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A CASE OF KNOWLEDGE TRANSFER BETWEEN RESEARCH AND INDUSTRIAL ORGANIZATIONS IN THE ROMANIA - SERBIA BORDER REGION

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Abstract:
The article presents the research results gained during a cross-border cooperation projects between Romania and Serbia. The researches done tried to fill-up the needs for a long-term strategy and the needs to establish means of intensifying the interaction processes through the Research - Industry – Investment development triangle, which can be a driver for a long-term development of a value-added oriented industry, and the introduction of new technological dimension for the European Union integration processes inside the particular cross-border area. The main rationale was driven by the low interaction between research and development performers and small and medium size enterprises (SMEs) in the cross border area. In addition, there have been identified a dire need for a number of SME's to achieve a technological compatibility level with the European Union and because usually the SME's do not have the specialized staff to tackle all the necessary issues related to manufacturing processes modernization (up-date and reengineering) and/or to European standards compliancy. Through the research approach, a technological screening of the Romania – Serbia cross-border technological needs were made and based on the results there were defined benefits for SMSs from both countries, related to technological consultancy via a voucher system. The research presented in this article are linked with the results of our implication in the "*Partnership and technological support for cooperation between R&D and SMEs in the border region*" project, financed by Romania and Republic of Serbia, in the context of IPA Cross-Border Cooperation Programme.

Keywords: knowhow; transfer; strategy; cross-border; EU integration

1. KNOWLEDGE OF THE TECHNOLOGY TRANSFER

In the academic sector the process of commercialization is known as “technology transfer”. Technology transfer now refers to institutions that are receiving public funding for research. By and large, technology transfer is accomplished through licensing intellectual property (IP) to companies that have the resources and desire to develop and produce the technology for specific applications. In return, research institutions like universities or institutes for Research and Development receive payments (in the form of cash fees and/or equity and/or royalties on earned revenues) for the products or services that were licensed. The income to the research institution is distributed according to each institution’s policy, but it includes compensation to inventors and a mechanism for channeling income back into the research programs.

The Council on Government Relations (COGR) from the United States, for example, defines technology transfer as “the handing off of intellectual property rights from the university to the for-profit sector for purposes of commercialization”. While technology transfer has been commonplace in the industrial and business sectors for a long time, the notion of selling intellectual property for commercialization purposes has really only become a university phenomenon in the last thirty years, or so.

To keep up with the extensive reporting requirements most research institutions have established an office to coordinate technology transfer activities. Main activities of these offices are to receive invention disclosures from scientists and technologists, to evaluate the disclosures for merit as well as the type of intellectual property protection that is most appropriate, to see that the proper filings or registrations are carried out, to market the inventions to potential commercial partners through licensing efforts, to monitor the patent filings and license agreements. In addition, offices of technology transfer are often responsible for other kinds of agreements related to intellectual property and proprietary information and materials.

As it was pointed out in the paper “General Aspects Related to the Technology Transfer, The Main Source of Innovation and Development Among Economic Operators” by authors Felicia Diana Nicoară, Dorin Maier, Andreea Maier, „*increasing the technological endowment through the process of technological transfer from research to industry contributes significantly to the improving of the economic growth rate at the national and regional levels”.*

2. MAIN ACTORS INVOLVED IN THE PROCESS OF TECHNOLOGY TRANSFER

In the process of technology transfer the following main actors participate [1]-[11] :

1. Research and development institutions, public or private, which are the source of knowledge and have the technology transferred object;
2. The agent arranging technology transfer process which may belong or not to the research institution;
3. Entity (company) that receives and implements scientific results;
4. Public or private institutions that provide financing mechanisms;
5. Government through strategies, policies, resources.

All actors involved have a main target in accelerating the economic use of research results involving the transition from invention to innovation and distribution on the market creating added value. Universities, research institutes and government research laboratories are sources of technology which must be exploited in the interest of society [11].

To facilitate the connection between them and the economic entities wishing to implement and apply technological innovation for achieving a competitive advantage various intermediary organizations have emerged. The role of intermediation is very important, as evidenced by the large number of institutions of this type that occurred in the last 15 years [12].

Worldwide there is a network of organizations that aims to increase competitiveness by enhancing and streamlining the process of technology transfer. They act as an interface between research units and industrial companies, being attached to or associated, in most cases, with a public research organization. A European Commission study shows that in 2004 European wide, there were 1393 technology transfer institutions divided into three organizational types [12]:

1. *Technology transfer offices.* These are defined by the OECD as "organizations or parts of an organization that helps the staff of a research institutions to identify and make available intellectual property management, including protection of intellectual property rights and transferring or licensing such rights to other parties in order to increase the possibilities for development ";
2. *Technology parks* and business incubators that help staff of research institutions to create new companies in order to develop and commercialize an invention*;*
3. *A specific research organization* providing research services to the private sector, provided that they have specific technology transfer functions located in one or more departments or disseminated within the organization.

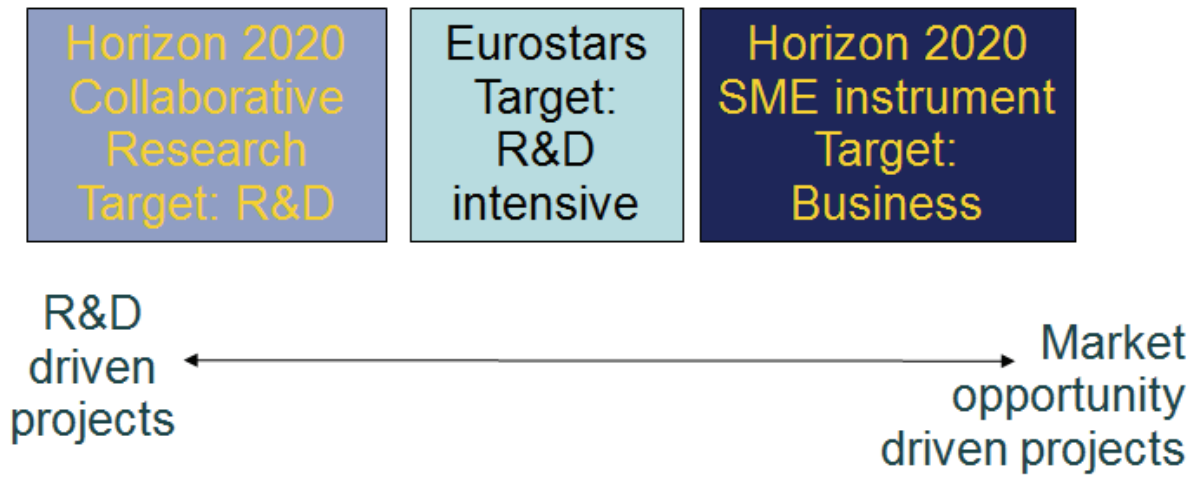
Technology transfer offices (TTO) act as intermediaries between researchers, government research institutions and companies in the economic environment, being an essential tool for developing relations with industry. They constantly supervise the results of research and knowledge capital of the institution to identify those results with real potential for recovery and encourage researchers to focus their research towards technological opportunities offered by the market. The activities carried out have strong economic implications because besides the fact that they can generate substantial revenue for the research institution they may lead to local economic growth and job creation. Technology transfer offices act as catalysts in the process of technology transfer, as converts of knowledge and economic impact enhancers [13]-[14].

3. E.U. AND HORIZON 2020

When it comes to the European Union, we can notice the 2020 strategy and policy designed for the knowledge transfer. According to it, the new trends in technology transfer are to synergy with national & international policy. The purpose of Europe 2020 Strategy is to aim an intelligent, sustainable and competitive economy.

In order to achieve it, all the actors and regions in the innovation cycle must be involved. The Innovation Union wants to improve the access towards financing for research and innovation, to make sure that the innovative ideas can be turned into products and services that can determine growth, competitiveness and jobs. The public and private sectors must work together through the Innovation Partnership and the technology transfer is developed through knowledge transfer.

Picture1: Partnership for innovation and development – Innovation Union



The Partnership is established between Universities, Regional Development Agencies, Units for Structural Funds, SMEs & Research and Innovation Centers, Professional Associations, Ministry (Business Environment, Research & Innovation), IPR Agency.

Its objective is the creation of an Innovation Union, as a support pillar of regional development through innovation and technology transfer.

Its purpose refers to the growth of the capacity to promote the innovation, competitiveness, research, technology transfer as a regional development policy sustainable by the inter-connection of the knowledge, technologies and people.

4. TECHNOLOGY BROKER AND INNOVATION VOUCHERS

Occupational standard: Technology Broker: Cod COR 2419

The Technology Broker is the person qualified to do the technology transfer, which connects offer with request, respecting the intellectual property rights.

He also identifies the results including those of research, especially those considered fit for the exploitation of a third party and their promotion in connection to market needs.

He carries out a set of specific activities like:

- The systematic and independent examination of a technology offered by an owner in order to determine characteristics, advantages, the way of market application, for finding a partner interested in applying the technology;
- The realization of technology transfer assuring consultancy and assisting the parties during the transfer;
- The promotion of services, publication of technological opportunities.

Innovation vouchers

Their beneficiaries are the SMEs with technological potential. The providers of this kind of services are consultancy companies, Research Institutes, Universities.

The purpose or an innovation voucher is to support the SMEs from the productive sector for the technological modernization and the increase of innovation degree by simplifying the financing procedures. This can be carried out through:

- Services for the development of new products, technologies, IPR
- Implementation and testing of experimental models, patents
- Industrial research having the purpose of putting into production
- TT, evaluation and technology audit, phesability studies, business plans, support activities for innovation
- Transfer of research results towards the SMEs,
- Products certification, testing, laboratory analyses.

5. INNOVATIVE SMEs AND GOOD PRACTICE. A CASE OF KNOWLEDGE TRANSFER BETWEEN RESEARCH AND INDUSTRIAL ORGANIZATIONS IN THE ROMANIA - SERBIA BORDER REGION

Between September 2013 and March 2015 the National Research and Development Institute in Welding and Material Testing – ISIM Timisoara was the beneficiary of the project called "Partnership and Technological Support for Cooperation between R&D and SME's in the Border Region", acronym PARTECH, MIS ETC code 1396, financed by Romania - Republic of Serbia IPA Cross-Border Cooperation Programme.

The project was carried out by ISIM Timisoara as Lead Partner and Association for Development Kladovo as Project Partner.

The rationale of the project was given by the low interaction between RTD performers and SME's in the cross-border area, especially in Serbia. A dire need exists for a number of SME's to achieve a technological compatibility level with the EU, mainly because usually the SME's do not have in their staff the necessary specialists to tackle all the necessary issues related to fabrication process modernization and / or to EU standards compliancy.

PARTECH's project main goal was to help (some of) the companies from the RO-SRB border area to become more agile, flexible and to be open for innovation through the industry->science->industry cycle and to raise their competitiveness.

PARTECH's objectives had in mind:

- The development of a joint initiative of cooperation between research and industry in the RO - SRB border area
- The Creation of a partnership for innovation and technology transfer between RTD organizations and SMEs in the RO-SRB border area
- Technical support for cross-border SMEs in order to help raise their competitiveness on national and international market

The objectives have been reached by increasing the interaction between RO and SE RTD performers and the crossborder SME's through an interactive website (in 3 languages), through direct interaction on the opening events and other meetings and through joint promotion of the two partners RTD activities.

During the project technological audits have been performed on both sides of the border, resulting the selection of 5 + 5 SME's as voucher beneficiaries (5 in Romania, 5 in Serbia). Technical and technological support for the selected SMEs has been given by the two partners in their own expertise fields.

PARTECH's target groups were SMEs from the Romania - Serbia border region, SMEs having needs for technical support related to innovation in fabrication or process organization, in the field(s) of expertise of the project's partners:

- Process technology (welding, cutting and related processes, etc.)
- Materials science (behavior of materials, mechanical testing, non destructive testing, structural analysis, heat treatments, etc.)
- Welding related QA
- Certification of welding personnel and of the personnel in the field of non-destructive examination and the qualification welding procedures
- Technological transfer

The project's main Indicators were:

1. Technological audits in SMEs in order to identify their need in the field of new products, new technologies, quality management system etc.: 60
2. Technology transfer to selected SMEs: 10
3. Partnership between R&D providers and SMEs: 1

Romanian and Serbian project teams have identified 60 SMEs in the border area and, after careful analysis, 10 of them were selected as beneficiary of innovation vouchers (5 for Romanian side, 5 for Serbian).

Our case of study mainly focuses on the way the knowledge transfer was made in the 5 companies from Romania. The five vouchers had the following beneficiaries and results:

1. Name of the innovation voucher: *Conditioning mechanical machining processes using ultrasonic energy*. Beneficiary : INTELIFORM Engineering Solutions

   The activities were conducted and completed in accordance with the protocol of experimental program for implementing the innovation voucher received by Inteliform. ISIM specialists provided consultancy in the field of unconventional technologies for processing of metallic materials.

2. Name of the innovation voucher: *Consultancy regarding the development and equipping of a material testing laboratory aimed at examination of tubes for guiding cables buried underground, according to SR EN 61386.* Beneficiary: TEVO S.R.L.

   The aim of the voucher was to innovate the beneficiary's activity through informed selection and implementation of the adequate testing methods for their products, in order to assure

proper product quality. Furthermore, through the voucher implementation, the beneficiary gained know-how regarding the creation, development and accreditation of a testing laboratory for their products in different stages of production.

Through the voucher implementation report, the beneficiary gained the necessary know-how and information about the financial effort to choose between the following alternatives:

- Creation of a new material testing laboratory to test the produced PVC tubes
- Externalization of the compression and impact tests to an independent laboratory
- The beneficiary was presented with the necessary information to carry out compression and impact tests on PVC tubes according to SR EN 61386-24

The results of the demonstrative tests indicated the conformity of the tested products and opened up new opportunities for collaboration.

3. Name of the innovation voucher: *Specialized consultancy to modernize manufacturing processes used in the production of medium and large welded structures (arc welding, cutting processes)*. Beneficiary: S.C. Plastomet S.A.

   Metal structures / welded assemblies represent products that the companies always had demands from the market. Due to the economic problems and requirements demanded at the EU level and the steep competition among manufacturers, PLASTOMET increased its preoccupation with modernizing and optimizing the fabrication processes of welded structures by retrofitting two main directions: electric arc welding processes and cutting processes.

   The voucher's technical report concluded that the beneficiary was notified about current information with modern technical solutions applicable to his activity regarding efficient arc welding technologies, modern arc welding equipment, possibilities for mechanization/robotization, equipment costs (informative), issues of economic efficiency, etc and current information with modern technical solutions regarding efficient unconventional cutting technologies as alternative to the conventional methods in terms of cutting processes, cutting equipments, implementation costs, etc.

   The technical report is dedicated to technical personnel responsible with the manufacture of welded steel construction, but may be useful for young employees who are preparing to work in this field.

4. Name of the innovation voucher: *Sclerometrical and structural researches concerning the hard layers deposited on the excavator teeth. Heat treatments.* Beneficiary: S.C. SUDOTIM S.A.

   The teeth of specialized excavator used in exploitation of magnetic rocks used by the beneficiary were made of forged alloyed steels, which have 0.45% C and 1% Cr and a hardness value less than 45 HRC. The operating time of these teeth is about 1500 hours.
   This voucher estimated the possibility to make a structural hardening of the excavator teeth using electrodes type Cr-W-V-Ti, with a hardness ranging from 52 to 55 HRC.

   In order to obtain the best results in a short time, the experiments were made on the equipment subjected to maximum and complex loadings, namely the frontal excavator Volvo L220 E.

   The process of structural hardening of the teeth active surfaces (frontal and lateral) was performed using a technology elaborated by SC SUDOTIM AS SRL Timisoara, concerning the hard layers deposition by welding with alloyed electrodes having 25%Cr.

   Based on the specifications of the pWPS (proposed parameters) and the WPS (realized parameters), the technology of hardening by welding of the excavator teeth active surfaces is ready to be used in the beneficiary's activity.

5. Name of the innovation voucher: *Techniques and technologies for welding thermoplastic materials in the automotive industry - thermal contact welding, ultrasonic welding.* Beneficiary: S.C. FLORIMPEX TIM S.R.L.

The innovation vouchers consisted in the process optimization of certain activities and/or developing new welding technologies in order to find innovative or improved solutions/technologies for joining polymeric material used for packaging, conservation and transport components for the automotive industry.

Expected results were in correlation with the analysis of experimental results. Our goal was to increase the quality and productivity of joining the polymeric materials. Three processes were taken into consideration: thermal joining, hot air joining and ultrasonic joining.

The performed comparative study showed that, in terms of investment costs, the purchase of new equipments (ultrasound equipment - 18,000 euro hot air mechanized equipment - 1,800 euro) is needed. Considering the results, the specialists concluded that hot air joining method is more efficient than ultrasound one.

FLORIMPEX made the decision to invest in the acquisition of automatic/mechanized hot air equipment that will allow to increase the work productivity and to extend its activity into the automotive industry.

6. CONCLUSIONS

Technology transfer is a very complex process and, therefore, for an efficient implementation all parties must work strategically together.

In present day Research and innovation heads towards to the capitalization of research and the growing marketing of transferable results. In those given times we must mention the necessity to see the innovation as a strategy, for companies, for cities, for regions in order to achieve competitiveness and the sustainable development.

From the analysis of the literature on technology transfer and having in mind the current aspects seen in our case study and in the European Union, we can identify that the week points of the region are in:

- The capitalization of the research results (creation of knowledge, technologies, expertise)
- Attracting the business environment in research,
- Entrepreneurship, intellectual assets, the capitalization of inventions.
- Marketing the technology knowledge
- Organization of regional innovation.
- Creation of the Smart specialization

Efficient partnership must be made between the main promoters of innovation: universities, research centers and institutes, private sector and generators of regional policy makers.

The increase of competitiveness can be achieved through knowledge generators that would create new technologies, services on benefit of SMEs, Research results transferred to industry, properly market valued, transferable technologies towards the economic environment, intellectual property - Patents, trained personnel (Technology Transfer & Innovation, technology brokers), innovative SMEs with high added value, promotion of a mass innovation culture.

Following the example seen in our case study, the needs of the business environment can be identified by Research and Development Institutions, Universities, Local Administration (when it comes to innovation). Most of this kind of institutions, especially the ones from countries that recently joined the European Union like Romania, have already a strong background of projects that were financed by European Union Programms and can easily identify and elaborate project proposals for the incoming EU projects call in the EU2020 system. Their past experience and know-how can be correlated with strong training programms for staff that is working in the field of innovation, like the innovation manager. The rationale is to show how innovative companies attract funds and how transfer knowledge can be made.

At an more global level, a synergy between national and regional strategies must be realized, also between the actors involved in the innovation competition, between research and business, between different funding programs with the of the Structural Funds carried out by the E.U.

This kind of synergy can reveal new models and best practices for financing innovation (including the creation of Venture Capital, Business Angels and innovative entrepreneurs), also Cluster development strategies must be taking into account, as the clusters are the poles of competitiveness which is based on the regional needs.

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