

Recent advances in industry-university cooperation - a Hungarian view

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Abstract

This contribution gives a short overview of recent and current cooperation forms of the ICT industry and higher education including the Faculty of Electrical Engineering and Informatics of BME. Following some introductory remarks, the concept of recently established innovation and knowledge centres is reported together with the characterization of the ICT industry related activities.

1. Introduction

The major institutional source of ICT professionals in Hungary, the Faculty of Electrical Engineering of BME was established in 1949, and rather soon, due to its special situation, became a relatively strong background institution of the Hungarian electronic industry. The reason of this rapid growth is simple: on one hand, even up till now, this is the single faculty in Hungary, which offers MSc equivalent degree in electrical, and computer engineering (5 years Diploma engineering degree, and since 2005 BSc+MSc degrees), while on the other, up till the political changes of 1989, the Hungarian measuring, and communication equipment industry was a strong and important supplier of the Eastern European market. This position was “defended” by different regulations of the regional governments. Even if this situation is already a real history, there are still imprints of these decades in our education, because our departments could serve as active research and development units of various local players of the electronic industry. We were forced to be innovative due to the fact that the majority of the latest electronic components were hard to buy, and the quality of the available instrumentation was rather limited. This shortage of facilities was rather beneficial in the “education” of problem solving. The components of a computer science and engineering curriculum were added step-by-step; the first complete program in informatics was launched only in 1986.

The change to a real market-oriented economy resulted in a big transient: the Hungarian measuring and communication equipment industry was almost completely destroyed. Fortunately, in the nineties, the drastic technological changes in telecommunication and computer networking have caused a very rapid development within the country’s infrastructure: the design and implementation of the missing local communication networks and services have generated again real engineering cooperation among university department and the actors of industry.

In recent years the frameworks of these activities have been further developed. Rather remarkable form of R&D cooperation is that of Ericsson Research and our Department of Telecommunications and Media Informatics, which involves many PhD students working on future and emerging communication problems potentially interesting for Ericsson Research in Hungary, and worldwide. Interesting R&D projects were and are conducted with Nokia, and Microsoft Hungary, as well.

Quite recently, the National Office for Research and Technology in Hungary has launched new innovation and knowledge centres at different local universities. The research and training activities of the Mobile Innovation Centre, established at our university, supports the local representatives of several major international companies, like Hewlett Packard, Nokia, Siemens Communications, Siemens PSE, Sun Microsystems, T-Mobile Hungary, Ericsson Hungary Communication Systems, and some others.

Another important example is the Innovation and Knowledge Centre of Information Technology, again at our university, which is involved in the development of various complex projects aiming at products and services based on novel system integration, and rapid prototyping technologies. This Centre serves a Consortium consisting of nine companies of the local ICT industry.

A further element of this network of ICT players and our university is the Budapest Unit of the IBM Centres for Advanced Studies, established in October, 2006. This unit is in strong cooperation with our Faculty, mainly in the field of dependability issues of system design and integration.

As far as the measurement and instrumentation traditions of the country are concerned, the situation is less promising. The electronic industry in Hungary has been “transformed” into large assembly plants of major international companies, like Elcoteq, National Instruments, Bosch and several others. The departments of our Faculty can cooperate with these larger factories mainly serving their marketing purposes. Typical items of this cooperation are: donation of software licenses and laboratory equipment. Unfortunately the average local ICT SMEs have serious financing and market problems. Industry-university cooperation in this field requires urgently a series of step-by-step actions.

As an early conclusion: in Hungary several promising governmental actions attempt to improve industry-university cooperation. The majority of these programs are rather new, the outcome is hard to predict.

2. The Mobile Innovation Centre (MIK)¹

The Mobile Innovation Centre (MIK) was founded in 2005, as a result of the call „Establishment of R&D and Innovation Centre for Mobile Communication” supported by the National Office for Research and Technology, Hungary. The Centre is based on the cooperation of universities, an academic research institution, industrial companies, suppliers and organisations dealing with scientific research and innovation, including the representatives of profit-oriented and non-profit sectors.

Similar technological centres can only be found in a few advanced countries. MIK is a consortium founded by 17 partners. MIK was established to solve the scientific and technological problems existing in future mobile and wireless systems, and to contribute (1) to the implementation of 3G services, (2) to the introduction of later mobile and wireless communication technologies, and (3) to the development of the up-to-date applications. Furthermore, its aim is to attract small and medium sized enterprises to be involved in the above-mentioned topics.

The Mobile Innovation Centre operates at the Budapest University of Technology and Economics (BME) together with a professional test-bed, and the necessary administrative/service units. The mission of the Mobile Innovation Centre is as follows:

- Supporting the research and development of high-speed mobile and wireless technologies, including the B3G technological trends following the 3G mobile systems.
- Promoting the implementation of 3G/4G mobile and wireless technologies, network services, systems and applications based on these technologies and testing them in an independent environment.
- Encouraging the establishment, development and practical use of the latest mobile and wireless technologies/services.
- Supporting the tough cooperation of universities, industrial companies and small and medium size enterprises, and supporting small and medium sized enterprises established for the development of mobile and wireless technologies and services.

MIK actively participates in the research and development programs initiated by the European Union, increases its own incomings from domestic and international financial resources and maintains itself

¹ MIK Annual Report 2006. (www.mik.bme.hu)

from its own products, services, applications and research and development contracts. Besides the research purposes, the formed testing system is accessible for the domestic partner companies producing, distributing telecommunication devices and developing telecommunication services for whom it is able to make tests without investing into their own testing system. MIK aims at building new international relationships, promoting the exchange of researchers, drawing in students and PhD degree-holders, and making its relationships with the project-partners fruitful.

In the long term, MIK strives for becoming the regional research and development centre of Hungary, and encourages the settlement of international high-tech companies and their capital investment in Hungary, contributing to the general rising of the technological level of the country, the creation of new workplaces and this way to the economic development of the country.

The R&D activity of MIK is hierarchically organized. The lowest level elements are the projects, which are created to attain the specific R&D purposes. The projects are merged into subprograms, while from the subprograms, at the highest level, 3 major programs are composed. Program (1) focuses on the radio link of mobile systems. It examines the presently available radio solutions, and also that of the near future. The development of radio systems, adaptive antennas and software radio are in the centre of the research interest. Program (2) concerns the size of 3G/4G info-communication systems. Integration methods of wired and wireless systems, security issues, and multimedia transmission in heterogeneous mobile systems are investigated. Program (3) is devoted to the integrated development of mobile services and applications for different mobile platforms, to multimedia content management and to the analysis of users' behaviour.

3. Regional Knowledge Centres (RKC) - Péter Pázmány Programme²

The main goal of the Péter Pázmány Programme is to establish Regional Knowledge Centres (RKC) to exploit research and development results of universities in close cooperation with the industrial sector. National Office for Research and Technology announced a call for proposals in October 2004 for the first time to establish and support the operation of RKC's at universities.

The aim of the programme is to establish professional and regional centres of excellence in cooperation with companies and other research organizations to manage innovative projects, focused on research and development at an international level. These research centres effectively cooperate with the industrial sector, and stimulate the technological and economical development of the regions.

The task of the supported RKC's is to transfer R&D results to marketable new products and technologies.

From the 19 recently established RKC's 5 are directly devoted to information and communication technology related activities. A short description of these centres and its activities are given in the subsequent paragraphs.

² Sponsored by the National Office for Research and Technology (Hungary). (www.nkth.gov.hu)

Supported Regional Knowledge Centres 2006

University	Title of the project
University of Pannonia	Information Security Research and Development Centre
Corvinus University of Budapest	Research and Development in the Food chain Regional Science Centre
College of Nyíregyháza	FOOD-ENERG Regional Knowledge Centre
Eötvös Lóránd University	Cell-communication Knowledge Centre
College of Dunaújváros	Regional Material Science and Logistics Knowledge Centre
Budapest Tech Polytechnic	Transportation Informatics and Telematics Knowledge Centre

Supported Regional Knowledge Centres 2005

University	Title of the project
BME	Innovation and Knowledge Centre of Information Technology
University of Szeged	Environmental- and Nanotechnology RSC: development of integrated systems for the improvement of the quality of human life
University of Pécs	University Innovation Knowledge Centre for Developing Life Quality Improving Medicines and Methods of Treatment
Széchenyi István University	University-based Regional University Knowledge Centre for Vehicle Industry
Eötvös Lóránd University	E-Science Regional University Knowledge Centre
Szent István University	Centre of Excellence in Environmental Industry
Eszterházy Károly College	EGERFOOD Knowledge Centre

Supported Regional Knowledge Centres 2004

University	Title of the project
University of Debrecen	High-technologies around the University of Debrecen
University of Szeged	Szeged Neurobiological Knowledge Centre
Semmelweis University	Szentágothai János Regional University Knowledge Centre
BME	Advanced Vehicles and Vehicle Control Knowledge Centre
University of Miskolc	Knowledge Intensive Mechatronical and Logistical Systems Knowledge Centre
University of Western-Hungary	Regional Knowledge Centre of Forest and Wood Utilization

a) Advanced Vehicles and Vehicle Control Knowledge Centre (at BME)

The Advanced Vehicles and Vehicle Control Knowledge Centre was established in 2005 with the intention of organizing, documenting and developing the knowledge that is available at the consortium partners in the fields of vehicle electronics and mechatronics. The result of this consolidation procedure is a marketable product of "knowledge" that will be promoted through the Knowledge Centre of BME.

The National Office for Research and Technology provides significant funding for the operation of the Knowledge Centre in the first four years, thus reduces the operating risks, while formulates clear requirements as a major stakeholder.

Special emphasis was put on defining appropriate business processes and building their support system, i.e., the project management process and its information technology background. Since the future prosperity of the Knowledge Centre depends on the satisfaction of customers purchasing the "know-how", networking efforts have received special attention. Strategic alliances were formed with professional organizations of potential clients (Association of the Hungarian Automotive Industry, Hungarian Logistics Association, and Hungarian Road Haulage Association), and cooperation was initiated with other Knowledge Centres involved in related businesses.

The five research programs (1) Control of a Vehicle Group, (2) Direct Vehicle-Environment Contact based Control, (3) Control on the Vehicle Level, (4) Intelligent Actuators, (5) Platform Systems, Solutions) proved to be appropriate. The success achieved within the "Control of a Vehicle Group" program should be highlighted, where in addition to the initial projects; three additional external orders were attained, one of which has already been partially fulfilled.

The Knowledge Centre conducted notable educational and training activities even during its first year of operation, involving 15 undergraduate and 18 PhD students in its R&D activities, coming from various departments of BME, and other universities, as well.

b) Innovation and Knowledge Centre of Information Technology³ (at BME)

The cooperation between the university and its industrial partners, within the framework of the BME Innovation and Knowledge Centre of Information Technology aims at creating research- and development-intensive, value-added products and services for complex IT applications, and at rendering it self-sustainable by setting up practical innovation mechanisms and business models. The results of the R&D programs are utilized in four major product- and service-oriented fields of exploitation:

1. *e-Document program:* The projects of this program, (1) content and document conversions, (2) authenticity and quality audit, (3) document management, are linked to existing products of the industrial partners, and aim at updating existing modules and developing new ones by putting into practice research achievements.
2. *Middleware, knowledge base and graphical applications program:* The projects of this program are related to (1) transport logistics, (2) geographic information system databases, (3) internal security algorithms, and (4) real-time rendering methods.
3. *e-Security development program:* The activities in this program are focusing on (1) establishing IT quality laboratory, (2) log-gathering and analysis, and (3) virtually closed networks.
4. *Grid and security lab program:* The projects of this program are related to (1) planning distributed and extended file systems, (2) industrial applications of Grid systems, and (3) maintaining an IT security lab.

The consortium, led by BME, includes three multinational companies (Hewlett-Packard Hungary Ltd., Nuance-Recognita Corp., T-Systems Hungary Ltd.), that already have considerable research and development bases in Hungary. There are six founding SMEs in the consortium (Megatrend Co., e-Group-Services Ltd., Balabit Ltd., ESRI Ltd., DSS Consulting Ltd., Secfone Research and

³ BME Innovation and Knowledge Centre of Information Technology, Ann. Rep. 2006. (www.it2.bme.hu)

Development Ltd.) that have R&D background, and growing need for innovation and product-development skills. The expectation is that the systematic cooperation between the university and SMEs promise competitive advantage for both the partners and other Hungarian IT SMEs.

Several enterprises (Ericsson, Montana, Microsoft, Quatrosoft, Triad, SQI) and local organisations have expressed their intention to co-operate with the knowledge centre.

An important external partner is the “Simonyi College for Advanced Studies” of the students of the Faculty of Electrical Engineering and Informatics at BME. The College contributes to the cooperation with graduate and PhD students, and through this, to their professional and personal achievements.

c) E-Science Regional University Knowledge Centre (at Eötvös Loránd University)

The main purpose of the E-Science Regional University Knowledge Centre is the establishment, improvement and development of effective and scalable processing technology of great amounts of data with the aid of university professionals and students, and support of industrial partners.

The Knowledge Centre provides training covering effective and scalable processing of large amount of data, and construction of databases. The services to be developed include data mining methods surpassing the standard content provision.

Within the scope of information technology, the Knowledge Centre focuses on the utilisation of special knowledge (e.g., concerning bioinformatics, and handling complex structures, etc.). The participants of the consortium are: Eötvös Loránd University, Delta Elektronik Ltd., Econet.hu Corp., ESRI Hungary Ltd., and MultiRáció Ltd.

d) Transportation Informatics and Telematics Knowledge Centre (at Budapest Tech)

This Knowledge Centre at the Budapest Tech Polytechnic was established on 14 September 2006. Its mission is to collect and provide information for partners belonging to the corporate body, and to create new knowledge in the area of transportation informatics and telematics. The Knowledge Centre positions itself as an interim body between the academic world and the market economy, bringing market and product centric issues into the system of higher education, and promoting the utilization of the most recent vehicle technology in industry.

The R&D activities of the Centre are based on the results achieved by the "Cooperative Vehicle Infrastructure Systems" (CVIS) project sponsored by the EU, and being planned to be adapted by the European vehicle industry.

The Knowledge Centre operates within the organizational structure of Budapest Tech as an independent R&D-organising and managing unit. The industrial partners of Budapest Tech in this project are: Knorr-Bremse Railways Systems Hungária, Ltd., Ramsys Inc. SDA Stúdió, Ltd. The following institutions act as external supporters: Inventure Automotive Electronics R&D, Inc., TÁRKI Social Research Centre, and the Budapest Transport Company Ltd.

e) Information Security Research and Development Centre (at Pannon University)

The aim of the Centre is to create integrated security solutions by establishing a methodology for planning, building and evaluating integrated security systems, developing software for supporting the application of this methodology and its system elements, and planning intelligent sensors together with an integrated security centre capable of overall system management and control.

These solutions incorporate cutting-edge academic research results along with the latest information security and data protection experience, and combine logical security (encryption processes, protection from computer hacking), physical security (entry control, surveillance, secure power supply, fire and water damage control) and human security (protection from fraud, malicious and involuntary loss control) and significantly reduce potential losses caused by the risk of security

incidents at institutions and companies by providing comprehensive protection – for all items of valuable information, human capital and physical assets – from damage, loss, or theft, or from becoming unusable or being destroyed.

This Research and Development Centre incorporates the expertise, the research, education, and development capacities, international relations and experience of the Faculty of Information Technology at Pannon University, the market-leading KÜRT Ltd., the co-operating ALBACOMP Ltd., and other higher education and industrial partners.

4. IBM Centre of Advanced Studies (CAS) Budapest⁴

The centre, operational since October 2006, currently works very closely with BME. Its mission is as worldwide: Innovation through collaboration:

- Facilitate the exchange of academic research knowledge and real world industry challenges towards enhancing IBM products, processes & services;
- Establish IBM as the partner and employer of choice for top students as they learn and develop skills to create the technology of the future;
- Build and foster relationships among researchers, funding agencies, IBM, and customers;
- Expose IBM developers to current research directions, and identify new and emerging technology issues for academic research.

The current activity is related to the integration SOA (Service Oriented Architecture) and SOA management concepts into the curricula, and increasing the exposure of IBM Tivoli, Rational and other SWG products to students. It will also continue the IBM local history of supporting collaborative research through Faculty Awards and other funding mechanisms.

The centre currently sponsors a visiting professor within his organization, with plans to increase the university activities sponsored by CAS Budapest over the coming years, including outreach to other universities. The centre is currently supported by Sales & Distribution (S&D) (specifically SWG Technical Sales and Services) and represents a successful model for a CAS created and sustained by that business unit.

5. Conclusions

In Hungary several promising governmental actions attempt to improve industry-university cooperation. These include innovation and knowledge centres located at major universities offering BSc& MSc programs in computer science engineering, and/or electrical and computer. The majority of these programs are rather new, the outcome is hard to predict. However, it is important to note, that better industry-university cooperation is rather beneficial for the curriculum development required by the actual changes in the higher education in Hungary.

⁴ IBM CAS Budapest (<https://www-927.ibm.com/ibm/cas/sites/budapest/index.shtml>)