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**UNIVERSITIES IN REPUBLIC OF MACEDONIA
AND THE CHALLENGES OF THE MODERN
WORLD
(INTELLECTUAL PROPERTY AND TRANSFER
OF TECHNOLOGY)**

Abstract

Today the world's focus is on the transfer of technology from universities to the economic sector, and thereby globally emphasizing the strategic importance of intellectual properties and rights. All of this in terms of development and job creation. Research method: A questionnaire will be distributed to teaching and research staff of the State University in Republic of Macedonia. This paper will emphasize the importance of applying good practices in the area of intellectual property rights (IPR) to the work of universities in the Republic of Macedonia, which will contribute to an efficient and effective way to meet the challenges of the modern world - University of the 21st century, that is, development-oriented university.

Keywords: Intellectual property, IP policies, technology transfer, university, EU, USA, Republic of Macedonia

INTRODUCTION

In reality in which we are living today, globalization and liberalization of the world economy, the management of intellectual property rights within the universities is increasingly important and necessary. This challenge requires development in human resources, education and upgrading in order to do research in an atmosphere where one will create knowledge and skills to enable drawing benefits from the intellectual property systems. Universities must respond to this open question. Along with this, their mission should address issues of economic development and protection of domestic knowledge, which is closely related to intellectual property rights. To achieve this, the university should create an institutional framework. This includes the university to establish an internal policy regarding intellectual property and rights. The question of the contribution of the universities to promotion of the economic development in the country is important. Somehow these higher education institutions should participate with scientific advices, as well as with production of intellectual property which includes new inventions and innovations. For beginning, there should be a strategy to put pressure on national innovation policies and funding in order to meet them. 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 the purpose of progress, knowledge must not only exist, but also to be delivered to others. Both knowledge and technology are products of higher education institutions. Most often, the results come in the form of intellectual property. In addition, part of the management need to create links between the universities and national bodies for development, such as the government, industry and businessmen. Nationally and internationally there is compliance on the importance of the innovation, technology transfer and entrepreneurship regarding the sustainable economic development. The collapse of the global economy made the universities have a central role in economic recovery, through the transfer of technology of their discoveries, innovations and inventions. In response to this challenge structural and organizational change in the universities themselves is more than necessary. There is a trend of changing the demand for universities to expand their research beyond being just as a category of fundamental research, that is, such research is required to contribute directly to specific economic development. Societal expectations of the universities now go beyond just pure research, teaching, and role of public service. The mission of the University is expanded to its role in increasing the economic development, in which the university's research have a big part. The size and significance of the university is not only in the scope of its research grants and cooperation agreements, but in

the way of actual impacts of the university on changing and improving the world and society in general. In order to release the research potential of the university, scientific activity must convert the basic research into market-viable processes and technologies. The inclusion in new markets, integration into European Union (EU), cooperation with United States of America and other developed countries, mean that we must be prepared for competition in the free market even in the field of education and scientific research and inventions.

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. There must be partnership between all the different groups, which would provide an atmosphere of creativity (The Triple Helix- The concept of the Triple Helix of university-industry-government relationships initiated in the 1990s by Etzkowitz (1993) and Etzkowitz and Leydesdorff (1995), encompassing elements of precursor works by Lowe (1982) and Sábato and Mackenzi (1982), interprets the shift from a dominating industry-government dyad in the Industrial Society to a growing triadic relationship between university-industry-government in the Knowledge Society.” Triple Helix Research Group, Stanford University, USA). More than evident is the need to facilitate and accelerate technology transfer between the scientific units and companies; promoting cooperation between research units and technology and industry at the state and beyond the regional level; growth of university companies, including startups, by increasing the technological leadership; and accordingly, support of the priorities at regional and national level will be fulfilled, in terms of economic development. Universities have always been involved in the field of research and transfer, but now this new role is given to them as a center for economic development and job creation through their transfer of technologies. Universities get the role of encouraging and promoting national economic development and the leader of innovation processes in the society.

WORD PRACTICE

The European Union introduced a strategy and program Innovative Union (“Innovation Union is the European Union strategy to create an innovation-friendly environment that makes it easier for great ideas to be turned into products and services that will bring our economy growth and jobs. The Innovation Union is one of the seven flagship initiatives of the Europe 2020 strategy for smart, sustainable and inclusive growth” European Commission), as a continuation of the Lisbon Strategy (“The Lisbon Strategy, also known as the Lisbon Agenda or Lisbon Process, was an action and development plan devised in 2000, for the economy of the European

Union between 2000 and 2010.” European Commission) in the direction of approving funds, resources, through universities and their transfer technology to achieve: economic growth, job creation and stopping the brain drain. The European Union through Innovative Union has a plan to encourage countries to invest 3% of their GDP (1% public funding, 2% private sector) in research and development, within the determined objective of achieving by 2020. This strategic plan is intended to open up 3.7 million jobs and to increase the annual GDP by almost 800 billion euros. The importance of intellectual property for the development of the economy is shown by the results of a joint study (“Intellectual property rights intensive industries: contribution to economic performance and employment in the European Union” Industry-Level Analysis Report, September 2013, A joint project between the European Patent Office and the Office for Harmonization in the Internal Market.) conducted 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 revealed important information about the importance of intellectual property in terms of industry and the US economy. The study that was conducted by the US Commerce Department entitled “Intellectual Property and the US Economy: Industries in Focus (Economics and Statistics Administration and the United States Patent and Trademark Office Intellectual Property and the U.S. Economy: Industries in Focus Prepared by the Economics and Statistics Administration and the United States Patent and Trademark Office U.S. Department of Commerce March 2012.) led to indications that (IP) intensive industries are supporting at least 40 million jobs and have advantage of more from \$5 trillion or 34.8 % of GDP of the US in 2010. Some IP-intensive industries indicated in 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, it is not just one man / professor, but rather many persons who are part of the academic community, students, assistants, doctoral students and so on. Intellectual property is important in the work of universities, and often encourages tough questions that are to be resolved in connection with its use. If one makes a comparison, the practices are different. Namely, the United States have the Bayh-Dole Act - regulations governing intellectual property in government-funded research, Canadian universities on the other hand are free to make individual arrangements for IP. In the European Union is more complex because at stake are different national practices and legislation, but

the European Commission is trying to bring them closer and reduce the diversity through the harmonization of the legal practice. The Bayh-Dole Act allows 50% of the IP to be assigned to the researcher and the remaining 50% to the university. The Bayh-Dole act starts from the assumption that universities will play an important role in protecting and commercialization of IP. MIT and other institutions vary part of its share of the researcher. WIPO¹ published the latest data on the number of patents in 2014 by countries. According to these data, South Korea has the most patents - 3.254 per million, followed by Japan and Germany with 2,092 and 913, respectively. The top ten countries look like this: 1. South Korea 2. Japan 3. Germany 4. United States 5. China 6. France 7. United Kingdom 8. Italy 9. Russia 10. Canada.

THE CASE OF REPUBLIC OF MACEDONIA

The Republic of Macedonia as a candidate country for the European Union is obliged to synchronize its legislation, which includes and the laws regulating the intellectual properties with the European standards and to demonstrate a consistent application of these laws in practice. The Secretariat for European Affairs is responsible for implementation and coordination of these before mentioned laws. Republic of Macedonia became part of the World Intellectual Property Organization in 1993, and a member of the Permanent Committee of Industrial Property Protection Information of WIPO in 1994. In addition to the new conventions and regulations, Republic of Macedonia as a member is bound to abide the conventions and treaties which were signed in the time of Yugoslavia, that is, as heir to the liabilities of Yugoslavia. When it comes to Republic of Macedonia (Innovation Union Competitiveness Report 2013 - European Commission, Directorate-General for Research and Innovation, 2014) there are available data from 1993² when patents were reported for the first time, 128 patents precisely. The biggest number of patents in Republic of Macedonia 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. Although intellectual properties, at a worldwide and European level became the top topic and one of the main tasks in Republic of Macedonia, especially universities, they can not boast about it.

¹Link: http://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2015.pdf, last visited august,2016.

²Link: http://www.wipo.int/members/en/details.jsp?country_id=114, last visited august, 2016.

On June 12, 2009, upon the proposal of the Ministry of Economy, in coordination with the State Office of Industrial Property, a 2009-2012 Strategy for intellectual property was adopted in the Republic of Macedonia, which opens the door for adoption and regulates the legal basis for support technology transfer, protection of intellectual property, spin-off etc., as part of scientific research activities in the universities. In 2013 a Law on Innovation Activities was adopted (Official Gazette No: 79/2013) which along with the recent amendments of the Act in 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. A scientific-technological park has been established within the South East Europe University, which is already operational, as well as a Center for Technology Transfer and Intellectual Property at the University of Information Sciences and Technologies in Ohrid (funded through 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, Faculty of 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 are characterized by innovation, profitability, and based on knowledge. There are also few others forms of centers/offices at state universities, but without any real output and positive impact in the field of IP, patents, transfer of technology etc. (no practical and real implementation of its form). Macedonia through budget financing provides basic resources for work at the universities, according to the size of the university, the number of students and the like. At the same time universities also provide their own funds from operations, and are encouraged to provide funds for research and development from other national and international institutions and the economic sector. The legal framework is already set which means a step toward to the development university. Unfortunately, the universities in the country are far from the world practices, and even from 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 the country.

RESEARCH

A questionnaire was distributed to teaching and research staff of the State University in Republic of Macedonia (40 top scientific staff). The number of respondents is carefully selected, in order to avoid large sample, and to avoid the sample to be unknown. That is, selected samples are used among the teaching and

scientific personnel having the following characteristics: commitment to science and research, extensive portfolio of publications and surveys, proportional representation of different groups by age, proportional representation of different groups of species. In this way it is believed that the answers received will give accurate and relevant research. As to the ethical component in the present study, it is taken care of the privacy of the respondents - professors / scientists.

Question no.1: How much new knowledge (patents, innovations, inventions, etc.) from your field of research is transferred into practice?

| Option | Number of answers |
|------------|-------------------|
| zero | 2 |
| not enough | 26 |
| average | 5 |
| enough | 7 |
| a lot | 0 |
| Total | 40 |

Question no.2: Interest in transferring the technology to the business sector

| Option | Number of answers |
|-------------------|-------------------|
| not interested | 0 |
| little interested | 2 |
| average interest | 5 |
| Interested | 14 |
| very interested | 19 |
| Total | 40 |

Question no. 3: How often are you in contact with the economy for the purpose of transferring technology?

| Option | Number of answers |
|------------|-------------------|
| not at all | 3 |
| rarely | 8 |
| average | 15 |
| enough | 6 |
| a lot | 6 |
| Total | 38 |

Question 4: According to your experience and assessment, is it useful and applicable (the transfer of) technology into practice?

| Option | Number of answers |
|-------------------|-------------------|
| not useful | 0 |
| a little useful | 0 |
| average useful | 1 |
| reasonably useful | 22 |
| very useful | 15 |
| Total | 38 |

Question no. 5: In your opinion, what are the key factors for transfer of technology from scientific institutions in the economy?

| Option | Number of answers |
|---|-------------------|
| scientific-research institutions should be more open for cooperation | 2 |
| cooperation should be based on a long-term contract | 8 |
| technology should be in line with the needs of the industry / economy | 11 |
| scientific institutions must produce more applicable knowledge | 15 |
| communication should be market-oriented | 4 |
| Total | 40 |

Question no. 6: The main problems with the transfer of technology in the Republic of Macedonia. What do you agree with?

| Option | Number of answers |
|--|-------------------|
| companies must be development-oriented | 3 |
| scientific institutions do not provide sufficient research support | 0 |
| new technologies are too expensive for the economy | 1 |
| the state must approve more funds for applicable research and education | 22 |
| the attitude of business managers to the researchers and their research is negative | 5 |
| collaborations are usually friendly based | 4 |
| there is no co-operation on the part of the management of scientific institutions | 1 |
| researchers lack knowledge of the needs of the economy | 1 |
| insufficient formal and informal cooperation between the economy and scientific institutions | 12 |
| rigidity of scientific institutions | 1 |
| Total | 50 |

Question no. 7. Do you think that the existence of a Technology Transfer Center within the University will advance the transfer of technologies from scientific institutions to the economy?

| Option | Number of answers |
|-------------|-------------------|
| not at all | 1 |
| very little | 2 |
| Average | 7 |
| Enough | 22 |
| a lot | 8 |
| Total | 40 |

Question no. 8: How often have you encountered formal and administrative problems during the legal completion of your inventions / new technology?

| Option | Number of answers |
|-------------|-------------------|
| not at all | 5 |
| very little | 7 |
| Average | 3 |
| Enough | 10 |
| a lot | 15 |
| Total | 40 |

Question no. 9: What is your knowledge of intellectual property (patents, etc.)?

| Option | Number of answers |
|-------------|-------------------|
| not at all | 0 |
| very little | 6 |
| Average | 10 |
| Enough | 18 |
| a lot | 6 |
| Total | 40 |

Question 10: Who performs the formal work related to the protection of your invention?

| Option | Number of answers |
|-------------------------------------|-------------------|
| Myself | 21 |
| the institution where I am employed | 10 |
| Friend | 3 |
| private company | 4 |
| Total | 38 |

Question 11: Do you think the Technology Transfer Center will improve and will facilitate your efforts to establish cooperation with the economy and vice versa, with the researchers, as well as in the field of protection of your intellectual property (patents, etc.)?

| Option | Number of answers |
|-------------|-------------------|
| not at all | 2 |
| very little | 8 |
| Average | 6 |
| Enough | 12 |
| a lot | 11 |
| Total | 39 |

CONCLUDING REMARKS AND RECOMMENDATIONS

Investing in research and development does not consist solely of approval financial resources to the higher education institutions; it refers to the investment of taxpayers' money, better and more beneficial use and benefit of the invested money, involvement of the private sector in these innovations and technology transfers, by creating a smart and proactive oriented policy in this sphere in the institutions. The aim must be to give value to the money invested, not only to double the research without concrete applicable outputs, as well as to pay major attention to the expertise and technology, patents and cooperation with economic sectors, funds and similar research and innovations which are part of the universities. It is necessary to establish a good model of use of the intellectual property at the University with the ultimate goal of reaching a development-oriented university, following the example of European and American universities. At the time of the beginning of the 4th Industrial Revolution, the old organization, structure and functioning of the universities proves to be disastrous, not only nationwide but also regional and more internationally. We must use the essence of the integration of the university to establish a new structure for the implementation of intellectual property, and therefore applicable knowledge on the transfer to the economic sector in order to follow the European strategic objectives in the areas of development, education, innovation and finally, benchmark university achievements.

Some proposals can be stated for better cooperation with the economic sector and technology transfer from the research institutions to the economic sector and the State:

Greater initiative for cooperation of the three parties (university, state and economic sector- The Triple Helix) in the form of round tables, seminars, fairs, workshops etc., is necessary; Full and continuous cooperation between the economic sector and academia- it's the only way science can adequately react rapidly to the demands of the economy; The mobility of the scientific staff as a problem. Absence of a growing number of young staff; Trust between the economy and science is also important: it is present, but it is difficult to maintain. Permanent contacts are very important; Companies need to invest in R & D, which will establish close cooperation with scientific institutions; It is necessary to devote more attention to the practical application of the matters that are taught in school. The theory is the basis of knowledge, but if inapplicable, it remains only on paper, without real significance; The Republic of Macedonia lacks scientific-research institutes that would deliver knowledge and experience to economic entities that would be able to solve problems that affect the economy; The cooperation depends on both sides, and state support is also significant. Scientific institutions should be more concerned about the needs of the economic sector, the economic sector 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 economic sector and setting common goals and deals with specific statements and actions, with moderated support from the state; Organization of more conferences and workshops where new developments would be promoted; There should also be more formal and informal cooperation between businesses and scientific institutions; The state should allow more funds for research and education; To produce more application knowledge (reform of the curriculum so that it will include more practical skills); Managers in the economic sector should recognize the added value of research; Scientific institutions should be open for more practical cooperation with economic entities.

The conclusions drawn from the analysis of the interviews with the teaching and researching staff, are the following: Center for technology transfer as a formal body would not make any change, regardless it is established at university or national level, if it does not produce any results through professional and dedicated work; It is important to offer appropriate instruments implemented by competent people, where the commitment by top management of the universities is very significant; Proactive and proven personnel should be assigned; A total lack of cooperation within individual higher educational institutions; The economic sector should also have interest in innovation, not only the scientific institutions. There is an impression that their willingness to cooperate is small; There must be greater coordination between relevant ministries, industry and scientific institutions; Scientific institutions should be agile (fast adjustable) to the needs of the industry. The University should be agile and able to react quickly to the changing market conditions; It is very difficult to achieve in a highly bureaucratized academic institutions with predefined processes that are full of bottlenecks in the process of decision making;

Today, the expectations from the universities are much bigger and more complicated than they used to be until now. Universities themselves struggle between balancing the fiscal financial needs and human resources, despite the high expectations and demands that society is setting on them. The extreme changes in social actions and societies as a whole, geopolitics, technology, new scientific knowledge request from universities an answer to these challenges and supposedly to adapt. On the move are the universities that still maintain their conservative structure and functioning, and are not optimally included in this road of change. Technology transfer from the University to society is of great national importance. Technology transfer helps to develop the tools of intellectual property and intellectual policy, leading to the development of new scientific awareness, products, platforms and services and general welfare of the state. Developed and applicable Intellectual Property at the University = source of finance and development.

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