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COMMERCIALIZATION OF SCIENTIFIC RESEARCH IN POLAND: PROCESS OR PROCEDURE? ORGANIZATIONAL SOLUTIONS IN SELECTED POLISH AND FOREIGN UNIVERSITIES

ABSTRACT

This article aims to illustrate the different ways of organizing commercialization processes at universities to inspire existing technology transfer offices (TTO) and increase their effectiveness. Its implementation was based on a qualitative study conducted among 4 Polish and 2 foreign (Belgian and Spanish) universities. The study results show that the standardized commercialization system doesn't exist at Polish universities. Research results present that there are many commercialization models, but it is a rather formal procedure than a system or process. Moreover, polish universities perceive TTO as a part of the administration, even if TTO's employees have ambitions to build merit potential. Finally, the challenge is combining the research process with commercialization to increase efficiency. Our research presents interesting new approaches concerning commercialization: the flipped knowledge transfer (FKT) and the community engagement research initiative (CERI). It is essential to understand that commercialization starts with a research project not with a research result or patent. Both approaches mention before focusing on social engagement in research first

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and may have an essential impact on TTO's effectiveness and the university's social impact. An interesting option is to implement CERI first and evolve it to FKT to perform university research "from the outside to the inside" approach, i.e. undertaking research work in response to stimuli coming from the social and economic environment.

Keywords: commercialization, technology transfer, entrepreneurship, process

1. INTRODUCTION

The commercialization of intellectual property of research units such as universities is not only an important statutory task but also a challenge they have been constantly trying to meet for years. It is supported by the legislator's action on the one hand, and demand-driven from entrepreneurs on the other. Both entrepreneurs and society expect science to provide innovative solutions to increase their competitiveness and well-being.

For this reason, the university's efforts in the area of commercialization are of great importance. At the same time, the commercialization of the intellectual property of universities in Poland is regularly evaluated, and its result is still not satisfactory enough (NIK, 2018). Similarly, in terms of cooperation between universities and entrepreneurs in the area of R&D, Poland occupies a very low, 94th position in the Global Innovation Index 2022 (WIPO, 2022). This result may indicate the lack of effective mechanisms affecting the willingness to undertake innovative activities and use the results of research in business practice (Szczerek, 2022). Concerning universities, commercialization was to take on a new dimension due to the conditions for the evaluation of universities for the period 2017–2021 and the Act of 20 July 2018, Law on Higher Education and Science (Journal of Laws of 2018, No. 1668, as amended). These regulations, following the previous Law on Higher Education of 27 July 2005 (Journal of Laws of 2005, No. 164, item 1365, as amended), introduced the principles on which commercialization in higher education institutions is to take place, indicating organizational conditions, reasonably leaving processes and procedures within the limits of the university's autonomy. This solution, along with the complexity of the commercialization process at universities, results in the functioning of many different models of market use of research results. (Kalinowski, 2010), (Gwarda-Gruszczyńska, 2013). In addition, there are many different models related to the innovation process (Smith, 2015; Tidd & Bessant, 2018), the knowledge commercialization process, and entrepreneurial processes (Gierulski et al., 2018). Unfortunately, the diversity of models does not translate proportionally into an increase in the effectiveness of commercialization processes of scientific research results (Łobacz & Niedzielski, 2015), especially when this process is anchored only in the administrative system and is not coupled with the implementation of scientific research, which is also often beyond the interest of the socio-economic environment (Van Den Ende & Dolfsma, 2005). At the same time, an important element of any model of the commercialization process is access to data with potential. Therefore, the following activities can ensure effectiveness in this area: 1) searching for and identifying ideas (project planning), 2) evaluation and selection of ideas/projects, and 3) their implementation as part of business practice (Tidd & Pavitt, 2018). For this reason, excellent organizational preparation of the university, deprived of access to a database of ideas with an assessment of their application in practice, will not ensure

the effectiveness of the process, and each of the above-mentioned activities is dependent on each other (Głodek, 2016).

Based on the above, this article aims to illustrate the different ways of organizing commercialization processes at universities. Its implementation was based on a qualitative study conducted among 4 Polish and 2 foreign (Belgian and Spanish) universities.

2. LITERATURE REVIEW

Commercialization is a paid or free transfer by a research unit of the right to use the results of scientific research or the sale of rights to R&D results (Wawrzynowicz, 2022). In relation to research results, commercialization is also defined as the totality of activities related to the transformation of knowledge into new products, technologies and organizational solutions or very broadly as a process aimed at transferring scientific and development results to the market (Flisiuk & Gołąbek, 2015). On the basis of Polish legislation – in accordance with the Act of 20 July 2018, Law on Higher Education and Science (Journal of Laws of 2018, No. 1668, as amended) – a distinction is made between direct commercialization, which consists in the sale of research results, development works or know-how related to these results, or putting these results or know-how into use (e.g. on the basis of a license, rental and lease agreement) and indirect commercialization, consisting in taking up shares by a scientific unit in companies. The legislator's assumption was most likely to take up shares in an existing or newly formed company as the sole shareholder or jointly with other entities or its own employees, covering these shares with rights on intangible property (Stec et al., 2017). At the same time, the Act imposes on university the obligation to adopt regulations for the management of copyrights, related rights and industrial property rights, as well as the principles of commercialization, which is specified in particular, the principles of remuneration of authors for commercialization and the rules and procedures for commercialization. Commercialization in the described form has become an important element of the functioning of universities due to the emphasis on broadly understood entrepreneurship of universities, and above all on the effective use of knowledge in practice, including especially the concept of open innovation (Bogers et al., 2019; Chesbrough, 2003) and entrepreneurial university (Etzkowitz, 2004). Previous research on university entrepreneurship has focused, mainly on stimulating innovation, developing incubation and joint ventures with business actors (Etzkowitz, 2010; Etzkowitz & Leydesdorff, 1995). Currently, the emphasis is put on three key aspects. First, university managers are expected to be entrepreneurial in formulating and implementing strategies (Novela et al., 2021). Secondly, the ability to commercialize (direct and indirect) the results of scientific research (Battaglia et al., 2021). Third, attention is paid to encouraging and empowering researchers, students and graduates to become more entrepreneurial (Guerrero et al., 2019). As a result of this approach, Romano et al. point out that modern universities are modifying their traditional roles of education and research to generate and disseminate knowledge to foster economic growth (Romano et al., 2014). It is also worth emphasizing that technology transfer and cooperation between universities, industry and government generate various benefits, providing an important source of funding for universities (Henry Etzkowitz, Andrew Webster, Christiane Gebhardt, 1966) (Miyata, 2000) (Martin, 2002) (Mustar &Wright, 2010), innovation for industry and economic development for policymakers (Gulbrandsen & Smeby, 2005) (Muscio, 2008) (Muscio, 2010).

Although the trend towards an entrepreneurial university seems inevitable, Polish universities still occupy the last places in European rankings in terms of cooperation with entrepreneurs (WIPO, 2022). It seems interesting to note that many Polish universities have not yet implemented systemic solutions in the field of commercialization of research results and technology transfer, and do not have an internal, comprehensive policy in this area (Ładziak, 2014). At the same time, representatives of the academic community have too little contact with business practice, which means that their initiatives and ideas are often impossible to be applied in practice (Orłowski, 2013). At the same time, the commercialization models functioning are in fact organizational and administrative processes, detached from other areas of university activity and not building competencies related to cooperation with business at the university (Szarek & Pachciarek, 2021). However, new concepts are emerging, accompanying consortia of young European universities built on the initiative of the European Commission, which may have an impact on the effectiveness of commercialization: the first is the flipped knowledge transfer model (Cleyn et al., 2006) and the second is the model of community engagement research initiative (Benneworth et al., 2018). However, both must function at the level of planning and implementation of scientific research. Therefore, the above raises a research question on how to increase the efficiency of the commercialization process based on existing research activities in public universities. In particular, the following issues shall be examined:

1. the process of monitoring research and scientific works,
2. the process of commercialization of scientific research results,
3. cooperation with the socio-economic environment.

3. METHODOLOGY

The qualitative research was divided into two stages. The first one involved the study of Polish units performing the tasks of a technology transfer office (TTO) or a special purpose vehicle (in the absence of a technology transfer office) at universities. At this stage, the study was conducted among four universities. The second stage included the examination of units performing the tasks of the technology transfer center in two foreign universities: Belgian and Spanish. The study used the method of in-depth individual interviews in accordance with the designed interview scenario. Representatives of 4 public universities from Poland were invited to the study, which were selected from a group of deliberately selected universities that met the following criteria:

1) an entity selected to implement a project under the Incubator of Innovation 4.0 program – the aim of the program is to support the process of managing the results of scientific research and development works, in particular in the field of commercialization;
2) a university belonging to the Polish Association of Centers for Technology Transfer (PACTT), which is a voluntary association of representatives from units responsible for the management and commercialization of intellectual property of Polish universities, research institutes and the Polish Academy of Science.

As part of the further selection of respondents, the criterion of ensuring representation in each of the following groups was adopted: a university, including a university of technology, a university operating in the field of social and humanities, a university with a special

purpose vehicle, a research university. Based on the presented research sample selection path, interviews were conducted with representatives of technology transfer centers and/or special purpose vehicles of selected universities involved in the process of commercialization of research results. Finally, as part of the study, 6 focus meetings were held in the period from 01/07/2021 to 10/11/2021.

4. RESULTS AND DISCUSSION

Referring to the first research area covering the process of monitoring research and scientific results, in the case of Polish universities, the information obtained for the first thematic area showed at the outset the lack of systemic solutions that would support the aggregation and sharing of information about research results carried out in them at the level of universities. Technology transfer offices operating within universities use all possible sources of information to identify the commercial potential of the university, e.g. an employee portal in which the researcher's profile and scientific experience (especially application/implementation) are identified. Other sources of knowledge are meetings of heads of departments, as well as information collected by patent attorneys at universities, offices/departments of science, offices/project departments, academic innovation incubators or academic portals/journals run by universities. Equally often, information about the potential of the university is collected independently by the employees of the TTO's, including through the invention application form. Although the application for an invention is an element of the commercialization process indicated in the Law on Higher Education and Science of 20 July 2018, it does not function as an element of the system for monitoring research work at Polish universities. However, it has evidential value in the case of unauthorized use of the intellectual property by an employee. A representative of one of the centers points out that scientists usually report to the unit after agreeing with entrepreneurs on the terms of cooperation, expecting the preparation and handling of documentation, seeing only an administrative unit in the center. At the same time, the respondents note that it is impossible to monitor everything, and it is certainly not about everything – the research that is evaluated on the market and can be monetized is important. A different approach was identified at the level of foreign universities surveyed – where the departments of science and innovation have been integrated into one body subordinate to the Vice-Rector for Science, in which the so-called valorization officers work on increasing the economic and social value of scientific projects. This seems to be an original organizational solution, enabling the aggregation of scientific information in one unit, additionally coupling the research process with the expectations of the socio-economic environment. The role of an innovation broker at Polish universities compared to a valorization officer at a Belgian university is also interesting. While the task of an innovation broker is usually to identify research and researchers, search for an investor/buyer and prepare the terms of the contract accordingly, the valorization officer gives economic and/or social value to the research project already at the design stage of the research. The Spanish university covered by the study takes a similar approach. The unit responsible for handling research projects implements a common policy with the unit responsible for innovation and entrepreneurship management under the counterpart of the Vice-Rector for Research and Innovation. It should be noted that innovation and its impact on the environment is an inseparable element of research. This is essential for increasing the effectiveness of the commercialization of the university's intellectual property.

It is also important to think about commercialization as a part of research, not as an optional process.

Referring to the process of commercialization of scientific research results, in the case of Polish universities, the Act of 20 July 2018 is of fundamental importance. Law on Higher Education and Science (Journal of Laws of 2018, item 1668, as amended) imposes on HEIs the obligation to adopt regulations for the management of intellectual property and the principles of commercialization. Attention should be drawn here to the procedural nature of the statutory obligation. The degree of interference of the legislator in the process itself seems sufficient. Universities, on the other hand, fulfill their obligation and introduce procedures. The university units responsible for commercialization are the core of these processes, but they indicate what role they actually play with dissatisfaction. One of the special purpose vehicles (SPV) established for indirect commercialization points to the contractual authority to manage intellectual property, but states that it plays the greatest role as a tool accelerating the pace of purchasing goods. SPV also emphasizes that the university in which it operates, despite many years, has not developed mechanisms showing the essence and seriousness of the company's operations. Subsequently, Polish units point to close cooperation with departments responsible for supporting scientific research, projects, legal advisors, and the vice-rector as a supervisor in the procedure of handling the transfer of research results and commercialization, in accordance with the regulations for the management of intellectual property. One of the leading Polish universities, covered by the study, directly states that technology transfer centers are identified in Polish universities as administration, and the commercialization process is unknown. The reason for this perception may also be the frequent service of commissioned study by technology transfer centers, which focuses less on building a business relationship, and more on handling and settlement of the order. At the same time, it should be emphasized that administrative services in this area may also be an incentive to cooperate with business, without which some scientists would not undertake this action at all. Another Polish university, subject to the study, has a recognizable certification of its procedures. At the same time, that university points out that the implemented certification system allowed for ordering the procedures in the unit. By identifying, mapping, and describing processes, they could be visualized and then optimized in the direction of shortening and simplifying the paths of dealing with matters in order to achieve the assumed goal as soon as possible as part of external and internal customer service. Priority was given to processes strictly related to transfer and commercialization, and the improved processes are documented. Through audits and management reviews, potential changes are indicated so that the system is constantly evaluating, especially in the context of changing law, obtaining information resulting from parameterization requirements, linking technology with fields of science. The above confirms the belief in the administrative approach to the organization of the ecosystem for commercialization.

The position of the academic special purpose vehicle in this respect is interesting, which in turn indicates the lack of investment opportunities, support in the area of procurement or legal services for spin-off development projects. At this point, it is worth quoting the experience of the surveyed foreign universities. It indicates having its own internal administrative and service structures, independent of the central administration, focused solely on the commercialization process, such as: legal services, patent attorneys (also verifying the results of scientific research before publication in terms of industrial potential) or external

advisory/consulting business (e.g. valuation of intellectual property, analysis of the state of the art, etc.). Moreover, the commercialization process at both universities is supported by an IT system for intellectual property management (e.g. MyIP), which was not identified in the surveyed universities in Poland.

When examining the third research area, i.e. cooperation with the socio-economic environment, it can be noticed that it is no different in the case of customer relationship management systems. None of the surveyed entities from Poland had such a tool.

At the same time, entrepreneurs apply to universities through various channels: directly to scientists, vice-rectors, deans or through technology transfer centers. Those, in turn, do not have a common information exchange platform and operate independently of each other. A representative of an academic special purpose vehicle says: "I was informed that the company has met with the authorities and I have not been invited." Despite many procedures, complexity and formalization of commercialization, the way companies reach universities is basically unregulated and often accidental. Entrepreneurs do not know who to contact at the university to establish cooperation. There is chaos in this area, and as a consequence, there is no specific answer for business and no cooperation with it. At the same time, scientists do not know how the process of cooperation with the socio-economic environment works: who prepares the contract, what is the path of document approval, who is authorized to make decisions and represent the university outside.

Referring to cooperation with the environment at the foreign universities surveyed, the approach at the level of research policy is surprising. One of them indicates that the directions of development in this area are determined by the vice-rector responsible for development and valorization (currently 3, including smart cities), and research projects are financed for identified problems of the socio-economic environment. The commercialization process is supported by a technology transfer center type unit, but structurally included in the innovation and research office.

It seems that the constantly insufficient state financial outlays for science may change the perception of cooperation with the social and economic environment in favor of diversifying the sources of financing research at universities and seeking them in business. This need could, in turn, accelerate the introduction of innovations in Polish companies. It is very important to observe a representative of one of the Polish research units that a special purpose vehicle set up to commercialize research results (implicitly also a technology transfer center) should shine with the brilliance reflected from the university.

5. CONCLUSIONS

In light of the study, commercialization in the examined Polish universities operates primarily based on a formalized administrative procedure. Usually isolated from the research process and without systemic support at the university, commercialization is perceived by the academic community as an unclear, complicated procedure. Employees of technology transfer centers and academic special purpose vehicles give it a business flair. Individuals involved in the commercialization process aspire to be the dominant party in initiating and implementing cooperation between universities, scientists, and business. At the same time, they want to obtain information from scientists on their research and scientific works at the earliest possible stage of their undertaking in order to increase the effectiveness of commercialization

activities. At the same time, TTOs and special purpose vehicles would like scientists to come up with ideas for the commercialization of their research results, but they do not see any interest in this, and they treat cooperation with an individual as a formal requirement rather than a chance for market success. Although researchers are encouraged to cooperate with innovation support units, usually as a part of targeted meetings organized by innovation brokers at individual faculties, speeches at Faculty Councils (Disciplines), initiated individual meetings with scientists with high research and commercialization potential, instruments for evaluating and rewarding researchers in the case of commercialization are relatively rarely used.

Certainly, procedures cannot replace the commercialization process, which is why a strategic approach is necessary, evolving towards the formula "from the outside to the inside", i.e. undertaking research work in response to stimuli coming from the social and economic environment. It seems that this is the path chosen by foreign universities covered by the study, implementing the approach in the formula of the Community Engagement Research Initiative (CERI – social involvement in scientific research) and Flipped Knowledge Transfer (FKT – reverse knowledge transfer). The first, CERI, is based on the inclusion of communities, including the local community, in scientific research. It is a process that includes the input of people who will be affected by the research results and involves such individuals or groups as equal partners in the research process (Benneworth et al., 2018). The second, FT (Cleyn et al., 2006), is based on a demand-side approach to knowledge and technology transfer in research organizations where the leading driving force for take-up is the social and economic environment, in particular start-ups for which academic knowledge can affect competitiveness (Cleyn et al., 2006).

Both approaches became an inspiration for the construction and implementation of a pilot model of commercialization support at the Nicolaus Copernicus University in Toruń. The Centre for Academic Entrepreneurship and Technology Transfer at NCU as an internal organizational unit of the technology transfer centre type has started the process of implementing this model. It is based on active cooperation between the unit and the research team, whose research project has not been verified by the market before. For this reason, the first step is to gain knowledge about the market in order to identify stakeholders. Others include: identifying and building end-user communities, verifying buyer needs, and building strategic partnerships in production, distribution, research and development. The construction of partnerships also includes the joint implementation of projects aimed at the best possible matching of research results to market requirements, and thanks to external funds, the financial risk of both parties will be minimized. The acquired knowledge is to be the basis for creating a prototype and market entry strategy. The pilot teams operated by the Centre can exemplify social engagement as part of market success and stimulate technology transfer at the University to a demand-driven approach.

Each of the indicated formulas actually touches on the approach to the strategy of conducting scientific research. Thus, by answering the research question, by coupling the commercialization process with research at the university, you can increase the efficiency in commercialization. It is obvious that the private sector is not able to undertake basic research, which is an important element of the activities of public universities, however, a change in the approach to designing research in universities responding to strategic branches of the economy may affect the effectiveness of the commercialization process. Meanwhile, the results of the survey among Polish scientific units indicate that it has not yet been possible to build a commercialization system, but only administrative procedures, based on a statutory obligation.

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