

A COMMON CENTRAL EUROPEAN MODEL FOR INNOVATION AND ITS APPLICATION IN SLOVENIA – THE CASE OF ALGAL BIOMASS

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Abstract

Using the example of algal biomass for sustainable production of energy and renewable energy sources, the article presents an application of model for innovation management as developed under project CERIM (Central Europe Research and Innovation Model). The model and its implications for project partners are presented and case study of Slovene spin-off AlgEn is described.

Keywords: algal biomass, innovation management, sustainability, Central Europe

1. INTRODUCTION

Technology transfer and innovation are considered as potentials for economic growth. Though there are many examples of how it is organized and implemented in the USA and UK, their practice should be adapted to the needs of EU members from Central Europe. We represent an example of transforming an initiative which was based on gaining more funds for university R&D into an independent start-up, adapting some of the recommendations from project CERIM.

2. METHODOLOGY

This article is a result of work performed by Institute for Innovation and Development of University of Ljubljana (IRI UL) in cooperation with partners on project CERIM – Central Europe Research and Innovation Model, which was co-financed by the EU's Central Europe Programme. The aims and methodology of the project are briefly presented and then its application to the case of algal biofuel innovation in Slovenia.

2.1 CERIM model

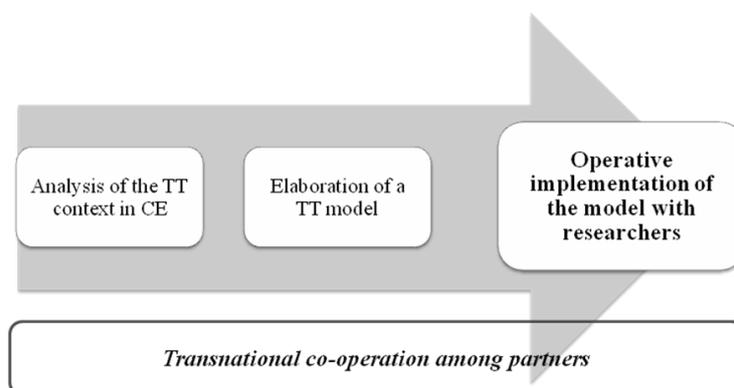


Figure 1 – CERIM model [1]

Innovation and technological development are important competitive advantages in modern world. The contribution of institutions of higher education and research to innovation and the welfare of the European

economy is a key concern of countries as well as regions. Yet, most regions lack well-functioning technology transfer organisations (TTOs) capable of supporting the development of academic-based innovations and their transition to the markets. In particular problems are typically related to:

- unclear policy and legal frameworks;
- lack of motivation of research institutions and of researchers;
- lack of qualified personnel managing the technology transfer process;
- lack of networks to regional, national and international resources, industrial partners and venture capital.

This is why CERIM partners decided to cooperate in the project in order to unleash the innovation potential of the higher education and research institutions of participating regions in Austria, Germany, Hungary, Italy, Poland, Slovakia and Slovenia through the development and validation of a technology transfer model, adapted to the situation of the partners and characterized by transnational co-operation. The final goal is that the partners jointly develop and validate a sustainable model for more efficient and effective transfer of research results to the market [1, 2].

Thus, the project consists of three main phases (Figure 1): the analysis of technology transfer (TT) in the participating regions, consequent development of a potential model and, finally, its implementation in collaboration with the researchers. As project is in final stages, the model represented below is applied to IRI UL and the specific situation of innovation regarding growing algae for biofuels.

2.2 Application of model to IRI UL

The regional TT analysis [2] showed that within an innovation system which is considered to be a complex set of relationships among actors producing, distributing and applying various kinds of knowledge [3], the support for entrepreneurship in academic sphere is vital. Namely, the analyzed countries have set a legal framework which defines the functioning and the legal relations regarding the innovation in the higher education, yet the implementation of it is lacking due to motivation of researchers and support for their entrepreneurship.

Slovenia is a clear example of a country within the project that does not yet implement fully the guidelines of its innovation policy, despite the renovated legislation regarding intellectual property rights and existing innovation support mechanisms such as technology parks and incubators. Main inhibitor (Figure 2) is the fact that the entrepreneurship and market-based results of researcher's work are not considered significant for the researcher's career in the university. University of Ljubljana created an incubator to provide guidance and facilities for start-ups and spin-offs, yet the main companies are based on student ideas, and not a consequence of university researchers' work. On the other hand, the university's office for intellectual property primarily functions as a service for patent-related issues and does not function as an interlocutor for the companies.

This is why, in line with University of Ljubljana 2006-2009 strategy [4], IRI UL was established in 2007 by the University of Ljubljana and by leading Slovenian companies as the innovation and development institute and service for knowledge and technology transfer of Slovenia's largest University. It is a non-profit research and development institution whose aim is to establish a long run and reciprocal partnership between the University of Ljubljana, Slovene industry and public institutions in order to foster research and development activities.

Among others, the mission of the IRI UL is to identify the research and development needs of the Slovene economy and competencies of researchers at the University of Ljubljana. Institute decided to form an environment where the researchers would be supported in their quest to develop the identified inventions with the primary focus on the market application and collaboration with the potential investors – an example of this process is presented below in the case of start-up AlgEn.

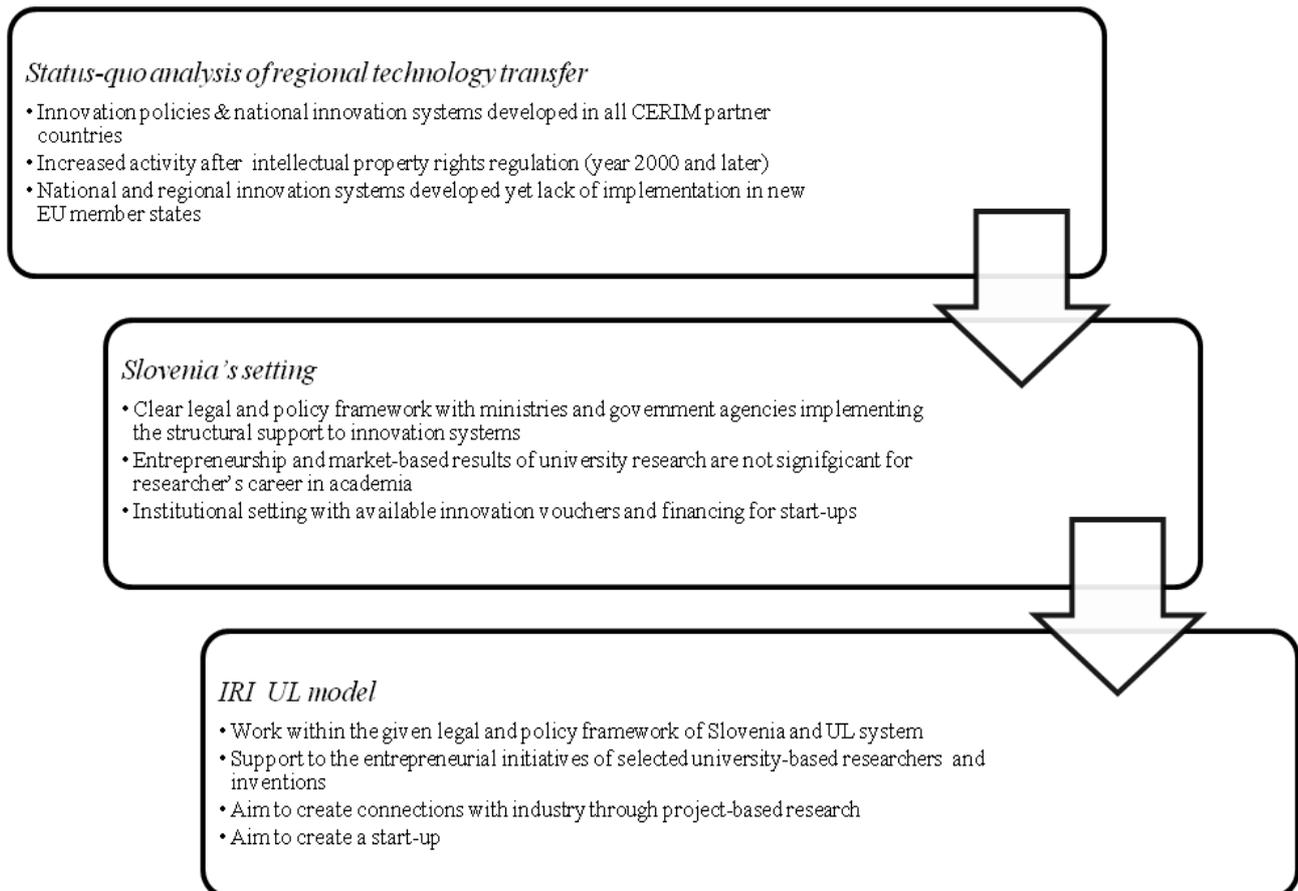


Figure 2 – IRI UL adapted model

3. GROWING ALGAE – THE CASE

One of the most important challenges today is to curb the effect of climate change by limiting the use of fossil fuels. A solution could be in producing sufficient quantities of biofuels, which do not compete with food production. One of few options is the use of algae biomass. Algae can grow continuously 5–10 times faster than traditional crops, with no lands suitable for plant raising competition. The production rate per area unit is 20–50 higher than other plants [5]. However, the actual production of algae biomass with already developed technology is still negligible the production costs are 5–10 times too high and algae biofuel are still non-competitive.

Because of the great potential of algal technologies many development groups were established around the world in both companies as well as universities in the last five years with the focus on economically efficient and scalable solutions for algae biomass production[6].

3.1 Reasons for algae development at IRI UL

The main arguments in favour of algae development were presented to IRI UL by a non-formal group of researchers based on University of Ljubljana Faculty of Biotechnology and Faculty of Chemistry and Chemical Technology who approached IRI UL in Autumn 2008, after information on the potential collaboration of university researchers in CERIM project. Their main wish was to:

- create awareness on algae biofuel in Slovene industry;
- gain financing for further research and development (focused on algae growth in labs) through joint university-industry project applications in Slovenia and EU;
- create national network and influence Slovene policy-makers to provide targeted financing.

However, they underlined that lack of time and human resources was preventing them from leading the initiative. Thus, they proposed IRI UL to function as the networking mechanism. After consulting several experts in the issue area of renewable energy, biotechnology and mapping the interest of researchers in University of Ljubljana, IRI UL decided to work on developing algae networking.

3.2 Process: from interest group to start-up

IRI UL decided to engage actively and work as a leader of the initiative instead of functioning merely as a contact point. As the researchers wanted to pursue further research and development, with no immediate market-related proposals, whereas IRI UL was interested in the development of interdisciplinary research centres under the then forth-coming Slovene Centres of Excellence (estimated to be open within 12 months), the following agreement was reached:

- A researcher was employed by IRI UL with main tasks to create network of Slovenian companies and research organizations with main aim to form a consortium for national call for centres of excellence planned for 2009, as well as to act as intermediary between the university researchers and the companies;
- IRI UL became a member of EABA (European Algal Biomass Association) network;
- Strategic alliance with company Pivot d.o.o. was formed with aim to focus on developing algal photobioreactor for growing algae in labs;
- Expert seminar on potential of algae biofuels was organized in Spring 2009;
- Application for the national call for centres of excellence in the field of renewable energy was prepared in Summer 2009.

Given the results of CERIM regional TT analysis, IRI UL focused on maximizing the potential of the given institutional and legislative framework in Slovenia – this means applying for the upcoming calls and looking for the collaboration with technology park – and creating an environment where a researcher from the field could develop the entrepreneurial incentive, finally leading the initiative not only to new projects, but potentially also creating independent company.

Thus, a researcher (biologist) was employed at the institute in order to have a competent person who could be a credible interlocutor to both business sector as well as to university researchers. Employed at the independent institute, he was exempt of the university constraints regarding the flexibility of work and reaching habilitation criteria. As the professors who started the initiative were not interested in the additional entrepreneurial and managerial work, this researcher primary task was thus the search for gaining finance and networking with the industry. An initial group uniting the above-mentioned faculties, four SMEs, and three research institutions not-related to the university, was established with the main aim to win the national call.

As the awareness on biofuels, let alone algal biofuels, is relatively low in Slovenia, IRI UL engaged in promotional activities that led to a strategic partnership with a consulting company Pivot d.o.o. which was interested in the development of model for improved algae growth.

After the negative result on the application for the call for Slovenian centres of excellence, the group continued in two directions:

- IRI UL and Pivot supported the work on algal photobioreactor as well as developing other potential areas of using algae (lead by the employed researcher, working in collaboration with the team who worked on CERIM project at IRI);
- IRI UL continued to lead the initiative for project applications and collaboration with Slovene industry, both on national as well as EU- level.

In Spring 2010, company AlgEn Ltd. was established by researchers from IRI UL and Pivot, and became a member of the Ljubljana Technology Park. AlgEn's priority is to act as a centre for algal biotechnology.

In mid-2010, the algal photobioreactor won the call for patent voucher at the Public Agency of Slovenia for Entrepreneurship and Foreign Investment, enabling further development. The innovation was also included in the CERIM list of innovations, and was presented at the project meetings in Autumn 2010 as well as at Slovene Forum of Innovation in Winter 2010.

During this period, IRI UL researcher became employed in the start-up. IRI UL provided assistance under CERIM project for the development of prototype in the issue-area of patenting as well as promotional activities.

The initiative of developing algae biofuels is now led by AlgEn company, with IRI UL functioning as the potential partner in further development projects, especially in those cases where faculties would not be able or willing to participate due to administrative issues or managerial demands. IRI UL and AlgEn continue consultations on potential project applications and joint address to the companies on this issue.

3.3 AlgEn's further plans

In 2011 AlgEn has one full-time employee and several student researchers who work at the company on their university projects. Collaboration with the industry is not so intense, yet with the development of the initial equipment for the labs, more companies are interested in the collaboration.

AlgEn focused on developing a suitable process control system for algal photobioreactors. They can provide a stable environment in which optimal biomass growth can be reached. Because of huge biodiversity of algae species, their specific physiology and ecology and different growing techniques every single PBR setup needs its own customized control system.

Their additional activities include growing algae for other users (e.g. for university labs) and for food; developing the system of extraction of energy source from the algae; as well as performing algae-related tests.

4. CONCLUSIONS

The case presented shows how IRI UL chose to use the proposals of CERIM model for transfer of technologies in Slovenia. IRI UL applied the main conclusions of the project to the potential given in the environment: as the legal and policy framework was relatively set and could not be changed within a short span of a year, thus the focus went on finding an invention and developing it to the level where it would attract investment in form of a start-up. The model emphasized the need to have an "entrepreneur" who understands both the researchers as well as the business sector working on the issue full-time. However, the communication with the industry and the presentation of the potential the innovation for the market still has to be improved.

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