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ПРОЦЕС КОМЕРЦІАЛІЗАЦІЇ НАУКОВИХ РОЗРОБОК У ВИЩИХ НАВЧАЛЬНИХ ЗАКЛАДАХ: ІНОЗЕМНИЙ ДОСВІД ТА УКРАЇНСЬКІ РЕАЛІЇ

ã Гавран В. Я., Гавран М. І., 2018

Проаналізовано процес комерціалізації наукових розробок у вищих навчальних закладах України та в окремих розвинених зарубіжних країнах. Процес комерціалізації дослідницьких продуктів у вищих навчальних закладах України розглядається як обґрунтований та необхідний спосіб збільшення їхнього фінансового потенціалу. Проаналізовано різні механізми та способи комерціалізації дослідницьких продуктів, що використовуються іноземними вищими навчальними закладами. Виокремлено певні проблеми процесу комерціалізації наукових розробок в Україні. Запропоновано перспективні шляхи адаптації іноземного досвіду щодо комерціалізації українських вищих навчальних закладів.

Ключові слова: комерціалізація, наукові розробки, вищий навчальний заклад, науково-дослідна діяльність, зарубіжні країни, Україна.

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THE PROCESS OF RESEARCH PRODUCTS COMMERCIALIZATION AT HIGHER EDUCATION INSTITUTIONS: FOREIGN EXPERIENCE AND UKRAINIAN REALITY

ã Havran V. Ya., Havran M. I., 2018

The article deals with analyzing the process of research products commercialization at higher education institutions in Ukraine and certain developed foreign countries. The process of research products commercialization at Ukrainian higher education institutions is observed as a reasonable and necessary way for increasing their financial potential. The authors study and analyze different techniques and ways of research products commercialization used by foreign higher education institutions. Some problems of research products commercialization in Ukraine are identified. The perspective ways for adapting foreign experience in commercialization to Ukrainian higher education institutions have been suggested.

Key words: commercialization, research products, higher education institution, R&D activities, foreign countries, Ukraine.

Statement of the problem

In the era of knowledge society, Ukrainian higher education institutions need more financial resources not only for meeting new requirements arising alongside with creating European Higher Education Area but also for their sustainable development and ability to offer high standards in studying

and R&D activities. However, the level of state financing for higher education is decreasing and higher education institutions must search additional sources for raising money.

The process of commercialization of educational services, results of R&D activities and research products is a reasonable and necessary way for increasing financial potential of higher education institutions especially in challenged economic times. R&D activities provided within universities and other academic and research institutions have to become an efficient source of funding and gaining new revenues for sustainable development in the competitive educational marketplace.

Analysis of recent research and publications

The process of research products commercialization at higher education institutions in Ukraine is under consideration of many Ukrainian scientists, such as T. Boholib, P. Bubenko, V. Denysuk, O. Lapko, V. Menyailo and others. T. Boholib admits that university science has significant intellectual resources, many scientific developments and technologies, but they are not used in practice, there is no proper market for scientific products and technologies [1, p. 35].

Foreign scientists actively investigate different issues of commercialization of research results, products and R&D activities (M. Karlsson, J. Sandelin, M. Schankerman, P. Druker, J. Powers, E. Campbell, G. Markman, D. Siegel, M. Wright etc.). They are interested in finding different perspective ways and mechanisms for successful commercialization of research results. For instance, Joshua B. Powers and Eric G. Campbell investigate the effects of technology commercialization on researcher practice and productivity at USA universities [2, p. 245].

The formulation of objectives

The aim of this paper is to analyze the process of research products commercialization at higher education institutions in Ukraine and certain developed foreign countries.

According to the defined aim we set the following objectives: 1) study and analyze the process of commercialization of research results and R&D activities in foreign countries and Ukraine; 2) observe different ways, structures and elements of research results commercialization at foreign higher education institutions; 3) suggest perspective ways for adapting foreign experience in commercialization to Ukrainian higher education institutions.

Presentation of main materials

Nowadays, the commercialization of research products at higher education institutions in Ukraine might be considered as one of the significant ways for their further successful development, especially in conditions of reducing state financing and increasing competitive environment at labour and educational marketplaces. Ukrainian universities to be admitted as science and research institution has to meet requirements which are mostly based on R&D activities, appropriate amount of academic and pedagogical staff, scientific publications cited in scientific journals with impact factors, etc. But only some of the research products and developed technologies are disclosed for potential commercialization. In order to change such situation in the area of higher education, it is important to study the experience of foreign countries where the process of commercialization of research results has growing indicators.

In general, the problem of research products commercialization has widely been studied in the USA, highly-developed and even developing European countries for several decades. In the USA, since 1980 the federal government has begun enacting a series of policies designed to incentivize a stronger triple-helix (relationship between the federal government, universities, and industry) with the intent of speeding movement of new technologies to the marketplace. [2, p. 246]. Commercialization of research products and technologies not only better leverage the intellectual capital of its researchers but also facilitate the transfer of technologies to the private sector and marketplace. At the same time commercialization is considered as a prime example for generating academic impact because it constitutes immediate, measurable market acceptance for outputs of academic research [3, p. 1403]. Furthermore, it is an essential element of the innovation process, which represents the process of transforming the results of scientific

activity into goods and their subsequent effective implementation on an industrial scale; and as result it is more akin to an entrepreneurial act or at least, in the case of patenting, a first step towards it [4; 5].

Considering our findings in notion and content of commercialization, it is important to focus on different stages of research products commercialization. Some scholars identify four stages for commercializing R&D activities [6, p. 44]:

- 1) searching scientific developments, their expertise (assessment of commercial opportunities) and selection;
- 2) involving investments and other sources of financing;
- 3) distribution of rights to the future intellectual property and their legal consolidation;
- 4) introduction of scientific development into production; and if it is necessary – modification and refinement of scientific development; intelligent product support.

The successful performance of every stage requires involvement and interaction of different interested parties: individual scientists, universities, government agencies, entrepreneurs and businesses. Such cooperation facilitates perspective thinking, creating new ideas, providing necessary motivation, technical facilities and financial opportunities.

Taking into consideration investigation carried out by Malaysian scientists, we completely agree that for a sustainable research product commercialisation some elements should be interrelated to each other within a particular platform [7, p. 286]. They identify eight elements, such as:

- 1) knowledge, skills and personal traits of the researcher;
- 2) creation of idea;
- 3) development, packaging and promotion of the research product;
- 4) commercialisation paths;
- 5) building competitive advantage in the market;
- 6) selecting a business partners;
- 7) nurturing relationship with business partner;
- 8) facilities and support.

All of the above mentioned elements are important prerequisites for creating a perfect commercialization environment within particular platforms or innovative commercialization structures. Science parks, technological parks and incubators are considered as the most popular and widely provided by universities platforms for research products commercialization.

Business incubation industry is mostly well-developed in the USA where academic institutions are the most common incubation program sponsors. Some scholars also distinguish university business incubators. As J. Wonglimpiyarat emphasizes incubators should act as intermediary for effective utilization of university research, that's why he defined university business incubators as incubators set up by the universities to provide office space, equipment, mentoring services as well as other administrative supports to assist the formation of new ventures [8, p. 18]. Except mentioned services and supports business incubators can also offer access to research facilities and manufacturing equipment, offering entrepreneurs access to in-house investment funds, assistance with product designs and loaned executives to manage their companies.

While analyzing the foreign experience in commercializing research results we found out that establishing new companies or their affiliates around major universities is also one of the perspective mechanisms for collaboration between businesses and academic researches. For example, during financial year 2001, including both USA and Canadian research institutions, at least 494 new companies were created based on academic discoveries, 84 percent of them were established in the same state/province of the academic institution that created the technology. Academic institutions received an equity interest in 70 percent of their start-ups [1, p. 36].

Having studied experience of different higher education institutions abroad, we found out that one of the important steps for the intensive process of commercialization of research results at universities is to change their organizational structures especially scientific and research departments by creating new units and specialised structures, such as innovation and transfer departments, centres for technology transfer, technology transfer offices, etc. As example, we consider Gdańsk University of Technology has a Center

for Knowledge and Technology Transfer that provides support to researchers of the University in the following fields [9]:

1) verification of grant applications (managing intellectual property in projects, developing strategies to protect intellectual property, establishing business principles of division and exploitation of intellectual property generated in the course of the project, concluding agreements and consortia contracts with industrial partners);

2) sharing the rights to the results of research conducted by the staff of the University;

3) implementation of research projects and services for corporations and institutions, 4) creation of spin-off companies based on research results of the University in collaboration with Excento.

It is worth mentioning that without individual incentives of each researcher, being involved in R&D activities with further commercialization of his/her investigations, it will be very difficult to achieve high scientific results and incomes. For example, the authors of research products or innovation by Gdańsk University of Technology get 50 % of the profit from commercialization. Researchers at Stanford University receive one third of net royalties from the licensing of their inventions, because economic incentives such as royalty sharing agreements, affect the number of produced inventions and licensed revenue generated by universities which providing higher royalties to their researchers trigger more inventions and higher license incomes [10, p. 36].

It is obvious that carried out R&D activities and created research products at Ukrainian higher education and research institutions are characterized with sufficient level but very often they don't meet high European standards and are not recognized or are not output to the market. Each innovation provided by higher education institutions must be supported by internal and external rules, regulations and procedures. Nowadays in Ukraine, there is a new legislation that regulates and facilitates commercialization of research products at higher education institutions, such as the Law on Higher Education and the Law on State Regulation of Activities in the Field of Technology Transfer, the Law on Science and Scientific and Technology Activities. According to the Law on Science and Scientific and Technology Activities "scientific and R&D activities at higher educational institutions are an integral part of educational activity and are carried out in order to integrate scientific, educational and production activities in the system of higher education" [11]. For the last decade a number of offices, departments and units aimed at supporting commercialization process (patent and information departments, design bureaus, computing centers, etc.) have been established within higher education institution structures.

The process of research results commercialization in Ukraine is only on the developing stage as unlike other countries, there are almost no venture technology parks. But there are business incubators: 12 in Kiev, Odessa – 9, and in most other regions – for 12. There are also 24 innovation centres, 28 research centres, 11 innovative business incubators, 5 centres of innovation and technology transfer, 23 centres of commercial intellectual property, 21 science-intensive enterprises, 19 regional centres of scientific and technical information, 10 innovation technological clusters. [12]. Nevertheless, it is important to create a sectoral or corporate venture capital fund that should invest capital not only in its own scientific and innovation projects, but also in market projects that determine sectoral and corporate priorities [1, p. 43].

Having analysed different research papers by Ukrainian scientists we come to the conclusion that there are some problems in developing sustainable commercialization process in Ukrainian higher education institutions. We emphasize on such problems as:

1) obtaining the rights to results through a license agreement;

2) financial resources for doing researches;

3) lack of up-to-date laboratories and equipment;

4) protection of intellectual property rights;

5) venture investments;

6) underestimation of research products;

7) lack of public coordination bodies and regulation agencies;

8) no incentives for carrying out investigations and creating new high standard research products by Ukrainian researches and scholars.

The innovative steps and advanced techniques should be taken into account to develop and improve the process of research results commercialization at Ukrainian higher education institutions. Firstly, higher education institutions should be interested in creating and providing favorable environment and incentives for transforming scientific and technical developments into innovative products suitable for being produced and offered to the market. Furthermore, they must be aware of benefits gained from research results and research products. Another ways for solving this urgent problem is taking an equity position in the start-up companies or involving extra budgetary funding sources via venture capitals. In addition higher education institutions should evaluate the importance of establishing different innovative commercialization structures, such as innovative firms, business partnerships, engineering centers, educational innovation institutions, science-intensive venture structures, as well as, business incubators and technology parks.

Conclusions

To draw the conclusions from the results we should point out that commercialization of research products at Ukrainian higher education institutions could be an effective way for raising additional funds and gaining more financial independence. Ukrainian research and scientific universities with a great number of science and pedagogical staff are able to establish a strong national technology-licensing infrastructure to support the commercialization of their research products. One of the important ways for developing commercialization is to create incentives for researchers in order to motivate and increase their interests in conducting investigations for their further licensing to industry or producing. Besides, higher education institutions should be interested in establishing innovative firms, business partnerships, business incubators, technology parks, etc. Their activities and services are proved to be an efficient mechanism for the future successful development of universities.

Prospects for future research

The subject under consideration can be further researched for improving the process of research products commercialization according to new requirements and increasing interest to this sphere. Further studies need to be carried out in order to validate the detailed insights into the implementation of foreign experience into practise of Ukrainian higher education institutions and to develop commercialization process at economic, educational and legislation levels.

1. Боголіб Т. М. (2014). Комерціалізація наукових розробок університетів. *Економіка України*. – 1 (626). – С. 33–50 // available at: http://nbuv.gov.ua/UJRN/EkUk_2014_1_4 (accessed 10.08.2018).
2. Joshua B. Powers, Eric G. Campbell (2011). *Technology Commercialization Effects on the Conduct of Research in Higher Education*. *Res High Education*. May. 52(3). – P. 245–260.
3. G. Markman, D. Siegel, M. Wright. (2008). *Research and technology commercialization* // *Journal of Management Studies*, 45. – P. 1401–1423. DOI: 10.1111/j.1467-6486.2008.00803.x.
4. Фоміна Є. В. (2017). Комерціалізація наукових розробок як основний елемент інноваційної економіки // *Вісник Харківського національного університету імені В. Н. Каразіна. Серія “Міжнародні відносини. Економіка. Країнознавство. Туризм”*. – В. 6. – С. 124–128.
5. Perkmann M., Tartari V. at al. (2013). *Academic engagement and commercialisation: A review of the literature on university–industry relations* // *Research Policy*. – Vol. 42, Issue 2. – March, P.423–442 // available at: <https://doi.org/10.1016/j.respol.2012.09.007>.
6. Ashley J. Stevens and Frances Toneguzzo (2004), *Northbrook: The Association of University Technology Managers. AUTM Licensing Survey, Survey Summary* 76 p.
7. Norain Ismail, Mohd Jailani Mohd Nor, Safiah Sideka. (2015). *A Framework for a Successful Research Products Commercialisation: A Case of Malaysian Academic Researchers – Social and Behavioral Sciences*. – 195. – P. 283–292 // available at: <http://sciencedirect.com>
8. J. Wonglimpiyarat (2016). *The innovation incubator, university business incubator and technology transfer strategy: The case of Thailand* // *Technology in Society*. – Vol. 46. – P. 18–27 // available at: <https://doi.org/10.1016/j.techsoc.2016.04.002>.
9. Gdańsk University of

Technology. Center for Knowledge and Technology Transfer // available at: <https://ctwt.pg.edu.pl/consulting>. 10. Karlsson Magnus (2004). *Commercialization of Research Results in the United States An Overview of Federal and Academic Technology Transfer*. – Stockholm. ITPS, Swedish Institute for Growth Policy Studies. – 107 p. 11. Закон України Про наукову та науково-технічну діяльність // Відомості Верховної Ради (ВВР) (2016). – № 3. – Ст. 25. 12. Інноваційний розвиток технопарків в Україні і світі // available at: <http://do.gendocs.ru/docs/index-24248.http>.

1. Boholib T. M. (2014). *Komertsializatsiya naukovykh rozrobok universytetiv. Ekonomika Ukrayiny [Commercialization of scientific developments of universities. Ukraine economy.]* 1 (626). p. 33-50. Retrived from: http://nbuv.gov.ua/UJRN/EkUk_2014_1_4. 2. Joshua B. Powers, Eric G. Campbell (2011). *Technology Commercialization Effects on the Conduct of Research in Higher Education. Res High Education. May. 52(3). P. 245–260. DOI: 10.1007/s11162-010-9195-y.* 3. G. Markman, D. Siegel, M. Wright. (2008). *Research and technology commercialization. Journal of Management Studies, 45. P. 1401–1423. DOI: 10.1111/j.1467-6486.2008.00803.x.* 4. Fomina E. V. (2017). *Commercialization of scientific developments as the main element of innovation economy. Bulletin of Kharkiv National University named after V. N. Karazin. Series “International Relations, Economy, Country Studies, Tourism”. B. 6. C. 124–128.* 5. M. Perkmann, V. Tartari at al. (2013). *Academic engagement and commercialisation: A review of the literature on university–industry relations. Research Policy. Vol. 42, Issue 2, March, P. 423–442. Retrived from: https://doi.org/10.1016/j.respol.2012.09.007.* 6. Ashley J. Stevens and Frances Toneguzzo. (2004). *Northbrook: The Association of University Technology Managers. AUTM Licensing Survey, FY 2003 Survey Summary 76 p.* 7. Norain Ismail, Mohd Jailani Mohd Nor, Safiah Sideka. (2015). *A Framework for a Successful Research Products Commercialisation: A Case of Malaysian Academic Researchers – Social and Behavioral Sciences 195. – P. 283 – 292. Retrived from: http://sciencedirect.com.* 8. J. Wonglimpiyarat (2016). *The innovation incubator, university business incubator and technology transfer strategy: The case of Thailand. Technology in Society. Volume 46. P. 18–27. Retrived from: https://doi.org/10.1016/j.techsoc.2016.04.002.* 9. Gdańsk University of Technology. Center for Knowledge and Technology Transfer. Retrived from: <https://ctwt.pg.edu.pl/consulting>. 10. Karlsson Magnus (2004). *Commercialization of Research Results in the United States An Overview of Federal and Academic Technology Transfer. Stockholm. ITPS, Swedish Institute for Growth Policy Studies. 107 p.* 11. *The Law of Ukraine “Scientific and Technical Activities of the Verkhovna Rada (BBP) (2016), No. 3, cm.25.* 12. *Innovative development of industrial parks in the world and Ukraine. Retrived from: http://do.gendocs.ru/docs/index-24248.http*