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KNOWLEDGE TRANSFER BETWEEN UNIVERSITIES AND ENTERPRISES IN THE ŁÓDŹ REGION

Key words

Innovations, knowledge transfer, university-industry cooperation, knowledge transfer practices.

Abstract

The paper presents the state of cooperation between universities and industry in the area of knowledge flow (transfer). Knowledge transfer can be defined as transfer of specific technical or organisational knowledge and the associated expertise to be used in the economic (commercial) way. It mainly occurs between the sector of science and research and the sphere of economic activity creating a specific bridge between these worlds by means of the rule of multiple channels and organisational forms. Knowledge transfer between the sector of science and research and enterprises brings numerous economic, marketing, organisational, educational and other benefits to both parties. This phenomenon has not been fully recognised in the Polish economy. The paper describes knowledge transfer practices within the framework of the university-industry collaboration illustrated with the use of the example of the Łódź region, including the effects and benefits of knowledge transfer for both cooperating parties.

Introduction

In order for the innovative activity to be effective, the company needs, among others, to acquire access to external sources of knowledge. It is particularly important for smaller entities due to their limited human, technical, and financial resources. Among external sources of knowledge, the regional sphere of science and research, including universities, can play useful roles in this respect. Knowledge transfer between the two spheres and the conditions for its effective and efficient course are currently the subject of great interest on the part of science, politics, and innovation management. It refers to such areas of research as academic entrepreneurship, regional innovation systems, and models of open innovations [2, 6, 8, 9, 10, 11, 13]. Determinants and barriers to the cooperation between universities and enterprises and to its effective continuation, the role of the regional innovation policy in this process, the criteria for evaluating the effectiveness of knowledge transfer, and the recognition of benefits for both parties and for the local economy are mainly the subject of research. This paper aims to describe and assess the practices of knowledge transfer between universities and industry illustrated with the example of the Łódź region, including the types of practice, the practice initiative, the duration and the character of practice, the subject scope, the effects as well as the risk and benefits from knowledge transfer for both collaborating parties.

1. Knowledge transfer between universities and enterprises

Innovation is based on usable knowledge (innovative ideas). Its acquisition is the necessary prerequisite to carry out innovations in an enterprise. The sources of innovation can be divided into internal sources, external sources, and mixed ones [1, 9]. Internal sources comprise works created within the company and its employees' ingenuity. For the innovative company, the main advantage is the exclusivity to the solutions at its disposal and the disadvantage is the high uncertainty of desirable effects, a long lead-time, and high costs. External sources include works created outside the company, licences, acquisitions and joint venture companies. External technical thought is the simplest way to acquire new solutions. It is effective and carries little risk, but it can cause dependence on technology suppliers.

Transfer of external solutions can be defined as *supplying the market with technologies* [4]. It constitutes a special case of the process of communication. This process is very often interactive with a variety of feedback loops between knowledge senders and knowledge recipients [11]. It encompasses all types of solution diffusion and technical education. Knowledge transfer means transfer of information essential for one entity to copy the work of another entity. This

information exists in two forms: (1) in the form of technical information (engineering and scientific knowledge, standards) and (2) procedures (e.g. legal, confidentiality agreements, patents, licences). It is usually a market process in which technology is purchased and sold [4, 11]. Thus, knowledge transfer means the transfer of the specific technical or organisational knowledge and the associated expertise to be used in an economic (commercial) way.

Knowledge transfer can be divided into commercial and non-commercial [3]. Non-commercial knowledge transfer encompasses, among others, (1) knowledge provided free of charge, studies, training, etc. (2) professional associations, (3) mutual transfer of licenses, and (4) knowledge passed on within the company, e.g. multinational companies. Commercial knowledge transfer encompasses the transfer of knowledge and technology between structurally unrelated entities and encompasses the following: (1) transfer materialised (hard), (2) trading of invention licences and utility models and *know-how*, (3) information in the broad sense of the word, including “quiet knowledge.”

Knowledge transfer occurs mostly between the R&D sector and the sphere of business activity creating a specific bridge between these worlds and bringing numerous economic, marketing, organisational, educational, and other benefits to both parties. Partners in the process of knowledge transfer in various combinations are research institutions, large, medium and small enterprises, public institutions, and private individuals. The characteristic feature of the collaboration between academia (universities) and enterprises is the occurrence of many cultural and organisational differences coming from both worlds (different motivations, objectives and ways to conduct activities, performance evaluation criteria, etc.) It creates numerous difficulties in establishing and continuing the effective cooperation in the area of knowledge flow [6, 12].

Knowledge transfer from the public science and research sector to enterprises is carried out through numerous channels and organisational forms [2, 3, 4, 12] including the following:

- Joint research and objective projects implemented in cooperation with enterprises;
- Contracted research commissioned by companies;
- The provision of licences for different forms of intellectual property, *know-how*;
- Consulting, opinions, evaluations, reviews and science and technology agency;
- The transfer of technical staff, training;
- Spin-off companies;
- Scientific publications and popular science publications, patent specifications;

- Conferences, seminars, fairs; courses and training;
- Scientists' informal contacts;
- Staff mobility programmes (exchange/transfer of employees from the academia to enterprises and vice versa), student placements;
- Information on new technologies, transfer initiating;
- Support for innovative undertakings of small and medium-sized enterprises;
- Initiating cooperation networks and collaboration; and,
- The development of a system to support innovative and entrepreneurial ventures.

The regional innovation policy plays an important role in knowledge transfer from the public R&D sector, including universities, to enterprises. In the functional approach, it constitutes a specific forum for the cooperation of a variety of organisations and institutions operating in the region whose main objective (or one of the main objectives) is the development of innovative entrepreneurship in the region. These entities include regional authorities (on the *voivodeship*, *poviat* and commune level), regional development agencies, universities, R&D institutions, innovation centres, financial institutions, consulting firms, manufacturing and service companies, etc. A kind of functional network combining all entities that operate in the area of innovation and technology transfer is created within the framework of this regional structure. The regional innovation policy is oriented toward the demand aspect of innovation in which interactions between enterprises, particularly SMEs, and the sphere of research, science and technology are required. It results from the closeness to and greater trust toward partners coming from the same area, adhering to the same values determined by the same cultural factors [5, 6, 8, 10, 11, 13]. Services for technology and innovation transfer between universities and local enterprises are provided mostly by regional institutions of the innovative business environment and by commercial providers operating in the area of entrepreneurship, innovation, technology transfer, and commercialisation. The condition and development prospects of this economic sphere, the quality, and the scope of provided services have an increasingly notable impact on the transfer of knowledge and innovativeness in particular companies and in the whole economy [6, 14].

2. Knowledge transfer practices between universities and enterprises in the Łódź region

Thirty-five cases of knowledge transfer practices between universities and enterprises from the Łódź region were analysed. Twenty-eight cases were related to knowledge transfer between the University of Lodz and enterprises, six between the Technical University of Lodz and enterprises and one between

the Medical University and enterprises. The analysis was conducted in 2010¹. The study encompassed the types of practices, the practice initiative, their duration and character, the subject scope and effects, as well as the risk and benefits from the knowledge transfer practices. The diagnosis, interviews and innovative studies indicate that the analysis encompassed most of these of practices, which means that it is representative of the Łódź region.

2.1. Types of knowledge transfer

As for the types of knowledge transfer between universities and enterprises, seven types of such practices were distinguished. Simple practices prevail. The first position is held by cooperative practices in the area of training and education addressed to students, university staff, company employees and other people (40.5% of cases). Knowledge transfer between universities and enterprises conducted on a contract base, mostly research contracts (23.8%) as well as in the framework of the informal cooperation, in the area of practices carried out without the permission of both parties (9.5%), also plays an important role. This informal cooperation is mostly concerned with using research infrastructure and research results as well as organising training sessions on the university premises free of charge and without the permission of the university. Other types of knowledge transfer between universities and enterprises occur much less often. They include knowledge transfer in the form of infrastructure usage (7.1% of cases) as well as strategic cooperation between universities and enterprises (only three cases – 7.1%). Only in one case, knowledge transfer between universities and enterprises in the framework of joint venture seen as a very advanced form of knowledge transfer occurred.

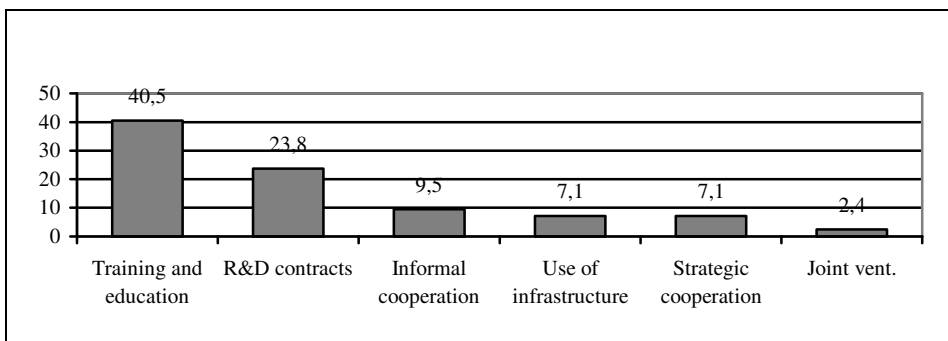


Fig. 1. Types of knowledge transfer (% of practices)

¹ The paper makes use of the results of the empirical study carried out in 2010 in the framework of the international project: “Innovation Policy in University City Regions – INNOPOLIS” (INTERREG IVC Programme) implemented, among others, by the University of Łódź.

2.2. Knowledge transfer initiative

Knowledge transfer practices between universities and enterprises in the Łódź region were initiated in the framework of the policy to support innovation in the region by universities or by enterprises themselves. The analysis of the forms of knowledge transfer initiatives between universities and enterprises in the Łódź region indicates that they are initiated mostly by universities (67.6% of cases), mainly within the framework of a variety of cooperation programmes with the economy of the region. One in six cases (18.9%) resulted from the initiative on part of the enterprises, one in seven cases was carried out in the framework of programmes supporting regional innovation (13.5%). Among the seven cases initiated by enterprises, there are 4 cases carried out in the framework of the (research) contract-based cooperation and 3 cases that resulted from informal cooperation. Among the five cases initiated by innovation support programmes, there are 4 cases carried out in the framework of research contracts and one case of training and education.

2.3. Duration and reproducibility of knowledge transfer

Knowledge transfer practices between universities and enterprises in the Łódź region were analysed in terms of their duration and reproducibility (in other circumstances and institutions).

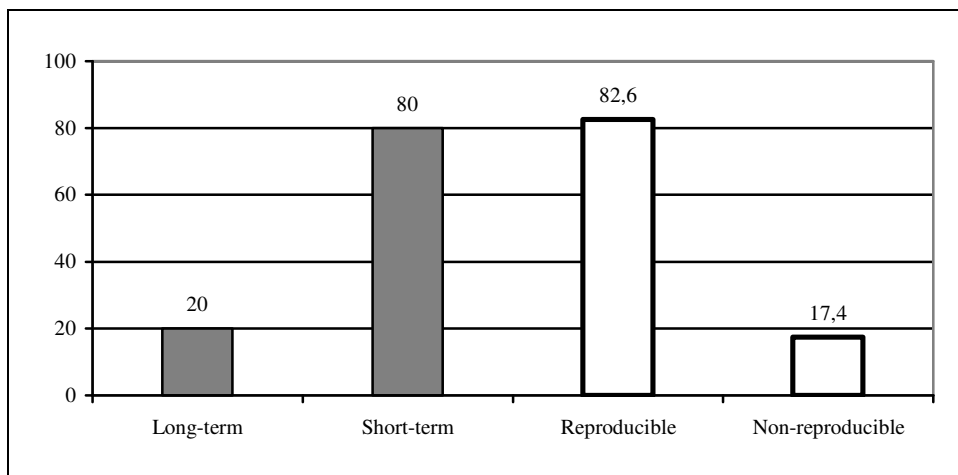


Fig. 2. Types of knowledge transfer (% of practices)

In terms of their duration, the practices were divided into two groups: long-term (the duration of over 6 months) and short-term (less than 6 months). The analysis conducted shows that short-term practices are dominant – four in five of all the cases. Long-term practices, which are the most useful ones for

knowledge transfer, constitute only one in five of all the cases. All these cases were related to knowledge transfer between universities and enterprises carried out on a contract basis or in the framework of long-term strategic cooperation.

More than 4/5 of all the cases (82.6%) have a reproducible character, which means that they can be used in other circumstances and by other entities; therefore, they can be disseminated in the Łódź region as the so-called “good practices.” Only 17.4% of the cases had a non-reproducible character, which are difficult to disseminate. These were mostly the cases of knowledge transfer between universities and enterprises carried out in the framework of informal cooperation.

2.4. Subject scope of knowledge transfer

In terms of the subject scope of knowledge transfer between universities and enterprises, the analysis distinguished two types of the scope, i.e. the direct cooperation between both parties and the cooperation with the third party, e.g. public institutions and other stakeholders. The dominant kind of cooperation in knowledge transfer is the cooperation between universities and enterprises (77.1% of cases). The largest percentage of participants involved only 22.9% of the cases. Half of these cases were contract-based.

2.5. Effects of knowledge transfer

In terms of the effects of the analysed knowledge transfer practices between universities and enterprises in the region, direct effects in the form of knowledge transfer as well as indirect effects that initiate knowledge flow were distinguished. The conducted analysis of knowledge transfer practices between universities and enterprises in the region indicates that indirect effects dominate (62.9% of cases). Indirect knowledge transfer took place in just over 1/3 of cases. It indicates the weakness of knowledge transfer between universities and enterprises in the region. Only one in three cases of cooperation resulted in direct knowledge flow. These cases concern contract-based cooperation, informal cooperation and strategic cooperation, hence long-term undertakings. The remaining 2/3 are the cases of potential knowledge transfer constitute only the beginning of this process.

2.6. Risks and benefits of knowledge transfer

The analysis conducted indicates that knowledge transfer practices between universities and enterprises in the Łódź region are connected with little risk of failure. This applies to as much as 70% of the analysed practices where there was no or minimal risk of failure. Only 30% of the analysed practices were burdened with a risk of failure, estimated as moderate. A considerable risk of failure was encountered mostly in the following cases:

- Cooperation with the third party, e.g. business support institutions, technology transfer, government agencies (80% of this type of practices);
- Cooperation initiated in the framework of the top-down approach (formal) where both parties, i.e. the university and the enterprise, are in a way “forced” to start cooperation in the area of knowledge transfer (60% of cases); and,
- Cooperation carried out in the framework of research contracts that, as a rule, are burdened by a high risk of failure.

Knowledge transfer between universities and enterprises allowed the acquisition of a number of academic and research, educational, economic, organisational, and marketing benefits by both parties, i.e. universities and enterprises. Relatively more benefits were achieved by enterprises (97%) than universities (88%).

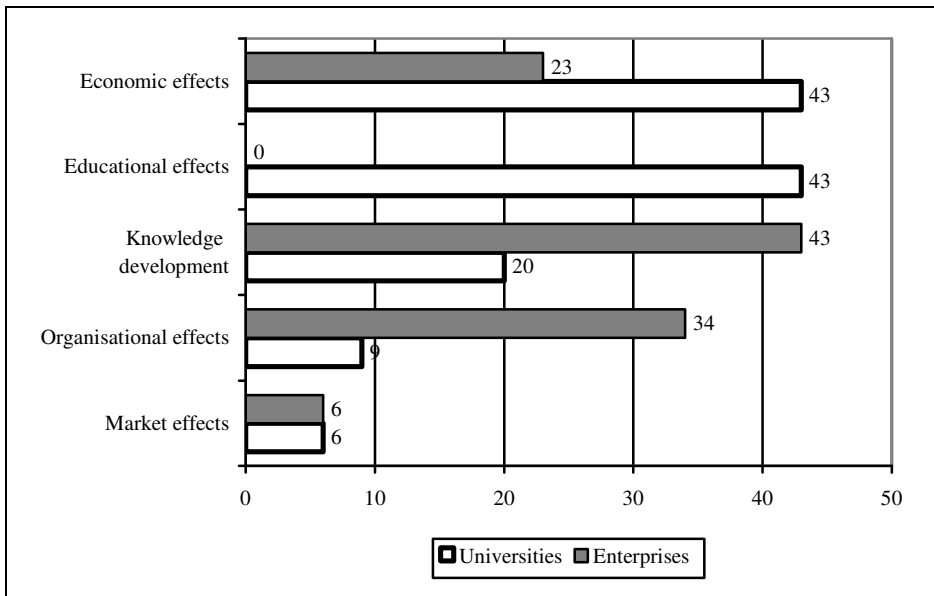


Fig. 3. Types of knowledge transfer (% of practices)

Both parties involved in knowledge transfer indicated different types of benefits.

1. In the case of enterprises, the benefits were as follows:
 - a) Research benefits connected with acquiring new or improved knowledge for the enterprise (43% of enterprises); [It should be noted that the acquired knowledge in most cases was implemented into practice (60% of this type of enterprises), which shows significant advantages of knowledge transfer];

- b) Organisational benefits concerning employee skill development in the enterprise as well as the improvement of its operational strategy (34% of enterprises);
 - c) Economic benefits connected with the improvement of economic performance, e.g. production costs reduction, payments for services rendered (23% of enterprises);
 - d) Marketing benefits connected with knowledge commercialisation and the improvement of the market position of the enterprise (6% of enterprises).
2. In the case of universities, the benefits were as follows:
- a) Economic benefits, e.g. payments for services rendered (43% of universities);
 - b) Educational benefits, mostly connected with the possibility to conduct internships for students in companies (43% of universities);
 - c) Research benefits connected with the development of knowledge in cooperation with enterprises, e.g. lab research and testing of technology in companies (20% of universities);
 - d) Organisational benefits concerning the development of scientific staff (9% of universities);
 - e) Marketing benefits connected with the commercialisation of knowledge generated at universities (6% of universities).

This review of the benefits acquired shows that enterprises indicated research and organisational benefits, whereas universities pointed to economic and educational benefits.

Conclusions

The analysis of knowledge transfer practices between universities and enterprises in the Łódź region indicates that they are dominated by simple practices, initiated mostly by universities in the framework of a variety of cooperation programmes with the economy of the region. These are short-term practices carried out in the framework of cooperation in the area of training and education. They are mostly reproducible, which means that they can be used in other circumstances and by other entities. Thus, they can be disseminated in the Łódź region as “good practices.” Knowledge transfer is dominated by cooperation between universities and enterprises. The effects of these practices are mostly indirect, because they only initiate the flow of knowledge. It indicates the weakness of knowledge transfer between universities and enterprises in the Łódź region.

More advanced practices carried out in the framework of strategic, contract-based cooperation or joint venture concerning more long-term cooperation with a larger number of participants are definitely much less numerous. Only one in three cases of cooperation yielded direct knowledge

flow. Only 1/4 of all the cases were initiated by enterprises themselves. The cases estimated as more advanced, hence more useful for knowledge transfer between universities and enterprises in the Łódź region, concern just over 1/5 of all the analysed cases.

Knowledge transfer practices between universities and enterprises in the Łódź region are connected with little risk of failure, which indicates that their relative majority is likely to be successful and achieve the projected outcomes. Almost all the studied cases yielded a number of various benefits. Relatively greater benefits were achieved by enterprises (97%) than by universities (88%). Both parties involved in knowledge transfer, however, pointed to different types of benefits: enterprises indicated mostly research and organisational benefits, whereas universities pointed to economic and educational benefits.

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Reviewer:

Krystyna POZNAŃSKA

Transfer wiedzy w układzie uczelnie wyższe – przedsiębiorstwa w regionie łódzkim

Słowa kluczowe

Innowacje, transfer wiedzy, współpraca uczelni wyższych z przemysłem, praktyki transferu wiedzy.

Streszczenie

W artykule zaprezentowano stan współpracy uczelni wyższych z przemysłem w dziedzinie przepływu (transferu) wiedzy. Transfer wiedzy można określić jako przenoszenie określonej wiedzy technicznej lub organizacyjnej i związanego z nią *know-how* celem gospodarczego (komercyjnego) wykorzystania. Dokonuje się on głównie pomiędzy sektorem nauki i badań a sferą działalności gospodarczej, tworząc specyficzny pomost pomiędzy tymi sferami z wykorzystaniem z reguły licznych kanałów i form organizacyjnych. Przepływ wiedzy pomiędzy sektorem nauki i badań a przedsiębiorstwami przynosi obu stronom wiele korzyści ekonomicznych, rynkowych, organizacyjnych, edukacyjnych itp. Zjawisko to jest, jak dotychczas, słabo rozpoznane w polskiej gospodarce. W artykule przedstawiono opis praktyk transferu wiedzy uczelni wyższych z przemysłem na przykładzie regionu łódzkiego, w tym efekty i korzyści przepływu wiedzy dla obu stron współpracy.

