

Universities in the Republic of Macedonia in the Era of the European Union's Ambitious Plan for Research and Innovation

Research Article

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Abstract

The research and innovation characteristic for modern universities actually are creating the world of tomorrow. That is why the European Union (EU) has proposed the famous Horizon Europe, an ambitious €100 billion research and innovation programme, that will succeed Horizon 2020 and with that offer a better future for Europe and the world. The focus is on the transfer of technology (innovation) from universities to the economic sector and thereby globally emphasizing the strategic importance of research and innovation. All of this in terms of development of the policies of job creation. This paper emphasizes the importance of applying best practices in the area of research and development (R&D) to the work of universities in the Republic of Macedonia (RM) which will contribute to an efficient and effective way to meet the challenges of the modern world.

Keywords: Europe, research, innovation, technology, transfer.

1. Introduction

Globalization and liberalization of the world economy together with the management of intellectual property rights within the universities plus R&D are extremely important, consequently, extraordinary necessary. These challenges require developments of human resources, educations and upgrading in order to do be possible researches in an atmosphere where are created knowledge and skills to enable abstraction benefits of intellectual property systems. Modern universities must respond to this open question. Along with this, their mission should address issues of economic development and protection of domestic knowledge, which are closely related to intellectual property rights.

To achieve all these, modern universities are to create institutional frameworks. It means that contemporary universities have to establish internal policies regarding intellectual property and rights. Consequently, the question considering the relevant contributions of actual universities and research institutes is the one concerning the process of promotion of the necessary economic development in each particular country as very important one. Somehow the existing higher education institutions should participate as scientific advices mostly to product themselves as intellectual property which includes new inventions and innovations. In this sense the starters need to be a strategy for making pressures over national innovation policies and funding the whole process in order to be as efficient and as needed. This is necessary for sustainable economic growth, which relies on a continuous flow of new ideas and products. This is because the systematic application of knowledge in solving problems creates new advanced technologies. For that to happen, progress and knowledge must not only exist, but also to deliver to others. In

addition, knowledge and technology are products of higher education institutions. With the downturn in the global economy, universities occupy a central role in economic recovery, through the transfer of technology of their discoveries, innovations and inventions. Response to this challenge requires more than structural and organizational change within the universities themselves. There is a trend of radical changing demands for universities to expand their research beyond just as a category of fundamental research or to require such research and contribute directly to specific economic developments. Societal expectations of universities nowadays go beyond just pure research, teaching, and public service roles. The latest mission of the universities throughout the world is to expand their roles through increasing economic development, where universities' research is a big part. The size and significance of the universities is not only in their scopes of research grants and cooperation agreements, but in the way of actual impacts of various universities in changing and improving the world and its distinguished societies as a whole. In order to release the research potential of the universities, scientific research must be converted to basic research into market-viable processes and technologies. The inclusion in new markets, integration into Europe, United States of America and collaborations with other developed countries, mean that we must be prepared for competition at the free market even in the field of education and scientific research and inventions.

World practice

Very ambitious program called "Horizon Europe" was published by the EU Commission. The program is part of the proposal for the next EU long-term budget 2021-2027 (the multiannual financial framework (MFF)). This most ambitious research and innovation programme ever will keep the EU on the top of the global processes of research and innovation and will continue to grow up on the bases of the results of the already pretty much respectable "Horizon 2020". Namely, according to Carlos Moedas, the European Research, Science and Innovation Commissioner:

“The next European science and research funding programme, known as Horizon Europe, is designed to connect people with the achievements financed by their tax money, and to fix problems with innovation funding”

and according to Commission's Vice-President for Jobs, Growth, Investment and Competitiveness - Jyrki Katainen:

“Investing in research and innovation is investing in Europe's future. EU funding has allowed teams across countries and scientific disciplines to work together and make unthinkable discoveries, making Europe a world-class leader in research and innovation. With "Horizon Europe", we want to build on this success and continue to make a real difference in the lives of citizens and society as a whole.”

"Horizon Europe" will introduce the following main new features:

- A European Innovation Council (EIC);
- New EU-wide research and innovation missions focusing on societal challenges and industrial competitiveness;
- Maximisation of the innovation potential across the EU;
- More openness;
- A new generation of European Partnerships and increased collaboration with other EU programmes.
- This new program is essential to ensure that EU funds start delivering results in the practice as soon as possible. Delays would force Europe's brightest people/ researchers to look for

opportunities in other parts of the World. This would negatively imply to the thousands of research jobs and downfall the positive trend of EU's competitiveness.

Background

The "Horizon Europe" proposal builds on the success of the current programme, "Horizon 2020". As of May 2018, it has supported over 18,000 projects with over €31 billion awarded. About two-thirds of Europe's economic growth over the last decades has been driven by innovation. "Horizon Europe" is expected to generate new and more knowledge and technologies (promoting scientific excellence) and to have positive effects on growth, trade and investment, as well as significant social and environmental impact. Each euro invested by the programme can potentially generate a return of up to 11 euro of GDP over 25 years. Union's investments in R&I are expected to directly generate an estimated gain of up to 100 000 jobs in R&I activities in the "investment phase" 2021-2027. The "EU Strategy and Program Innovative Union" is a continuation of the Lisbon Strategy regarding the direction of approving funds, resources, through universities and their transfer technology to achieve economic growth, job creation and stopping the brain drain in/from the Union. EU through "Innovative Union" has a plan to encourage states to invest 3% of their GDP (1% public funding, 2% private sector) in research and development, within the objective of achieving the established goals by 2020. This strategic plan is intended to open up 3.7 million jobs and annual GDP to increase up to almost 800 billion euros. The importance of intellectual property for the development of the economy shows according to the results of a joint study by the Munich-based European Patent Office and the Office for the Harmonization of the Internal Market based in Alicante, Spain, the results show that 39% of all European economic activity, amounting to €4.7 trillion, a year derived from intellectual property. The study titled "IPR intensive industries: contribution to economic performance and employment in Europe", shows that even more than a third of European jobs (35%) are based on intellectual property rights, patents, trademarks, industrial designs. This study was based on a similar study done in the US in 2012 by the US Patent and Trademark Office in cooperation with the Economics and Statistics Administration, which reveal important information about the importance of intellectual property in terms of industry and the US economy. In the study that made The US Commerce Department entitled "Intellectual Property (IP) and the US Economy: Industries in Focus," leading to indications that IP intensive industries supported by at least 40 millions jobs and have advantage of more from \$5 trillion or 34.8 % of GDP of the US in 2010. Some IP-intensive industries, which leads the study include: computer engineering, production of video and audio equipment, publishers of books and newspapers, pharmacy and medicine, electronic components, medical equipment. In the process that leads to innovation, not just part man / professor, but rather persons who are part of the academic community, students, assistants, doctoral students and so on. IP is extremely important for the work of universities and often encourages tough questions to resolve in connection with its use. In the EU is more complex because at stake are different national practices and legislation, but the European Commission is trying through the harmonization of the legal practice to bring and reduce diversity. World Intellectual Property Organization (WIPO) published the latest data on the number of patents by country in 2016. By WIPO report:

"more than 3 million patent applications were filed worldwide in 2016 – a record number." According to these data, China has the deal of patents, followed by USA and Japan.

2. Republic of North Macedonia

The Republic of Macedonia as a candidate country for the EU, is obliged to synchronize its legislation, this includes laws governing the intellectual properties which are owned by European standards and demonstrate a consistent application of these laws in practice. The Secretariat for European Affairs is responsible for implementing and coordinating the aforementioned laws. The penalties appointed in the Macedonian national legislation for violation of intellectual property depend on the severity of the injury. For example, fines up to € 5.000.00, closing a business from 30 to 60 days and serving up to 5 years in prison.

It should be noted that cases related to intellectual property are not treated by special courts specialized in that area, but in the civil courts. RM became part of WIPO in 1993 and in 1994 a member of its Permanent Committee of Industrial Property Protection Information. In addition to the new conventions and regulations, RM, as a member-state is bound to abide the WIPO treaties which were signed by former Yugoslavia (SFRY) on the basis of the succession institute of international public law. When it comes to RM there are available data from 1993, when patents were reported for the first time, 128 patents precisely. The biggest number of patents in the RM was recorded in 1994 - 236. The number is significantly smaller in recent years, notably since 2008 onwards, where the number of patents exceeded 50 only once. In the Macedonian legislation on regulation of industrial property, the Law on Industrial Property, introduced provisions concerning particularly the rights derived from innovative activities and the university-funded research of funds from the State Budget, in one of its amendments.

According to the Law Amending the Law on Industrial Property, innovations/inventions created in the higher education institution through the Budget of RM, belongs to the institution where the invention was created. The invention created in higher education or research institution as a result of innovation or development activities, funded by the State Budget in accordance with the innovation activities, belongs to a higher education or research institution where the invention is created, unless a different agreement is reached before the project takes place. If the invention is economically exploited, the inventor is entitled to compensation in the amount of at least 25% of the total realized income that the institution has achieved in its commercial exploitation. The percentage may be modified by a written agreement between the inventor and the institution which realized the income, the percentage cannot be less than the percentage determined. If the invention created in the institution is funded entirely by the purchaser, the right to dispose of the invention belongs to the client, unless otherwise agreed. The client cannot prevent the publication of the invention by the inventor in a way that does not hinder intellectual property rights or potential commercialization of the invention. When there are more participants in the project, or more inventors have created an invention, the participation in the profits determined according to their individual contribution in its creation pursuant to the agreement. As legal successor of the inventor is given to consideration also the higher education, or research institution where innovation is created as a result of innovation or development activities, financed with funds from the State Budget, according to the innovation activity, unless a different agreement is taken before the project starts. Higher Education Act and its amendments, the Innovation Law, the industrial property Law and its amendments provide the legal possibility to utilize the tools and the protection along with commercialization of intellectual property rights created at the university. Legal Acts relating to intellectual property cover the rights and obligations of the researchers, institutions and students. Legal rules are set more generally giving the opportunity to higher education institutions to clarify and determine their policy on intellectual properties.

Unfortunately, although intellectual properties, on a worldwide and as well as on European level became the top topic and one of the main tasks in Macedonia, especially universities, they cannot boast about it. In 2013, S s. Cyril and Methodius' University (UKIM) began organizing and conducting workshops on this topic, during the same year a Policy on Intellectual Property was adopted. Yet no application of the adopted policy has been noticed at the University. In the RM there is no opportunity to obtain relevant information about patents that were made at different universities funded by the State Budget. The reason is that although there is a possibility to accomplish certain patentable project, the University is not taking the initiative to assess the degree of commercialization and in particular the patent application. Mostly it is due to additional funds which are to be given in patenting, but even more by a lack of interest and initiative. This is why researchers themselves patent their innovations, and consequently there is no data for individual achievements in the field of patents of the respective universities. Within the universities themselves there cannot be found specific departments specialized in intellectual properties, or they simply are in an unsatisfactory shape and size. Patenting academic institutions is complex because the funding comes from the State Budget, but perhaps it includes the University or another fund, and even more the characters of the research. Because of that it is very important to determine before the outset whether they have set special policies on the funds with which the researches are promoted, which rate is fixed for participation in patent / innovation, and who is responsible for the institutional costs and administrative expenses. This is important so that in the end the concrete innovator or the particular group of innovators will not remain with a very small percentage of their research work.

Some obstacles to an effective management of intellectual property rights are those related to:

- Lack of abundance of reference information;
- Need to create trust;
- Cover all areas related to various areas of intellectual property;
- Lack of a dynamic and rewarding policy, which is fully supplied to members, will also be an obstacle;
- All stakeholders involved in its development and review process;
- Should be expected of difficulty of implementation, due to infrastructure deficiencies;
- Underfeeding, cultural issues and a weak economy and industries;
- The query of documentation and storage of information and its retrieval could slow the process.
- There are no specific obstacles to cooperation's among universities in terms of researches and technology transfers to the industry, from a technical standpoint of view. But regardless of that, the cooperation between universities and the economy remains sub-level development. The main reason is on both sides, namely:
 - The economy is not yet ready for joint research ventures with the scientific profession (joint research) and
 - The lack of skill and preparation of universities' scientific staff to sell knowledge about the economy.

In terms of technology transfer, the legal regulation, a few years ago there was a hole in the lack of legislation on this issue. Until December 2012 year there was no legal framework for the creation and commercialization of intellectual property and rights which originate from it, as a result researches in universities contributing any initiative of the scientific staff could face the deadlock. Also, the policies of the institutional level, some on a national, did not allow spin off companies and encouraged researchers to participate in technological transfers. There was no

rewarding as plus point in evaluating naive CB's, participation in new companies, participation of scientists in projects licensing etc. It would stress that it wasn't present, but there is a feeling that it still lacks public support, views and proactive steps in the area of licensing, technology transfer and the like. On June 12, 2009, at the proposal of the Ministry of Economy, in coordination with the State Office of Industrial Property, a Strategy for intellectual property (2009-2012) was adopted in the Republic of Macedonia, which opened the door for adoption and regulates the legal basis for support technology transfers, protection of intellectual property, spin-offs etc., as part of scientific research in universities. In 2013 a Law on Innovation Activities was established which with the recent amendments of the Act of 2015 largely regulates and provides an opportunity for scientific profession to develop and implement global trends in the area of technology transfer, spin-off and the like.

The initiative of the Government of RM, to encourage innovation and entrepreneurship, was launched, promotions of the universities' start-up initiatives and legislations on universities' spin-off companies. The plan is to approve 10,000 euros for scientists who through R&D will be able to create a spin-off company. A scientific-technological park has been established within the scope of the South East Europe University, which is already operational and the Center for Technology Transfer and Intellectual Property at the University of Information Sciences and Technology in Ohrid (funded by FP7 EU, which has no data on real technology transfer in the economy or product, except issuing scientific publications). A start-up Business Center was established at UKIM, Mechanical Engineering (UKIM-BSC), supported by the Austrian Development Agency (ADA) in 2013. All companies which are established within this business center are managed by students or new graduates, and all the characteristics of innovation, profitability, are based on knowledge. With the support of ADA funds, UKIM-BSC has organized six competitions for business plans between students and provided circa E 100,000. There are also few others forms of centers/offices at state universities, but with no real output and positive impact in the field of IP, patents, transfer of technology etc. (no practical and real implementation of its form).

It must be emphasized that the various models of universities should increasingly engage in research and development through the transfer of knowledge to the whole society and the economy in particular, integration between the university and industry and institutions. RM, through budget financing provides basic tools for work at universities, according to their specific sizes, the number of their students and the like. At the same time universities provide their own funds from operations, and are encouraged to provide funds for research and development from other national and international institutions and the economy. Since 2012 the Ministry of Education and Science of the Republic of Macedonia should point out that it started by assistance and co-financing of research projects at universities, access to scientific journals, publication of scientific books, participation in national and highest international conferences, international student visits to world universities' equipment at numerous universities and laboratories and the like. All this in order to raise and give a boost to awareness of new research projects, actually, technology transfers to intellectual property. State funding of universities makes it consistent with the objectives and priorities set in the National Program for Science and Research Program for Technological Development, the Program for the implementation of the industrial policy strategy and development programs of public interest of the RM. It is a good idea to reminisce the changes introduced from 2010 onward, in the area of regulation of the advancement and the choice of teaching and researching it requires: a growing number of publications, participation in international conferences, "quotations", subventions for publishing papers in world-renowned scientific journals, creating a fund for innovation and technological development and the like. In

the period from 2011 to 2014 the project for equipment of 160 laboratories is commenced within scientific institutions, where 60 million were invested in 80 laboratories for information sciences, technological sciences, medicine, life sciences, biotechnology sciences, security, mathematics as social and social sciences. We should pay attention to the approval of funding for hiring young new staff of universities, which would enter the path of the new technical and technological research initiatives in this field. The Ministry of Education and Science together with the Ministry of Finance are indubitably responsible for this, upon request and within the real justified needs of universities. Thus the amendments to the Law on Higher Education in January 2013, the Parliament adopted several key tools through which brought more impetus for advancing the field of development studies and new intellectual property rights:

- Establishment of centers for career and alumni who have to maintain regular meetings with stakeholders;
- Board of cooperation and trust with the public, which will include members from the business community and society, and will have the opportunity to study programs are taken in accordance with market needs;
- Compulsory input items innovation and entrepreneurship;
- Mandatory 40% funding of research activities at the university, the amount of the overall budget;
- Scientific projects, study visits of the top 500 universities;
- Criteria for academic advancement based on quality and numbers in international publications.
- Here we stress the changes in legislation in higher education institutions, in more precisely, modifications of the university statutes, which enter opportunities career centers and more and more importantly centers for technology transfer, spin-off and the like. Which means that the legal framework for the implementation and step towards the development university is already set. Unfortunately, the universities in our country are far from worldly practices, and even the regional practice of using intellectual property and technology transfer, through which universities make substantial inflow of funds. We could not come up with such significant statistics in our country.

3. Recommendations

From the interviews which were recorded with 60 top scientific staff at a state University in the RM, some proposals can be highlighted for better cooperation with the holding and transfer of technology from research institutions to the economy and the State:

- Greater cooperation initiative of the three parties (university, state and economy) in the form of round tables, seminars, fairs, workshops etc.;
- The introduction of technology transfer requires full and continuous cooperation between the economy and academia. The only way science can adequately react rapidly to the demands of the economy;
- The mobility of the scientific staff of a problem. How to create time for scientific work when aging teaching staff. Absence of a growing number of young staff;
- Trust is also important between business and science - it is present but it is difficult to maintain. Permanent contacts are very important;
- Companies need to invest in R&D departments within their business, which will establish close cooperation with scientific institutions;

- Need to devote more attention to the practical application of the things that are taught in school. The theory is the basis of knowledge, but if inapplicable, it remains only on paper, no real significance;
- RM lacks research institutes that would deliver knowledge and experience to business entities that would be able to solve problems that affect the economy;
- The cooperation depends on both sides, and is also a significant state support. scientific institutions should be concerned about the needs of the economy, the economy should see a partner in scientific institutions, and the state should create policies that will positively affect the cooperation and implement measures for financial and non-financial support to research, development and technology transfer;
- Annual regular conferences with target theme to unite the interests of scientific institutions with the economy and setting common goals and deals with specific statements and actions, with moderated support from the country;
- More frequent conference organizations and workshops through which promote new developments;
- Companies should be more development-oriented (and not only business oriented) and there should also be more formal and informal cooperation between businesses and scientific institutions;
- The state should approve more funds for research and education;
- To produce more application knowledge (reform the curriculum so that there will be more practical skills);
- to recognize the added value of research by managers in the economy;
- to open scientific institutions for more practical cooperation with economic entities;
- to achieve long-term and continuous contact of higher education institutions and economic entities. As conclusions deduced from an analysis of the interviews with the teaching and researching staff:
- Center for technology transfer as a formal body would not change a thing, if it does not produce any results: whether it is based on the a university or on a national level;
- It is important to offer appropriate tools implemented by competent people, which is very significant commitment by top management of the university / universities;
- In managerial positions there is a need to have young and proven personnel as long as the head of departments and deans are people with dogmatic thinking, they would not care about anything else but to hold their ground;
- A total lack of cooperation within individual higher educational institutions;
- The economy should have also interest in innovation, not only in scientific institutions. There is an impression that their willingness to cooperate is small;
- There must be greater coordination between relevant ministries, industry and academia;
- Scientific institutions should be agile (fast adjustable) to the needs of the industry;
- Cooperation should be based on the interest of the institution and not the personal interest of researchers;
- TTO at the University should be agile and able to react quickly to market conditions;
- It is very difficult to achieve in a highly bureaucratized academic institutions with predefined processes that are full of bottlenecks in decision making;
- You probably need to think about some form of public-private partnership - think of another part of the legislation in the area of public procurement, does it include the transfer of technologies, and the like, if so, consider changes and breaks in this section.

4. Conclusion

The process of managing property rights in universities and research organizations will succeed if institutions create permanent sustainable culture of innovation, inventions, and respect for intellectual property. Partnership must be created between all the different groups, creating the atmosphere of creativity can succeed (The Triple Helix). More than evident need to facilitate and accelerate technology transfer between scientific units and companies, promoting cooperation between research units and technology industry at the state and beyond the regional level, university growth companies, including start-ups, by increasing the technological leadership and with all that support the priorities of the regional and national level in terms of economic development.

In the last 20s, we have seen a continuous changing the structure of universities in Europe. Meaning, more is given to universities through their research and inventions, reform the old structures of universities in organizations with a new management structures that can respond to meet new goals and strategies on universities of the 21st century. Universities have always been involved in the field of research and transfer, but now this new role that is given as a center for economic development and job creation through their transfer of technologies is remarkable. Technology transfer centers become strategic points of universities not only as sources for the use of funds for research, but also as a tool for economic development. In fact, universities get the role of encouraging and promoting national economic development and the leader of innovation processes in society.

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