identify

opportunities beyond the resources already controlled by a company. The same authorized entity (World Economic Forum, 2014) mentions that there are three core factors to foster entrepreneurial culture: attitude, skills and cultural/social framework. A Forum’s survey (2014, p.15) revealed that the main reasons towards entrepreneurship are: independent working style, creation of something innovative as a concrete offer or idea and challenge. Earning money as a reason was voted by not so many people (38% of respondents) that shows the people’s desire to explore their own ideas, to manifest freedom by controlling the others more than gaining financial advantages.

These ideas conduct to another definition of the entrepreneurship as a new way of expression which can help the entire society, through new ideas, jobs and an offer for a better life.

On the other way, the same survey of the World Economic Forum (2014, p.15) finds that the entrepreneurship activity is less attractive when it’s about job security (64% of the respondents) and financial benefits (26% of the respondents). This could be an explanation why the respondents prefer a better alternative as employee in an entrepreneurial venture instead of a private own business.

All these information reflected by the World Economic Survey (2014, p.15) were a proper occasion for the World Economic Forum to indicate the direction policy makers might focus to attract new entrepreneurs, to enlarge markets, to increase the non-pecuniary benefits of innovation-driven entrepreneurship.

Another issue of this report (World Economic Survey, 2014, p.6) is that “entrepreneur ecosystems are deeply affected by technological and cultural developments”. Regarding this subject, there is a rich literature about the technological trends, innovation, culture, management of the change, but it comes poor when it’s about understanding how innovation can be managed (Lerner, 2012, p.4).

Lerner (2012, p.5) says for more than two decades that economists developed a lot of insights about the role of incentives for promoting new ideas, but the practice remains poor in results. The main explanation is that people responsible for “managing, investing in, and shaping innovation are scientists and engineers” (Lerner, 2012, p.5).

As Fah (2008) says, the organizations and institutions are the mirror of the people involved in their activities and they react according to a mental program and values.

After many years of studies, there are still questions and uncertainties about the proper way to boost an innovative and collaborative environment. Some results say (Welzel, 2013, pp.5-6) prosper

societies are more creative because education and information are diffused at a mass level.

Even if it is well known that better ideas are created individually or in small groups, they can be modified and improved after they are shared in proper networks at the right moments (Leadbeater, 2010, p.7). In this way, creativity becomes a collaborative activity (Leadbeater, 2010, p.8).

For a long period of time, the work of scientists developed knowledge within the borders of one discipline. Today we assist to a cross border interaction among many sciences, a propagation of advances to many fields of knowledge. The right question born in this situation is how people with different specialisations can work together in a multidisciplinary environment? One of the proper answers comes from Leadbeater: the trust (Leadbeater, 2010, p.35), the goal of the group achieving a common interest (Leadbeater, 2010, p.39) regarding the use of the resources (Leadbeater, 2010, p.54) to obtain concrete results. All these reflect a sort of intelligence mix which creates the intelligence of the group (Leadbeater, 2010, p.69).

As Leadbeater (2010, pp.78-79) says there will always be a starting point when “somebody” and “something” are the core of the resources procurement, then a need to persuade the others to work, to share and to communicate together. Shortly, a good collaboration means the mix of the right people to cooperate and generate new ideas even if their way of thinking is different. Scott E. Page mentioned by Leadbeater (2010, pp. 81-82) says that collective people are intelligent when their opinions are different, but supportive and freely expressed. He says that these kinds of groups are more efficient only if they are well organized in terms of order and a proper way to communicate their ideas.

Leadbeater (2010, p.7) talks about two kinds of economies, one for the things and the second for the ideas.

The ideas guide to new discoveries and as Lerner says (2012, p.16) there are innumerable studies that focus on the link between the “new discoveries and economic prosperity across nations”. In Lerner’s opinion (2012, p.15) there are two ways for a society to prosper: working harder for long time or through innovation, which is more desirable in a world of diminishing resources.

The main focus of the nowadays economic activity is the small consumption of the raw materials through new technologies with substantial advantages. Every technological change designs a new industrial landscape with impact on the countries’ competitiveness and on their existence on the market. The new developers called pioneers bring their own contribution to the technological evolution and to the new born industries with little connection to the past.

The characteristics of these evolutions rely on high levels of cooperation between private companies, state and universities as a result of a certain cultural approach for developing an innovative chain. Each entity has its own contribution. Universities usually supply ideas and highly qualified labour, private companies develop them into practice, propagating new products on the market, with the help of the state that can be an environment catalyst.

The new industries created in this manner are the results of a wide range of multidisciplinary research that integrates fields like information technology, electronics, communications, chemistry, physic and are applied in almost all the industries known, called the industries of a new era. All this knowledge mix is called by IDEA et al. (2012) key enabling technologies or shortly KET’s. There are six types of KET’s: photonics, nanotechnology, biotechnology, advanced materials, micro-systems and advanced manufacturing systems (IDEA et al., 2012).

Nanotechnologies refer to the dimensions smaller than 100 nm, applications are used through electrical, magnetic, mechanical, biological an optical procedures at the molecular level (European Commission, 2010, p.77).

The micro-systems suppose miniaturization of the integrated components, combining semiconductor technologies with nanotechnologies applied to silicon structures smaller than 100nm (European Commission, 2010, p.77).

Biotechnology is based on the use of microorganisms in the industrial production of bio-materials, bio-fuels, textiles, paper, within an environmentally-friendly process by recycling the “wastes” as raw materials (European Commission, 2010, p.77).

Advanced materials enable better properties than traditional materials, they are applied in all industries, affording low costs with high performance and a positive impact on environment in comparison with the traditional products (European Commission, 2010, p.77).

Photonics use photons replacing electronics by combining physics, nanotechnologies, material sciences, biotechnology, chemistry, electric engineering in the development of laser, electronics, optic fibres (European Commission, 2010, p.77).

Advanced manufacturing systems integrate production systems, equipments and processing controlled by remote communication (IDEA et al., 2012, p.26).

The main characteristics of KET’s are their location into the small and medium sized companies placed in clusters. As IDEA et al. (2012, p.33) says, KET’s require substantial investments and often support by the state. Even it seems a paradox when it’s about huge amount of money in small and medium enterprises, this form of

economic activity is suited to offer flexibility, communication and the best control. A small or medium sized company has its limit in creating complex networks, but it can cooperate efficiently at the international level.

IDEA et al. (2012, p.39) explains that not all the countries can be intensive in all the KETs. Because of the country's conditions or the way the actors act, they sometimes choose only one or more technologies, the so called "smart choice" (IDEA et al., 2012, p.4) as a consequence of what Lerner (2012, p.28) shows: the fundamental science has little impact on commercial applicability and the effort is concentrated on finding the right way to do better and to create competitive advantages.

3. Building a Romanian entrepreneurship in the research field

This paper tries to find a realistic answer to the question: is it possible to follow the global trend of KET's and to foster them in Romania? The first approach is from the philosophical point of view, with the help of questions and answers that can argue and analyse ideas starting from a realistic picture of Romania nowadays supplied by statistical data correlated with elements of the national plan of R&D. Why is philosophy suitable and helpful in analysing an economical reality? Since it's about new technologies, the statistical data do not reflect a presence on the market. Besides a philosophical way of thinking offers results that could be analysed again in the near future by the new thinkers and develop new perspectives of these ideas (Nagel, 2014, p.10) maybe finding better realities than this paper.

The mechanism for obtaining the right answer is logical and simple: first it's important to understand where Romania is, according to the conditions required for implementing KET's; second it's important to understand if Romania really wants to follow this trend and to find what really does in this direction; third according to the theory and successful examples, it's important to understand what can be done for implementing KET's in this country and what is the role of the entrepreneurs.

3.1. Where is Romania according to KET's?

As was written before, KET's require a very high qualified labour, integrate huge activity of research and development and capital intensive investments. They can be better developed in small and medium sized companies organized in clusters. They often receive the state support in terms of funds and proper policies. In the following, these directions will be drowning through some statistical data or information supplied by authorized Romanian entities.

- The Research and Development activity

According to the National Strategy for Research, Development and Innovation 2014-2020 (2014, p.

6), there are some insights about the strategy 2007-2013. The last plan focused on the growth of the scientific production and the quantitative increase in the human capital research. Another target was obtained successfully as a result of internationalization process by increasing the quantity and the quality of the scientific publications and due to this the R&D projects evaluation become international. In comparison with international standards, Romania does not benefit from a consistent number of researchers. A critical mass misses to implement and develop issues in promising directions, especially regarding the multidisciplinary approach. The number of economy researchers decreased and the foreign companies do not show any interest in the research field. The intra and inter sector mobility is limited with a little impact on knowledge propagation.

As EUROSTAT (2014) shows the research and development activity in Romania is the poorest supported by the state in comparison with all the other European members arriving at 0.42% of GDP in 2012. On the other way, the same EUROSTAT (2014) shows the research activity is almost disconnected to the business environment and state: 0,12% in 2012 in business sector, 0,20% in government sector and 0,10% in higher education sector.

Due to these figures it's obvious the fact that the R&D sector in Romania is not seen as central point for the development.

- High level qualified labour in terms of present and the future

A statistical survey regarding the education in Romania (EDU-01, 2014) reflects that more than 40% of the total students study technical or industrial insights in 2012, which is a promising direction for the future. There is hope for equilibrium between the education offer, the level of the specialized future labour and the expectations of the companies that use this work force. All are difficult to be measured but likely it is not the direction where this study can be interested in.

Looking at the present, the IDEA et al. (2012, p.16) supplies a cruel Romanian reality regarding the KET's showing no sign of activity.

The same source (IDEA et al, 2012) reveals that there is no important actor playing on the patent market, but there are some universities or projects founded by European Union with no significant impact.

- Small and medium sized companies organized in clusters

The Association of clusters from Romania (Clustero, 2011-2014) concentrates a few clusters in different fields where there is a national interest for boosting competitiveness. Those based in electronics could be a proper place to implement

KET's. As a study supplied by ObservatoryNano Work (2011, p.17) shows the distribution in Europe of funding new discoveries was dedicated more to companies and less for the research institutes that means the private sector has a real interest in the applied research.

In comparison with other European clusters, in Romania the existing model is pioneering, but there is something very important missing here: an intensive activity of research. This pushes the limits between what is a Romanian cluster and how really works a modern cluster abroad, where KET's are on the every actor's list: state, research institute and private companies.

- **Entrepreneurship**

The small and medium sized enterprises cover a turnover about 57% of the total turnover existing on the market (IMM-01, 2014) which means the important role of this kind of economic organization. Even if they seem so important for the economy, the entrepreneurship meets difficult environment conditions, uses unstable labour in terms of fidelity, has fragile connection with policy makers, and suffers of high level state taxes instead of support.

All this information above reflect weaknesses in terms of R&D activity, no proper state investments, a small number of researchers and no existing of any important actor (research institute, private company or state) involved in KET's or patents with national impact. It seems the future labour will be specialized in the new direction, and real hope could appear from the entrepreneurship and from some existing clusters.

3.2. Where does Romania want to go to?

After seven years of experience with the first research strategy 2007-2013, thirteen fields were selected according to the results obtained - patents and dissemination of results - (National Strategy 20014-2020, pp.11-31). The National Strategy for Research, Development and Innovation 2014-2020 is based on the idea to move from the competitiveness generated by costs to that based on innovation. The core of this plan is represented by the intention to create a dynamic entrepreneurship environment as a consequence of some policies in the directions of fiscal, public acquisitions of innovation, founding the public and private research sector, regulations of the patents, human capital and the research and development governance. To stimulate the private sector the Government plans to offer credits and expenditures deductions with better conditions than in the past. A solution to encourage the R&D private sector is to be found.

It's for the first time when the National Strategy regarding the R&D activity refers explicitly to the KET's (National Strategy 20014-2020, pp.17-18) trying to follow the European Union 2020 Strategy where the KET's are the trend for boosting SME,

innovation, technological innovation for every European country, even Romania. One main idea is worth to be mentioned: the entrepreneurship based on innovation.

As a result of this optimistic plan, Romania targets to increase the R&D expenditure to 1% of GDP for public sector and another 1% of GDP for private sector. In the same direction, the number of researchers from private sector will be tripled. All the figures show a very ambitious plan, but it's better to wait for the reality.

Starting with the first of July 2014, the Romanian Government offers some subsidies for companies that create workplaces in a number of industrial fields considered strategically for the national competitiveness (Ministry of Finances, 2014). There are voices claiming the inefficiency of this decision, but it is successful for those activities where there is a lot of work to do.

At least the future seems more optimistic than the present. The National Strategy for the Research, Development and Innovation mentions directly the intention for developing the private sector of the research with the help of the entrepreneurship for innovation (National Strategy 20014-2020, p.14). To make this to come true, Government policies will be settled.

The seven years between 2014- 2020 could be enough for some countries to make some substantial breakthrough, but for Romania could easily be not enough to obtain the expected results. Besides a good plan, awareness is required and to understand exactly the steps needed to be implemented to reach the final goal that is a new kind of industry based on the best technologies.

3.3 New ideas for entrepreneurs

This paper insists on the idea that entrepreneurship in the research field is the best way to implement KET's in Romania, to boost education in the right direction, following the technological trends and to push the state to act. Taking into account the experience of the state in the research filed until now, waiting for the first state's step it's like waiting in vain and loosing more and more chances to get some advances in this direction.

Entrepreneurs are usually people with vision. Maybe there are some of them who identified the new directions unexplored by the others. What could stop them?

As the World Economic Forum (2014, p.15) shows, most of the people want to be involved in an entrepreneurial activity as an independent working style. As it was mentioned in this paper, the KET's suppose an interdisciplinary work interacting with many people with different backgrounds which means a certain culture of cooperation.

The same survey (World Economic Forum, 2014, p. 15) reveals the intention of the potential entrepreneur to offer creativity or new ideas. When the offer it's a product that integrates KET's this is

creative indeed, but there are few chances to be the result of own ideas, rather than a group's ideas.

In terms of financial benefits or job security, KET's projects could take years or decades and sometimes the results could fail. For this reason, the investment and funds procurement for maintaining the activity could be an entrepreneurial nightmare.

This means that an entrepreneurial activity in the multidisciplinary research field suppose a new form of managing and organizing system. Lerner (2012, p. 5) said the main problem of this kind of activity is the fact that scientists and engineers were responsible for driving it.

Starting with this, maybe the best way for implementing every kind of a research program is to create managers for this activity and this suppose a learning practice from the other's more specialized, from abroad. These managers should be people with entrepreneurial skills, experienced in working with different people and having the ability to open doors. This kind of person has to be able to work in two ways to get a good start: to collect ideas from companies regarding their needs and then finding the right groups to develop new products for them or to pick ideas directly from creative people and developing them as new offers for the market. On the other way, when it's about KET's, maybe the right way could be a partnership with an existing and experienced company or research institute to implement and spread knowledge and in time to settle cooperation in different levels of the value chain using patents already registered.

As a model of innovative organisation, Lerner's (2012, p. 5) proposal is to create a "hybrid model" that combines features of a laboratory owned by a corporation and a venture-backed start-up. This concept exists more in theory than it is implemented (Lerner, 2012, p. 6).

There are some insights belonging to Steve Kaplan and Per Stromberg and presented in Lerner's book (2012, p. 67) about the way venture funds or investors evaluate where to invest. In this way there are some external factors as the evolution of the market, the depth of the entrepreneur's knowledge, dedication to work, ethics and finally the firm's performance.

Ventures owning factories and equipments or important assets seem safety to be found (Lerner, 2012, p. 68). Even Lerner (2012, p. 122) states that these times are the worst ones for investing because of low investments returns and non-persuasive business plans, but the programs focused on high technologies – biotechnology, software and energy- are most appreciated by investors.

Thus the alternative of cooperation or joint venture is the best, since investors are interested in company reputation and through this the trust is a key point to persuade some investors.

The essential element for this approach remains the entrepreneur who is the one able to find the right partners and to organise the process: finding the structure of the proper joint venture (it could be a research institute, a foreign research company or a private company) and to collect financial resources from the partners or from other financial institutions, international research programs or private investors.

Another important step in doing such an activity is finding people to create a productive and good team. Until looking for the future, it's better to concentrate on the present. It is obviously, there is not a critical mass achieved in the number of researchers, but some of them could be trained through stages abroad. The key factors for stimulating researchers in innovation or patent creation are financial and non-pecuniary reward, as respect and recognition (Lerner, 2012, p. 54). Even if the studies show (Lerner 2012, p. 54), the payment for performance seems to be the best way for a productive research activity. But other studies show (Lerner, 2012, p. 55) individuals are creative when they are not under external pressures. In this case, the monetary rewards could be an external pressure that kills new ideas.

On the other side, working in a group makes sometimes difficult to commensurate everybody's contribution. That is why the importance of non-pecuniary benefits is not to be neglected. Especially in the laboratory experiments the incentives stimulates the work if they are properly designed.

In the R&D field, the advances are spread in the proximity of the researchers and do not reach the investors or entrepreneurs environments. The transfer of information from one group to the other, from researchers to entrepreneurs is crucial. This is the most sensitive obstacle to achieve progress. Improvement could come from the both directions: the researchers could signal their findings to the entrepreneurs and in the same time, the entrepreneurs could synchronize their activity with the researchers.

There are many other ways to find the right people and involve them into the programs. When it's about technology, the quality of people is very important. The success key is to find the right person. Maybe sometimes not only researchers or high qualified people are needed, but even creative people with vision. It is an art to find them, but it is a master to put them together and explore their potential as an amount of skills and ideas. Sometimes, innovative companies can invest venture capital offering funds for original ideas possible to be developed.

Every entrepreneurial effort should be done in a proper environment created by the public sector if it's about research or any other activity. Some studies show (Lerner, 2012, p. 144) "firms in technology-intensive industries patent more, and

those patents are more frequently cited, if they are based in nations with forgiving bankruptcy laws than in countries that are pro-creditors". In other terms it's about the way of how society punishes failure taking into account that innovative activity sometimes fails.

Another ways for the state to foster entrepreneurship is to enhance immigration of talents (Lerner, 2012, p. 144), create an academic base (Lerner, 2012, p. 146), being aware of the importance of the tax policy (Lerner, 2012, p. 147) and making ease the process of going public (Lerner, 2012, p. 148) which can help companies to get validation on the market and offering better conditions and specialists in patent registration.

As a conclusion to all these from above, the entrepreneurship in the research field is the key to success if the right people meet together and cover the best ideas making them to come true.

4. Conclusions

Entrepreneurship is the best way to explore new ideas and creativity, but it is not easy for everyone to join in, since special skills are required and own values are fundamental to be observed. Creativity is a common feature of the developed societies and here technology is spread at the mass level. Technology and cultural development have strong impact on all the business systems, even on entrepreneurship. For this reason it's important to understand better how innovation can be managed. The management of innovative entities was ensured by people with no economic background. Researchers and engineers were the first choice in the management teams, but they proved to be unsuited for this work.

To be innovative is like following the right route and the trend that exists on the market, and this means to develop a cooperative, multidisciplinary environment, to stimulate cooperation and identify where advantage could be created. Practical data show the link between new discoveries and prosperity of the nation. In the same time, to become prosper is like a choice between doing an easy work of innovation or working harder; it seems that who selects the first choice obtains competitive advantages.

On the other hand, the crises of the natural resources, pushes to smaller and smaller levels of raw material consume. Innovative advances respond to such needs, and they are the results of good cooperation between state, private companies and research institutes and academies. New directions are opened by combining advances from information technology, electronics, communications, chemistry, physics, involving people with high skills and requiring intensive investments. These advances are called KET's developed in accordance to the country conditions to enable one or more such technologies. It is

generally agreed that these KET's are the best way to create competitive advantages and making the right thing at the right time.

This paper tries to find a realistic answer if it is possible to follow the global trend of KET's and foster them in Romania. The good news could be that there are a lot of things to do and the World is a place full of good practices.

According to the National Strategy for Research, Development and Innovation 2014-2020, the European objectives are comprised and targeted to be accomplished in the mentioned time. Theoretically the state has an intention to develop the activity of research and development. It is not the right moment to wait for a miracle, but to act as individual decisions, using entrepreneurial skills to boost research activity and implementing some proper KET's.

To enhance an entrepreneurial activity in the multidisciplinary research field supposes a new form of managing and organizing system observing the following goals:

- creating suitable conditions for managers with entrepreneurial skills and learning practice from the other's abroad.
- a theoretical Lerner's concept "hybrid model" that combines features of a laboratory owned by a corporation and a venture-backed start-up should be a model to implement and try as an experiment, but a partnership is recommended to get benefits from the trust and good reputation of the partners.
- involving people with ideas and vision to develop a cooperative, multidisciplinary environment to identify where advantage could be created

- observe the transfer of ideas between researchers and entrepreneurs.

The state has a key role and the duty to act in the following directions:

- enhance immigration of talents
- create an academic base
- create a proper tax policy
- make ease the process of going public
- offer better conditions and specialists in patent registration.

Meeting the above mentioned goals, through high levels of cooperation between private companies, state and academies, creativity and innovation will boost new ideas for a better life in a healthier environment.

Discussing about entrepreneurship in the research activity is a very complex issue that need to be developed continuously. Every direction recommended in the conclusions could be an interesting approach for new studies, but an important direction will be developed through understanding if new technologies that are not

incremental could be implemented in beginner countries as Romania is this field.

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