Josef LAZAR*

# TECHNOLOGY AND KNOWLEDGE TRANSFER IN POST-TRANSFORMATION ECONOMIES

**Abstract:** Within this contribution the questions of how the knowledge and technology transfer within a non-university research institution in a post-communist country could be managed. The presented experience comes from the Czech Republic that went through the transformation to market economy, loss of the former markets, reorientation to new ones and is now trying to catch up with the Western Europe. The present structure of Czech industry reflects this transformation and has specific expectations and demands towards the academia. This raises questions about what is the role of publicly funded research, what the scientists should do and what might be a violation of the principles of fair competition. The push from governments on academia to produce applicable results or even to generate financial return through contract research makes this problem very urgent.

Institutionalized knowledge and technology transfer is quite new initiative in our environment. Experience shows that a certain level of maturity of both academia and industry is inevitable to make the system working. A question of what should be included in the knowledge and technology transfer will be addressed in this contribution through the concept of a broadly defined societal relevance and responsible research and innovation. The establishment of the knowledge and technology transfer office of the Czech Academy of Sciences will be presented. Its concept is a network-based system with a combination of centralized and distributed activities, a central office and a host of contact-persons and local TTOs at the level of discrete research institutes.

## INTRODUCTION

Knowledge and technology transfer is an activity that we interpret as an integral part of scientific research. The Czech Academy of Sciences is looking for a concept or strategy within this field able to answer the key questions about the purposes, mission, target groups and specific approaches for various sectors of research.

The experience and background is based on the recent history of the Czech Republic that went through the transformation to market economy, loss of the former markets, reorientation to new ones and the effort to catch up with the Western

* Czech Academy of Sciences

Europe. The present structure of Czech industry reflects this transformation and has specific expectations and demands towards the academia. This raises questions about what is the role of publicly funded research, what the scientists should do and what might be a violation of the principles of fair competition. The push from governments on academia to produce applicable results or even to generate financial return through contract research makes this problem very urgent.

## CZECH ACADEMY OF SCIENCES

The Czech Academy of Sciences is a non-university research institution doing in-depth and focussed research in fields of science covering natural sciences, life sciences, social sciences and humanities. Its basic principle is a focus on quality and efficiency. Top quality is the key criterion for providing financial support of research with periodic international evaluation of all of research activities and concentration of human and material resources into specific research programmes. Together with quality the Academy is pursuing social relevance and openness through support of economic competitiveness and innovation performance of the Czech Republic and involvement of partners from education and application spheres in research programmes together with intensive cooperation at the European and international level.

## MISSION OF THE KNOWLEDGE AND TECHNOLOGY TRANSFER

The motivation for knowledge and technology transfer (TT) may be quite diverse. It may easily be only politically motivated, because it is fashionable to do it and it is what the politicians want to have. This may easily lead to disfunctioning institutions only pretending this activity. Another approach (quite often) is simply only to earn more money for research. More complex attitude includes serving society in the broadest sense, because when science is funded by taxpayer's money, TT is a form of return of the investment to the society. There may be a number of non-financial benefits (environment protection, expertise for authorities & government, etc.) that can be well included into TT. Contribution to well-being of society and contribution to competitiveness can easily be a part of this wider concept as well. Next to it the ability of finding applications for research results is also quite motivating for scientists themselves. So we try to define TT as simply an inevitable part of science management

Institutionalized knowledge and technology transfer is quite a new initiative in our environment. Experience shows that a certain level of maturity of both academia and industry is inevitable to make the system working. An important question is what kind of activities should be included into the knowledge and technology transfer. Within the concept of a broadly defined societal relevance and responsible research and innovation it may not be only the traditional approach of licensing patents that are a by-product of (fundamental) research. Broadly shared experience shows that this works more or less only in bio-pharma sector. If arranging of collaborative or contract research should fit into the scheme, a question wheth-

er publicly financed research institutions should do research (applied) on demand is raised. This may be interpreted as commercial activity just like any other and doing it with partial or full support of public money can be seen as a distortion of market. To which extend or whether at all should public research institutions become demand oriented and state funded design bureau is not easy to answer. This is something what we are in the Czech Republic at the moment only trying to resolve.

## APPLIED RESEARCH AND INVOLVEMENT OF INDUSTRY

Differentiation between applied and fundamental research seems to be more and more and obsolete concept. Sometimes pure fundamental blue-sky research quickly transforms into breakthrough application and on the other hand applied research with a clearly defined target results into non-mature technology with pretty long way to go before it turns into commercial product. Unfortunately this differentiation often serves political struggles for research funding. The position of academia vs. industry differs and industrialists often consider industrial development to be applied research.

According to the EU stand, public funding of applied research/development/innovations is acceptable only in case that there is a significant development risk involved, which contrasts with the considerable potential benefits should the initiative succeed; that the ensuing costs are very high and can only be met by pooling multiple public sources; that the period of time until practical benefits emerge is too long; that it involves cross-cutting or key technologies (e. g. new materials); and that the result cannot readily be marketed, but there is a general social or environmental need. This can be considered a well-defined limitation to avoid the market distortion.

## REALITY OF THE POST-TRANSFORMATION ECONOMY

The position of industry in the Czech Republic is very strong; this country is the most industrialized country in the EU with the largest contribution of industry output to the GDP. The structure is dominated by mechanical engineering and electrotechnology production mostly on demand for Western Europe and the US. This can be considered the legacy of the difficult period of the transition to the market economy and a result of the transformation process. There is too little number of innovative companies and the majority does only routine production. Foreign experience from technology transfer centers in Western Europe shows that the traditional concept of TT based on licensing patents works only in biotech and towards pharmaceutical industry. This might mean, that to perform TT in this country is doomed to be mission impossible. To make technology transfer work and to define which form it should have in the Czech Republic, i. e. towards let us say mechanical engineering is something we have to find out ourselves.

The goal of the post-transformation economies — at least speaking for the Visegrad Four — is clearly the change in the structure of industry from supplier of components for the richer world towards production of outputs with higher add-

ed value, i. e. this means to climb the value ladder. New ideas and disruptive technologies are welcome including creative destruction. This is something that can hardly happen within any apriori defined priorities. More, it is in conflict with the too inclusive and cautious concept of RRI (Responsible Research and Innovations) pushed through by the EU.

A Concept derived from the law of comparative advantages representing „Smart" Specialization on the other hand tends to preserve the status quo. It reflects the idea to find the comparative advantage and concentrate on it defining it as a preferred sector. But sectors differ in added value and we want to climb the value ladder. Setting priorities is a popular idea among politicians and industry managers but there is a danger that the result will be setting of the priorities set by interest groups and preserving of the status quo leading into stagnation. We consider the freedom of scientific research as something that must not be infringed. As Pavel Bělobrádek, the vice prime minster for science of the Czech Republic stated: „Let there be more science in politics and less politics in science".

## STRATEGY OF THE CZECH ACADEMY OF SCIENCES

The Czech Academy of Sciences launched its new Strategy AV 21 with a motto „Top Research in the Public Interest". It should contribute to increasing of the social relevance of scientific knowledge, and reflect the globalization and acceleration of the worldwide exchange of knowledge and the financial demanding nature of modern science. Towards the Academy it aspires to exploit the potential of the CAS for resolving the current scientific and societal challenges and its ability to react to the dynamics of development. It should strengthen the role of the CAS in science and society and promote synergy of interdisciplinary and inter-institutional collaboration. Transfer of results into the educational, application, and the public spheres is and inevitable part of it.

The establishment of the knowledge and technology transfer office of the Czech Academy of Sciences is seen as a horizontal activity within the Strategy AV 21 serving all its programmes. Its concept is a network-based system with a combination of centralized and distributed activities, a central office and a host of contact-persons and local TTOs at the level of discrete research institutes. We have drawn inspiration from models in Western Europe and from the experience of TTOs in our country. We consider the institutional model the most promising while the regional model is of limited functionality not only in the Czech Republic. Here the regional TT centers mostly converted themselves into start-up incubators.

## SUCCESS STORY OF TECHNOLOGY TRANSFER

The Institute of Scientific Instruments of the Czech Academy of Sciences in Brno has been doing methodology oriented research in physics and engineering for more than 60 years. One of its long-term programmes is electron optics and microscopy. The first electron microscope in former Czechoslovakia was built here in

the group of Prof. Armin Delong. This later resulted in start-ups and a long-term research relationship with them.

Now there are very successful companies well established on the market in Brno that together hold 40 % of the market of all electron microscopes worldwide that are produced in Czech Republic. Tescan is today one of the global suppliers of scanning electron microscopes and solutions for materials science, industry, biology and life sciences, forensic science and others and FEI Electron — optics designs, manufactures, and supports the broadest range of high-performance microscopy workflows that provide images and answers in the micro-, nano-, and picometer scales.