CONDITIONS FOR TRANSFERS OF KNOWLEDGE IN POLAND
AND HIGHLY DEVELOPED COUNTRIES

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Summary

Transfer of knowledge in highly developed countries consists in trilateral cooperation between science, business and R&D (research and development) units. The present article offers an analysis of the conditions for the transfer of knowledge in highly developed countries. The theoretical considerations are illustrated with examples from the U.S., Finland and other selected OECD (Organisation for Economic Co-operation and Development) countries. In conclusion, some recommendations are given concerning the improvement of knowledge transfer in the Polish political-economic conditions.

Keywords: transfer of knowledge, model of transfer of knowledge, academic spin-offs, incubator of entrepreneurship, political-economic conditions for transfer of knowledge

1. Introduction

Contemporary conditions make scientific research units (including universities and higher schools) face the necessity of implementation of constant changes and improvements. As a consequence, there is a growing interest in collaboration between science and the sphere of business as well as a search for such solutions that would give both partners measurable profits.

Although such ties are still rare in Poland (stronger relations of this type can be observed, among others, in the United States, Canada, Germany, Sweden or Finland), both enterprises and scientific research units increasingly frequently perceive transfer of knowledge as a source of thus far underrated uniqueness, and, consequently, a chance to become more competitive in the constantly changing, turbulent surroundings.

In spite of the fact that enterprises are aware of the positive aspects of involvement in collaboration with scientific research units, in reality they still rarely cooperate with them or do not manifest any interest at all. The reason for this are several barriers such as: high transaction costs, the uncertainty of whether the enterprise is going to succeed, high informational asymmetry separating potential partners as well as asymmetry between the period of financing of the developmental activity and the period of waiting by enterprises, which are oriented at short-term results. Those factors very often constitute barriers unacceptable for one of the parties.

The aim of this article is to present some solutions pertaining to knowledge transfer in highly developed countries using the example of the U.S., Finland and some selected OECD countries, as well as to indicate the conditions of their functioning. In conclusion, some recommendations are
made concerning the improvement of knowledge transfer in the Polish political-economic conditions.

2. Theoretical solutions concerning knowledge transfer

For highly educated inhabitants of highly developed countries knowledge is one of the basic products. The issues related to knowledge and its management are gaining increased attention [1, 161–174].

Two processes make up knowledge management: knowledge creation and its transfer [18, 1441–1456; 24, 421–439]. Creation of knowledge is closely related to innovation in products and services [22, 450–463].

Knowledge transfer is a process that puts knowledge into practice. It relies on the flow by which largely tacit knowledge, not technology *per se*, is transmitted among people from one unit (the source: a single person, group or organisation) to another (the recipient), with all kinds of feedback loops [8, 291].

In the academic context, knowledge transfer embraces the processes of transferring research, skills, experience and ideas within universities and from universities to a greater community of users – including the business sector – for the purpose of increasing economic returns from this investment and achieving cultural, educational and social benefits for the society. This definition covers the forms of knowledge transfer and technology transfer [10, 39].

Effective knowledge transfer means accumulation or acquisition of new knowledge in the recipient. Knowledge transfer pertains to "transmitting of well-organised and interpreted pieces of information; however, not always must this information be of a strictly technical kind, it can be the knowledge of economy or production management, organization and marketing." [26, 34].

Knowledge transfer is not easy to understand or practise, especially in the face of a lack of a clear-cut definition or a proven best practice for the transfer of knowledge. In-general, knowledge transfer is about identifying the knowledge that already exists (the accessible knowledge), acquiring it and subsequently applying this knowledge to develop new ideas or enhance the existing ideas in order to make a process faster, better or safer than it would otherwise be. So, basically, knowledge transfer is not only about exploiting accessible resources i.e. knowledge, but also about how to acquire and absorb it well to make things more efficient and effective [13, 122].

2.1. Types of knowledge transfer

We could, following Nancy M. Dixon, make a division into 5 types of knowledge transfer (table 1): serial, near (imitation), far (imitative), strategic and expert, basing on the following criteria:

- the character of knowledge which is transmitted in a given manner,
- the repetitiveness of the circumstances in which knowledge becomes needed,
- the degree of similarity of the tasks in the realisation of which knowledge becomes indispensable.

In the case of serial knowledge transfer, the team, being both the source and the recipient of knowledge, may learn to avoid repeating costly mistakes, achieving at the same time an increase in the effectiveness of their performance and in the speed and quality of their decision-making.
Near transfer allows for relocation and, consequently, for the application of explicit knowledge from one location to another. In the economic reality, transfer of this type normally occurs in the course of transmission of the so-called Best Practices.

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<th>Table 1. Five types of knowledge transfer</th>
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Far transfer is mostly based on reciprocal interpersonal relations. It normally occurs at the recipient’s wish. Basically, it is oriented at the acquisition of knowledge crucial in solving a specific problem, often very narrowly specialised. In principle, using this type of knowledge transfer leads to achievement of significant effects in case of costly decision-making.

Strategic transfer is used in case of very complex problem solving. The use of this kind of knowledge transfer, and, consequently, of the knowledge characteristic for this model of transmission, sometimes results in effects for the system as a whole, which distinguishes this manner of
knowledge transmission from the far transfer, whose effects have a more limited range – they usually relate to the particular teams or organisational units.

Expert transfer of knowledge is inevitably connected with specific problems exceeding the range of knowledge of the team facing them – in such situations expert knowledge from a given field turns out indispensable. In such situations there appears a fear of not being able to grasp or properly receive the transmitted information because of the varying levels of abstraction in the transmitter and in the recipient.

Summing up, knowledge transfer assumes different shapes depending on the type of knowledge transmitted and on the kind of tasks for the execution of which the given range of expertise is needed. Also, the circumstances under which the given range of expertise is to be exploited are of great importance. Nevertheless, it seems that what counts most is not the division itself but the comprehension of the differences resulting from its use and, at the same time, determining it – only adequate selection of the manner of transfer will make it effective.

3. Transfers of knowledge in Poland

Spin-off companies are widely regarded as subjects transferring knowledge and technologies not only from higher schools to businesses. Studies of academic spin-offs in the US and Western Europe indisputably point to the importance of large firms as buyers of the high-tech product, process technologies, and research services provided by academic spin-off firms [23, 190]. In the early years of transition, the lack of ‘buyers’ of high-tech products and services became an acute problem and the academic spin-offs in Eastern Europe suffered the dismantling of the large corporate structures in the economy, especially in the ‘second wave’ countries of EU enlargement. Both large enterprises and those from the SME (small and medium enterprises) sector were then contending with what were key problems. Large enterprises were often directed by managers who did not know what rules applied in practice in the market economy. Mistakes in decision-making as well as the necessity of restructuring were frequently a cause of their fall. In Poland enterprises of the SME sector, coming from the relatively numerous at the time of centrally planned economy sector of small private enterprises, were taking care of meeting the high demand and finding investors. Therefore, there were no subjects interested in shaping knowledge-transfer-creating connections, as ready-to-implement solutions were expected, such that would ensure quick returns on the money invested.

Polish higher schools of learning survived the period of transformation maintaining in fact their status quo, i.e. trying to conduct scientific research at increasingly smaller factual expenditure on scientists’ payments, and therefore contending with the problem of researchers leaving for work in business enterprises. However, scientists did not go to businesses in order to conduct research there, but simply to get a better salary than they were getting in higher academic institutions. Thus, a great number of talented Polish researchers fell out of the stream of scientific life, sacrificing their skills for work at workstations characterized by relatively low requirements as compared to their qualifications. At present Poland is making up for that period, increasing the total number of researchers per thousand labour force. However, Figure 3.5 is the total number of researchers per thousand in the labour force in Poland, in comparison to 5.6 in the EU, 9.3 in the US or as much as 15.3 in Finland, the country to be discussed later on, which leaves a lot to be desired. [4, 52–53].
Such problems have arisen so that Polish scientists got a chance to have a more intensive development and due to that growth an increase in salary practically only thanks to the EU. The plan of development for the EU under the name of the Lisbon Strategy is crucial (in spite of the fact that the results of the realisation of this plan from 2000–2010 have been ranked as very poor). The Innovative Economy Operational Programme 2007–2013 is the main vehicle in Poland for pursuing the objectives of the Lisbon Strategy. The purpose of the Innovative Economy Operational Programme is to improve the coherence of policies toward innovation that fall within the competence of the Ministries of Economy, Science, Tourism and Informatisation. In particular, it aims to adapt the activities of the science sector to the needs of enterprises – especially SMEs – and to create a better interface between the science and business sectors in order to more effectively transfer advances in science to the wider economy [17, 90].

Spin-off enterprises, and especially academic spin-offs, play an important role in knowledge transfer. It is extremely difficult to assess the number of spin-off enterprises in the Polish economy. The main reason for this is the fact that their basic features are extremely difficult to capture using statistical methods. Certain achievements in this measure may be noted only with spin-offs originating from university and research institutions which have formally executed a knowledge transfer from their parent unit (e.g. in a form of a license, a sale of a patent or a contribution of intellectual property rights).

As far as Poland is concerned, the number of academic spin-offs established since the 1990s can be estimated as circa 80–100 units. This number refers to the calculations assuming strict criteria for definitions and, in particular, taking for granted an execution of a formal transfer of technology. If somewhat less strict criteria were to be accepted and if the enterprises established by higher education staff with no regulation of the question of intellectual property were to be taken into consideration, this number would increase at least 12 times or so [9, 18].

Summing up, an optimistic statement may be risked that the number of spin-offs may increase in the years to come, in light of the Eurostat data [5], which clearly indicate that from 2005–2010 gross domestic expenditure on R&D by source of funds displayed a growing tendency in Poland as far as financing of R&D from the state budget and from foreign sources were concerned (which is connected with EU funds), and, unfortunately, a falling tendency – as far as financing of R&D from the budgets of business enterprises was concerned. It will provide more favourable conditions for the development of spin-off firms created on the basis of knowledge and achievements of higher education institutions in Poland, but in the area of knowledge transfer stimulated due to the funds from enterprises there still remains a lot to be accomplished.

4. Conditions for transfers of knowledge in the U.S.

In the past 15 years (1990–2005) it has been possible to observe a growth in the United States of small business management and entrepreneurship courses offered at both two- and four-year college and university levels. This expansion of the educational offer was partly fuelled by the dissatisfaction voiced by students and accreditation bodies [20, 25–40].

Business innovation in the States is fuelled by highly competitive markets, advanced financial, property rights, labour flexibility, university infrastructure and government support of R&D, directly and through procurement. There is also a unique, multi-faceted system for nurturing high-
impact entrepreneurship, which provides a lot of valuable insight for other countries. In the States, entrepreneurship is a result of the long-developed cultural and educational environment.

Entrepreneurship education is extensive and varied, from high schools through to doctoral training, which fosters entrepreneurial risk taking. The U.S. Small Business Administration also offers a range of courses that keep small business owners abreast of developments in their industries and teach them to deal with problems faced in managing and expanding their companies [21, 1–22]. There exist programmes at Babson College, Case Western Reserve University and Syracuse University which retrain the interested faculty from other disciplines to teach entrepreneurship. Other universities hire former government officials, top managers from different companies and entrepreneurs to teach their entrepreneurship courses [27, 167].

Universities in the U.S. are part of the “triple helix” of university-industry-government as well as the trilateral networks and hybrid organisations created in the overlap of the three, with technology transfer constituting a major part of each [6, 109–123].

The solution of spin-offs from university research are a common goal and important intermediating entities between the academic research and the commercial world [7, 339–347]. The U.S. science parks have been created in order to increase the possibilities and profitability of the commercialising university research [15, 515–528].

What is more, HEIs (institutions of higher education) are now noticed as “an important element in a region’s knowledge infrastructure, and the knowledge infrastructure, to a large extent, decides the success of a region in today’s knowledge-based economy” [19, 4].

There is also a huge impact of science parks with an incubator to attract entrepreneurs with higher levels of education. It prompts a lot of enterprises to adopt advanced technologies, participate in international R&D programmes and make collaborative arrangements, especially with universities [2, 1103–1122].

There are three potential licenses of federally sponsored technology – the existing companies, start-up entities and third-party licensing organisations. Traditionally, the mechanism by which U.S. universities developed and commercialised research has been the licensing route to large, established corporations. However, a growing trend among U.S. universities is to pursue riskier paths through the creation of academic spin-offs or licensing of young and newly created enterprises [12, 246].

5. Transfers of knowledge in OECD countries

In OECD countries (example of Poland discussed earlier) institutions of higher education (HEIs) have nowadays taken up the challenge of entrepreneurship. They support entrepreneurship education and training and engage in a variety of knowledge transfer activities that promote entrepreneurship. Transfer of knowledge can take place directly, as in academic spin-offs, or indirectly – through research, training and education. More often, this occurs at the regional level, where HEIs enter into different relationships with other stakeholders pursuing economic growth and competitiveness [16, 18].

Different countries offer different contexts for the role of HEIs in encouraging entrepreneurship. Central and South-eastern European (CESE) countries have specific problems and opportunities, and the purpose of higher education and the role of universities in those countries are different than in highly developed countries. That is why any focus on entrepreneurship and higher
education needs to take into account the environment, the institutional factors that provide the necessary rules and constraints for entrepreneurial activity, and higher education involvement [16, 19].

There are large differences between highly developed countries and the countries that formerly belonged to the Soviet Bloc. History, geography, culture and ideology have all shaped the experiences of those different countries. Also, their transition to a market-based economy has made them view entrepreneurship differently both as a profession and as an academic discipline. These differences are deep and wide and have shaped the way entrepreneurship education has developed in these countries [25, 166].

There are traditions and training backgrounds that exist across European OECD countries. For example, in the United Kingdom entrepreneurship education is based on a strong tradition of small business research and teaching. This might explain the predominance of SMEs, the majority of which were established decades ago [25, 52–54].

Moreover, in Switzerland, at the University of St. Gallen, training for small business owners and teaching small business management to students has been conducted for more than 50 years in the Institute for SMEs. A similar situation has place in Germany, where only recently universities and universities of applied sciences have established entrepreneurship chairs. Entrepreneurship education in smaller European countries such as the Netherlands or Belgium remains limited in scope and reach. It is primarily organised in modules or in the economics or business administration programmes [11, 293–301].

5.1. Model of knowledge transfer in Finland

The model of knowledge transfer used in Finland is an example showing that collaboration between a scientific research unit (in this case the Laurea University of Applied Sciences) and an enterprise may bring a lot of profit. It proves that knowledge transfer used skillfully may result in an enterprises success.

The Laurea University of Applied Sciences in Helsinki (Finland) is a forerunner of the practical application of knowledge transfer in Europe and the creator of the “SID LABS Internation” programme (Service, Innovation and Design). The SID programme is a research-developmental programme focusing on the following:
- the service of conducting research-development projects,
- the mechanisms of applicability of training and scientific research,
- innovatory solutions of the existing problems,
- combination of the scientific potential of the academic staff, students and graduates,
- the designing of "made-to-measure" solutions for the particular entrepreneurs.

On the basis of the above assumptions model of knowledge transfer IRPro2015 [14] has been created, whose main objective is to extend the cooperation in the sphere of services and research to the international level. It assumes exchange of knowledge on a global scale and indicates unlimited perspectives. It was planned for the period of its duration, from April 2010 to April 2015 (Diagram 1).

The detailed objectives of model of knowledge transfer IRPro2015 (Diagram 1) can be summarised as follows:

1. Exchange of expertise between the Finnish universities and their overseas partners.
2. Involvement of the public and private sector.
3. Support of the international partners for the ideas of the particular projects (from the angle of problem solving and of the help in selecting the appropriate kind of source of financing of the particular projects).
4. Creating opportunities for long-term partnerships.
5. Creating opportunities for the collaboration between domestic and overseas enterprises (provided that students'/academics'/university’s research results are going to be used).

Project model of knowledge transfer IRPro2015 assumes that students constitute the main executive force. The process of the project idea stimulation and development is supported by the academic staff of the Laurea University as well as by specialists - practitioners, who jointly form the group called the Advisory Committee Educators. That Committee supports and supervises projects throughout the entire cycle of their existence.

The assumption of each project is that it will be students who will introduce the problem. Next, that problem will be discussed and analysed in the students’ discussion group, in front of the Advisory Committee Educators and in research groups, so that it finally assumes the framework of a project. At the same time, students will create a project group and will transmit their results to firms and economic organisations in a controlled and long-term manner. A large number of the students will continue working at the University as part of the project after their graduation.

The circumstances under which Finnish scientific-research units and enterprises operate differ radically from the Polish reality in such units. It is a complex result of the psychological and sociological factors as well as economic, legal and political conditions.

Diagram 1. Model of Knowledge Transfer IRPro2015

Source: Materials from the Laurea University of Applied Sciences in Helsinki (Finland).
6. Conclusions and recommendations for the improvement of knowledge transfer under Polish political and economic conditions

The role of higher education in society is changing. No longer are universities expected to remain within their ivory towers. Today, Academia is expected to be equal partners to private and public sectors alike. European university leadership (also Polish) should see this new role as an opportunity and leverage the Bologna reform process to make their universities more innovative and dynamic, in line with the goals of the Lisbon agenda.

Nevertheless, a number of actions are necessary at the national, regional and local level. Universities, policy makers and the business community need to work together to seize this opportunity to fuel the engine of Poland’s future growth by preparing young people to compete in a globally competitive and dynamic world.

Also there is a need to facilitate spin-offs from technical and scientific institutions and accelerate the application of science and technology to market through well-developed technology transfer offices. Poland should also establish stronger links between Academia, businesses and entrepreneurs and provide the necessary fiscal incentives to encourage interest.

There is a chance for HEIs to succeed as they are now noticed as “an important element in a region’s knowledge to encourage the development of the local angle and venture capital funds and cross-border entrepreneurship faculty and research collaborations. The Polish government should create opportunities for professors and researchers from various countries to work together on projects and assure international mobility and exchanges of educators and researchers.

The analysis of the conditions for knowledge transfer in highly developed countries conducted in this article has let us formulate some recommendations directed at scientific-research units operating within the framework of Polish economic reality. The most important ones are the following:

1. Polish universities should develop models that permit new, university-based business ventures to start and create a positive entrepreneurial spirit at the university and therefore:
   a) to select business starters to be supported,
   b) to offer and arrange consulting and training of business starters,
   c) to create functionally oriented courses and degree programmes consistent with those at an international level.

2. More possibilities for researchers:
   a) encourage researchers to bring their research to the market,
   b) cooperate with professors, doctors who also have entrepreneurship experience,
   c) organise workshops and training programmes (also international ones) for teachers and researchers,
   d) provide international mobility and exchanges of researchers,
   e) identify market signals between employers and students.

3. Support of cooperation- and team-work-oriented types of behaviour (through project tasks):
   a) creation of a Fund for the University Staff, Students and Entrepreneurs Supporting Knowledge Transfer (similar to vouchers for higher schools, already in use in Poland),
   b) creation of an efficient system of motivating (rewarding) the individuals participating in various projects,
c) extension of the scope of application of modern measures for group work results evaluation (allowing to take into consideration the interests of all the parties involved and thus build corporate harmony).

4. Creation of a consistent organisational culture strengthening the process of changes;
5. Creation of the data bases for the offers of potential partners (demand of enterprises for innovation, as well as students’ and academics’ project proposals);
6. A clear, legible flow of information between scientific-research institutions and the institutions around business;
7. Pointing out possible advantages both for enterprises and the institutions around business (including the advantages for scientific centres, research workers and students), achieved thanks to collaboration;
8. Minimalisation of red-tape limitations;
9. Foundation of a permanent committee in the form of a chapter for the evaluation of promotional projects, study-research elaborations or other procedures useful for the development of entrepreneurship and directed at the concrete recipients;
10. The foundation of the chapter should be preceded by conferences and seminars in which both university people (including students) and practitioners, business representatives, should take part.

It should be kept in mind that the implementation of a knowledge transfer model should be carried out in favourable external conditions. The following issues are of special concern:
1. Implementing a policy that clearly establishes the ownership of intellectual property in research collaborations;
2. Minimalisation of the barriers counteracting the implementation of a knowledge transfer model and of those caused by inconsistent regulations (including too high transaction costs, not providing e.g. for the right to deduct tax);
3. Stimulating the processes of economic growth and development generating the advancement of science and research.

Elaboration of the model of knowledge transfer in the Polish conditions is a difficult process, calling for both practical and theoretical expertise. It requires a qualified, competent staff and the engagement of many workers. The effectiveness of these actions depends to a great extent on the creation, by the implementing unit, of adequate mechanisms favourable for the collaboration between enterprises and scientific research institutions. It also depends on favourable external conditions.
Bibliography

[14] Materials from the Laurea University of Applied Sciences in Helsinki (Finland) from scientific research practice at the Laurea University (Finland), part of the project: "Academic Entrepreneurship – Effective Knowledge Transfer 2", May 2010. Finland.
Conditions for transfers of knowledge in Poland and highly developed countries


Streszczenie

Transfer wiedzy w krajach wysoko rozwiniętych polega na trójstronnej współpracy zachodzącej pomiędzy nauką, biznesem i jednostki B+R.artykuł stanowi analizę uwarunkowań transferu wiedzy w krajach wysoko rozwiniętych. Rozważania teoretyczne zostały zegzemplifikowane przykładami z USA, Finlandii oraz innych wybranych krajów OECD. Zakończenie stanowią rekomendacje dotyczące usprawniania transferu wiedzy w polskich warunkach polityczno-gospodarczych.

Słowa kluczowe: transfer wiedzy, model transferu wiedzy, academic spin-offs, inkubator przedsiębiorczości, uwarunkowania polityczno-gospodarcze transferu wiedzy

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