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Information Technology Transfer Model as a Bridge between Science and Business Sector

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Abstract

Statistics from Innovation Union Scoreboard 2015[1] shows that the Baltic States have a low innovation index in comparison with other European countries. One of the main reasons is that a lot of developed prototypes do not use in the business area and stay at the research laboratories. Research organization does not have a direct link to the market.
The purpose of this paper is to contribute to the solution of problems in Latvian innovation system. Authors of this paper have selected innovation, knowledge and technology transfer model as the bridge between academia and market. During research work selected Information Technology (IT) research results developed in Riga Technical University (Latvia) were validated according to proposed technology transfer model.
The paper presents a description of the communication process with the information technology developers and potential end-users and document results of it.

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Keywords: Information Technology Transfer; Innospice; Validation; Innovation; Commercialization

1. Introduction

The role of innovation is important for economic development of a country. Researchers every day searching for answers how to improve the quality of life. They face environmental or social problems and specific business tasks. A lot of effort and finances has gone into solving a list of challenges.

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Many years researchers from European Commission (EC) provide an assessment of the EU Member States innovation systems. This report is named European Innovation Scoreboard[1] and a result of this evaluation is innovation index of each country. Evaluation based on 25 indicators that include a number of doctorate graduates, scientific publications, patents, trademarks, the number of employees involved in activities related innovation development, the expense of research and development, and many others. Indicators involved in assessment contribute to economic growth and social development. High innovation index allows to increase the quality of life and people interested in research and innovation development have more opportunities to have better jobs or spend their time on developing something new for the country's and society needs. The path from innovation index to a better quality of people life is illustrated in the figure below (see Fig. 1).

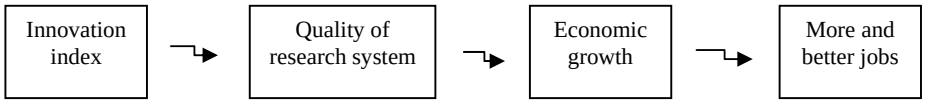

Fig. 1. From the innovation index to better jobs.

EC assessment shows that Switzerland, Finland, Denmark and Germany are leaders in innovation activities. But the Baltic States, including Latvia, have a low innovation index in comparison with other European Countries. The current position of Latvia is a 31st place from 37 and it is equal 0, 28142 (see Fig. 2)[1].

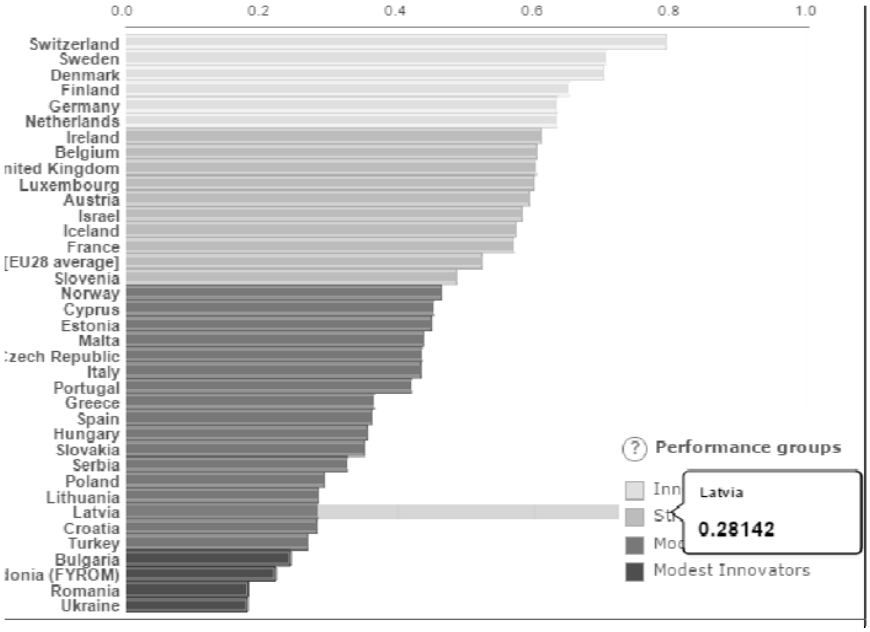

Fig. 2. EU countries innovation indexes visualisation[1].

The paper consists of 3 parts. The first part is devoted to the Ministry of Education and Science related work on Latvian innovation system and its challenges. Next part represents the main and it describes the Innovation, knowledge, and technology transfer process capability model that was selected to solve a problem of communication between science and business. This chapter includes a description of the communication process with technology developer and feedback collection from potential end-users. Last part of paper presents the results of the proposed approach validation and some recommendation to improve current state of innovation system

2. Related work

This paper is devoted to the problem solving of poor communication between the business sector and research organization, scientific capacity and quality of research.

Direct path of research results from universities to the potential end-users is not defined on a governmental level. But exist developed by Latvian cabinet of ministers document “Guidelines for Science, Technology Development and Innovations”[2] that is related to the implementation of country priorities "Innovative and efficient economy" and "a Paradigm shift in Education". This document identifies Latvia’s goals and priorities for science, technology and innovation for the period up to 2020.

Assessment of current state indicates several problems in Latvian innovation system (see Fig. 3):

- The current business model is weak-oriented on innovations. Nowadays Latvian business owners are oriented on cheap workforce and nature researchers, energy consumption. Productivity level, export production, and innovation capacity are low
- Poor communication between the business owners and research organizations. Many types of research results never go out of laboratories to the market. New technology introduction is limited. New solutions exist only in a form of reports or scientific publications. They are not adapted to the business needs
- The agreement between a supply of students and demand of workforce is not reached. A lot of students chose education programs that are not actual in the current state of the country. At the same time, there is a lack of educated people in some other area that is more important nowadays
- Lack of scientific and research capacity. There is an insufficient number of employees involved in innovation development. It is not enough doctoral students and lack of motivation to develop science. One of the reasons is low base funding of research sector
- Centric region development that increases infrastructures costs and population reduction in other regions that loses an opportunity to develop their own regions

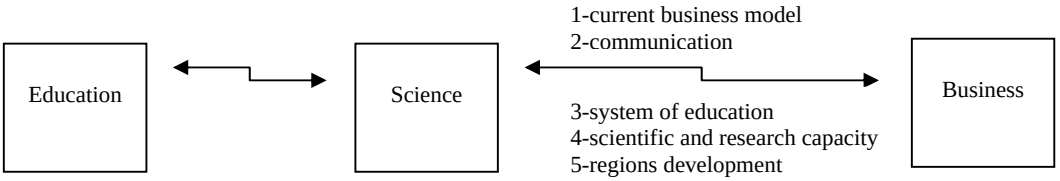

Fig. 3. Problems in Latvian innovation system.

During research was concluded that last years, different initiatives were established to promote collaboration (competence centres, technology transfer contact points, and supporting cluster initiatives). But they are relatively new and are not developed enough to help the country development at all stages of research and innovation.

The commercialization process is not defined and most of researches still are oriented on European projects and researches are developed “from the project to project”. They are not motivated to increase innovation index of country. There are many developed prototypes that are described in scientific journals, project reports, but not used on the market. Low mobility of scientists between the public and private sectors, weak commercialisation potential are still challenges of innovation system.

3. Innovation, knowledge and technology transfer process capability model – InnoSPICE

The high quality of research results is the base of competitiveness of the country. Information Technologies (IT) provide a greater contribution to the development of all important sectors of the country and increase implementation of the single digital market, contributing the growth of national economy. This paper is focused reaching high-quality solutions and its development process.

There are different innovation transfer scenarios in a modern world. In this paper, authors present a case where innovation developer is the initiator of the commercialization process. The continuous improvement of products quality and work environment is a critical factor for the development of our economy and society. Authors of the paper proposed to check the quality of selected developed prototypes form the Riga Technical University and interest of potential end-users before it will come to the market.

It is offered to apply InnoSpice – innovation, knowledge, and technology transfer process capability model[3] for validation of readiness of IT research results "to go to the market". This model was developed in 2010 in the framework of INTERREG Baltic Sea Region Programme funded project BONITA[4] and evaluated in more than 30 research and business organization in 13 European countries. This model is based on best practices of Software engineers, Capability Maturity Model[5] and International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) standard for process assessment (ISO/IEC 15504-1, 2004): Process assessment framework known as SPICE (Software Process Improvement and Capability dEtermination)[6]. Based on the experience of Software Engineering and combination with CMM and ISO this approach allows to assess research result and get process capability profile of it. The main idea is to take a prototype to decompose process-oriented activity into a set of processes and their performance level. This approach proposes that 13 processes contributing the Information Technology development and commercialization process:

- Process 1: Technology transfer Concept
- Process 2: Initial market assessment
- Process 3: Evaluation of transfer opportunities
- Process 4: Technical analysis
- Process 5: Intellectual property protection
- Process 6: Market and competitive analysis
- Process 7: Technology value evaluation
- Process 8: Go to market estimation
- Process 9: Commercial/social-economic interest confirmation
- Process 10: Business case establishment
- Process 11: Go to market strategy establishment
- Process 12: Business plan establishment
- Process 13: Financing sources raising

Each process has a goal, tasks (process-oriented activities) and outcomes. Each task should be checked by the scale: fully performed (100%), largely performed (75%), partly performed (50%) or not performed at all (0%). Task performance measuring allows the evaluator to get capability process profile. This profile allows detecting weak parts of evaluated prototype at the early stage before commercialization process is started.

During this research simple questioners was developed for Riga Technical University prototypes to be answered by technology developers. Example for the processes assessment is shown in the figure (see Table 1).

Table 1. Example for the processes self-assessment.

Process 1:Technology transfer Concept Performance%				
	Non performed (0%)	Partially performed (50%)	Largely performed (75%)	Fully performed (100%)
Task1				+
Task2				+
Task3			+	
Task4			+	
Task5				+
Task6		+		
Task7	+			

This assessment looks like the checklist for innovation developer. The output of this self-assessment is the list of weak-performed processes and process that are fully performed.

Capability process profile is based on process measurement and it allows to improve developed technology quality before it will go to the market. At the same time, it is important to get knowledge about the demand of such kind of innovation. That why communication with potential end-users was an important part of the research. Authors were developed a questionaries' for potential end-users with key elements as innovation description, functionality, and interface (see Table 2).

Table 2. Template for technology end-user.

1. Please, rate the capabilities/functionality of the technology using the 1-5-point scale

"excellent"	"good"	"average"	"poor"	"very poor"
5	4	3	2	1

Tick the appropriate score with **"x"**

2. Please, rate the technology in terms of simplicity and clarity for user

"excellent"	"good"	"average"	"poor"	"very poor"
5	4	3	2	1

Tick the appropriate score with **"x"**

3. Please, rate an interface of the technology

"excellent"	"good"	"average"	"poor"	"very poor"
5	4	3	2	1

Tick the appropriate score with **"x"**

A special group of volunteers has been formed for validation selected IT solutions. It incorporated researchers and students from Riga Technical University, and representatives of business sector interested in a particular technology.

4. Results of validation

The proposed innovation, knowledge and technology transfer process capability model was validated on selected research results [7, 8, 9] developed at Riga Technical University. Example of capability process profiles is illustrated on Fig. 4.

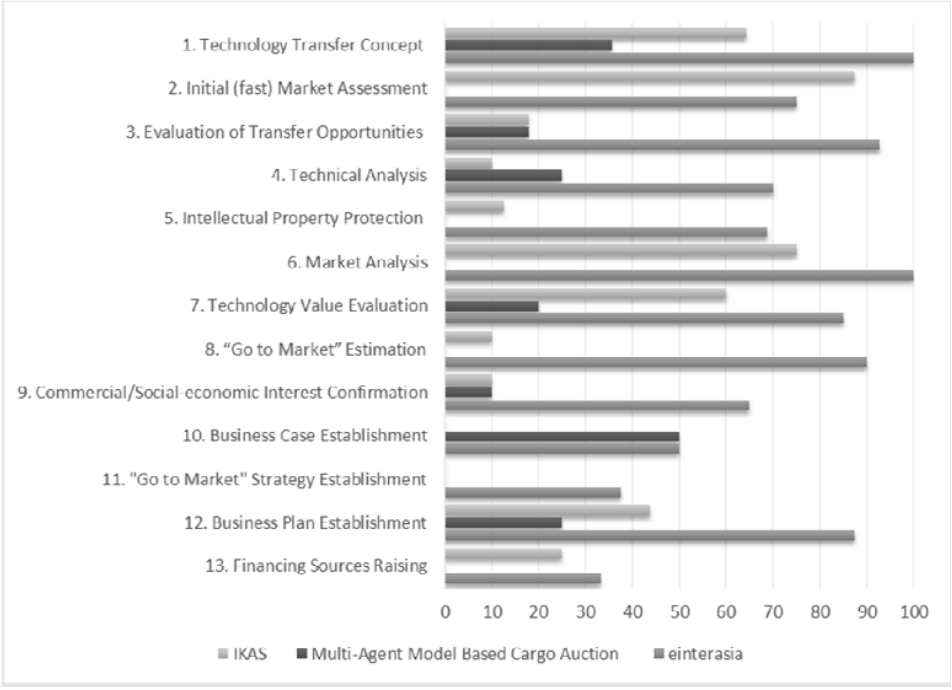

Fig. 4. Process capability profiles of selected technologies.

Developed prototypes were assessed with a help of described questionnaires' about process performance and the outcome of evaluation process were documented. Potential end-users also positively evaluated provided prototypes. The functionality, capabilities, and interface of systems mainly met user's requirements.

Results of the research indicate that Riga Technical University developers make a lot of effort to series of experiments, observations in a particular problem area, invention disclosure stage. In most cases, researches are disseminated in the scientific environment (scientific reports, publications, conferences). But the processes related to the sales and commercialization are performed partially or completely unheeded. The technology developers do not pay more attention to the processes related to technology commercialization. For example, some Information Technologies developers cannot define technology cost and minimum revenue from it. Thus, good ideas exist only in the scientific community and do not flow to the business environment.

This study is going to apply the InnoSPICE model to save time and costs for developers and get a better quality of innovation. It should increase the path from science to the market (see Fig. 5).

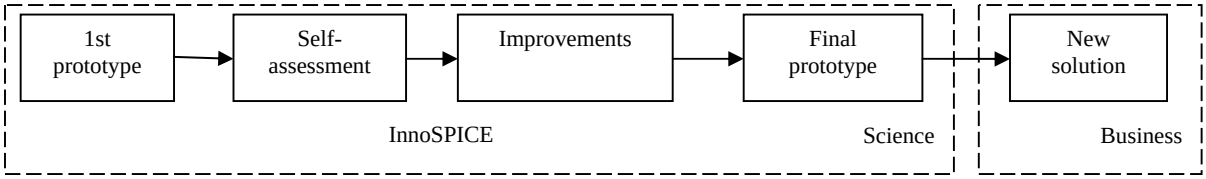

Fig. 5. Research result transfer process.

The high quality of the new solution is motivation for promotion and dissemination their research results further on the market. Ready research results should be offered on conferences and business forums, exhibitions and mass media to increase the interest of investors. InnoSPICE model also proposes to find more opportunity of financing rousing (Process 13).

Fig. 5 reveals that communication between science and business begins from 1st prototype development and ends with the new solution on the market.

5. Conclusion

This research work proposed that innovation, knowledge, and technology transfer process capability model can contribute in collaboration between science and business sector. InnoSPICE model can be one of the effective mechanisms in improving research result quality and to increase scientists' motivation in promotion and dissemination of their founding. Given approach is also applicable for any process oriented activity assessment and improvement and can be adapted to any organization needs. Future plans are related to the promotion of Riga Technical Universities research results and further adaptation of the proposed technology transfer model for systematic transfer.

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