

ACADEMIC ENTREPRENEURSHIP – CONCEPTUAL FRAMEWORK AND EXAMPLE FROM POLAND

Kamil Bąk

e-mail: kambak86@gmail.com

Koźminski University, Poland

Abstract. The article is devoted to very important subject of Academic Entrepreneurship. Author tries to describe state of the art by reviewing various articles presenting most recent approaches to different aspects of this subject. Review emphasize the complexity of the problem and numerous factors determining the success of the institutions in their entrepreneurial endeavors. Second part of the paper describes the case from Poland – Technology Transfer Office of University of Warsaw. In the last part author presents identified areas for further research and investigation as well as comments on current state of Polish AE and proposes some possibilities for development. Important finding states, that for business success investment in social capital and attitude change may be equally important as capital investments and policymaking.

Key words: academic entrepreneurship, innovation, spin-off, license, science-business collaboration, technology transfer.

Introduction

This paper aims to present the state of the art of Academic Entrepreneurship (AE), allowing for understanding of the most recent trends in this subject and trying to identify the fields for further researches to be conducted. To achieve this goal author has reviewed the publications about AE (mostly from the recent decade) and chosen the sample to present various angles of this subject. They complement each other to present wider perspective, however in some cases the undertaken research resulted in opposing or more controversial findings. First part of the article is trying to present the theoretical background and main concepts of this crucial for economy process. Author reviews various researches and articles regarding various perspectives of this subject. In second part, author presents the example from Poland, how the process of technology transfer is organized by University of Warsaw. In the last part, findings are summarized and commented, also the recommendations for further development are presented.

Academic Entrepreneurship is a relatively young concept in the Management Science. Entrepreneurial University was described for the first time in 1983 by Etzkowitz in the discussion about application of American academic

science in commercial environment. Since then, the concept was developed in various countries and became an important part of modern economies. Effectively, the whole process of creation, protection and commercialization of intellectual property was organized with the whole framework surrounding it.

To understand the idea of Academic Entrepreneurship it is vital to become familiar with concepts and definitions of entrepreneurship, innovation, technology transfer, spin-off, license, collaboration. All those elements are interfering with each other and allow to understand the whole process.

Entrepreneurship

Since the research and work of Schumpeter (1934), multiple definitions of entrepreneurship were developed and presented. Disregarding all the minor differences, there can be a unified core part identified in most of them. It states that entrepreneurship is a set of actions that combine various resources in order to produce new goods or services. It always includes the risks as the outcomes of the process are uncertain. It needs to be organized, to create the whole process leading to expected results. And lastly it should be innovative in a certain way, that it is not just replicating the existing solutions (Shane 2004).

Innovation

For many years scholars have attempted to define and explain innovation. Despite their efforts, it seems there is still no agreement on single definition of this concept. In public debate, innovation is very popular concept, extensively used on various occasions, among many groups of stakeholders. Almost every day, we can hear or read in the media about building the competitive economy based on the innovation. Support for the innovative solutions and enterprises is widely debated. However, to make discussions more effective it should be agreed at the beginning what is understood under this definition. Some groups may read it as a disruptive kind of innovation with impact comparable to the creation of wheel, digital camera, Skype or Facebook. For the others innovation is presenting new, more effective or efficient way of conducting the same old process. Both approaches are correct and have support in the literature, but for the sake of e.g. creating policies on a government level, it is important that the idea and its understanding is unified and precise. One the most recognized and widespread definition was created by Peter Drucker (1985) “*The practice of innovation is the specific tool of entrepreneurship, the means by which they exploit change as an opportunity for different business or a different service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced. Entrepreneurs need to search purposefully for the sources of innovation, the changes and their symptoms that indicate opportunities for successful innovation. And they need to know and to apply the principles of successful innovation*”. Later he was leading numerous studies about inno-

vation subject in his career, but this basic understanding is sufficient for the purpose of this article.

Technology transfer

Technology transfer (TT) became very important part of the economy in last couple of decades, therefore is a field of multiple researches and studies. The importance of the subject is emphasized by publishing a dedicated Journal of Technology Transfer. It can be briefly described as a process of passing the intellectual property (IP) to another party for an agreed remuneration (usually certain amount of money). Transfer is a crucial step in commercialization of technology, and allows further business development and use. For universities, well organized and effective Technology Transfer Office (TTO) is one of the most important elements to become successful in its entrepreneurial proceedings. It is the unit, which supports the commercial endeavors of scientists and as a technology broker it connects the needs of both sides, of business-science equation at any stage of collaboration. It can help to organize the funding for the research as well as offer to the market technology already developed at the university. What is important, studies of Powers and McDougall (2015) proved that TTOs age is positively correlated with its significance for commercial success of the institution. Along with gathered experience, TT officers were open to more sophisticated commercialization methods, utilizing their expertise in such a complex process. From the same study, another factors were identified to have impact on effectiveness of university technology commercialization. Among them faculty quality, R&D spending of the industry and generosity of venture capital proved to predict success in that area. What might be surprising, there was no such a positive correlation with numbers of patents. Reason for that might be vast number of other factors affecting the extensive way from filing the patent to commercial success of innovation. More details about particular TT methods will be described further part of the article.

1. Various aspects of academic entrepreneurship

All previously presented definitions give wider perspective on Academic Entrepreneurship and allow for better understanding of the concept. Previous paragraphs offered the description of Entrepreneurship. One of its specific types is AE. It can also be approached wider – adding Academic based Entrepreneurship – then it would include all enterprises created by faculty and students, not only those exploiting the technology or IP created at their institution (Osiri et al. 2014). Core AE, where IP created inside the institution is used, can be further divided in two categories. First one is the most common understanding of AE – commercialization of technology via TT, it may also be referred to as ‘hard’ type of AE. The ways of transfer include: creation of spin-off company, licensing, selling the technology. Majority of scientific papers about AE are

dedicated to this one. One of the reasons for this can be ease of measuring its effectiveness by numerical parameters (number of spin-off companies, value of sold licenses, number of staff etc.) (Osiri et al. 2014). Second category includes all the actions that are entrepreneurial in nature and can result in any financial reward (either for them individually or for their institutions. This may include any type of commercial collaboration like: consultancies, sponsored research, cooperative programs. This category is much wider and includes much more activities which are not in scope of typical TT. Those more informal methods of partnership may be more frequent for some science fields like: humanities, social sciences – where technology transfer is usually not the case (Abreu et al. 2013). Informal ways of technology transfer, such as collaborative research, contract research, consulting, providing ad hoc advice and networking with practitioners are also referred as academic engagement (Link et al. 2007; Siegel, Wright 2015) propose very different approach. Their groundbreaking article propose to look on the whole subject from a new perspective. According to their findings, AE needs to be analyzed much wider, as roles of stakeholders have changed dramatically in recent years. The new position of the university in the AE process and the framework for further research in this new perspective of AE is proposed by authors.

For the purpose of this article AE will refer to the first category, i.e. mainly formalized process of technology transfer.

Success factors

Another group of studies investigate the personal motivation and characteristics of Academics involved in the entrepreneurial activities. Number of factors affecting success of business endeavors in academic world is very wide. Giuliani et al. (2010) reviewed different factors, which may generally be divided into three groups – institution, organizational and individual. All of them are equally important for the final success and neglecting any of those groups may be the reason why some institutions are performing better than the others. Many studies focus on understanding who are the scientist most interests in various types of collaboration. They identified the impact of country (e.g. Azagra-Caro et al. 2006), field of the conducted studies, as well as the sex and age (Klofsten, Jones-Evans 2000; O'Shea et al. 2005). The faculty experience, cannot also be ignored, however some articles suggest that many institutions put to big focus on experienced professors with decades of research, numerous publications, and not taking into account the meaning of young scientists, including PhD student, who will take over their positions in the future (Bienkowska et al. 2016). This factor is especially important while working on policies regulations and streaming the resources in the new solutions and fields One of the studies proved that the level of government funding for certain scientific field or a group can highly affect willingness of individuals to start a business (Bo-

zeman, Gaughan 2007). The influence of peers' behaviors cannot be neglected – working within a group active in commercial collaboration, can highly increase the chance of individual decisions to cooperate with business.

Personal characteristics of entrepreneurs are correlated with the type of activities they are involved in. That imply the need for acceptance of certain risks and focus on applicability of their actions to achieve the expected commercial results in the most effective way. Scientists, however, are usually focused on exploring unknown areas and contribution to scientific environment. Many of their projects are dedicated to an extremely narrow field with no guarantee of further commercial benefits. This could lead to a conclusion that by default those two groups are presenting different behaviors. In contrary to that approach, some studies present the research results, proving that both entrepreneurs and scientists share some common characteristics. This might be the result of the fact that in many countries, process of patenting results of the research and commercializing it on the market, already fell into typical scope of scientists' duties (Lee, Rhoads 2004). Some authors propose, to look at those similarities as a possible source for further research. That could allow to determine, how this fact could be used by authorities to motivate scientists for more engagement in entrepreneurial activities (Sinell et al. 2015).

2. Limitations of previous studies

Researchers already approached the subject from various angles. However due to the fact that the area is relatively young, and most of the articles fall into the last decade, it can be concluded that there is still many opportunities for further development in area of AE. This is also supported by the fact that new definitions of AE arise, what opens space for another researches and studies (Siegel, Wright 2015). Some reviews proved that the growth number of publications about AE is still lower compared to core entrepreneurship (Osiri et al. 2014).

There are some limitations, identified by the author during the review of existing literature. Firstly, there is always a need to choose proper sample for any detailed research. High quality review of the whole population – all research centers and universities from various countries would be impossible to conduct due to resource limitation. That leads to other issue. Many of the studies have been exposed to a school, discipline or country bias. That means the sample was too small and therefore not diversified or too homogeneous. Most of the studies were located in highly developed countries – United States of America, United Kingdom, Germany or Scandinavian countries. There is also limited number of studies from developing economies, but they were able to present that the motivation and factors affecting entrepreneurial behaviors, as well as the whole process can be very different for those cases (Bernasconi 2005). The same problem is linked to choice of University or discipline for a research

– visible tendency to concentrate mostly on the successful cases and known leaders, can affect the ‘whole picture’. Effectiveness of the process varies among the departments of a single University, and can be very diverse for the whole region or country.

3. Example from Poland – University of Warsaw

Poland is not a leader in the area of business-science collaboration. According to Global Innovation Index Report (2015) Poland was ranked 46th in general classification. That was the second worst (26th) result among EU countries (only before Romania) It was even worse in terms of efficiency – where the inputs on innovation were compared with its effective output – the 93rd position (out of 141 countries). That leads to the clear conclusions. High spending on the innovative infrastructure cannot guarantee the commercial success. It is vital to create well-structured processes and policies, allowing to properly streamline the resources, spent on the innovation. It is necessary to remember that big part of technological solutions is created at the scientific centers, it is crucial not to overlook the importance of business – science relations. Effective regulations and policies could present the possibility to coordinate and efficiently utilize existing infrastructure in the future. Research conducted for Eastern Europeans countries confirmed the importance of Higher Education development in creation of competitive knowledge based economy (Fotea, Guju 2016). Very important aspect is a social capital. Brendzel-Skowera (2016) described the European paradox of problems with low efficiency of commercialization, despite the taken efforts. One important finding is that internal university regulation alongside with social capital and lack of trust are major problems.

It was determined in previous paragraphs that success of commercialization is determined by vast number of factors on the multiple levels. The highest one would be the government regulations and institutions. In Poland central institution for business-science collaboration is National Center for Research and Development (NCBiR) runs projects (e.g. financial grants) with aim to ignite science – business collaboration. As stated on their website: *“The National Centre for Research and Development is the implementing agency of the Minister of Science and Higher Education. It was appointed in the summer 2007 as an entity in charge of the performance of the tasks within the area of national science, science and technology and innovation policies. When it was founded, it was the first entity of this type, created as the platform of an effective dialogue between the scientific and business communities.*

The Center plays also an important role in managing government and EU funds for the researches and granting it through the various programs. One of the examples can be Bridge ALFA – a seed level funding for technological startups/ spin-offs. In first half of 2016 the center changed the whole board. That also led to the change in strategy and policies within NCBR. One of the

main goals is closer cooperation with business and more engagement from this side in business-science relations. However, it needs some more time to properly assess the effects of undertaken changes.

Next level are Scientific Institutes (currently more than 100 in the country), most of which are organized with affiliation of different universities. The biggest ones have already created their TTOs.

University of Warsaw is one example of the institution which has formally organized the process for commercialization of technology. It consist of 3 different bodies responsible together for the whole process.

Inkubator UW – is a system of business incubators. They are responsible for promoting entrepreneurship among students and faculty. Support is given from the very early stage of business idea. They are managed together with AIP (Akademickie Inkubatory Przedsiębiorczości – which stands for Academic Entrepreneurship Incubators), a countrywide network of incubators. What is worth mentioning, it allows for development of any kind of business ideas, by students, faculty and alumni. It is mostly focused on Academic based entrepreneurship, therefore it is not reviewed in the details.

UOTT – University Technology Transfer Office (TTO) The office is supporting scientists from the University to protect the intellectual property from their researches, studies. Allows them to file the patents and leading them through the whole process. At the stage of creation spin-off projects are send to UWRC.

UWRC – is responsible for revenue side of the process. It is organized as a Special Purpose Company, wholly owned by University of Warsaw. It supports creation of the spin-off, and its development. It takes equity share, which spin-off company is obliged to buy back after finished cooperation (maximum 5 years). On top of that it offers three ways to commercialize the project:

- license – granting the rights to the Intellectual Property in return for the agreed percentage of revenue. Split of the income is transparent and set by the UW regulations
- spin-off Company – creating a new venture, usually led by one of the research team members. It can also be a user of the license
- selling the rights – one time transaction to sell the rights for the technology. Split of the income is also regulated.

Beside the main scope of duties the office is also organizing various projects to promote entrepreneurship among the faculty and students, offers legal advisory and Intellectual Property related consultancies.

UOTT is operating since 1998, but it probably was not very active at the beginning. All the spin-off companies in its portfolio were founded no more than a few years ago. This fact is showing some alignment to the trends of leading institutions from other countries. On the other side, according to previously mentioned studies, it may take some time for the TTO to gain the expertise necessary to compete with the leading institutes.

More TTOs are organized by other technical universities. All of them could be possible sample for very valuable researches – from the organizational side, to compare them with the most effective TTOs from other countries. Other streamline of research could include scientist and staff of TTOs, their motivation and individual characteristics.

Conclusions and recommendations

In conclusion, the paper presented various aspects of Academic Entrepreneurship and its application in Poland. The definition of AE was located in comparison with general entrepreneurship and various types of AE were presented. Author also reviewed existing literature to present various angles of the subject and researches conducted before. The best described area seems to be Technology Transfer, especially at the level of leading Universities in United States or United Kingdom. In contrary, areas of motivational aspects, ‘soft’ science-business collaboration and all aspects of AE in developing countries could still highly benefit from further research.

Presented example from Poland proved that the whole process needs a lot of improvements. At the time the paper is prepared there are numbers of actions undertaken by the government to support business-science cooperation, including changes in NCBR, legal regulations, policies and surrounding institutions. Effects of those actions could be possible to measure and describe within a few years from implementation. Currently it is possible to conclude from previous years, that high government spending on the scientific infrastructure, without proper regulations and building social capital is not sufficient for success in technology commercialization. As the article described, many studies proved that the whole process is much more complex and success needs coordination on various levels. Very important aspect is also attitude and social capital among academics. Poland still suffers from lack of trust among many stakeholders, not only between business and science but also among groups in the same environment. Breaking those barriers is necessary to proceed to the next level of economic development. Effectiveness of described TTO of University of Warsaw (UWRC) is also difficult to assess at this stage, however it seems to confirm the study mentioned before, that its effectiveness is highly correlated with the age of TTO and experience of its staff. Conducting a case study research of Polish TTOs would be very beneficial and recommendations and findings from detailed study could improve their effectiveness.

References

- Abreu, M., Grinevich, V. (2013), The nature of academic entrepreneurship in the UK: Widening the focus on entrepreneurial activities, *Research Policy*, 42(2): 408-422.
- Azagra-Caro, J.M., Archontakis, F., Gutiérrez-Gracia, A., Fernández-De-Lucio, I. (2006), Faculty support for the objectives of university – industry

- relations versus degree of R&D cooperation: the importance of regional absorptive capacity, *Research Policy*, 35(1): 37-55.
- Bernasconi, A. (2005), University entrepreneurship in a developing country: The case of the P. Universidad Católica de Chile, 1985-2000, *Higher Education*, 50(2): 247-274.
- Bienkowska, D. Klofsten, M., Rasmussen, E. (2016), PhD students in the entrepreneurial university-perceived support for academic entrepreneurship, *European Journal of Education*, 51(1): 56-72.
- Bozeman, B., Gaughan, M. (2007), Impacts of grants and contracts on academic researchers' interactions with industry, *Research Policy*, 36(5): 694-707.
- Brendzel-Skowera, K. (2016), Paradoxes in the development of academic entrepreneurship, *Research Papers of the Wroclaw University of Economics*, 419: 33-42.
- Drucker, P. (2014), *Innovation and entrepreneurship*, London-New York: Routledge.
- Etzkowitz, H. (1983), Entrepreneurial scientists and entrepreneurial universities in American academic science, *Minerva*, 21(2/3): 198-233.
- Etzkowitz, H. (1998), The norms of entrepreneurial science: cognitive effects of the new university-industry linkages, *Research Policy*, 27(8): 823-833.
- Fotea, A.C., Guju, C. (2016), Historical and theoretical framework of the relation between higher education institutions and the process of regional economic development, *Entrepreneurial Business and Economics Review*, 4(1): 23-42.
- Giuliani, E., Morrison, A., Pietrobelli, C., Rabellotti, R. (2010), Who are the researchers that are collaborating with industry? An analysis of the wine sectors in Chile, South Africa and Italy, *Research Policy*, 39(6): 748-761.
- Global Innovation Index – 2015 report, available at: <https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2015-v5.pdf> (accessed 30 April 2016).
- Klofsten, M., Jones-Evans, D. (2000), Comparing academic entrepreneurship in Europe – the case of Sweden and Ireland, *Small Business Economics*, 14(4): 299-309.
- Lee, J.J., Rhoads, R.A. (2004), Faculty entrepreneurialism and the challenge to undergraduate education at research universities, *Research in Higher Education*, 45(7): 739-760.
- Link, A.N., Siegel, D.S., Bozeman, B. (2007), An empirical analysis of the propensity of academics to engage in informal university technology transfer, *Industrial & Corporate Change*, 16(4): 641-655.
- NCBiR, available at: <http://www.ncbir.pl/en/> (accessed 28 April 2016).
- O'Shea, R.P., Allent, T.J., Chevalier, A., Roche, F. (2005), Entrepreneurial orientation, technology transfer and spinoff performance of US universities, *Research Policy*, 34(7): 994-1009.
- Osiri, J.K., Miller, D.R., Clarke, L., Jessup, L. (2014), Academic entrepreneurship: technology transfer in higher education, *Journal of Entrepreneurship Education*, 17: 39-61.
- Powers, J.B., McCougall, P.P. (2005), University start-up formation and technology licensing with firms that go public: a resource-based view of aca-

- demic entrepreneurship, *Journal of Business Venturing*, 20(3): 291-311.
- Schumpeter, J.A. (1934), *The theory of economic development*, Cambridge: Harvard University Press.
- Siegel D.S. Wright, M. (2015), Academic entrepreneurship – time to rethink?, *British Journal of Management*, 26(4): 582-595.
- Shane, S. (2004), *Academic entrepreneurship: university spinoffs and wealth creation*, Cheltenham: Edward Elgar.
- Sinell, A., Heidingsfelder, M, Schraudner, M. (2015), Entrepreneurship and academic employment – more alike than you'd think, *Journal of Technology Management & Innovation*, 10(3): 1-10.
- UOTT, available at: <http://www.uott.uw.edu.pl/> (accessed 26 April 2016).
- UWRC, available at: <http://uwrc.pl/> (accessed 26 April 2016).