
OPTIMIZATION OF TECHNOLOGY TRANSFER BY USING IT SYSTEMS

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Abstract

The applied research and the innovation represent priorities for the European policies, the researchers focusing on certain directions of action for thus fixing an economic, social and environmental problem. The Romanian research, although presents notable results, is not adapted to the needs of the local business environment. This paper aims to analyse the modern methods of technological transfer used at international scale, and to identify some applicable solutions for the local economy. Following the researches, it was evidenced that the models of technological transfer, based on the utilization of the advanced IT technologies may be successful in the national business environment. The Romanian entrepreneurs are pragmatic, avoiding the useless costs and being interested, mainly, in identifying some viable financing sources. The consultancy, the access to the new technologies and to training services and assistance in the field of innovation are the main categories of advanced technological transfer services that are of an interest for the in-house business environment. The results of research may be useful for the business environment but mostly for the national officials in creating some adapted strategies of technological transfer and of selling the outcomes of the research.

Keywords

technological transfer, models, ITC, Romania

JEL Classification

O21, O32

Introduction

The research and innovation may contribute to the transformation of the European Union (EU), granting jobs and better life conditions for the citizens of the member states. The EU Policies focus on supporting and stimulating the innovation, also for establishing small companies. In 2008, the European Forums adopted the Small Business Act initiative, meant to accomplish a favourable climate for the small companies and to potentiate the entrepreneurial energies. The National Strategy for Research, Development and Innovation 2014-2020 suggests the development of the national sector by PNCDI3 2014-2020, correlated with POS-RDI 2014–2020. Romania is an important provider of higher education personnel for research, the generative base being represented by 97 universities (out of which 56 are public ones), comprising 560 faculties. The National Research System is

formed of public and private legal entities: 263 public organisations, and 600 public or private business enterprises. (Ministry of Research and Innovation MCI, 2017).

Material and Methods

The information about the technology transfer models was collected from the specialized literature or from websites belonging to some specialized technology transfer centres. The data referring to the technological transfer units in Romania were selected from the Ministry of Research and Innovation database. For the Romanian clusters, the information was selected from the data belonging the Ministry of Economy, Trade and Business Environment.

The National Network of Entities Specialized in Technological Transfer

On the European rankings, Romania occupies the penultimate place in technology transfer and commercialization (TTC). TTC in Romania is defined by a reduced cooperation between companies and research entities, a small number of innovative SMEs, a low rate of technological transfer and a poor entrepreneurial culture. Several trials of facilitating the information transfer were done in 2006, by creating The National Network for Innovation and Technological Transfer (ReNITT) and The Romanian Association for Technological Transfer. The initiative aimed to increase the visibility of the research units and to improve the SMEs competitiveness, by developing the offer of knowledge and technology transfer services, particularly in the poorly developed areas.



Fig. no. 1. Technological Transfer Units (ReNITT)

Source: Adaptation by Ministry of Research and Innovation, 2017

The network members are legal RDI entities (Scientific and Technological Parks, Technological and Business Incubators, Technological Transfer Centres, Technological Information Centres and Industry Connection Offices). Recently, the business clusters were considered strategic instruments, allowing the companies to be competitive at international level. The joint contribution of the clusters in Romania to the main national macro-economic indicators is presented in the Figure no. 2.

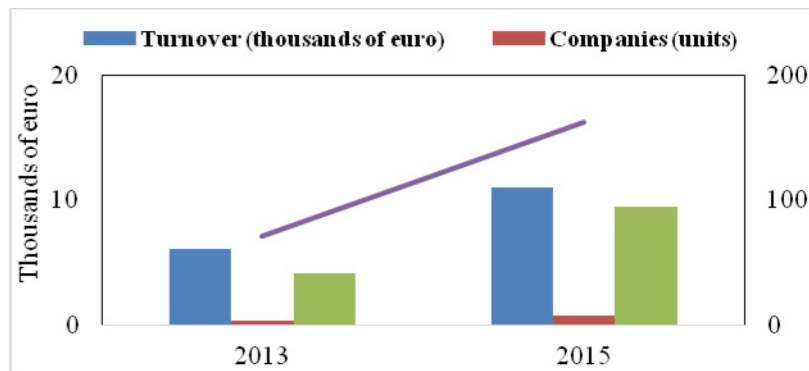


Fig. no. 2. The Joint Economic Contribution of the Clusters
 Source: Authors, Adaptation by Cluster.ro, 2016

During 2013-2015, the number of enterprises included in the recognized clusters at national level increased from 336 units to 780 units, evolution also reflected as an important increase in the number of employees, from 71,169 persons (2013) to 163,009 persons (2015) (figure no. 3).

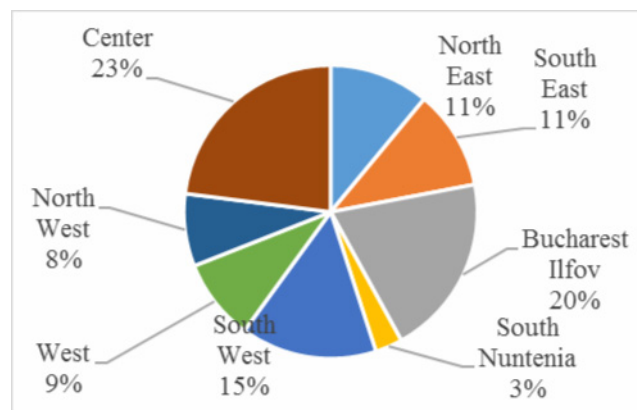


Fig. no. 3. The Clusters Distribution on the Areas of Romania
 Source: Authors, Adaptation by Cluster.ro, 2016

The clusters distribution on the areas of Romania is not uniform, the most entities being recorded in the areas in the Centre, Bucharest-Ilfov and South-Western part (figure no. 3).

Models of Technology Transfer

In Romania, the IT sector is among the most developed and attractive fields for the IT giants and for the entrepreneurs. According to the study “IT Applications Made in Romania. Mobile Tech Report 2016 Study” (Andriescu, 2016), and the production of mobile applications, available for smartphones, tablets or laptops entered its maturity stage, while the spread of mobile devices reached important values on most of the developed markets (Poushter, 2016).

The smartphone utilization degree doubled in the last years, the new emerging technologies related to the mobile applications joining the hyper-applications cycle (Walker, Burton and Cantara, 2016). Until 2022, it is estimated that the use of the mobile phones and of the corresponding applications will increase by 25% in the industrial sector. The mobile solutions for enterprises include software, mobile devices and applications that work together to help companies and the employees to improve their work and increase

efficiency. The trend registered a modest progress regarding the implementation on the Romanian market, but a considerable development is estimated in this area, until 2020. The mobile applications projects are usually developed for Retail, eCommerce and Finance, but it is possible to be adapted for technological transfer optimization purposes as well. As the mobile applications lead to a new phase in the digitalization process of the society, an increase by 31% is forecasted in 2018, at international level (Kolowitch, 2015). The company MOBIO Technologies proposes the utilization of the mobile applications for technological transfer, offer that is presented on the website <http://www.mobioproject.org/technology-transfer.html>.

The study developed in Australia by Rampersad, Plewa and Troshani (2012), regarding the selling of the outcomes of the researches performed in universities, indicated that using the ITC for managing the innovation is an interesting option, as the innovation applications a one step ahead the promoted novelties, thus being able to initiate pivot evolutions and new innovation elements. The study, that was conducted in the specific context of selling the academic research, used the survey as investigation method, the inquired subjects being the academic researchers, the university employees or the partners and collaborators from the business environment. The target was adopting a transfer application, to act as an interface between research and development, marketing and innovation development administration. The study, based on qualitative criteria that also included a focus group and 16 detailed interviews, indicated the necessity of integrating the ITC solutions with the performance results of the innovation process and with the marketing information. The accomplished technological transfer application can be used in a larger variety of organizations, including research, companies offering various kinds of services or Governmental administrative agencies.

Kuraki, Nakagata, Tanaka and Anan (2014) analyse the potential Fujitsu Laboratories has for transmitting complex information via smartphone-type mobile applications. The quantity of information that can be transmitted /received within an interception period of 2 up to 3 seconds and that does not cause stress to the users is of 16 kB.

In Romania, Bio Danubius, the first cluster belonging to the Romanian producers of ecologic products was launched in 2018, a process of entrepreneurial discovery about using advanced technologies in the field of bio food. The project focused on applying the new technologies (blockchain, GIS, IoT, Big Data) for producing, processing, tracing, certifying and selling the ecologic products under the Bio Danubius brand (2018). The entrepreneurial discovery seminar, that took place in Braila on 25 April 2018, organized by Ministry of Research, rated the research project proposed by the Bio Danubius cluster among the valuable projects at regional level (Gazeta de Agricultura, 2018a).

BASF and Arc-Net cooperate together in using the blockchain technology, for enhancing the sustainability in the field of zootechnical field. The calculation instrument used by BASF, AgBalance Livestock, quantifies the impact of the inputs and outputs in the animal protein production process, along one life cycle. By combining AgBalance Livestock with the blockchain technology, important information on sustainability can be generated and also verifiable data referring to the meat, milk and eggs origin. The project may allow the consumers to make documented decisions regarding the meat they consume (Gazeta de Agricultura, 2018b).

Bento Granar proposes a Software for managing the cereals storing into silos (Gazeta de Agricultura, 2018c). The Bento Granar Software was developed in cooperation with Siloz Carani, the biggest logistic hub for agricultural products in the Western part of Romania, having a storage capacity of 70,000 tons and of receiving/delivery of 5000 tons/day. The product is adapted to the management processes that are specific to the silos, from the automated issuing of the Justificatory Inventory Document to the automated issuing of the monthly invoices, considering the storing days and conditions. SIVECO Romania launched

a modernized version of the INOVAGRIA weather application, available on Android and iOS, having facilities dedicated to the management of the meteorological and agrometeorological phenomena in Romania. The application presents new facilities for farmers, by using an easy-to-use design (Gazeta de Agricultura, 2018d).

CLAAS opened a new development centre for the electronic systems in Dissen, Germany. The assistance electronic systems, the software and communication technologies are more and more important for agriculture. More than 170 software developers, engineers and specialists from CLAAS E-Systems project innovative solutions for equipment interconnecting, for thus helping the farmer to manage his business more efficiently. The ITC novelties include command units, electronic architecture, terminals, video systems, automated direction systems based on satellites, and many other devices (Gazeta de Agricultura, 2017).

The Eastern Marketing Insights Study (2015) shows the limitations of the technological platforms when it comes to technology transfer.

A questionnaire filled in by 1,250 companies, out of which 1150 activating in intelligent fields, indicates the fact that it is difficult for the companies to find the contacts of the Universities or to cooperate with them. The main services the companies in the North-Eastern area need are: support for recruiting qualified personnel in the field of technology ("not-qualified personnel even", as some subjects stated) (51,1%), innovation financing (48,1%) and support in business (48%).

The universities and research institutions are taken into consideration by 23,6% of the companies and respectively by 24,1%, a larger number of these companies activating in fields like: Foodstuff, Others, IT&C and Environment. The databases are a source of innovation for 51,7% of the companies (a larger percentage being recorded in the field of Environment), fairs and exhibitions - for 50,7% of the companies (a larger ratio in the fields of IT&C and Others). Around 12% of these companies „did not think of technological transfer”, „did not have access to this information” or „did not receive collaboration proposals”.

When it speaks about sources of information and innovation, the research institutions are a source of innovation for 24,1% of the companies while the Universities, for 23,6%. There were also mentioned other sources of innovation: other education institutions than the universities. The study that was conducted at universities and research institutes level indicated that the service generating the biggest share in the profit of the institution, compared with other similar services is „scientific & technological guidance/expertise/consultancy”. In the case of universities, this service represents a low share in the total of profit/turnover, the largest share coming from the tuition fees. We consider that a free mobile application, available on smartphones, may facilitate, in a first phase, the access to consultancy and the connection between CTTs and the business environment.

The analysis developed by Zhang et al (2016) highlights the efficiency of the technological transfer methods and the specific advantages and disadvantages in using the mobile applications in the agricultural field, in China (Table no. 1). ITC-based information transfer systems in the field of agriculture, similar to the ones in China, are also used in Malaysia (Kang'ombe and Markon, 2017).

The advantages of using such systems were immediately visible in China. The portal dedicated to the workers in agriculture functions as a platform for the assisted genomic selection, cellular engineering and informatics, simulating the development of a modern production of seeds and the action of the monitoring and warning systems for the integrated management of the major diseases and insect pests in agriculture.

IngGreen.com-professional Internet platform for environment industry, developed by Beijing Inggreen Technology Co., Ltd. provides media coverage, industrial analysis, recruiting and international technological transfer for the client.

Saini and KumarKhurana (2016) stated that ITC technologies facilitate the communication and the information exchange for the organisation, with improvement effects on connectivity and internal and external interactions. The fore-cited paper analyses the communication problems that might occur during the technological transfer process and also their impact on the technological transfer implementation, a specific model for technological transfer (STAR) based on the utilization of the ITC systems for a fast and efficient action, being recommended.

The FITT European project elaborated a set of instruments dedicated to the practitioners in the field of technology transfer, working to support the innovation in the field information and communication technologies.

The efficient technology transfer is an essential element for transforming the innovative ideas resulted from the research outcomes into new products and services. FITT Toolbox (www.fitt-for-innovation.eu) offers a selection of practices from the partner organisations that evaluated the solutions that correspond to the common needs of the technological transfer. (www.fitt-for-innovation.eu).

The study developed in the Central Area evidenced the privileged place granted to the clients and to the technology providers, as sources of information for the technological progress, in an informal environment - by direct contacts, or formally - by technology fairs participations. The answers indicate the necessity for a bigger effort to be done by the clusters and universities/research institutes for positioning themselves as vectors in the process of transferring the technological progress.

Table no. 1. The Analysis of the Technological Transfer Models

Model	System	Support	Strengths	Weaknesses
Web Portal	Collection of relevant Websites - acces portal	Ministry of Agriculture China	Easy access comprehensive, detailed information	General information, irrelevant, the specific information the user might need is not available
Voice information service for agriculture	Information dissemination via telephone, (online) voice services	Liaoning 12316 Golden Line	Interractive, easy to understand, and individual services	Requires human involvement that is time-consuming, less efficient, more expensive
Text SMS-based service	Information dissemination via SMS Text for mobile phones	Telephonic Service Hunan Agri-Telecom	Closeness, efficiency in sending useful messages fast	Brief, not detailed information, and the SMS is the same for all users. The information might be not relevant/adapted to the specific of the individual user/need of information
Online Community MOA Portal Web,	Forum-type system, involves action from both interested parties, that are exchanging interractive information	Sevice Platform Mail box - agriculture worker Zhejiang Province	Interractive communication, relevant information, user's participation, profitable	Requires an active user participation, efforts and a good management of the information. Service available only for the network members

Video Interactive	Conference Service. Information dissemination by online conferences	Shanghai Farmers "One Click and Go"	Easy to understand, efficient communication, interactive service	Requires experts involvement, may be time-consuming and low efficient, involves high costs with the experts' salaries
Smart phones	Information dissemination - Mobile Internet service	E-Price - Ubiquitous Application	Profitable, easy to access, could incorporate GPS for identifying the location	Requires corresponding attention, infrastructure and intelligent slides utilization, IT abilities and also for using new technologies
Unified Multi-Channel Model Complex	Combined, mixed dissemination of the information via telephones, computers and mobile phones	"3 in 1 Service" Fujian	Combines flexible services and has the advantages of the previous models	Requires investments in IT, Infrastructure and equipment, effort and support from the interested parties

Source: Data Adaptation by Zhang, 2016

The first five required advanced technological transfer services are the consultancy in implementing technologies, the access to testing new technologies, training and assistance services in the field of innovation, cooperation with the end-user in further developing the product (Living Labs) or technological assessment services. On the opposite side, the least attractive services of technological transfer are represented by the open innovation platforms/the transformation of the activity into the Open Source platform, the industrial property portfolio management services, the integration in research-oriented clusters, creation workshops with the students' participation, coaching provided by top managers. The Romanian entrepreneurs are pragmatic in identifying the bottlenecks in the way of their access to technological transfer, their preoccupations concerning the costs and the financial resources. Thus, the first three positions in the hierarchy of the bottlenecks are occupied, in line, by „the associated costs”, „the access to financing for technological development” and „the access to financing in the perspective of business ideas development”. A relevant barrier in the way of the technological transfer is the lack of information consequently, the investment effort in the technological transfer entities should be doubled by an information and education effort. This aspect might be favoured due to the fact that the entrepreneurs placed the services of training and assistance in the innovation field, on the 3rd position in the top of their preferences when it comes to advanced technological transfer services.

Conclusions

The utilization of the knowledge/technology transfer models may represent a useful analysis and management tool, allowing the decision makers to establish some targets and objectives to be accomplished, in relation with which, the technological transfer unit, based on some CANVAS business models, can define a portfolio of activities for itself, including the necessary resources, and by their implementation, the planned results and performance to be achieved. Romania finds itself in the phase of establishing some viable strategies of technological transfer correlated with the occidental systems with tradition, proved performance and qualified personnel. Although, our research had mainly a theoretical and documentation character, it may set the bases for a further research for identifying the most appropriate methods of technological transfer.

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