

Forms of Cooperation Between Higher Education Institutions and Their Business Environment

Miran Kovač and Tanja Urbančič

Nova Gorica Polytechnic, School of Engineering and Management, Slovenia

In the paper, different forms of cooperation and knowledge transfer between universities and institutes on the one side, and companies on the other, are presented. The emphasis is on the role of education in knowledge transfer and the development of knowledge transfer models suitable for institutions of higher education. These should result in benefits for both sides: in improved products, services and processes for companies and in improved competitiveness, relevance and visibility for institutions of higher education. State-of-the-art at the Nova Gorica Polytechnic is described and several reference examples of knowledge transfer models developed worldwide are presented, providing some lessons learned and guidelines for further development.

INTRODUCTION

Global Entrepreneurship Monitor (GEM) analysis shows that with regard to the contribution of national research and development to new commercial opportunities and the availability of those innovations to new, small and fast growing enterprises (the transfer of that research and development to commercial ventures) Slovenia finds itself at the bottom, in the 33rd place out of 34 analysed nations (Rebernik et al. 2003). Although intellectual property protection in Slovenia is even higher than the average in the analysed countries, the number of patents, licences and new company creation in incubators or outside them is relatively low. Reasons for this are related to mechanisms of commercialization of intellectual property, which are either incomplete or missing. In addition, the current system of financing and evaluating research values bibliographical results much higher than achievements in commercialization of research results, so other motivation factors and commercialization mechanisms need to be used to stimulate knowledge transfer.

Motivation for an academic institution to cooperate with its business environment is not only financial. Besides getting paid projects, it is also important to get interesting challenges, problems and test-beds for methods and techniques it is developing. Last but not least, there is also a question of 'service to the community,' which features as a third task of universities, hand in hand with education and research, in most European countries (Goddard 1997). Besides technology transfer that brings more or less immediate benefits to the 'receiver' of the technology, higher education institutions have also great potential for knowledge transfer from academia to business environment, where benefits can not be measured by short-term savings or income increases. Rather, they are reflected in mid- and long-term improvements through better understanding of potentials and possibilities offered by the newest achievements in research and development, especially when presented by well-chosen case studies and prototype solutions.

Problems with knowledge transfer from academia to business environment are manyfolded, too. First, the market for advanced research and development results is not yet developed, so substantial efforts need to be put into informing and educating the market. Second, there is a lack of systematic ways of information exchange. Third, researchers at technical faculties, who produce most new knowledge that can be commercialized, are lacking business knowledge – technical researchers are usually lacking knowledge and experience in the field of entrepreneurship. Finally, there is not a good model of knowledge transfer just to be followed, since situation differs from country to country and from institution to institution. For example, to overcome the problem of the lack of business knowledge, one option is team cooperation between technical and business knowledge inside the university and cooperation with successful companies, investors and different supporting institutions. The latter option was studied by Lavrač and Urbančič (2003) in the European project SolEuNet where after attempts with fixed associations and networks with an exclusive marketing broker, a flexible network with several marketing brokers was suggested and implemented in a European virtual enterprise connecting several academic and business partners. Another alternative, suggested by Sijde and Cuyvers (2003), is to train researchers to commercialize their own research results.

In this paper, we present and discuss several examples of coping with the above mentioned problems, including experience from the Nova

Gorica Polytechnic, the Jozef Stefan Institute and several reference institutions in the UK, the USA and Germany. The emphasis is on the role of education in knowledge transfer and the development of knowledge transfer models suitable for institutions of higher education.

STATE-OF-THE-ART AT THE NOVA GORICA POLYTECHNIC

According to its vision, the Nova Gorica Polytechnic (PNG) is becoming a place where knowledge should be produced in a harmonious relationship between students and researchers and transferred to younger generations as well as to the business environment of the institution. Cooperation with the industry and the business environment is expected from all PNG employees. This way the conditions for knowledge transfer from an academic institution into the business environment are set, recognition of the institution is being enhanced and job opportunities for PNG alumni are increased. A whole range of activities complement and enhance each other in achieving these objectives: applied research projects, a track of seminars for postgraduates which is open to public, seminars of continuous education, visits of experts in companies in the region, etc. The Nova Gorica Polytechnic is also a co-founder of the Primorska region technology park, which should – among other things – contribute towards creating a business environment for Bachelor's, Master's and PhD students.

To approach knowledge transfer more systematically, we decided first to explore the potential we have, second to study models developed and established by other institutions, and finally, to suggest a model suitable for the Nova Gorica Polytechnic. Further on, we briefly present the potential through the profile of research and students' diploma thesis projects. In the next section, we proceed with the description of several reference models that will be taken into account when further developing our own model.

Research activity at the Nova Gorica Polytechnic is being conducted in four laboratories and one center:

- *The Laboratory for Environmental Research*, which conducts research in different areas of environmental sciences (e.g. basic research in new instrumentation and methodologies for measuring environmental pollution, applied research in environmental pollution problems in the Primorska region, such as the pollution of the

Soča river) and the development of expertise in the area of environmental risk assessment and environmental pollution for public and private enterprises from the Primorska region.

- *The Laboratory for Astroparticle Physics*, which conducts research in the area of experimental cosmic ray physics and elementary particle physics and is strongly connected with international collaborations and laboratories, such as the Pierre Auger collaboration and DELPHI collaboration at CERN. Part of the activity is dedicated to the synchrotron radiation research of new materials at the synchrotron radiation facilities of HASYLAB at DESY in Hamburg, LURE in Paris, ESRF in Grenoble and ELETTRA in Trieste. Besides basic research it develops R&D activity which is oriented towards the development of new detection techniques in astroparticle physics and environmental sciences, and provides access to advanced technology for material characterization with synchrotron light to Slovene laboratories (for material sciences, chemistry, pharmacology and environmental sciences).
- *The Laboratory for Epitaxy and Nanostructures*, where basic research activities are focused on electronic, structural and optical properties of thin organic semiconductors, and where the current applied research is focused on the development of gas sensors based on suitable thin organic layers in collaboration with a local firm from Nova Gorica.
- *The Laboratory for Multiphase Processes*, which conducts fundamental research in the development of advanced numerical methods for multiphase systems and development of physical models for solid-liquid processes, applied research in numerical modeling of a wide variety of processes with metallic, polymer or ceramic materials and their composites and expertise in computer simulation of the Slovenian low and intermediate nuclear waste repository, which is being developed together with Slovenian state agencies and regulatory bodies.
- *The Center for cryptography and computer security*, which is developing cryptographic systems and their applications for networks (the Internet), finances (banks, stock markets) and telecommunications.

Research topics as well as successful projects for end-users indicate great potential for even more intensive and systematic knowledge transfer. These projects can serve as good sources of interesting problems to

be tackled in students' diploma theses. Besides, we believe that being an educational institution helps also in the opposite direction: contacts established through work placement and diploma thesis projects can, if managed properly, also lead to bigger projects.

Currently, the following study programmes are offered by the Nova Gorica Polytechnic:

- Undergraduate study programme Environment and the postgraduate study programme in Environmental science at the School of Environmental Sciences;
- Higher professional study programme in Economics and Management of Production and Technological Systems at the School of Engineering and Management;
- Postgraduate study program in Materials Characterization at the School of Applied Sciences;
- Postgraduate study program of Karstology at the School of Karst Studies.

The Nova Gorica Polytechnic has signed agreements for work placement with 50 companies and cares a lot about the quality of work placement sessions that are obligatory for students of the School of Engineering and Management. Every work placement is defined as a project in cooperation with two mentors, one at school and one in the company. Projects tackle problems interesting for the company. Most of them continue to be developed in Bachelor's degree theses. As a rule, all theses of the School of Engineering and Management are practically oriented and solve real life problems found in companies. Since the study programme is interdisciplinary, technological as well as business aspects are mainly covered. Basically, they can be divided into two groups:

1. Bachelor's degree theses, where the main topic is ex-ante planning or modelling of certain products, services or processes – e. g. planning the purchase of raw materials in the company; modelling the organisation of the purchasing function; planning the information system; introducing the ISO 9001 and ISO 14001 standards; making a waste disposal strategy; producing a business plan; designing production automatization; developing products and services marketing plan, etc.
2. Bachelor's degree theses, where the topic is an analysis of a certain business situation or ex-post evaluation of certain business or

technical decisions – e. g. evaluating the investment efficiency; economic evaluation of an investment into a certain product or service or a production closure; analyzing production maintenance; analyzing business environment of a company; optimizing inventories; workplace arrangements; valuing the investment into automatization of production; technological, ecological and economic analyses of production; waste management planning, etc.

As seen from the topics mentioned above, students are expected to demonstrate their acquired knowledge by solving interesting problems in companies. This typically requires an interdisciplinary approach and cooperation of experts from different fields. Cross-disciplinary and cross-institutional cooperation fosters creativity and results in solutions that have proved to be useful in practice. We can also report a very high percentage of students being later employed by the organization of their work placement – it currently amounts to 41%. Although this figure will probably decrease with the increasing number of students, it has some value as a reflection of satisfaction in companies.

Of course, at Masters' and Doctoral level, there is much more emphasis on research novelties and scientific contributions. Nevertheless, theses written at the School of Environmental Sciences at these two levels also provide results that can be applied for the benefit of companies or society, as shown by some examples:

- identification of wastes and preparation of waste disposal and treatment strategy at Iskra – Avtoelektrika company;
- fault detection of industrial processes;
- analysis of changes of cultural mountain landscape (case study of Sv. Anton na Pohorju cadastral community);
- biological factors which influence the habitation of fish in the shallow coastal areas;
- environmental impact assessment – validity of long term predictions (a case study: radioactive waste disposal in Slovenia);
- development and application of photothermal biosensor for the detection of organophosphate and carbamate pesticides;
- development of laser spectroscopic techniques for the characterisation and studies of phytoplankton pigments.

In the forthcoming months, a repository of expertise available at the institution will be gathered and presented in an electronic form easy to

be searched out along different dimensions. This will serve as a knowledge management tool that will help in approaching companies when discussing new possibilities of cooperation and designing new knowledge transfer activities such as continuous education seminars.

SOME EXAMPLES OF KNOWLEDGE TRANSFER UNITS

Center for Knowledge Transfer in IT at the Jozef Stefan Institute in Slovenia

The Jozef Stefan Institute, the biggest Slovenian research institute and one of the co-founders of the Nova Gorica Polytechnic, introduced a model of continuous technical education in information technologies by establishing the Center for knowledge transfer in information technologies in 1996. This was part of the strategy for additional professional and specialist education of experts from Slovene companies and institutions. The main activity of the Center is the development of educational programmes, organisation of seminars and workshops and the development of the support infrastructure of the center (databases, procedures, repositories and an up-to-date homepage).

The Center developed a model of workshops, which are based on learning through problem solving in small groups and are being conducted following a carefully designed scenario in order to maximize efficiency. The Center also develops and organizes specialized seminars, which are based on advanced research and development, and thus offer more potential to attract end-users. Workshops and seminars are highly specialised and are targeted for experts in different fields, such as ecology, medicine, marketing, etc. and have proved to be very successful. However, there are negative sides to these workshops and seminars – development of such programmes is time-consuming and costly, while the audience is limited in a small country like Slovenia.

Because of the abovementioned limitations the Center for knowledge transfer had to find other sources of income by using other ways of knowledge transfer – e. g. long-term engagements between businesses and the Institute and expansion into the European market. That is why it has initiated the Sol-Eu-Net project (Mladenić et al. 2003), a 5th framework EU project which is concerned also with the modern organisation forms of cooperation between academic and business communities. There were 12 partner institutions from 7 countries – 8 from the academia and 4 from the business world.

The main activities of the Sol-Eu-Net project included research in the area of data mining and decision support, development of prototype solutions for end-users, educational activities (e. g. internal education inside companies, open market seminars, workshops, etc.), development of a network model of the virtual enterprise organisation (effective operational link between network partners and between experts and clients), infrastructure development (teamwork support, internet access to information, etc.).

122

In this project, the Center for knowledge transfer in information technologies coordinated the educational part. It produced more than 100 hours of educational events (mostly seminars and workshops), made a homepage with 21 standardized models of those seminars and workshops, developed an infrastructure for knowledge transfer in the form of experts, who cooperated in educational activities, and a network of employees in public institutions and companies, who were the users of those activities. All this forms a base for continuing the educational activities in the form of seminars and workshops as formal postgraduate programs and as applied projects in companies.

One of the important lessons learned was that the way from the first contact established through specialized seminars to the project for a client can be long, and also a two year period is not exceptional. So, getting projects simply by informing potential clients what researchers are doing in academia is an illusion. Instead, contacts should be nourished by information exchange and other trust building activities, and a step-by-step approach is highly recommended.

Reference Examples from UK, USA and Germany

In this section, we present some successful reference examples developed by universities and institutes with very high reputation as far as knowledge and technology transfer is concerned. This short review aims at raising awareness about some models that have proved to be successful in their environment and at showing their basic features. Of course we are fully aware that every particular situation requires specific solutions and that no model, however successful it might be in their environment, could be just copied. Nevertheless, it is instructive to look at some features shared by most of them. For easier comparison, we give them in the Appendix.

Oxford University, UK. Oxford is the leading UK university for knowledge transfer and commercial spin-outs and one of Europe's most inno-

vative and entrepreneurial universities. The areas of knowledge transfer include: spin-out companies; patents, licenses and other forms of intellectual property transfer; Isis college fund for financing entrepreneurial ventures; business innovation and consulting group, and Venturefest – Oxford's international fair for entrepreneurs.

Isis Innovation is the technology transfer company of the University of Oxford, a wholly-owned subsidiary of the University of Oxford, commercializing the research generated by university researchers and owned by the university. Isis provides researchers with commercial advice, funds patent applications and legal costs, negotiates exploitation and spin-out company agreements and identifies and manages consultancy opportunities for university researchers. Isis files, on average, one patent application each week and manages over 350 patent application families. It has assisted in the formation of more than 30 university spin-out companies since 1997, generating significant value in equity holdings for the university.

Cambridge University, UK. Cambridge University established the Research Services Division on March 1, 2000, which combines the Research Collaboration Office (formerly the Research Grants and Contracts Section) with the Technology Transfer Office (TTO – formerly the Wolfson Industrial Liaison Office) to create a single organisation dealing with technology transfer and the university's external research funding from industry, research councils, the European Union and from charitable trusts and foundations.

Within the Research Services Division, there is an organisation called Cambridge Enterprise, which has been established to enhance the University of Cambridge's contribution to society through knowledge transfer from the university to the community and brings the university's existing commercialisation activities (Cambridge Entrepreneurship Centre, Technology Transfer Office and University Challenge Fund) together in one new organisation, whose aim is more effective contribution to society, the UK economy, the inventors and the university.

The Technology Transfer Office (TTO) as part of Cambridge Enterprise manages the commercial development of the university intellectual property, and that arising from projects undertaken within the Cambridge-MIT Institute and the Cambridge Enterprise at Addenbrooke's initiative. The TTO helps with the formation of spin-out companies where the technology is sufficiently broad based or novel to form the

basis of a new company; the TTO has helped form around 30 spin-outs based on university research in the last 5 years.

Imperial College, London, UK. Since the year 1907, Imperial College London has been one of the leading research institutions in the world. It is also characterized by a very strong entrepreneurial culture – its mission is to deliver world class scholarship, education and research in science, engineering and medicine, with particular regard to their application in industry, commerce and healthcare. *Imperial College London Innovations Ltd.*, established at the college, is responsible for the transfer of new knowledge. *Imperial Consultants Ltd.* takes care of all the consulting activities of the college, and in the year 2001 a third institution in knowledge transfer was established – *The Entrepreneurship Centre.*, which fosters business innovation among the 10,000 students enrolled in the Imperial College. *Imperial College London Innovations Ltd.* takes a ‘hands-on’ approach to commercialization, working closely with university researchers to protect intellectual property and maximize the exploitation of patents, either through licensing or the creation of spin-out companies with over 50 successful technology-based companies since 1997. The seed capital for the spin-out companies is provided by the Imperial College’s own investment fund.

University of Texas at Austin, USA *The Office of Technology Licensing and Intellectual Property* is responsible for Knowledge Transfer at the University of Texas at Austin. Its mission is to protect, market, and license proprietary rights to intellectual properties created by the faculty and staff of the university to private enterprises. Of course, the office assures the public that the discoveries and inventions of the university will benefit the public and be disseminated as broadly as possible and that the licensing of intellectual property creates an on-going revenue source (through royalties and continued sponsored research) for the university so that it may further improve the quality of its research and educational activities. Licensing of intellectual property also encourages creative research and provides a substantial incentive to its inventors through the sharing of royalty income.

The Office of Technology Licensing is also part of *the Texas Alliance for Technology Commercialization*, whose aim is to expand and strengthen cooperative and collaborative efforts between Texas Universities and the society in ways that result in faster and more efficient technology transfer from Texas universities.

Stanford University, USA The *Office of Technology Licensing* (OTL) is responsible for managing the intellectual property assets of Stanford University. The OTL charter is to help turn scientific progress into tangible products, while returning income to the inventor and to the university to support further research and its mission is to promote the transfer of Stanford technology for society's use and benefit while generating unrestricted income to support research and education. In other words, the OTL is helping planting seeds today for the products of tomorrow. The OTL can patent the licensed inventions or not. The non-patented technologies which the OTL licenses include software that is under copyright, as well as emblematic ware carrying Stanford logos and trademarked symbols for use on products such as t-shirts and baseball caps. On the other hand, a patent is intended to publicly disclose the best mode of practicing an invention and, in particular, to point out the features that distinguish the invention from prior art. Within the OTL, there is also the *Industrial Contracts Office* (ICO), which is responsible for negotiating and signing sponsored research, collaboration, and material transfer agreements with industry except for clinical trial agreements, which are handled by the Office of Sponsored Research. ICO's goal is to foster and maintain mutually beneficial relationships with industrial sponsors and provide high quality and timely service to Stanford faculty and staff, while maintaining a balance between Stanford and industry interests.

MIT (Massachusetts Institute of Technology), USA. The *Technology Licensing Office* (TLO) manages the patenting, licensing, trademarking and copyrighting of intellectual property developed at MIT., Lincoln Laboratory and the Whitehead Institute and serves as an educational resource on intellectual property and licensing matters for the MIT community. The core of this office is a group of technically trained and business oriented people. They work with industry, venture capital sources, and entrepreneurs to find the best way to commercialize new technologies.

TLO is one of the most active university patent and licensing offices in the US. MIT. has had over 1000 issued US patents in its portfolio, many with foreign counterparts. In each of the past five years (1997–2002), they have had over 100 US patents issued to them and they have signed 60–100 option and license agreements. Most of those licenses were exclusive. Under those licenses, companies were granted rights to their patents in return for their commitment to develop those inventions into products for the public good. Licenses to patents and copyrights have a twofold

aim – firstly, to protect companies taking the risk of development, and secondly, royalties derived from licenses support further research and are shared with inventors to provide incentives for further innovation.

Carnegie Mellon University, USA. At Carnegie Mellon University in Pittsburgh, they started with the initiative on the *Carnegie Mellon Innovation Exchange*, which is a new approach for stimulating innovation across the Carnegie Mellon campus and facilitating the timely and effective transfer of new innovations to the outside community. It is designed to draw upon and support Carnegie Mellon's distinctive culture, which encourages interdisciplinary, problem solving creativity.

The Innovation Transfer Center (ITC) at the Carnegie Mellon University takes care of the commercialization of new discoveries. Innovation transfer is one way the university disseminates knowledge, innovations, and discoveries back to the public. The ITC seeks the most competent partners to license and commercialize its innovations.

Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen, Germany. At the RWTH Aachen, there are two institutions responsible for technology and innovation transfer: Department for technology transfer and the advancement of research ('Dezernat Technologie Transfer und Forschungsförderung'), and Entrepreneurship college ('gründerkolleg').

The Department for technology transfer and the advancement of research offers personalized consulting, wealth of business contacts and financial help through the PFAU program – Program for safeguarding the successful entrepreneurial ventures at the university (Programm zur Absicherung von Unternehmensgründungen aus den Hochschulen).

The activities of the Department for technology transfer and the advancement of research include:

- information on the available public and private support programs for entrepreneurs;
- help with contacts in the industry and other institutions;
- offering the information material on the topic of establishing a new company;
- providing information on different programs, classes, workshops in entrepreneurship, knowledge transfer on campus of RWTH and outside.

The department is also part of a regional network, called the Entrepreneurship Region Aachen – 'Gründer Region Aachen', which in-

cludes regional agencies, companies, banks, schools, research institutions and other interested institutions.

On the other hand, the entrepreneurship college offers both courses and individual training on how to think like an entrepreneur, how to write a business plan, what skills does a businessman need, and they also offer advice and contacts on finding the right business partner for a new venture.

CONCLUSIONS

Slovenian companies and public institutions are becoming more and more aware of the importance of new knowledge for the nation's competitiveness and this awareness will probably increase with our membership in the European Union in May 2004. The competition stemming from presence of the West European companies on the Slovene market will force companies to develop new or improved solutions to the old problems – new products, services and processes, which will be hard to accomplish without the collaboration between companies and educational and research institutions.

Not only companies but also institutions of higher education will be exposed to much higher competition after May 2004. There will be more opportunities for student, teacher and researcher exchanges, because by entering the EU Slovenia will also enter the common European education and research area, which could cause bigger 'brain leaks'. Thus educational and research institutions will have to offer attractive programs and practices of high quality. Programs should enable graduates to be competitive in the international labour market, therefore special care should be devoted to study contents that should be modern and relevant for the environment where graduates are likely to work. To do this, it is necessary to know the needs of companies better than academics usually do, which can be enhanced through their knowledge transfer activities. This means that knowledge transfer is to be understood as a two-way process.

The presented examples in the paper show that there are many different ways of knowledge transfer. Some common characteristics can be found in all examples – all the analyzed teaching and research institutions have some kind of division, department, center, office or even a company established, which specializes in the transfer of knowledge, especially technological, but sometimes also organizational or business. The tasks handled within those specialized units range from consulting,

educational and other basic information tasks to patenting, licensing and help with establishment of new companies. However, some units are specialized for certain tasks only, such as the Center for knowledge transfer in information technologies at the Jozef Stefan Institute in Slovenia, which focuses on educational forms of knowledge transfer and consulting.

In the forthcoming months, the Nova Gorica Polytechnic will continue with the analysis of knowledge transfer models, with building the repository of available expertise, studying the situation in the region – all this to lead towards enhanced and more systematic knowledge transfer that should go in two directions and contribute to the benefits at both sides, in academia as well as in its business environment. Thus a suitable form of cooperation for the Nova Gorica Polytechnic will be proposed following the analysis.

As stated above, companies as well as educational institutions will be better equipped for international competitiveness if they cooperate. This will only work if the interest at both sides is genuine and strong enough to put additional efforts into cooperation between the two worlds, which is not always easy, but pays off greatly when done in a proper way.

REFERENCES

- Goddard, J. 1997. Managing the university/regional interface. *Higher Education Management* 9:727–37.
- Lavrač, N., and T. Urbančič. 2003. Mind the gap: Academia-business partnership models. In *Data mining and decision support: Integration and collaboration*, ed. D. Mladenič, N. Lavrač, M. Bohanec, and S. Moyle, 261–69. Dordrecht: Kluwer.
- Mladenič, D., N. Lavrač, and S. Moyle, ed. 2003. *Data mining and decision support: Integration and collaboration*. Dordrecht: Kluwer.
- Rebernik, M., P. Tominc, M. Glas, and V. Pšeničny. 2003. *Kako podjetna je Slovenija: Global entrepreneurship monitor Slovenija 2002*. Maribor: Ekonomsko-poslovna fakulteta, Inštitut za podjetništvo in management malih podjetij.
- Van der Sijde P. C., and R. Cuyvers. 2003. Training researchers to commercialize research results. *Industry and Higher Education* 17 (1): 29–35.

Appendix A: Comparison of different technology and knowledge transfer units

Institution	Name of the center	Activities					
		Patenting	Licensing	New companies creation	Con-sulting	Education	Other tasks
The 'Jozef Stefan' Institute	Center for knowledge transfer in IT				Yes	Development and organization of educational programmes	Databases and repositories, research collaboration, contacts with potential business partners
Oxford University	Isis Innovation	One patent/ week (350 patent families)	Yes	More than 30 since 1997	Yes		Venturefest
Cambridge University	Technology Transfer Office (TTO)	Yes	Yes	30 in the last five years	Yes		Securing commercial partners, confidentiality agreements, research collaborations
Imperial College, London	Imperial College London Innovations Ltd. Imperial Consultants Ltd. The Entrepreneurship Centre	Yes	Yes	More than 50 since 1997	Yes		
University of Texas at Austin	The Office of Technology Licensing and Intellectual Property	Yes	Yes				

Stanford University	Office of Technology Licensing (OTL)	Yes	Yes	60–100 option and license agreements	Copyrights & trademarks; negotiating & signing sponsored research, collaboration and material transfer agreements with industry
MIT	Technology Licensing Office (TLO)	100 patents between 1997–2002	Yes	60–100 option and license agreements	Copyrights
Carnegie Mellon University	Innovation Transfer Center (ITC)	Yes	Yes		Contacts with outside licensees, marketing, promotion, IP protection
RWTH Aachen	Department for Technology Transfer and the Advancement of Research		Yes – personalized		Business contacts, information on public and private support programs for entrepreneurs
	Entrepreneurship College			Courses and individual training	Business partner contacts
Institution	Name of the center	Funding	Regional initiative	Management	
The 'Jozef Stefan' Institute	Center for Knowledge Transfer in IT	Projects (both government and non-governmental sources), registration fees		Head of the Center	

Oxford University	Isis Innovation	Isis College Fund	Managing Director, Executive Director, Portfolio Manager, Heads of Groups
Cambridge University	Technology Transfer Office (TTO)	Industry, research councils, the EU, charitable trusts and foundations; royalties	Acting Head of Technology Transfer; science teams
Imperial College, London	Imperial College London Innovations Ltd. Imperial Consultants Ltd. The Entrepreneurship Centre	Investment fund; royalties	Managing Director, Advisors, Heads of Teams
University of Texas at Austin	The Office of Technology Licensing and Intellectual Property	Royalties	Director, Licensing Associates
Stanford University	Office of Technology Licensing (OTL)	Royalties	Director, Licensing Associates
MIT	Technology Licensing Office (TLO)	Royalties from patents	Director and other technology licensing officers
Carnegie Mellon University	Innovation Transfer Center (ITC)	Royalties	Director and project managers
RWTH Aachen	Department for Technology Transfer and the Advancement of Research Entrepreneurship College	PFAU government program	Entrepreneurship Region Aachen Department Director, Division Director