# STRENGTHEN AND UPGRADE REGIONAL CAPABILITIES (REGIONAL UNIVERSITY KNOWLEDGE CENTRE PROGRAMME IN HUNGARY)

*Author*: Annamária INZELT*

***Abstract**. The emerging vision of the modern, innovative Hungarian economy, which can compete successfully in the global arena, made it absolutely necessary to encourage business firms to be innovation-oriented and to encourage universities to develop, beyond their traditional teaching mission, also their research performance and their capabilities to transfer research results and new knowledge to convert them into commercially relevant innovations. The role of government was to create a suitable legal environment and proper incentives to stimulate and support change and to enable collaborations between Public and Private Sector actors.*

*Despite all efforts in launching relevant programmes, the competency and attractiveness of universities for strategic research partnerships with the private sector remained heterogeneous and partially unsatisfactory because of shortcomings in their knowledge base and their capability to act as well-performing research partners in collaborative projects. In 2004 Hungary established a new complementary programme which addressed particularly these shortcomings, the Pázmány Péter – Regional University Knowledge Centre programme. This paper describes shortly the programme and then investigates the experiences of two initial calls. This Public-Private-Partnership model, where the state is not the single supporter of the programme, the participating Private Sector actors provide complementary funding. In addition, the centres can also attract external funding from various other sources. In addition, Private Sector enterprises make advanced technical equipment available for use by members and non-members. By the first experiences this programme is a good frame to support overcoming on one of the failure of the system, weak knowledge distribution capability.*

*This initiative, the Pázmány Péter programme provides a potentially transferable example for other countries with shortcomings similar to those of Hungary's National Science and Innovation System. It was the first policy measure which has attracted a large number of actors and united them in joint regional research activities. This form of Public Sector - Private Sector research collaborations is crucial for the flow of knowledge, the seamless transfer of research results to commercially relevant innovation and for feedback loops in development. The centres offer a stimulating environment for innovators and potential innovators, thus contributing to make the Hungarian economy more competitive.*

***Key words**: university-industry collaboration, regional university knowledge centre, public-private partnership*

***JEL classification**: O38 - Government Policy, P3 - Socialist Institutions and Their Transitions*

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* *Prof. Annamária INZELT, Ph.D., Director IKU, Innovation Research Centre, e-mail: annamaria.inzelt@uni-corvinus.hu*

Mismatches between the different components of its innovation system accounted for one of Hungary's biggest 'systemic failures'. As was the case in other former socialist countries, the initial level of co-operation between Government and enterprises after the beginning of the transformation was very low and not comparable in its nature with western countries. Many failings of the old system were therefore coded into the new institutional structure and the economic environment. To overcome this systemic failure, Hungary is re-coding its institutions and in particular the relationship between academic research and Private Sector innovation in an attempt to create the proper policy and economic environment for a modern, knowledge-based economy.[1]

The emerging vision of the modern, innovative Hungarian economy, which can compete successfully in the global arena, made it absolutely necessary to encourage business firms to be innovation-oriented and to encourage universities to develop, beyond their traditional teaching mission, also their research performance and their capabilities to transfer research results and new knowledge to convert them into commercially relevant innovations. The role of government was to create a suitable legal environment and proper incentives to stimulate and support change and to enable collaborations between Public and Private Sector actors.

In the first period of this transition (1990-1996/8), the majority of new laws relating to the national Science and Technology (S&T) system were enacted (laws covering the Academy of Sciences, Higher Education, Intellectual Property Rights and Public Procurement). The law on higher education (enacted in 1993) defined the tasks of a dual transformation of universities: The return of research to the broken-winged universities and their transformation from traditional, teaching-oriented universities to research-driven, modern academic institutions[2]. The legal framework for co-operation between government and universities was laid down and R&D governance commissions were established. The 1996 amendment to the Higher Education Act introduced a normative higher education research support system where a part of the budget is earmarked for the direct support of R&D. This law and other newly introduced measures were instrumental to encourage the reform of higher education organisations' research strategies and to enhance their research-based interactions with other stakeholders of the Hungarian Research and Innovation System. But practical experience after their introduction showed that a lot of subsequent fine-tuning would be necessary and that the effects of these amendments have melted.

The second wave of legislation in the years 2003-2005 refined the system, adjusted it to the new international environment (e.g. Bologna process, Barcelona targets) and harmonised it with EU legislation in preparation of Hungary's membership. It encompassed the following:

- *Act CXXXIV of 2004 on Research and Development and Technological Innovation* allows public organizations, e.g. universities, to participate in the creation of enterprises on the basis of scientific research results and technological innovation. The law

[1] *The previous version of this paper was prepared for ****

[2] *Important milestones of Hungarian transformation include: Introduction of master and Ph.D. curricula, new evaluation and grant system for professors in view of research quality, grants for Ph.D. students, accreditation of universities, higher education research bidding system and participation in EU-funded co-operative research programmes. In this process, mergers of higher education institutions were enforced by authorities. But at the same time, they developed to autonomous organisations. And an organisational framework evolved, including Rectors' Conference, trade unions for scientific personnel, and others.*

encourages also Public-Private-Partnerships in knowledge exploitation and allocates a high priority to collaborative research and innovation activities, primarily between public research organisations and Private Sector enterprises.

- *Act No. XC of 2003 on the Research and Technological Innovation Fund* enables support for application-oriented research and innovation.
- *Act XXXVIII of 2005 on Higher Education* regulates how universities can establish or participate in the establishment of knowledge utilisation organisations and spin-offs.

These new laws framed an improved environment for knowledge transfer and collaboration between universities and Private Sector enterprises. This was one of the government's declared main research policy priorities since the beginning of the transition to a market economy, together with the stimulation of business demand for R&D, enhanced technology transfer, the promotion of innovative, technology-devoted SMEs, the preservation and strengthening of national R&D capabilities and access to international networks.

**History of programmes**

Only in 1995, a first programme[3] started to provide specific support for this purpose. The time-line of government calls shows that until 2000 the stimulation of research collaboration was a secondary research policy priority.[4] But the new programmes allocated a higher priority to the development of collaborative research projects. Private Sector associations and representatives contributed to initiation and design of this policy measure (e.g. through membership of a politically recognised business representative in the OMFB Council).

The first programme which made collaborative research an important priority was the *Co-operative Research Centre* programme (CRC, launched in 2000). This programme made universities 'centres of gravity' of research collaborations to develop and leverage their potential as drivers of growth in a knowledge-based economy[5]. The programme induced the establishment of CRCs and supports their operation in close relation with Hungarian higher education institutions, other non-profit research facilities and Private Sector enterprises. In the CRCs, education, research and development, knowledge and technology transfer are integrated for strategic purposes. In a CRC "…the leading institutions of the consortia may only be those offering PhD courses and accredited by the Hungarian Academic Committee[6]" and it can only be established in a partnership with Private Sector partners.

A new large-scale programme, the *National Research and Development Programme of the Széchenyi Plan* (NRDPS) was launched in late 2000 to promote collaborative research in consortia with Private Sector participation, led by Higher Education or academic research institutes. The formation of consortia is mandatory except in the Social Science Programme.[7]

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[3] *The programme was called* Promotion of Applied Research.

[4] *For more details see Inzelt 2004.*

[5] *However, decision-making was also influenced by the restructuring of the administrative and government elements of the national research and innovation governance system.*

[6] *Quotation from the call for tenders.*

[7] *The NRDPs are built on a tender system focusing on five fields: (1) improving the quality of life, (2) information and communication technologies, (3) research into environmental and materials science, (4) research into agribusiness and biotechnology, and (5) research into the national heritage and contemporary social challenges. Members of consortia may be any legal entities and organisations without legal status registered in Hungary. Any research institution or business venture registered in the EU or in associated countries can join the consortia. But they are not entitled to Hungarian government funding (www.om.hu).*

Despite all these efforts, the competency and attractiveness of universities for strategic research partnerships with the Private Sector remained heterogeneous and partially unsatisfactory because of shortcomings in their knowledge base and their capability to act as well-performing research partners in collaborative projects. Table 1 summarises these limitations of Public Sector research collaborations with Private Sector enterprises.

**Table 1**

**Shortcomings of Hungarian industry-university collaborations**

| **Shortcomings of Public Sector research collaborations with the Private Sector** |
|---|
| • Few companies regarded universities as crucial innovation partners. As a result, the interaction in collaborative research had an *asymmetric* nature, with a very limited number of universities and enterprises involved and a focus on few disciplines, predominantly in the areas of natural, engineering medical sciences.<br>• Short-term market-oriented research contracts had evolved as the predominant form of Public Sector - Private Sector research interaction. These helped to solve short-term development problems of enterprises, but did not provide a basis for a *stable long-term relationship* which provides continuous knowledge transfer for the Private Sector partner and reliable sources of income for the Public Sector research institution. Such strategic partnerships were rare. |
| **Shortcomings of Public Sector research collaborations with the Private Sector** |
| • According to the judgement of several important Private Sector R&D representatives involved in collaborative research, only few universities had the capability to mobilise the necessary *critical mass* of research capacities and competencies. This was partially due to their absence, but partially also due to limited university in-house collaboration.<br>• *University-internal regulation and processes* did not support collaborative research to the necessary extent. For example, the allocation of Intellectual Property rights remained unclear and the reform of the administrative/economic functions and governance structures of universities had to be pushed further towards efficient structures. |

In view of this gap, several politically recognised business representatives made a strong case vis-à-vis policy makers to further improve legal and other framework conditions and to implement the new policy guidelines consequently. Another recommendation was to create incentives which stimulate a changed attitude of Public Sector researchers and enhance their commitment to Private Sector research collaboration. These interventions contributed to the launch of the above-mentioned second wave of legislation. And they were also instrumental for a newly initiated complementary programme which addressed particularly these shortcomings, the *Pázmány Péter – Regional University Knowledge Centre programme*.

**Programme overview**

Based on the assumption that universities could be a magnet for regional development, the *Pázmány Péter – Regional University Knowledge Centre* programme was developed. The National Office for Research and Technology launched the first call in October 2004. The aim of this programme is to attract leading-edge, technology intensive enterprises in search of research, development and education partners. In addition, the formation of spin-off companies and of innovation clusters with a critical mass of competencies and actors is

stimulated in support of regional business areas in different parts of the country. Both national and regional authorities, as well as various Private Sector stakeholders, contributed to the initiation of the programme. Debates about how to shape the programme were held in different formal and informal forms.

The design of this programme was also influenced by its predecessor, launched by the Ministry of Economic Affairs and Transport within the 'Programme for Technological Development and Innovation'. This programme aimed to support knowledge-based collaborations, to upgrade transfer of knowledge between university and industry, to make universities more attractive partners for R&D laboratories of Multi National Companies (MNCs), and to link (potentially) innovative SMEs to knowledge centres in regional clusters.[8] To achieve intensified collaboration, Public-Private-Partnerships were sought in this context. Government funding should mobilise complementary Private Sector resources and enforce a strong Private Sector impact on resulting research. This programme started with a call for feasibility studies, including the preparation of draft operational plans in 2003. Already this preparatory process led to enhanced joint thinking on strategic issues and had a positive impact, not only on the on-going legislation procedure but also on collaborative R&D[9]. In early 2004, the Ministry was not able to facilitate the designed strategies of the winners, but launched another call to support the infrastructure development at already established innovation and scientific centres. Three centres received grants under this scheme.

When the funding situation changed, there was a rearrangement in governmental structure. The Research and Technological Innovation Fund established at the end of 2003 offered much more generous financial support than support previously allocated by the Ministry of Economy and Transportation..

After the re-arrangement of STI governmental structure the Council of Research and Technological Innovation formulated its own strategic objectives, including the intensification of university-industry collaboration, the strengthening of regional knowledge-based capabilities and the development of clusters in high value-added sectors. An operative government agency, the National Office for Research and Technology (NKTH) was responsible for the development of the new *Regional University Knowledge Centres* programme[10], based on these principles. The first call for tenders was launched in the autumn of 2004.

**The Regional University Knowledge Centres Programme**

The programme objective is to stimulate the development of regional knowledge centres as joint Public and Private Sector consortia, centred at university sites. These knowledge centres aim to integrate the regionally existing knowledge-base and to support its development by the members for mutual benefit. For this purpose, they foster research collaborations, spin-offs, start-ups, and other innovation activities with a high relevance for regional development. The policy programme promotes the creation of such centres and supports their first years of operation financially with the objective to ensure a sustainable cluster development.

Under this framework, the independent partners of the consortium formulate jointly targets and strategies for collaborative research and the exploitation of its results. To enable such

[8] *Source: GKM Document, 2003.*
[9] *The winners of this call concentrated in Budapest, but there was one representative from both Northern Hungary and from the Northern Great Plain Region. All of Trans-Danubia was absent.*
[10] *Renamed subsequently Pázmány Péter.*

research on a state-of-the-art base, a critical mass of participants is crucial to ensure the necessary financial resources, trained staff and implementation power.

This paper analyses the experiences of two calls that were launched in October 4, 2004, and in the second one April 29, 2005. The winning consortia obtained access to funding by the programme, financed by the Research and Technological Innovation Fund (established at the end of 2003). Following the Public-Private Partnership model, where the state is not the single supporter of the programme, the participating Private Sector actors provide complementary funding. In addition, the centres can also attract external funding, e.g. from regional authorities, local and international financial investors and venture capital, non-profit investors, foundations or EU research programmes. In addition, Private Sector enterprises make advanced technical equipment available for use by members and non-members.

Two important experiences from the first round of centres funded led to modifications of the criteria used for the second call: (1) The short time available for the preparation of applications was criticised by several applicants. Therefore it was extended for the second call. However deadlines were kept short because the timeline of the second call since was known and because preference was given to support for regions, where at least a basic level of collaboration and dedication to partnership-building existed already. (2) The initial requirement to submit a 10-year strategic plan was released in the second call. This modification was based on formal logic: If the grant is available only for three or four years, any plans beyond this time frame should not be part of the selection criteria. However, this remained a controversial issue because policy makers' intention is to instigate sustained long-term research collaboration by supporting their initial development phase where they are particularly vulnerable. On the other side, it was argued that the majority of applicants have a credible long-term vision and dedication, which is a sufficient base for long-term joint activities, while formulation of a formal 10-year strategic plan might remain a theoretical exercise under the current, highly fluent external conditions

Table 1 summarizes the characteristics of the two calls. Compared with the first call, the second call targeted less centres with a lower overall budget. The minimum grant size and the duration of support were also reduced.

To evaluate the applications, monitor and evaluate the projects (with the help of expert reviewers), a programme governing committee was nominated by the NKTH for the whole duration of each call. Two business representatives in each of these committees ensured an appropriate involvement of the Private Sector[11].

**Table 2**

**The key characteristics of the calls**

| Issues | 2004 | 2005 |
|---|---|---|
| Maximum number of granted applications | 5 | 4 |
| Duration of support (months) | 48 | 36 |
| Allocated budget (Million HUF) | 9,000 | 6,000 |
| Minimum sum per project (Million HUF) | 1,440 | 1,000 |
| Period between launching calls and deadline for application (in calendar days) | 31 | 48 |

## 2.1. Implementation of Regional University

[11] *Source: RTI Fund.*

## Knowledge Centres

The 12 existing centres encompass 91 founding members from the Private Sector, including 43 SMEs. The programme provides flexibility for the winning regional consortia to develop and pursue tailor-made approaches for their specific research issues and regional environment. As a result, centres have developed different structures with Private Sector partners ranging from a group of SMEs cooperating with a single large multinational company to a grouping of several large companies. Figure 1 shows the stylised centre structure.

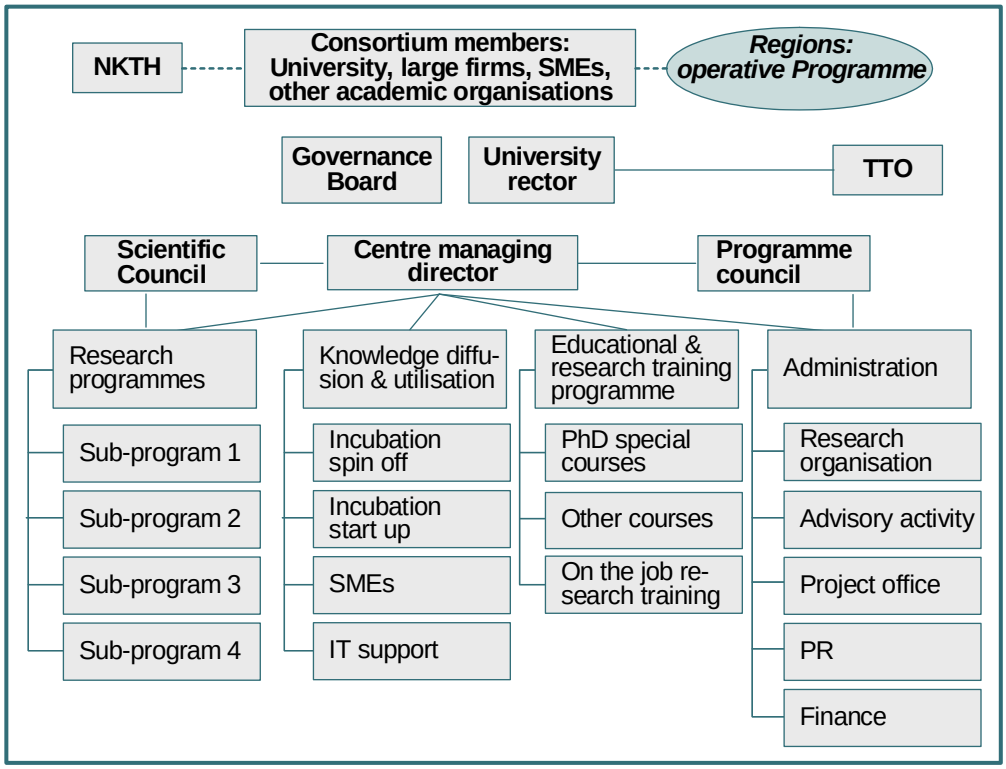


*Figure 1. Stylised Structure of Regional Knowledge Centres*

The centres' research activities are characterised by a high degree of inter- and trans-disciplinarity, where various university departments work together in targeted research programmes. The Private Sector participants have an important role in setting the research agenda and participate in the Centre's research activities as an active partner in projects, as a 'client' or as a user of facilities. The number of research programmes varies by centres.

The evaluation of the first round winners started in November 2005. The programme governing committee evaluates the performance on the basis of several criteria, which are partially newly introduced in Hungarian evaluation schemes. Table 3 summarises the common criteria applied in regular monitoring and performance evaluation of all centres.

**Table 3**

**Evaluation criteria of the Regional University Knowledge Centres**

| | **Regional University Knowledge Centres (Hungary)**<br>**Performance Evaluation Criteria** |
|---|---|
| 1 | *Scientific performance*<br>Scientometric methods; scientific awards; dissertations; integrated and acknowledged in the international scientific network. |
| 2 | *Human resources*<br>• Utilisation of research results in education<br>• No. of graduate students, PhD Students, young researchers involved in the projects<br>• No. of fresh scientific degrees<br>• No. of new jobs (mainly technical personnel and post-doctoral positions) generated at private firms, at research organizations |
| 3 | *Knowledge transfer and the industrial utilisation*<br>• Number of patent applications and registered patents (national, PCT, foreign)<br>• Number of other IPRs<br>• Patents reaching the phase of licence selling, and the amount of income thereof (which the researchers will directly financially be part of).<br>• Number of developed new products, process, service, prototype and innovation |
| 4 | *Economic utilizations*<br>• No. of participating research organizations and private firms<br>• No. and sales of start-up companies,<br>• No. of generated spin-off by projects<br>• Mode of utilization (product sales, selling licence and know-how)<br>• Project results<br>✓ Additional total incomes (in which export income)<br>✓ Diminished costs |
| 5 | *Societal utilization*<br>• Project contributed to<br>✓ Sustainable development<br>✓ Equality of chances<br>✓ Security<br>✓ Moderation of regional inequality<br>• Public presentation of projects to<br>✓ Professional audience<br>✓ General public |
| 6 | *Other criteria*<br>Evaluating personal and management competencies (team-work, managerial competencies, strategic orientation, organisational innovation, adaptability to changes, presentation skills), project marketing |

**1. Impact of private sector involvement and effectiveness in leveraging publicly funded RTD/stimulating private sector RTD investment**

The *Pázmány Péter – Regional University Knowledge Centre* programme was initiated in order to help correct historically grown inefficiencies in the Hungarian research system and to accelerate in particular the development of Public Sector – Private Sector research collaboration. At the time of preparation of this study, the following effects can be observed:

**a. "Kick start" for the mobilisation of (potential) clusters**

For the first call, 12 applications were received and 6 grants were awarded. For the second call, 15 applications were received and again 6 grants were awarded. The total grant amount was HUF 15 billion for two calls. As a result of the increased support for collaborative R&D in the centres, Private Sector participation grew considerably from a share of 12% of the grant

volume in 2004 to 30% in 2005. Private Sector contributions were HUF 2.31 billion in 2004 and HUF 2.58 billion in 2005. The Private Sector contribution constituted 26% of available financial resources in 2004, and 43% in 2005, meaning that additional financial resources were significantly larger in the case of the 2nd call. The number of Private Sector members in the applications was 72 in 2004 and 96 in 2005.

**Table 4**

**The results of the two calls**

| Issues | 2004 | 2005 |
|---|---|---|
| Nr of granted applications | 6 | 6 |
| Nr of all applications | 12 | 15 |
| Nr of represented regions in granted applications | 5 | 4 |
| Nr of represented regions in all applications | 7 | 6 |
| The total sum of grant (M HUF) | 9,000 | 6,000 |
| The smallest grant (Million HUF) | 1100 | 500 |
| The highest grant (Mio. HUF) | 1700 | 1200 |
| Average amount of the support of an application (Mio. HUF) | 1,500 | 1,000 |

The ratio between applications and awarded grants was 1:2 for the first call and 1:2.5 for the second call. Grant sizes are not comparable, because the duration of support was shorter in the second call than in the first, which affected the total sum of grants and the size of grants to individual centres.

In the implementation of both calls, some of the tender conditions were modified, because the governing committee wanted to ensure a sufficiently large sample of centres. Therefore, six applications were accepted in each call despite a limited overall programme budget (instead of five and four for the two years, as was announced in the calls), but with lower average grant sums.

In the calls, the minimum project budget was 1440 and 1000 respectively, but the smallest awarded grants were 1100 and 500 respectively.

**Table 5**

**Number of RETs by fields and regions in 2005**

| Regions | Total | Natural resources | Biological & pharma | Nanotech-nology | ICT | Vehicles |
|---|---|---|---|---|---|---|
| Great Plain | | | | | | |
| § Northern | 1 | | | 1 | | |
| § Southern | 2 | | 1 | 1 | | |
| Central Hungary | 5 | 1 | 1 | | 2 | 1 |
| Northern Hungary | 1 | | | | | 1 |
| Trans-Danubia | | | | | | |
| § Western | 2 | 1 | | | | 1 |
| § Southern | 1 | | 1 | | | |
| § Central | | | | | | |
| Total | 12 | 2 | 3 | 2 | 2 | 3 |

Overall, the scheme has proven its capability to strengthen region specific clusters. The winners include 10 out of 25 Hungarian universities. Each region - except Central Trans-Danubia - has at least one knowledge centre.

From 12 centres that were set up in 2004 and 2005, five were established in Central Hungary, mostly in Budapest and its surroundings, where large, established universities are located. In Budapest, around the country's largest technical university, BME, there are two knowledge centres: (1) *IT2*, focused on information technology and (2) *Advanced Vehicles and Vehicle Control*. The largest medical university, Semmelweis University, Budapest hosts one knowledge centre, *Szentágothai János* which focuses on *molecular biology and info-bionics*. With its strong natural sciences faculty, ELTE University, Budapest is the centrepiece of the *e-Science Regional University Knowledge Centre*. The fifth centre of the region is located outside of Budapest, mainly in Gödöllő, at the Szent István University, a Centre of Excellence in *Environmental Industry* based on Natural Resources.

The University of Szeged in the Southern Great Plain Region has attracted two centres: (1) *Environmental and Nanotechnology* that includes the development of integrated systems for the improvement of the quality of life; and (2) the *Neurobiological Knowledge Centre*.

Western Trans-Danubia has also two knowledge centres, attached to two different specialised universities with a strong link to their regional economic environment. The centre of *Forest and Wood Utilisation* is linked to the West Hungarian University in Sopron and the Széchenyi István University-based Knowledge Centre for *Vehicle Industry* is located in Győr.

Three other Centres are linked to other regions' largest universities: the *Genom-Nanotech Debrecen Knowledge Centre* at Debrecen University in the Northern Great Plain region, the *Centre of Knowledge-intensive mechatronics and logistics systems* at Miskolc University in Northern Hungary and the *Southern-Trans-Danubian University Innovation Knowledge Centre for Developing Medicines and Methods of Treatment to Improve Life Quality* at the University Pécs; in Southern Trans-Danubia.

As an example of such a successful regional initiative, the appendix of this case study provides a detailed description of the *Szentágothai Knowledge Centre (SzKC).*

### b. Private sector involvement and effectiveness in leveraging publicly funded RTD/stimulating private sector RTD investment

Because of the short history of the programme, it is too early for a final evaluation of the programme's impact on Private Sector involvement and resulting leverage[12]. But obviously, it has attracted a considerable number of business partners. The 12 consortia have 91 Private Sector members and many other partners. Among the Private Sector members, 48 are large firms and 43 are SMEs. The majority of centres involve a larger, mixed group of Private Sector partners[13]. Besides these formal members, centres have also developed partnerships with other small businesses in their regions. And some of them are also preparing spin-offs.

Changes in the programme regulations encouraged Private Sector participation further. For example, the first call employed a complicated method to calculate the level of support:

[12] *The first monitoring exercise started recently, but it will only be concluded after the end of this study.*

[13] *With some exceptions: One centre has only one single large business partner and several small ones. Another one consists of several large MNCs with no SME participation.*

Private Sector participants could obtain 100% support for basic research, a maximum of 60% for applied research costs and a maximum 35% of the cost of experimental development[14]. Fulfilment of additional criteria allowed to increase this support to 75 or 50 % respectively under certain conditions) This very complicated calculation method was revised after interventions from both Private Sector participants and the programme governing committee (In particular by its Private Sector members) A simplified calculation in the second call defined that Private Sector organisations could obtain 50% state support for their programme-related R&D expenditures. As a result, business members of the consortia established in 2004 received 12 % of the total support in the year of winning the grant, compared with 30% in 2005.

In the context of the 2004 call, Private Sector members of consortia added twice the amount of state grants. For the 2005 call, this relation was 1.5. According to our interviews, business members are willing to invest more and to launch additional joint projects.

In a preliminary summary view, after a time-consuming ramp-up period and the implementation of some improvements, the programme has achieved its objective to stimulate the formation of regional research and innovation clusters and Private Sector research investment therein.

## 1. Conclusions and transferability

The enhancement of interaction between the different actors of their innovation systems is vitally important for economies in transition. Backed by some political support and new legislation, Hungary's dedicated research policy approach has certainly made progress in this area through the described trials and errors-based approach of governmental agencies in setting up programmes for this purpose.

As a key element of this initiative, the Pázmány Péter – Regional University Knowledge Centre programme provides a potentially transferable example for other countries with shortcomings similar to those of Hungary's National Science and Innovation System. It was the first policy measure which has attracted a large number of actors and united them in joint regional research activities. The centres have created and/or brought forward forms of Public Sector - Private Sector research collaborations which are crucial for the flow of knowledge, the seamless transfer of research results to commercially relevant innovation and for feedback loops in development. The centres offer a stimulating environment for innovators and potential innovators, thus contributing to make the Hungarian economy more competitive.

In the assessment of the transferability of this research policy approach, the lessons of the initial programme period have to be taken into account:

- *Private Sector involvement*

Through its capability to stimulate Private Sector research activities and to strengthen its links with Public Sector research, the Pázmány Péter – Regional University Knowledge Centre programme contributes to Hungary's efforts to reach the Barcelona target of 3% of national R&D investment, out of which two thirds are Private Sector financed. In this particular scheme, the Private Sector contributed 20% of the total budget of first year winners and 30% of the second year winners.

[14] *Public Sector research organisations can receive up to 100% financing for their activities.*

Two different groups of Private Sector actors have to be considered:

- ✓ The financial and technological potential of *large multinational corporations* makes them attractive partners for local actors. To attract them, the centre must offer attractive research and innovation opportunities and access to regional research potentials.
- ✓ *SMEs* can benefit particularly from a participation in the centre for the development of their research and technological competencies. Regional clusters offer them access to an extended knowledge pool and research infrastructure with state-of-the-art equipment. This is beneficial for strengthening regionally important sectors.

Therefore it is important that consortia are open for new collaborators with own high research potential or with a specific need to be involved in state-of-the-art research. However, this creates another challenge: Centres must find a sound balance between this openness to achieve spill-over effects and the need to develop leading-edge research competencies to be attractive magnets for top-level research partners and to create sustainable competitive advantage. This may impose limitations on the centres' capability to broaden their regional impact.

- *Development of university organisations*

In their first years of operation, the centres have created a strong momentum to accelerate the modernisation of universities, including the development of their research competencies, organisational reforms and the orientation towards the transfer of research results and scientific knowledge. In this sense, the impact of the Private Sector partners in the consortia has reinforced the pressure coming from research policy makers through new legislation and regulations. Through these combined effects, universities were motivated to put the new regulations into practice rapidly and consequently. At the same time, enhanced new regulations, e.g. on university patents and efficient new technology transfer mechanisms, have contributed to making the centres more attractive and to remove barriers for their efficient functioning.

- *Advanced research*

Through the encouragement of interdisciplinary and trans-disciplinary research, the centres have also contributed to overcome the traditional shortcomings of university research in isolated disciplines. Collaboration between various departments of the involved universities is encouraged and incentives are created to enhance activities beyond the traditional teaching and research focus towards a 'third mission' of creating value for society through transfer of knowledge and research results. At the same time, the introduction of modern collaborative working methods and of a new performance evaluation system is accelerated and a new spirit is fostered in universities.

- *Sustainability*

After the ramp-up period of the centres, participants expressed a growing need for an enhanced formal framework for their durable long-term collaboration. Since they do not have a status as legal entities, the centres can for example not participate in tenders for research projects. According to participants, filing such applications through the centres' academic parent organisations or through Private Sector partners is not a satisfactory solution. This growing pressure to introduce an upgraded organisational collaboration framework is a sign for the high interest of the involved Private Sector enterprises.

- *Regional development*

The intellectual potential, research and educational activities and new technology/ business incubation function of the centres can become an important element of their region's economic development. As technologically attractive 'magnets', they attract innovative enterprises, thus contributing to strengthening the region's competency and resource pool. At the same time, they can play a vital role in the development of the technological capabilities of regional SMEs through collaborative research, the transfer of knowledge and the education of highly skilled staff.

But the successful development of such centres requires a favourable environment. There must be a critical mass of academic research potential and of technology-oriented enterprises. And there must be a supportive overall policy framework: Economic, education, tax and other policy domains must support the technology-driven development path for which the centres stand.

**Appendix A**

## Additional important literature and information[15]

### 1. Literature


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[15] *For basic information already quoted, please refer to the country report for Hungary in this study.*

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| www.ejjt.bme.hu | Advanced Vehicles And Vehicle Control Knowledge Centre |
| www.szjt.hu | Szentágothai Knowledge Centre (Password required) |
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**3. Documents**

- 2003 Act No XC. of 2003 on Research and Technological Innovation Fund
- 2005 Act CXXXIX of 2005 on Research and Development and Technological Innovation (short name: Hungarian Innovation Act)
- 1993 ACT LXXX of 1993 on Higher Education
- 2005 Law on Higher Education
- Different documents of the Szentágothai Knowledge Centre
- 2004 d) Research and development in Hungary 2003-2004 (Working Paper available on http://www.nkth.gov.hu/main.php?folderID=466&articleID=3653&ctag=articlelist&iid=1
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**Appendix B**

## Szentágothai Knowledge Centre (SzKC) as an example for a successful regional initiative

This Centre was one of the winners of the first call. It was established in 2004 by three scientific organisations, one large and four small Private Sector enterprises. The founding organizations had collaborated previously to re-channel and broaden their research. Their shared objective in the fall of 2003 was to fundamentally transform the university's research approach from an overly academic and publication-oriented attitude towards a seamless research and innovation chain which takes scientific results directly to the various forms of commercial utilisation.

In the spring of 2004, the participants signed a Letter of Intent to form a Consortium and initiated first steps for the establishment of an innovation centre and scientific park at an international standard - the BIMIP (Bio-Info-Medical Innovation Park). In July 2004, the president of the *Semmelweis University* Council, the leading organisation of the consortium, initiated an amendment of the University Constitution, allocating 0.5% of the total university budget to the transformation of the R&D process. At the same time, plan emerged to establish a Technology Transfer Office as an independent business entity owned by the university. It would be responsible for the commercialisation of the university's intellectual potential.

But this strategic plan was jeopardised by a shortage of financial resources. The new Regional University Knowledge Centre programme was launched just in time to prevent stagnation of the ambitious project.

The founding members of the consortium beside the host, *Semmelweis University* were:

- The *Information Technology (IT) Faculty of Pázmány Péter University* from the same region. This young faculty (launched in 2001) has a high competency in IT research and education and has established itself as a recognised actor in the field of natural and artificial recognition and sensing in conjunction with neurosciences and introductory physiological knowledge. The IT faculty operates the Jedlik R&D Laboratory. Its operations are supported by four academic institutions (SZTAKI, KOKI, MFA, and PKI).
- Another scientific founding member, *MTA Experimental Medical Science Research Institute* (MTA KOKI) is the exclusive medical-biological research site in Hungary. Its main activity consists of multidisciplinary neuroscience research.
- Hungary's enterprise with the highest rate of R&D spending (8% of revenues), the pharmaceutical company *Richter Gedeon SHC* is among the initiators of the Centre and a founding member. The company's own R&D organization works with a staff of over 700 in drug development.
- Four small companies are also among the founders:
  - ✓ *KPS Biotechnology Ltd.* (established in 2003) is the first bio-technological spin-off enterprise connected to the Semmelweis University. It obtained a 'start-up' state grant for developing gene-therapy and cell-therapy technologies.
  - ✓ *Analogic Computers Ltd.* (established in 2000) is a spin-off company of the Analogic and Neural Laboratory of the MTA-SZTAKI (Hungarian Academy of Sciences – IT and Automation). This laboratory's internationally recognised

scientists and research & development engineering group have been active in Cellular Network research and development in the past ten years.

- ✓ As an SME, *MorphoLogic Ltd.* (established in 1991) has had already considerable commercial success, for example with its spell-checking program integrated in the Microsoft Office software. The company is exclusively active in computer-based linguistic research (speech recognition, text reading, mechanic translating technology and sentence analysing technology).
- ✓ 3DHISTECH Ltd (established in 1992) had reoriented its core activity from trading to medical device development in 1996. The company developed an automatic object-slide digitalising system and a related program pack consisting of a pathologic database management system, object-slide digitalising software, a virtual microscope program pack and tele-consulting programs.

Besides the consortium members, several other enterprises supported the development of the centre and participate in the 4- and 10-year strategic concepts worked out by the consortium. These include four businesses enterprises (Philips Hungary Ltd – Medical Department, IBM Hungary Ltd – Life Sciences Department, Proactive Management Consulting, PMC 2002 Ltd., RÉV 8 /Futureal (Corvin-Szigony) Ingatlanfejlesztő SHCo.), three academic institutes (MTA – SZTAKI, National Nerve Surgery Scientific Institute, Gottsegen National Cardiology Institute) and the Budapest Local Government of District #8.

The aims of the Consortium were:

1. to transform the university's research activity fundamentally. The most important element is a new vision of a university research process that adopts a seamless innovation chain resulting in various forms of commercial utilisation of research results (including patent, licences, royalty, spin-off and start-up);
2. to identify synergies in relevant scientific fields and to stimulate a multidisciplinary research approach leading to innovative novel products and services;
3. to rapidly found and build the Technology Transfer Office at the university leading the consortium;
4. to develop a 'core facility' entity; and
5. to invest massively in the necessary infrastructure and in the incubator in order to host spin-off and start-up companies on an international standard.

An important underlying objective was the rapid change of the traditional, academic attitude towards business-oriented thinking. For this purpose, a strong emphasis was put on education and on student involvement in research and development to develop their professional, industrial and international skills. This included a Ph.D. course in industrial innovation and innovation management, the transfer of practical experiences and international "best practice" knowledge by recognised industry experts, founders and managers of successful start-up and spin-off companies and other support for career and professional development.

The centre's activities focus on interdisciplinary research at the interface between biological and IT sciences at the forefront of scientific progress. In this area, the SzKC has 5 coherent programs focusing on drug development, individual genetic medication therapies, exploration of predictive genetic patterns for the prevention of cancer and diseases of

civilisation and screening of such diseases, creation of diagnostic methods and instruments and information processes encompassing the therapy process, and a broader industrial introduction of info-bionic instruments and bionic prostheses. Targeted R&D activities focus on projects with a high application potential which utilise synergies between consortium partners. This provides also a further impetus for co-operation with industry experts, postdoctoral researchers, Ph.D. students and university researchers in R&D projects organised by the SzKC.

Co-operation is based on joint research & development and innovation activities involving the regional Public and Private Sector actors. This collaborative research is supported by the university infrastructure, which is extended through investments which are enabled by grants from the Regional University Knowledge Centre programme and by contributions of the consortium partners. Beyond collaborative research, other approaches gain importance for bridging the academic sector with the business sector, e.g. licence sales, royalty contracts, start-up and spin-off activities.

Another challenge for the development of the centre is its geographical dispersion. Today, it is spread out over several locations without a 'common roof' and a modern R&D infrastructure which ensures the necessary concentration and integration of resources and intellectual potential. As a prerequisite for participating in international R&D networks, EU-sponsored research programmes, etc., the centre needs a state-of-the-art infrastructure at international standards. However, this fifth aim of the centre is not supported by the Pázmány Péter programme, because infrastructure investments are not compatible with its principles. A possible solution for this problem could come from synergies with another governmental program, the *Regional Operative Program of Central Hungary* (ROPCH), which focuses on support for SMEs to develop the region's knowledge base. Another possible synergy could b with the city restoration program (Corvin-Szigony Project) which would allow significant development of physical infrastructure to offer a common roof in a 21st century research building for various activities of the knowledge centre. The presence of such supporting measures can contribute to the success of the centre concept.

In its first operational year 2005, the SzKC has prepared the foundations for its efficient operation. Methods and mechanisms for collaborative research and a project-oriented operational framework were defined and implemented[16]. This includes criteria for monitoring and performance evaluation of researchers and programmes. Evaluations take place regularly in defined time periods, for example at project milestones or before significant career steps. Project managers are responsible for the performance of their projects.

The Centre launched 3 new Ph.D. courses for medical and IT students on industrial property rights, on science and project management and on national and international bidding systems. 0 graduate students, 8 PhD students and 25 young researchers were involved in the numerous research activities of the centre. In the course of these activities, an international project was launched, five articles were published in international journals, and 15 new research jobs were created.

[16] *Resulting for example in two publications Regulation of Intellectual Property and Handbook for Operations*