

Knowledge and Technology Transfer in the Center for Scientific and Technical Information of the Wrocław University of Technology

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Abstract—Knowledge and Technology Transfer between a university and economic operators affects innovation and growth of competitiveness, as well as the development of a knowledge-based society. In the structures of Wrocław University of Technology, regarded as one of the best and the most innovative technical universities in Poland, a number of units responsible for a wide understanding cooperation with the economy have been established. To avoid dispersion of various activities, competences and information, Wrocław University of Technology has started to implement a technology transfer system. A Contact Point for Technology Transfer has been established in the Center for Scientific and Technical Information. It coordinates activities of all the organizational units of the University, as well as people who fulfill tasks concerning technology transfer, commercialization and cooperation with the economy. The paper discusses the activities of the Center for Scientific and Technical Information related to knowledge and information transfer, including guidance of commercializing research results, patent information and assistance in the purchase of innovative solutions, as well as intellectual property generated at Wrocław University of Technology.

Keywords—Wrocław University of Technology; technology transfer; knowledge transfer; commercialization.

I. INTRODUCTION

Knowledge transfer (KT) is a term used to include a very broad range of activities to support mutually beneficial collaborations between universities, businesses and the public sector.

It's all about the transfer and intellectual property (IP), expertise, learning and skills between academia and the non-academic community. For academics, KT can be a way of gaining new perspectives on possible directions and approaches to research. Discussion around KT often focuses on the formation of spin-out business, or the licensing of intellectual property, based on the outputs of university scientific and technology-related research. Although these are vitally important areas, KT actually encompasses a much broader range of activities and is not limited to science and technology disciplines [1].

The underlying assumption that there is a potential for increased collaboration between industry and universities is also underlined in much of current innovation literature. In particular, the Open Innovation [2] approach to developing business value is explicitly based on an assumption that Universities are a "vital source for accessing external ideas". Moreover Universities have been deemed to be "the great, largely unknown, and certainly underexploited, resource contributing to the creation of wealth and economic competitiveness" [3].

Nowadays, the term "knowledge transfer" is usually applied to transfers between universities and industry, or between experts and non-experts. The focus is frequently on "science management" [4].

Technology transfer, also called transfer of technology (TOT), is the process of transferring skills, knowledge, technologies, methods of manufacturing, samples of manufacturing and facilities among governments or universities and other institutions to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials or services [5].

According to the definition in the "Business Dictionary", technology transfer is "assignment of technological intellectual property, developed and generated in one place, to another through legal means such as technology licensing or franchising" [6].

The process typically includes: identifying new technologies; protecting technologies through patents and copyrights; forming the development and commercialization strategies, such as marketing and licensing to existing private sector companies or creating new startup companies based on the technology.

Section II of the paper presents the background of creating the knowledge transfer and transfer of technology at Polish universities, which is connected with current situation of technical universities. Sections III and IV describe Wrocław University of Technology and the Center for Scientific and Technical Information (CSTI) along with its' departments responsible for KT and TOT. Their tasks and the ways of implementing university system of cooperation

with the economy have been depicted. Section V presents detailed results of CSTI activity connected with the cooperation with the economy. This section presents work effects of particular teams and the specifics of inquiries and commissions directed to CSTI departments from the business and external entities. Last but not least, at the end of the paper, tables and graphs to illustrate the content of this paper have been presented. They depict commercialization scenarios, models and patterns of particular forms of cooperation with the economy, which have been developed and implemented at Wrocław University of Technology.

II. BACKGROUND

The importance of creating networks between business entities, public administration, non-governmental, scientific and research institutions is growing steadily. Such networks help merging ideas, exchanging information and establishing cooperation methods between the above. The innovation and entrepreneurship centers which have been developing in Poland since the early 1990s of the 20th century are gaining in importance in these processes. Currently, the entrepreneurship support infrastructure in Poland consists of different types of innovation and entrepreneurship centers: technology parks and incubators, business incubators, pre-incubators, technology transfer centers, training and advisory centers, loan funds, guarantee funds, seed funds etc. These institutions are generally intended to enhance human creativity, entrepreneurship and innovation leading to more effective use of the local growth factors. Since the beginning of system transformation, the number of innovation and entrepreneurship centers has been systematically growing. The process of developing the entrepreneurship supporting system is still running. New initiatives and new areas where the innovation and entrepreneurship centers operate are appearing. The changes observed and analysis of the experience acquired by “knowledge economy leaders” show an increasing role of support infrastructure in the process of the Polish economy innovation development. In the era of technological changes and dynamic expansion of the innovation to the services, organizations, marketing and social issues, the enterprises are looking for new solutions and this is where the innovation and entrepreneurship centers may have important contribution [7].

Nowadays, company competitiveness is based on components like knowledge, technological capabilities and skills. This led to a theoretical discussions on knowledge – based economies. In order to create this knowledge, which will eventually be transformed into new products and services, companies have internationally began to form increasing numbers of knowledge-based strategic alliances, thus creating a new form of competition. Nevertheless, the creation and transfer of knowledge and best practices through cooperation have proven to be quite difficult. Knowledge transfer is neither an easy nor a costless task. Unlike information, capabilities and knowledge simply cannot be bought in market. Instead, they have to be gradually built through intensive and systematic learning efforts. The issue of knowledge management and knowledge

transfer is all the more important for firms lacking, or late, in technological capabilities [8].

III. WROCLAW UNIVERSITY OF TECHNOLOGY

Wrocław University of Technology is one of the best technical universities in Poland. It was founded in 1946 in Wrocław, and organized by researchers from pre-war research centers in Lvov and Warsaw. Since the very beginning of its existence, it has been an important center of technical education. Today, over 34 000 students study here under the guidance of 2 000 academic teachers, at the 12 faculties, as well as in the 3 regional branches (Jelenia Góra, Legnica, Wałbrzych). It rates high in the annual rankings of Polish universities.

Wrocław University of Technology is situated in Lower Silesia – a dynamically developing region of Poland. Focusing on adopting its own offer to the market needs has become the regional strategy. Due to that, a synergy effect has been achieved with the development of segments strategic for the region. The University is strongly oriented toward cooperation with the economy and industry [11].

An excellent geographic location, teaching and research backup, and the developing infrastructure are the key assets of Lower Silesia, which have convinced international corporations to make investments there. Projects by such companies, as Volvo, Toyota, Volkswagen, Whirlpool, WABCO, Siemens, and LG Philips, 3M and Toshiba, have been implemented in the recent years in Lower Silesia.

Crucial for attracting investors to the region is the research and scientific potential of Wrocław academic center and the work on creating a knowledge-based economy. Wrocław University of Technology, as the only technical university in the region, has become a leader of active cooperation with the industry. Collaboration with the economy allows providing a comprehensive offer for companies looking for innovative solutions. Tens of long-term, many-sided collaboration agreements signed prove that this is the right approach to business partners. These agreements cover a wide range of activities, from providing training for the employees of Lower Silesian companies to joint research aiming at introducing new technologies and products, and increasing company competitiveness on Polish and international markets [12].

IV. CENTER FOR SCIENTIFIC AND TECHNICAL INFORMATION

On January 1st 2014, Wrocław University of Technology launched the Center for Scientific and Technical Information (CSTI). It is a unit serving the whole university performing scientific, research and service-oriented tasks. The Center is responsible for collecting and providing scientific and technical information for the needs of performing scientific research and supporting didactics, as well as coordinating cooperation with the economy and technology transfer. Within the structure of the Center, the Traditional and Electronic Libraries were established, providing the library-information services and creating also a digital library, knowledge repository and the data base for scientific

achievements. Besides the library resources, data bases and electronic periodicals, the Center makes available the patent and standardizing information, as well as the information on new technologies both, for the needs of scientific society and industry representatives [11].

Within the framework of the CSTI, units dedicated to cooperation of science with the economy, such as the Center for Science and Economy Cooperation (CSEC) operate. Its activity is focused on tasks supporting and initiating undertakings of all types in cooperation with representatives of business environment. The Center for Scientific and Technical Information runs the Contact Point for Technology Transfer. By creating a network of mutual relations with business and industry representatives, it identifies individual needs of enterprises in innovation, enabling that way development of solutions facilitating functioning of mechanisms of knowledge commercialization and widely understood cooperation of the University with businesses [13].

A. *Center for Science and Economy Cooperation*

The mission of the Center for Science and Economy Cooperation is to support the transfer of knowledge and information between the Wrocław University of Technology and external economic entities, with particular emphasis on the region of Lower Silesia, as well as to promote cooperation between academic and economic environment on regional and national level.

The activities of the CSEC focus on the tasks supporting and initiating all kinds of projects in cooperation between university units and business representatives. As a unit responsible for the coordination and organization of the cooperation process. The CSEC ensures efficient circulation of documents and deals with administrative formalities before signing cooperation agreements.

1) *Department of Knowledge and Information Transfer*

The Department of Knowledge and Information Transfer, which has been separated from the structure of the CSEC, undertakes activities, which aim at presenting University research offer. Moreover, these activities enhance the processes of efficient acquisition and transfer of know-how, allowing more effective use of knowledge by the economic environment.

The Department of Knowledge and Information Transfer realizes part of a strategic plan for the development of the University, involving creation of a new organizational model and entrance into qualitatively new relationship with business, thus increasing the possibilities for commercial exploitation of knowledge resources. The activities aim at creating optimal conditions and solutions for the use of the scientific and technical potential of the University in specific areas of the economy.

In the effort to ensure simplification and adjustment of the system regulation, as well as by direct consultancy, coordination, processing of orders and agreements resulting from the cooperation with third parties, the staff of the Department of Knowledge and Information Transfer counteract procedural constraints. Not only do they render

complex services, but they also complete all formalities on company behalf.

Taking into account the trend of development of the world economy based on the information society where innovation is a key factor, the staff of the Center for Science and Economy Cooperation have worked out an software which integrates databases identifying scientific potential of the University, including the access to expertise, cutting edge technologies, and research infrastructure. It is not only a perfect tool for promotion of intellectual output of the Wrocław University of Technology, but it also plays a role of a forum for exchange of modern technical and scientific ideas.

The collected data have been published on the website of the Center for Science and Economy Cooperation (<http://ofertadlagospodarki.pwr.edu.pl/en/o-nas/>) and include a variety of subject areas: research offer; laboratories (summarizes the list of research laboratories at the disposal of Wrocław University of Technology); key equipment; experts (the aim of creating this database was to provide both enterprises and scientists with a wide range of specialists, thus allowing efficient search for the right information, as well as contact); projects (on this site, users can publish new topics and attach suggestions for joint undertakings, resulting in starting new projects); inventions (it is a great tool for promoting research achievements of scientists among potential contractors interested in the implementation of products); standardization; knowledge repository (database developed in the Electronic Library. It includes scientific publications and papers, documentation of research data and other documents and resources being a result of scientific research and development works); product catalogue; innovative solutions (the database consists of technological solutions with full technical documentation, which can be immediately implemented in manufacturing companies); research centers.

Databases are regularly supplied with information verified by persons specialized in different disciplines. Databases do not only document scientific achievements of the University employees, but they also provide a direct exchange of information, enable its recording and processing, and in particular allow multivariate data mining.

The application mentioned above, accessible on the Center website, is extremely important from the point of view of the support for the commercialization process of the research results. One should take into account, that the scientific qualities of projects contribute often to the development of innovative products.

2) *Department of Intellectual Property and Patent Information*

The Department of Intellectual Property and Patent Information, within the CSEC, deals with problems of industrial property. It carries out activities for academic community of Wrocław University of Technology. Patent attorneys employed in the Department act as plenipotentiaries of the University in the proceedings before the Polish Patent Office, in cases related to obtaining and maintaining exclusive rights to solutions, which were

developed or co-developed by the University. Moreover, the Department comprises the Regional Standardization Information Center, which is a part of European PATLIB network, and runs consultancy activities concerning problems of intellectual property, its commercialization and cooperation with the regional economic environment. The Department staff provide patent information, help in use of patent databases and render legal advice not only to the staff of the Wrocław University of Technology but also to private individuals, thereby maintaining strong links between the University and economic entities.

In addition to providing professional service of patent attorneys and patent information, cooperation with industry reveals itself primarily in preparation of commercialization and substantive care throughout its course. An important task of the Department of Intellectual Property and Patent Information is concluding license agreements and contracts for the commonality of rights to industrial property objects and consulting draft agreements in terms of intellectual property with other departments, in particular the Department of Knowledge and Information Transfer. Implementations bring tangible and mutual benefits, contribute to the competitiveness of enterprises, increase their profits and favor economic growth. They are of use also to inventors. Thanks to attractive conditions of compensations, the Terms of Use of Intellectual Property, adopted at the University, motivate authors of inventions to support the commercialization process and search for potential partners.

B. Technology Transfer Contact Point

One of the first stages of implementing the System of Technology Transfer at Wrocław University of Technology was launching the Technology Transfer Contact Point (TTCP) within the structures of the Center for Scientific and Technical Information.

The aim of the Contact Point is to distribute powers and coordinate activities and cooperation of organizational units of the University in the commercialization process of intellectual property rights. In particular, the Contact Point excels in:

- identifying and monitoring research projects with high potential of commercialization of end products;
- supporting innovative ideas and technical and technological solutions in the process of gaining business partners for their development and applying for financing the implementation works;
- informing and consulting administrative and legal issues regarding opportunities and procedures of technology transfer;
- informing and consulting possibilities of obtaining financial support for the technology transfer process;
- rendering administrative and legal services related to starting and transferring intellectual property rights to new companies.

As a unit responsible for coordination of the actions mentioned above, the Contact Point divides tasks and responsibilities between organizational units of the University, and initiates and supports development and

implementation process of procedures and paths of commercialization, intellectual property management regulations, foundation of spin-off companies, internal regulations.

Launching the Contact Point will significantly improve and simplify procedures related to initializing and running commercialization actions at the University through coordination and implementation of the “one stop shop”.

The Contact Point for Technology Transfer should be perceived by scientists and entrepreneurs as the basic path of contact with the University on issues of technology transfer, not excluding previously used forms of communication - through Wrocław Center of Technology Transfer, departments or other organizational units. In addition, the Contact Point will be equipped with an electronic system of recording and monitoring orders of commercialization. It will allow to track the current status of ongoing actions for technology transfer at the University level.

The mission of the Technology Transfer Contact Point is coordinating activities of University departments as far as technology transfer is concerned. The Technology Transfer Contact Point is also responsible for overall registration of commercialization processes. Moreover, following the ‘one stop shop’ concept, it helps external entities contacting University units. Last but not least, it supports academic staff in establishing cooperation with business units in the area of technology transfer and through disseminating information about the development of new technical solutions. Each TTCP user will eventually save their time, as the TTCP staff will support them in fulfilling procedures and formalities connected with the commercialization process.

V. KNOWLEDGE AND TECHNOLOGY TRANSFER – PRACTICE

The main achievement of the Contact Point is the development and implementation of commercialization models and scenarios depicted below.

There are two scenarios of technology transfer in WrUT (Fig. 1).

Scenario 1 represents direct commercialization consisting in a direct sale to a company:

- The University has 30 days to make a decision whether they are interested in a given commercialization. If the decision is positive, the author gets informed and he/she is then to decide whether he/she wants to sign the contract with Wrocław University of Technology on proposed conditions. If he/she agrees, an agreement with the details of commercialization conditions and remuneration is concluded.
- The University renounces the commercialization or has not kept the 30-day-long deadline. In such case, the University transfers the offer to the author for maximum 10% remuneration. The author is then to decide whether he/she wants to commercialize individually. If yes, the author concludes an agreement transferring his/her economic rights with

the University and the commercialization is performed by the author.

Scenario 2 represents commercialization by means of a special purpose company:

In-kind contribution to a special purpose company (Fig.2):

- Deciding to commercialize a product and concluding a commercialization condition agreement with the author
- Determining copyrights distribution (the University covers the costs)
- Finding product recipient and makes product valuation (by the University or an external entity)
- Introducing products as University assets
- Obtaining a consent of the University for in-kind contribution
- Preparing and concluding an in-kind contribution contract
- Issuing and invoice and VAT settlement

First model of commercialization process described below (Option 2) by means of a special purpose company, depicting commercialization income path (Fig. 3):

- Sales revenues and company profits go to a special purpose company.
- University receives a revenue refund for technology transfer to the special purpose company.
- University pays remuneration to the author.

Second model of commercialization process (Option 1 – direct) depicting the path of commercialization incomes (Fig. 4):

- Economic entities transfer the sales and licensing income to the University
- The University pays remuneration to the author

The following tables present effects of the cooperation of the Center for Science and Economy Cooperation and the Contact Point with economic environment in 2014.

TABLE I. THE NUMBER OF DIFFERENT TYPES OF AGREEMENTS ELABORATED AND PROCEEDED IN THE CENTER FOR SCIENCE AND ECONOMY COOPERATION AND IN THE CONTACT POINT

No.	Elaborated agreements	Number
1.	Framework cooperation agreements	27
2.	Consortium agreements	10
3.	Research and development work agreements	11
4.	Agreements on cooperation in framework of a project	11
5.	Financing agreements	4
6.	Non-disclosure agreements	4
7.	Agreements on a series of lectures	2
8.	Agreements on transfer of materials	2
9.	Donation agreements	1
10.	License agreements	1

No.	Elaborated agreements	Number
11.	Letters of intent	7
12.	Memorandums of understandings	3
TOTAL		83

The next table presents different requests addressed to the Center for Science and Economy Cooperation and to the Contact Point in 2014.

TABLE II. REQUESTS IN 2014

No.	Letter of inquiry	Number
1.	Requests for performing tests/analyses	83
2.	Requests for cooperation	11
3.	Requests for an expertise	4
4.	Requests for preparing a review of innovation	8
5.	Requests for preparing a review for the court	4
6.	Other	13
TOTAL		123

The CSEC is responsible also for registration of the research and development work agreements, which in fact are research work orders commissioned and paid by different companies and external institutions. In 2014, our Center registered 252 of such agreements.

The results of the activities undertaken by the Department of Intellectual Property and Patent Information for 2014 are shown in the following tables.

TABLE III. THE NUMBER OF CASES HANDLED BEFORE THE PATENT OFFICE ON BEHALF OF THE UNIVERSITY

No.	Application type	Number
1.	Prepared applications for innovative solutions to the Polish Patent Office or European Patent Office or Office for Harmonization in the Internal Market	169
2.	Prepared trademark applications	7
3.	Total number of prepared applications	176
4.	Applications to the Patent Office in defense of inventions (responses to allegations or other provisions)	178
5.	Patents and other exclusive rights granted to the University	130

TABLE IV. THE NUMBER OF AGREEMENTS WITH EXTERNAL ENTITIES IN THE FIELD OF INTELLECTUAL PROPERTY

No.	Type of technology transfer	Number
1.	Agreements on community of law	36
2.	License agreements and cession of rights agreements	6

The Department of Intellectual Property and Patent Information supports the University also in the scope of

supervising the agreements. In 2014, the Department gave opinions on or negotiated 439 agreements.

CONCLUSION

With the move of advanced economies from a resource-based to a knowledge-based production, many national governments have increasingly recognized “knowledge” and “innovation” as significant driving forces of economic growth, social development, and job creation. In this context the promotion of “knowledge transfer” has increasingly become a subject of public and economic policy. Within the framework of knowledge and technology transfer (KTT), the university aims to use new research findings in cooperation with industry – as quickly and efficiently as possible – in an attempt to produce new products and services and to positively shape social development.

Wrocław University of Technology takes steps towards developing a system of cooperation with the economy. The implementation of a “one stop shop” concept is to support and facilitate contacts between the representatives of the scientific community and the economy. Last but not least, the goal of the system is to facilitate the access to information on new technologies, as well as the cooperation of business community with the university.

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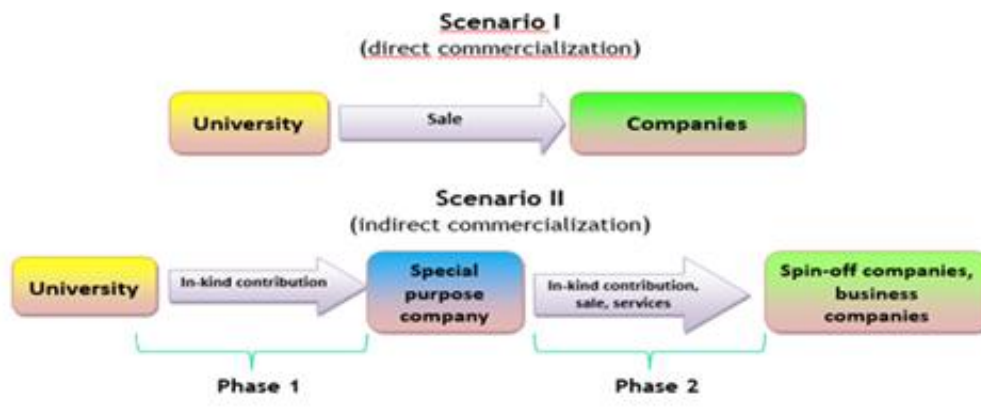


Figure 1. Technology Transfer in WUT – scenarios.

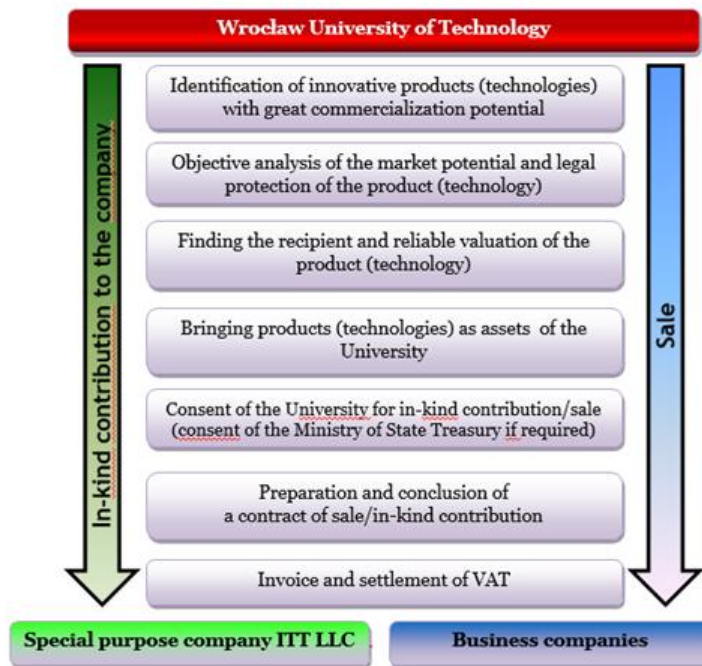


Figure 2. Model of commercialization process

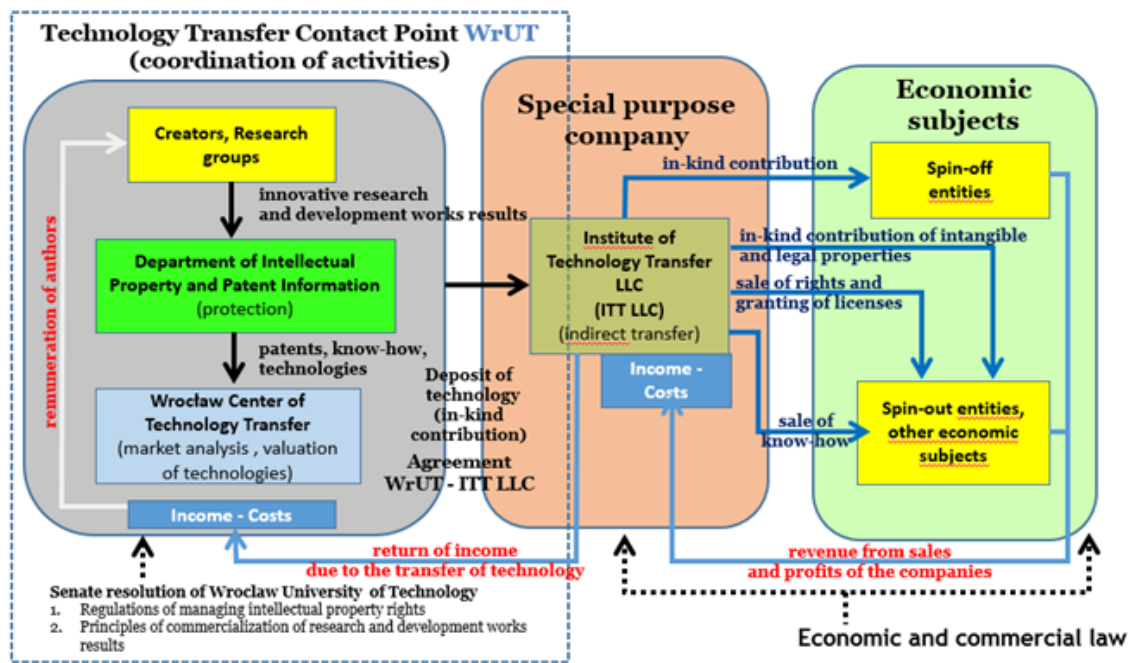


Figure 3. Model of indirect commercialization process in WrUT (Path 1 and 2)

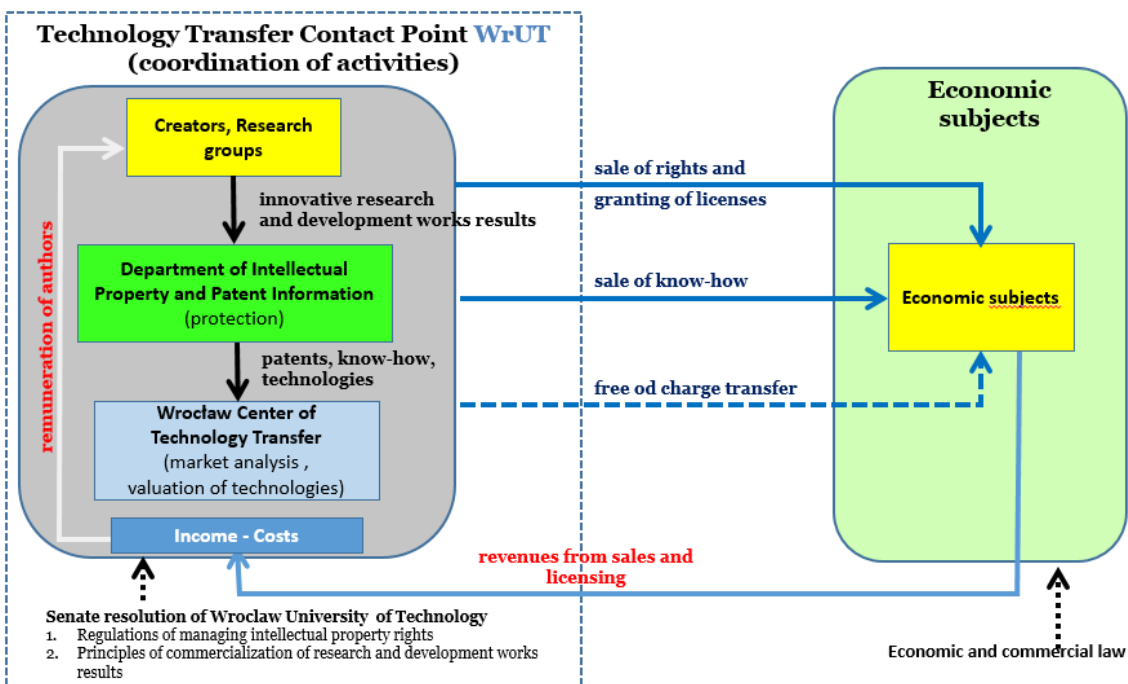


Figure 4. Model of indirect commercialization process in WrUT (Path 3 and 4)