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System Thinking Approach in Solving Problems of Technology Transfer Process

Habil Juris-Roberts Kalnins, Natalja Jarohnovich*

Ventspils University College, Ventspils, Latvia

Abstract

The role of knowledge creators and accumulation like universities is consistently growing and obtaining new forms of operation. New knowledge and ideas, used by researchers themselves, in spite of its great value to education system i.e. remaining separated from innovation, do not give much to economic growth. Competitive research may result in scientific carrier and high worldwide reputation, but remaining with negligible relevance for the innovation system. For a stationary economy, where entrepreneurs are engaged in reproducing the given, this poses no difficulty. But as soon as development enters, and comparative advantages based on given products and technologies are eroded by newly industrializing economies, the situation transforms fundamentally. The production of new knowledge, to become an economic activity with high value added, has to become embedded into new combinations of resources. This requires a structural coupling of the science with economic development level of society. The traditional division of labour and functions between academic science and academic teaching, industry and society (applied research, development, innovation, societal benefits) becomes insufficient. Today university activities crosses traditional boundaries through linkages with the socially economic development level, it should develop new ways to interact between each other. The role of efficient technology transfer system, providing conducive to spillovers environment and society ready to promote technological adoption, implementation and application determines also new role for regional universities or research centres. Less developed countries have an advantage to adopt new knowledge created by technology leaders. The ability and capacity to absorb secondary or tacit knowledge may increase competitiveness on different levels. The aim of this paper is to systemize linkages of technology transfer process in less developed country into proper system model scheme as well as to stress problems of technology transfer enforcement.

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* Corresponding author. Tel.: +371 268-38-344

E-mail address: natalja.jarohnovica@venta.lv

1. Introduction

In recent years technology transfer has become a buzzword in the context of higher education, it is not a new practice. Technology transfer is the process of developing practical applications for the results of scientific research. While conceptually the activity has been practiced for many, the present-day term technology transfer is used to describe various practices in which a relationship between at least two entities is formed with the intent of capitalizing on research for commercial purposes. In the case of universities, the research or invention is usually provided by the academic research, while the mechanism of commercialization is provided by for-profit entity and eventually commercialization organization.

The aim of the research paper is to highlight of feedbacks in technology transfer process management model. In this work there was considered the principles of systems thinking approach to technology, transfer processes and channels, there was discussed technology transfer raising role in the competitiveness of the company, there was made an analysis of the situation in Latvia, using systems approach. Successful management of technology transfer model is needed to achieve a balanced interaction of three components: basic science, management and technology transfer industry, where one of the prerequisites is immediate internal fundamental science support increase (the national budget of the EU funds with its high value alone could not provide necessary development of R&D and technology transfer).

2. Literature Review And Hypotheses

Traditional approach assesses technology transfer as a knowledge transfer between research laboratories and industry and is influenced by four main components: (a) level of collectivisation or / and globalisation; (b) availability of new facts (knowledge); (c) personnel skills and abilities to adapt, use, improve and innovate and (d) availability of advanced machines and equipment. Innovation is a driver of companies' competitiveness leading to increase of productivity and efficiency of production. The role of knowledge creators like universities is consistently growing and obtaining new forms of operation. Several authors covered by Etzkowitz H., Leydesdorff L. (2001) have outlined that since 1990s university-industry partnership was guided by interaction with government in a systematic way to promote economic and social benefits and outputs for society.

Triple-Helix theory emphasizes importance of commercial return from university, introduces entrepreneurial university model and distinguishes several routes of knowledge and technology transfer. One study informed that MIT graduates have funded 4000 companies with annual revenues for USD 232 billion worldwide. More detailed approach considers importance of knowledge flows in regional or national innovation systems (Etzkowitz (2001)) and EC (2001)). In essence, the model of interaction has more complex mode. Sometimes the best way how universities may transfer their knowledge to industry and society is via soft or indirect channels, like publications, exhibitions, conferences, consultations, informal exchange or unpaid advices. Non-linear approach to innovation processes requires more wide focus to understand clear role of both industry and university. Kautonen (2000) presents several categories of companies involved: customers, suppliers, competitors and partners. As a result of substantial private and public investment in research activities it is important to manage existing interactions in a way to get maximised return back. Sources of new knowledge might be classified as follows:

- research organisations (we can name them as R&D);
- customers (C);
- other research driven firms (B);
- intermediates (here we classify also educational and training institutions,
- it could be better to name it as external expertise class; I);
- individual persons (P).
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The variety of existing technology transfer channels, the main routes for commercial return - B2R&D, B2B, B2C, B2P, R&D2R&D we described in our previous work, where we identified main TT channels between R&D and

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