Enabling ICT R&D in Central and South-Eastern Europe

National report from Hungary

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1. Introduction

Much has changed in Hungary in respect to research, technology development and innovation (RTDI) in general, and to ICT R&D in particular since the ITSTAR Workshop in Prague held in October 2004. Even in this short period two phases should be distinguished with a boundary line in June 2006 when a renewed government entered into office after the parliamentary elections in April 2006.

In the first phase, most changes were triggered by the National Office for Research and Technology (NKTH),[1] and to a lesser extent by the Economic Competitiveness Operative Programme (GVOP) and the Ministry of Informatics and Communications (IHM). In the second phase the deep reforms in the public administration and the social care systems, started by the new government, have already effected the RTDI administration. No doubt, that these reforms, strengthened by the second National Development Plan (NFT-II) from January 2007, will have long-lasting effects also on ICT R&D in Hungary.

2. Organisational structure of RTDI in Hungary

The new government, after entering into office in June 2006, immediately announced deep and fundamental reforms in the public administration and the social care systems. These reforms, like in some other European countries, have been inevitable since many years, nonetheless, no Hungarian government dared to take the initiative so far.

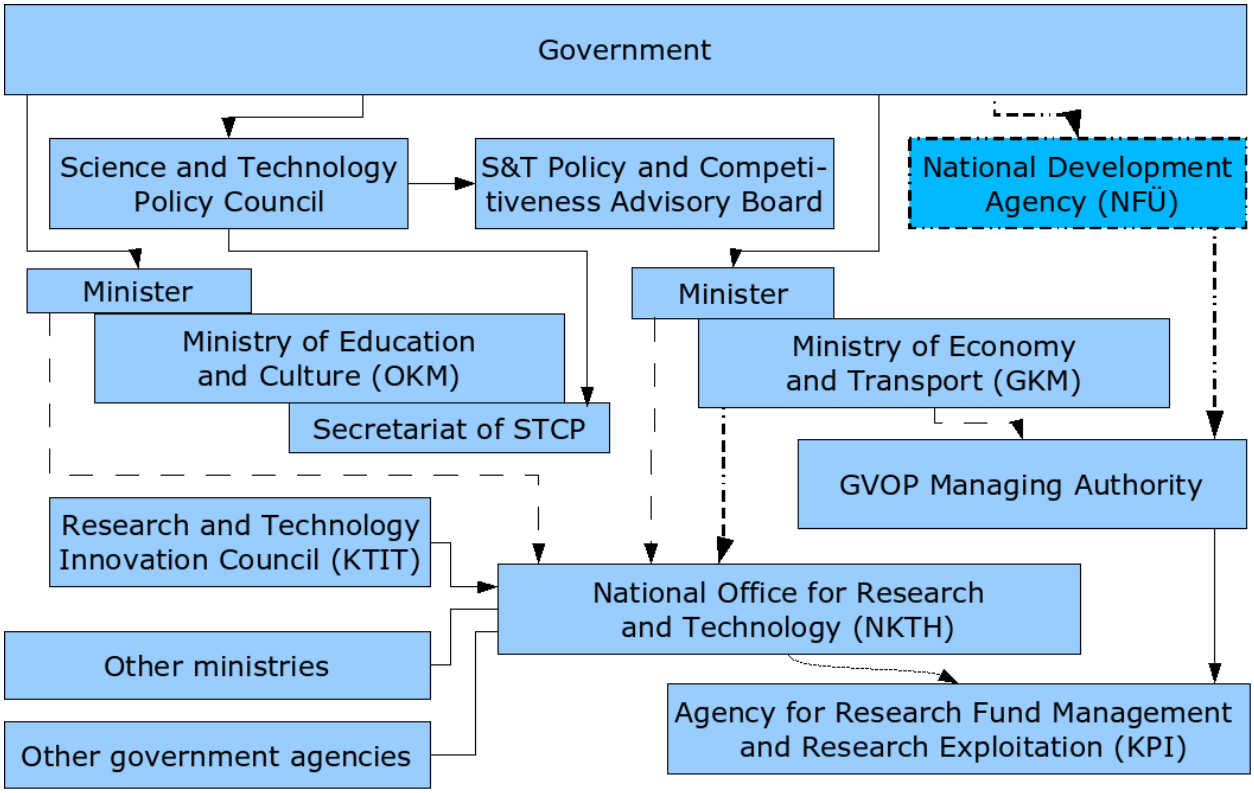
The major aims of the reforms are, as usual, improvement, rationalisation, sustainability, effectiveness and cost reduction. The latter is most urgent because Hungary has the largest budget deficit among the 25 EU member states – therefore the central budget had and will have to be cut significantly. These cuts effected the central government first, including the RTDI administration, and soon they will effect the local government levels, and then the healthcare, social insurance and pension systems as well.

Good news that the announced reforms offer excellent opportunities for hundreds of innovative ICT applications and create new challenges for future RTDI activities in ICT. For the time being, however, other - political, financial and economic - challenges are more urgent to solve for the government than the structural and operational problems of the Hungarian RTDI system.

The next figure shows the governance of RTDI in Hungary before and since June 2006. The major changes introduced by the new government are the following:

1 Abbreviations used in this paper with their meanings are listed in the Appendix.

- A new government office, the National Development Agency (NFÜ) has been set up to control the managing authorities of the operative programmes, including the GVOP Managing Authority; therefore the latter belongs no longer to GKM.
- Earlier NKTH was supervised and represented in the government by two ministers (Minister of Education, Minister of Economy and Transport), now NKTH is a background office of the GKM.
- KPI's ties to NKTH will weaken since NFÜ will control all public support activities.



RTDI governance structure in Hungary

It should be noted that more changes are to be expected before the second National Development Plan (NFT-II) for the years 2007-2013 will start in January 2007.

3. Appraisal of RTDI developments in Hungary

As told above, *two phases* must be distinguished since the Prague meeting of ITSTAR.

In the ***first phase,*** between October 2004 and June 2006 three major factors had the biggest influence on ICT R&D in Hungary:

a) the new policy and practice of NKTH,

b) the realisation of GVOP, under the supervision of GKM,

c) the “role seeking” of IHM.

In the ***second phase,*** started in June 2006, there are two important factors with long lasting effects on the Hungarian ICT R&D activities:

d) the fundamental reforms in the public administration and the social care systems, strengthened by
e) the second National Development Plan (NFT-II).

These five factors will be described in some detail in the rest of this section.

First phase (October 2004 - June 2006)

(a) The new policy and practice of NKTH

According to its statutes, NKTH, established in January 2004, is responsible for the government's technology policy, elaborates RTDI programmes, manages international R&D co-operation in bilateral and multilateral relations as well as supervises the network of Hungarian science and technology attachés. In brief, NKTH submits its strategic proposals for discussion and/or approval to the Research and Technology Innovation Council (KTIT), and implements the Council's decisions, in co-operation with its Agency for Research Fund Management and Research Exploitation (KPI).

The main objective of NKTH is the improvement of the conditions for innovation which NKTH, partially in contrast to its predecessors, wants to achieve by

- *focusing* financial resources on high priority areas;
- introducing *compulsory intellectual property rights* (IPR) regimes at public research institutions in order to enforce *patenting activities;*
- establishing *knowledge centres* and *technology innovation clusters;*
- encouraging researchers' *mobility between academy and industry*;
- building a *regional institutional system* to expand *innovation activities;*
- creating *attractive innovation environment* to promote repatriation of researchers.

While almost every interested party agrees with the principles listed above, the implementation practice of NKTH is frequently criticised for the lack of agreement seeking with the R&D community and other government organisations, short proposal preparation times, lack of transparency at the evaluations, voluntary decisions, poor information on the accepted projects etc.

The current practice of NKTH puts much emphasis on quickly applicable results, and thus sets researchers taking part in long-term research against researchers and developers who promise fast return of the investments. It led to a sharp and probably useless confrontation between the various organisations playing some role in the management of RTDI in Hungary.

The new programmes of NKTH are mostly "horizontal", i.e. without any thematic priority (with the exception of biotechnology) in contrast to the past and also to the practice of many European member states and the European Commission. In the lack of proper databases and published data the large number and variety of programmes makes it difficult for the potential applicants and other interested parties to have a clear overview about the application possibilities, the supported projects, and the results of the projects.

The new policy and its implementation has resulted in megaprojects (cf. with the list of selected regional knowledge centres established at universities in Section 5) with large consortia and higher grants (up to HUF 2 billion ~ € 8 million).

It is expected that bigger projects and larger consortia will, among others, lead to

- a smoother co-operation between academy and industry,
- an increase in the number of patents,
- the emergence of more practical applications,
- a more effective use of resources.

On the other hand, big projects and large consortia often lead to management and institutional problems that are difficult to handle for the academic staffs.

Another important and interesting aspect of the new policy concerns the uneven distribution of RTDI activities throughout the country. For historical reasons, most industrial and scientific activities are concentrated in Budapest, the capital. While there are acknowledged science universities and universities of technologies in a number of smaller towns their influence and attractiveness is not strong enough as far as industrial activities and technology developments are concerned. The strengthening of regional activities, among others innovation and technology development is of utmost importance.

(b) The realisation of GVOP

GVOP, the Economic Competitiveness Operative Programme (also known as ECOP) is one out of five operative programmes of the first National Development Plan (NFT-I) started in January 2004. There are three financial sources of the operative programmes:

- the Structural Funds of the European Union,
- the Cohesion Fund of the European Union and
- the national contributions.

The other operative programmes are the following:

- Agricultural and Rural Development Operative Programme (AVOP),
- Human Resources Development Operative Programme (HEFOP),
- Environment Protection and Infrastructure Development Operative Programme (KIOP),
- Regional Development Operative Programme (ROP).

As said, GVOP started in January 2004, a few month before Hungary entered the European Union, and stopped to accept proposals in Autumn 2006, with projects running up to the end of 2008. Community assistance amounts to more than EUR 429 million, out of a total budget of approximately EUR 606 million.

Most of the former R&D support schemes of the predecessor of NKTH were, for practical reasons, brought under GVOP. Out of the four priority areas of GVOP two are directly related to R&D and/or ICT:

- *Priority 3: Research & development and innovation,* supporting research projects in key areas; improving research infrastructure; supporting co-operation between

public research institutes and the private sector to promote technology transfer; and supporting innovation-related activities in SMEs, including spin-off companies.

- *Priority 4: Development of the Information Society and the e-Economy,* providing for investments related to the development of business-relevant services, applications, content and infrastructure; supporting the introduction of IT-based business systems in order to increase efficiency within SMEs and improve their capacity to share information with partners; supporting the production of business-related digital content in order to expand SMEs' knowledge-base; promoting the development of business-friendly e-administration services to make the exchange of information between public administrations and businesses more efficient; supporting the provision of broadband telecommunications infrastructure in remote and disadvantaged regions to ensure their inclusion in the information society.

Priority 3 was elaborated by NKTH and Priority 4 by IHM. However, the execution of all GVOP programmes became the responsibility of another organisation, the GVOP Managing Authority under the supervision of GKM, with the contribution of two programme managing agencies: KPI manages projects belonging to Priority 3, while a similar agency of IHM (IT Kht.) manages projects belonging to Priority 4.

This rather complex bureaucratic structure decreased the efficiency of the execution, made the co-operation difficult between the participants, hampered getting a clear picture about the projects and their expected results, etc. One of the objectives of the new National Development Agency (NFÜ) is to resolve this complexity, and create a much simpler, more transparent and more effective management structure.

However, the complete separation of the strategic and the executive levels has also disadvantages. For example, NKTH officials lost contacts with their professional constituency making more difficult for them to deploy new RTDI programmes or to represent Hungarian interests in EU committees and other international bodies.

(c) The "role seeking" of IHM

IHM, the Ministry of Informatics and Telecommunications was established in July 2002. Its mission was to promote the development of the information society. Among others, it

- supported ICT R&D projects and deployment projects, especially from 2002 to 2004;
- led the development of the Hungarian Information Society Strategy (MITS);
- contributed to the development of the broadband network, including the academic and research network;
- established *eMagyarország* Internet access points in most settlements in Hungary;
- promoted ECDL - European Computer Driving Licence – activities;
- launched the NAVA - National Audio and Visual Archive - and the NDA - National Digital Archive - megaprojects; and last but not least
- produced several important legal regulations.

Two organisations, established by law, helped IHM to fulfil its mission: the National Communications Authority **(**NHH) and the National Council for Communications and Information Technology (NHIT). As far as ICT R&D is concerned, a noteworthy initiative of NHIT is the ongoing IT3 (Technological Prospectives of the Information Society)

project paving the way for future ICT programmes and calls for proposals in important emerging areas.

While in 2002 IHM became responsible in the government for the promotion of the information society in general, the development of electronic government services remained the responsibility of the Electronic Government Centre (EKK) of the Prime Minister's Office, and ICT R&D remained the responsibility of NKTH.

To this end, it is worth to mention one of IHM's most far reaching contributions to the development of electronic government services, the *Act on procedures in the public administration* (KET, No. CXL/2004) which opens the door to authorised on-line government services in Hungary.

As far as ICT R&D is concerned, in the first two years of its existence, IHM had an ICT R&D grant programme, ITEM, to support innovative solutions promoting the information society. The first call in 2002 was prepared and executed with the participation of the predecessor of NKTH, and therefore the objectives of ITEM were harmonised with other existing ICT R&D support schemes (ITEM focused on *innovative applications* of ICT). The second call was already managed exclusively by IHM's own programme managing agency (IT Kht.).

Later, because of lack of resources, IHM had no more calls for proposals in ICT R&D. However, one of the knowledge centres, namely the Mobile Innovation Centre was jointly supported by IHM and NKTH.

Second phase (since June 2006)

(d) Recent structural changes effecting ICT R&D

One of the most far-reaching changes is the establishment of the National Development Agency (NFÜ). Its main role is to manage the implementation of the second National Development Plan (NFT-II). Increasing efficiency is one of the main reasons behind its establishment. In the first step, it took over the supervision of all managing authorities of the operative programmes. Further, it is planned that it will supervise also most of the other public support and grant schemes, and their managing agencies. For the time being, it is unclear, how and to what extent the existence of NFÜ will effect the support of ICT R&D activities – so far, the GVOP Managing Authority became part of NFÜ; and thus KPI got, at least partially, also under the supervision of NFÜ.

The supervision of NKTH has also changed: since September 2006 it is one of the “background” offices of GKM, loosing much of its former independence.

The “slendering” of the central government has led to the abandonment of IHM, distributing most of its former activities between GKM and EKK.

(e) The second National Development Plan (NFT-II)

NFT-II, without doubt, will have strong influence on RTDI activities in Hungary, including ICT R&D. However, in the current stage of its preparation nothing concrete can be said about its content at the time of writing this report.

Conclusions

To sum up, recent developments are in many cases promising, often questionable and sometimes alarming. Our general impression is that ICT offers much more opportunities for the economy and society than currently utilised in Hungary.

We can only hope that the changes will solve some of the problems of ICT R&D and its applications in Hungary, without creating even bigger problems and delays. However, as Attila Havas says in the 2005 issue of the *Annual Innovation Policy Trends and Appraisal Report on Hungary:* "These frequent changes obviously prevent organisational learning, the institutionalisation of involving key stakeholders as partners, and thus the establishment of good practices in policy co-ordination."

4. Basic data about R&D in Hungary

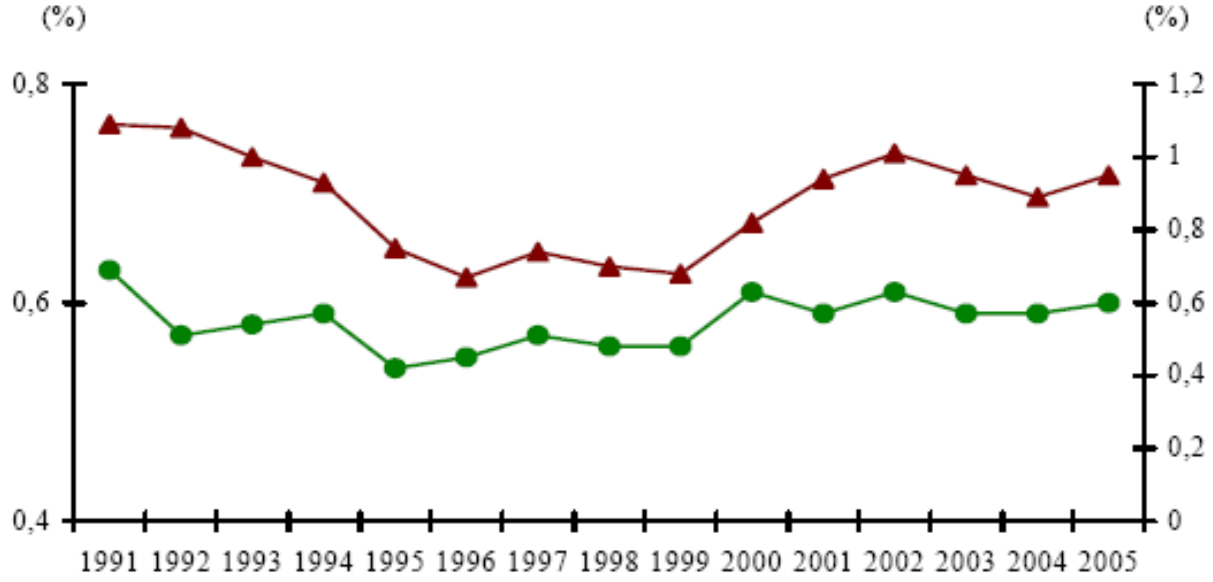
The Hungarian Central Statistical Office (KSH) publishes data on R&D activities annually. Here are some excerpts from their last report presenting data about the year 2005 (see the hyperlink to this document in the Appendix):

- In 2005 the growth of R&D activities became faster.
  - Expenditure was HUF 207,8[2] billion, 14.5% more than in 2004.
  - The share of R&D expenditure in the GDP in 2005 was 0.95% compared to 0.89% in 2004.
  - 45% of the expenditure was utilised in the business sector, 29% in non-profit R&D institutions and 26% in higher education.
  - Total R&D personnel (full-time equivalent) was 23 239 (0.6% of all active earners) in 2005 of whom
    - 15 878 (68.3%) were scientists and engineers,
    - their number increased more rapidly than the number of total R&D staff;
    - the number of technical assistants per 100 scientists and engineers was 29.
- Selected indicators for 2005:
  - 2516 R&D units were taken account of in R&D statistics, of which
    - 1566 were institutes of higher education,
    - 749 units were located in the business sector.
  - More than one third of the scientists has a PhD degree.
  - 69.5% of the total number of persons employed in R&D graduated from universities or colleges.
  - The distribution of total R&D expenditure by financial sources:
    - enterprises: 39.4%,
    - central budget: 49.4%,
    - funds from abroad: 10.7%,
    - other: 0.5%.
  - Current expenditure by type of activity in 2005:
    - research (basic, applied) 63.3%,
    - development 36.7%.

2 Throughout the year 2005, approximately HUF 250 = EUR 1 was the exchange rate.

- Capital expenditure was 32.2 billion HUF, of which:
  - 23 billion HUF was spent on instruments.
- The number of research projects and development tasks was 22 935, of which 10.7% were realised in international co-operation.

The following figure shows the main tendencies of R&D activities in Hungary since 1991 (source: KSH, 2005):



Legend:

- share of full-time equivalent R&D personnel among all active earners: left axis and green line with circles,
- share of R&D expenditure in the GDP: right axis and red line with triangles.

One of the worst structural problems of R&D expenditure is the share of the private sector (enterprises) compared to the public sphere (central budget + funds from abroad, mainly in the form of grants from the European Commission), being 40% and 60%, respectively. That is, public R&D expenditure is approx. 50% more than private R&D expenditure.

The goal of the Hungarian government is an increase of the total R&D expenditure to 2% of the GDP by 2013, with 1/3 of the increase from public sources and 2/3 of the increase from private sources. In consequence, it is expected that the government increases its contribution by an additional 7-9% only, while the private sector increases its contribution by 97-99% additionally. However, nothing has been said so far how this goal could be achieved, how the private sector will be persuaded to increase its R&D share so significantly.

5. National funding schemes

There are several sources for R&D support in Hungary, the largest source being the Research and Technology Innovation Fund (KTIA), managed by NKTH. Most forms of grants are available for public and private organisations as well.

The Hungarian Academy of Sciences (MTA) maintains a - slowly decreasing - network of research institutes, while the Ministry of Education and Culture (OKM) maintains a -

slowly increasing - set of universities and other institutes of higher education. Currently, none of them have sources to finance individual R&D projects, so their researchers are highly motivated to apply for grants.

Basic research grants from OTKA

The Hungarian Scientific Research Fund Programmes (OTKA) distribute annually approx. HUF 6 to 8 billion for mostly basic research in all fields of science. In 2006, in the area of natural sciences the minimum grant was HUF 3 million, the maximum grant was HUF 70 million, and the average grant was around HUF 10 million. The amount spent on ICT R&D was marginal.

Support for RTDI activities under NFT-I from 2004 to 2006

The ICT and R&D relevant segments of the first National Development Plan were already described above (cf. GVOP). GVOP allocated between January 2004 and October 2006 HUF 136 billion, out of the available HUF 156 billion, as grant to more than 10 000 projects, while the applicants spend another HUF 165 billion on these projects.

Recall that Priority 4 supported projects developing the information society and the e-Economy. Out of the submitted 2201 project proposals 558 were accepted, while the total amount of financial assistance was more than HUF 33 550 million.

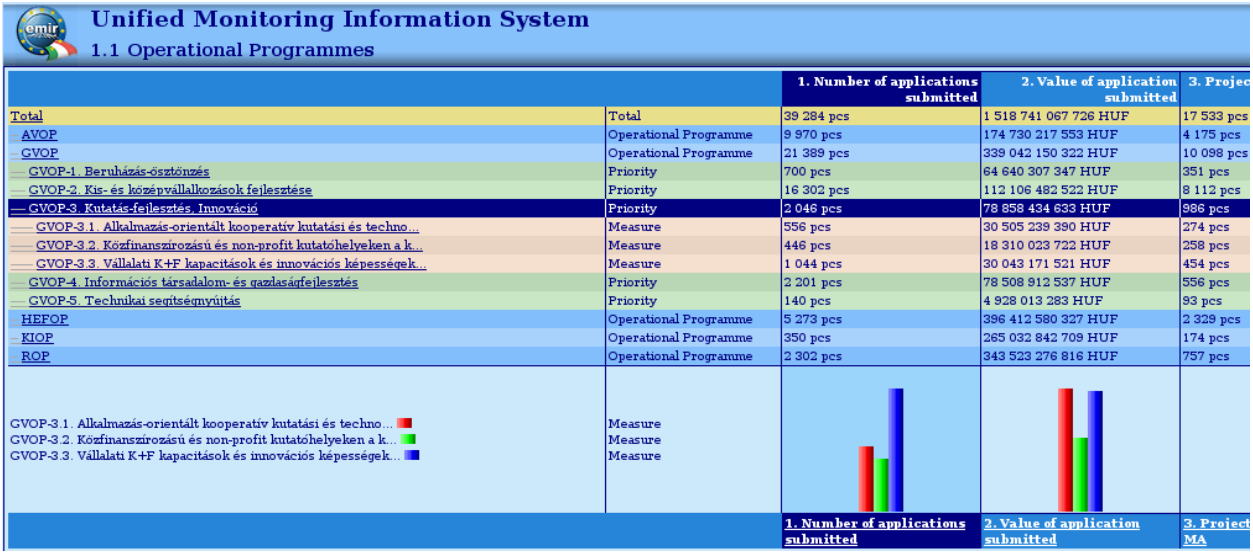
On the other hand, Priority 3 supported RTDI projects in general. Here the break-down between ICT and other fields is unknown. Relying on the titles of the supported projects the estimated share of ICT related projects is 10%. Based on this estimation, under this priority the number of accepted ICT related projects might be circa 95 with a total amount of financial assistance of approx. HUF 4000 million.

As far as applied R&D in a narrower sense is concerned Measure 3.1 supported such activities. Out of its seven fields only t*wo* can be *classified as ICT-related:* Information and communication technologies and applications, and Electronics, measurement and control engineering. Since no data is available on these special fields, we can only estimate again. Under Measure 3.1, out of the 556 project proposals 274 were approved, and 266 contracted with a total grant of HUF 14 661 million. Assuming that 10% of them were related to ICT R&D less than 30 ICT R&D projects were only approved with a total grant of less then HUF 1500 million, and with an average grant of HUF 50 million.

Statistical data on GVOP projects are available on the web[3]. The interactive website shows the current number of submitted proposals, approved projects and signed contracts with the corresponding amount of financial assistance by priorities, measures and sub-measures for all operative programmes.

Below, a snapshot is shown as an illustrative example of the statistical data provided about all the operative programmes . Unfortunately, no printer-friendly versions are available, and also the names of the priorities, measures and sub-measures are in Hungarian. Nonetheless, the availability of such data is important, all the more, for the publication of structured data on grants and other forms of public support is a rather unique practice in Hungary.

3 <http://www.nfh.hu/emir/eng>



Unified Monitoring Information System
1.1 Operational Programmes

		1. Number of applications submitted	2. Value of application submitted	3. Projec
Total	Total	39 284 pcs	1 518 741 067 726 HUF	17 533 pcs
AVOP	Operational Programme	9 970 pcs	174 730 217 553 HUF	4 175 pcs
GVOP	Operational Programme	21 389 pcs	339 042 150 322 HUF	10 098 pcs
GVOP-1. Beruházás-ösztönzés	Priority	700 pcs	64 640 307 347 HUF	351 pcs
GVOP-2. Kis- és középvállalkozások fejlesztése	Priority	16 302 pcs	112 106 482 522 HUF	8 112 pcs
GVOP-3. Kutatás-fejlesztés, Innováció	Priority	2 046 pcs	78 858 434 633 HUF	986 pcs
GVOP-3.1. Alkalmazás-orientált kooperatív kutatási és techno...	Measure	556 pcs	30 505 239 390 HUF	274 pcs
GVOP-3.2. Közfinanszírozású és non-profit kutatóhelyeken a k...	Measure	446 pcs	18 310 023 722 HUF	258 pcs
GVOP-3.3. Vállalati K+F kapacitások és innovációs képességek...	Measure	1 044 pcs	30 043 171 521 HUF	454 pcs
GVOP-4. Információs társadalom- és gazdaságfejlesztés	Priority	2 201 pcs	78 508 912 537 HUF	556 pcs
GVOP-5. Technikai segítségnyújtás	Priority	140 pcs	4 928 013 283 HUF	93 pcs
HEFOP	Operational Programme	5 273 pcs	396 412 580 327 HUF	2 329 pcs
KIOP	Operational Programme	350 pcs	265 032 842 709 HUF	174 pcs
ROP	Operational Programme	2 302 pcs	343 523 276 816 HUF	757 pcs
GVOP-3.1. Alkalmazás-orientált kooperatív kutatási és techno...	Measure			
GVOP-3.2. Közfinanszírozású és non-profit kutatóhelyeken a k...	Measure			
GVOP-3.3. Vállalati K+F kapacitások és innovációs képességek...	Measure			
		1. Number of applications submitted	2. Value of application submitted	3. Project MA

The snapshot shows partial data on *Priority 3* (Research, Development, Innovation) of GVOP and its *three Measures:*

3.1 Application-oriented cooperative research and technology development activities

3.2 Improving the conditions for research, technology transfer and co-operation at public and not-for-profit research sites

3.3 Strengthening R&D capacities and capabilities at companies.

Similar data are available on *Priority 4* (Development of the information society and e-Economy) of GVOP and its *four Measures:*

4.1 Development of e-Economy, promoting of e-Commerce,

4.2 Development of e-Content industry,

4.3 Development of e-Administration

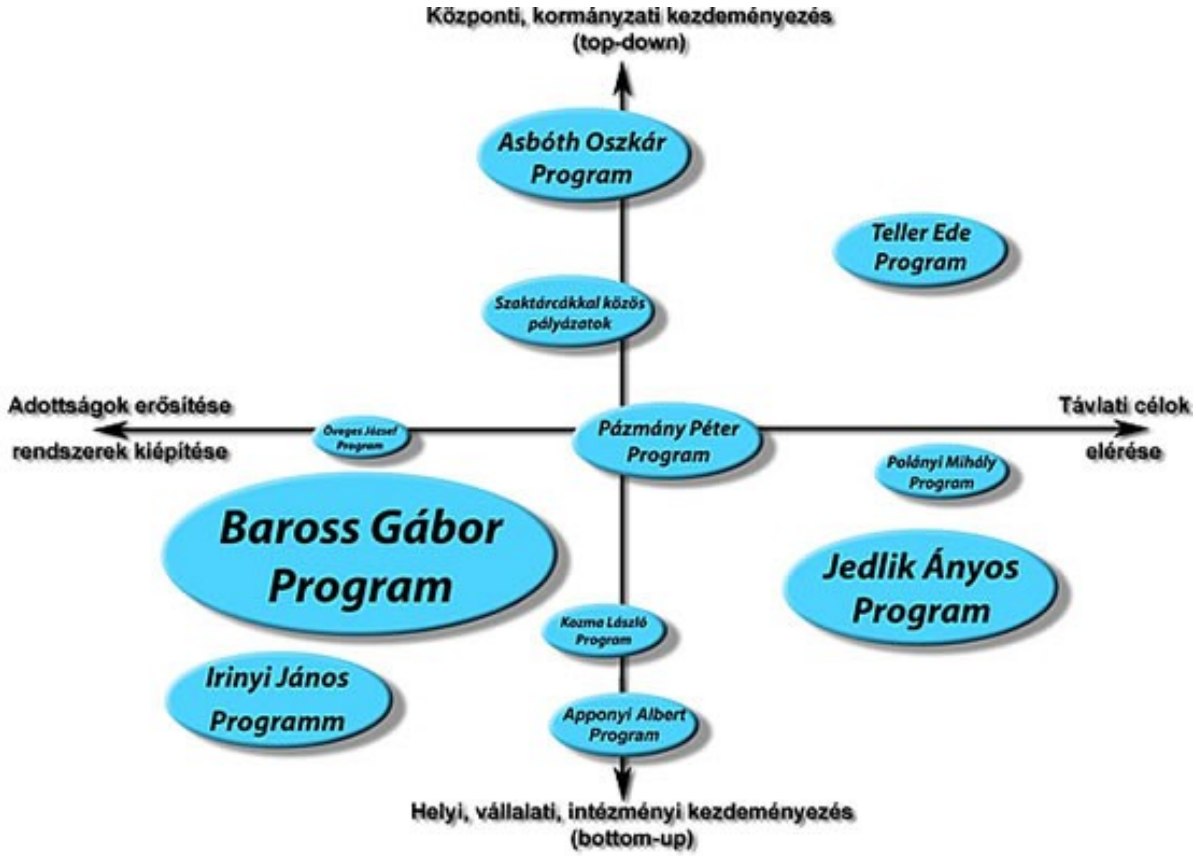
4.4 Extension of the broad-band telecommunication infrastructure.

Support for RTDI activities from KTIA

As mentioned before the biggest source of grants is the Research and Technology Innovation Fund (KTIA), established in 2004 and managed by NKTH. NKTH allocates HUF 33 to 39 billion from the Fund to RTDI activities annually under a network of technology programmes.
The Fund does not strictly depend on the annual central budget ensuring it a kind of stability: apart from the micro and very small enterprises, every enterprise is obliged to pay at least 0.25% of its turnover into the Fund unless it spends at least a corresponding amount on internal or contracted RTDI activities. The Hungarian government contributes to the Fund with a similar amount.

The next figure presents the *2006 RTDI programme portfolio* of NKTH (source: NKTH). The four axes correspond to the four main strategic objectives as follows:

- *Top:* Central initiative, e.g. at government-level (top-down approach)
- *Right:* Long-term goals
- *Bottom:* Local initiative at company- or institute-level (bottom-up approach)
- *Left:* Strengthening of capabilities, establishment of systems



The major programmes[4] depicted in the figure are briefly described below; the other programmes have less or no relevance to ICT R&D. The positioning of the bubbles in the figure expresses the special emphases of the corresponding programmes.

Asbóth Oszkár Programme: supports the creation of innovation clusters in different scientific areas having significant influence on the technological and economic development of the country.

Pázmány Péter Programme: supports the establishment of Regional Knowledge Centres and their co-operation with the industry, aiming to effectively utilize the R&D results.

Teller Ede Programme: supports international research and development projects, based on intergovernmental, international R&D agreements, bringing about short and mid-term results utilised in the Hungarian economy.

Baross Gábor Innovation Programme: supports the development of the Hungarian regional economy and competitiveness, promoting the elaboration of innovative ideas of SMEs, and enhancing their possibilities for regional co-operation.

Irinyi János Programme: supports the establishment and strengthening of innovative SMEs, and promotes the practical implementation and economic exploitation of R&D results and innovative ideas.

4 The programmes are named after famous Hungarian scientists and engineers.

Jedlik Ányos Programme: supports long-term strategic research promising major scientific and economic breakthrough in any field of science or technology (this programme is the successor of the former NKFP).

For reasons discussed earlier it is very difficult, if not impossible, to categorise the individual projects according to their fields of activity, especially in case of megaprojects, because they typically cross disciplinary boundaries.

As interesting examples, several large *ICT-related* megaprojects are listed below.

University	*Region*	*Title and website of the project*	*Program, year*	*Grant (M HUF)*
University of Pannonia	Central - Transdanubia	Information Security Research and Development Centre <http://www.futurit.eu>	PPP, 2006	800
Budapest Polytechnic	Central - Hungary	Traffic Informatics and Telematics Knowledge Centre <http://www.kitt.bmf.hu>	PPP, 2006	300
Budapest University of Technology and Economics	Central - Hungary	IT Innovation and Knowledge Centre <http://www.it2.bme.hu>	PPP, 2005	1200
Széchenyi István University	Western - Transdanubia	Regional University Knowledge Centre for the Vehicle Industry <http://www.sze.hu/jret>	PPP, 2005	1100
Eötvös Lóránd University of Science	Central - Hungary	eScience Regional University Knowledge Centre <http://escience.elte.hu>	PPP, 2005	800
Budapest University of Technology and Economics	Central - Hungary	Advanced Vehicle and Vehicle-control Knowledge Centre <http://www.ejjt.bme.hu>	PPP, 2004	1500
Budapest University of Technology and Economics	Central - Hungary	Mobile Innovation Centre <http://www.mik.bme.hu>	MKK, 2004	2000

As the table indicates the knowledge centres are placed at universities. The intention is to deploy these initiatives into highly specialised and influential knowledge centres of their region. Some of their interesting features are the following:

- they are operated by consortia composed of academic groups and companies,
- in some cases they are independent legal units (but it may be disadvantageous),
- more often they are part of the university but crossing school (faculty) or department boundaries,
- they are run by managers not scientists, although their scientific boards are led by university professors,
- they are supposed to be more flexible and dynamic than traditional university structures,
- they are more application- and utilisation-oriented than traditional departments.

In summary, regional knowledge centres, like their predecessors, the so called co-operative research centres, are interesting experiments. It takes time to see to what extent the concept can be realised.

All but one of these megaprojects have been supported in the framework of the Pázmány Péter Programme (PPP). The exceptional one was selected for support in a special joint call of NKTH and IHM to promote the establishment of a mobile innovation centre in Hungary.

Another interesting project is the BelAmi project, a forerunner of the Teller Ede Programme. This is a joint project of Hungarian and German research groups, on the one hand at the Bay Zoltán Applied Research Foundation and the Budapest University of Technology and Economics in Budapest, Hungary, and on the other hand at the Fraunhofer Institute for Experimental Software Engineering and the University of Kaiserslautern in Kaiserslautern, Germany. The aim of the project is to explore possible applications of ambient intelligence in intelligent transportation, healthcare, long-term care, etc. This 4-year project started in 2005, providing HUF 750 million support to the Hungarian participants while the German financing authorities ensure a corresponding amount of support for the German partners.

Future support for RTDI activities under NFT-II from 2007 to 2013

The second National Development Plan (NFT-II), recently called the New Hungary's Development Plan (ÚMFP), is a general description of the major areas that will be co-financed from EU sources.

The advancement of ICT and even more of ICT applications are among the priorities of ÚMFP. The document says that the development of traffic and transportation, public services and administration, production and business, etc. assumes the usage of ICT. Moreover, the document says, R&D capacities should be focused to promising areas, such as ICT, biotechnology, life sciences, nanotechnology, material sciences, environment technologies and renewable energy sources.

It is interesting to observe that the words *informatics, communications, ICT* and *infocommunications* occur 45 times in this 174-page document, *innovation* is mentioned 96 times, *research and development* 49 times – a sign of their importance for the advancement of Hungary.

Between 2007 and 2013 EUR 26 300 million will be available for the realisation of the ÚMFT. This amount is indicatively distributed among the major priority areas, such as economy, transportation, electronic public administration, social infrastructure, environment and energy, development of the seven regions, state reform, etc. In the current phase, however, no further details are known e.g. about the amounts allocated for R&D activities and ICT developments.

Other sources

It should be mentioned that sporadically other national sources also offer grants and other financial assistance to support ICT R&D activities: Ministry of Health, Ministry of Education, other ministries, Infopark Budapest, local governments, companies.

Last but not least, the RTD framework programmes of the European Union also offer invaluable financial assistance to the Hungarian R&D community.

6. Some topics of preference

It is difficult to predict future developments in ICT because of the very short life cycle of most ICT products and services. Nonetheless, there are several emerging areas that will definitely be important in the future, need further scientific investigation, and are expected to offer excellent business opportunities also for Hungarian ICT companies. These important emerging areas include

- embedded systems, intelligent sensors and transducers,
- ambient intelligence and its applications, especially in healthcare and transport,
- semantic web, intelligent agents,
- IT security,
- model-based software engineering,
- service oriented architectures,
- wireless and mobile communication,
- grids and other networked computing systems.

Most of these topics are also priority areas in the forthcoming 7th RTD Framework Programme of the European Union, and suggested fields in planned multilateral European co-operation programmes parallel to the Framework Programme.

Here are two examples of the planned joint European programmes. Realising their future importance also for Hungary NKTH has committed itself to join these programmes and to participate in their preparations.

Joint Programme in Ambient Assisted Living

Ambient Assisted Living (AAL)[5] aims at extending the time elderly people can live in their preferred home environment by increasing their autonomy and assisting them in carrying out everyday activities. The goal of the AAL programme is to enhance the quality of life of elderly or otherwise handicapped people by the use of ICT products and the provision of remote services, including care services, that will assist them to achieve the autonomy, independence and dignity appropriate to their needs and determinations.

The programme is an initiative of a number of mostly European countries participating in the Framework Programmes of the European Union, among others Austria, Belgium, Finland, Germany, Hungary, Israel, Italy, Spain and Switzerland. The start of the programme is expected by Mid 2007, its planned duration is 7 to 10 years.

Joint Technology Initiative in the area of Embedded Systems

Embedded systems directly impact on European competitiveness: the possibility to deliver systems with new functionality or improved quality within a competitive time frame has ensured substantial market shares for the European economy in domains like automotive (37% in 2002), industry and energy (30% in 2002), or defence and space (30% in 2002). In the next five years, the share of the value of embedded electronics components in the value of the final product is expected to reach significant rates in areas such as industrial automation (22%), telecommunications (37%), consumer electronics and intelligent homes (41%), and health/medical equipment (33%). In the automotive sector, given that 20% of the value of each car today is due to embedded

5 See <http://www.aal169.org>.

electronics and that this is expected to increase to an average of 35-40% by 2015, more than 600.000 new jobs will be created due to embedded systems alone.[6]

Taking these trends seriously, a Joint Technology Initiative in the area of Embedded Systems has been suggested by a number of large European companies (e.g. Thales, Siemens, Philips, ARM, Infineon, Bosch, Ericsson, Nokia, Airbus, British Telecom, Symbian, Daimler-Chrysler) backed by a number of mostly European countries participating in the Framework Programmes of the European Union (Austria, Belgium, the Czech Republic, Finland, France, Germany, Hungary, Israel, Sweden, etc.). The start of the programme is expected in 2007, its planned duration is 7 to 10 years.

7. Some important ICT R&D groups

Because of the relatively high number and great variety of ICT R&D groups in Hungary it is impossible to enumerate all of them. Therefore, we list here more or less randomly selected examples for characteristic R&D groups.

Organisation	*Type*	*Field of R&D activity*	*Website (if exists)*
Computer and Automation Research Institute, Hungarian Academy of Sciences	acad.	grids, semantic web, intelligent transport	<http://www.sztaki.hu>
Dept. for Measurement and Information Systems, BME[7]	univ.	embedded systems	<http://www.mit.bme.hu>
Dept. of Automation and Applied Informatics, BME	univ.	software technology for mobile devices, visual modeling & transformation	<http://www.aut.bme.hu/Portal/Kutatas.aspx>
Dept. of Computer Science and Information Theory, BME	univ.	semantic web	<http://www.szit.bme.hu>
Dept. of Software Engineering, Univ. of Szeged	univ.	energy-optimising compilers for mobile devices	<http://www.inf.u-szeged.hu/kutatas/starten.xml>
Ericsson Hungary	multi	mobile communications, reconfigurable systems	<http://www.ericsson.hu>
Hexium Co.	SME	embedded systems, image processing	<http://www.hexium.hu>
Holografika Co.	SME	3D holographic monitors	<http://www.holografika.hu>
Innomed Co.	comp.	medical equipment	<http://www.innomed.hu>
Kürt Co.	comp.	information security	<http://www.kurt.hu>
Meditech Co.	SME	medical equipment	<http://www.meditech.hu>
MIT Fault Tolerant Computing Group, BME	univ.	dependable computing, service-oriented and model-driven architectures	<http://www.mit.bme.hu/eng/department/mit/education/labor/ftlabor/index.html>
MorphoLogic Co.	SME	computer linguistics	<http://www.morphologic.hu>
ScanSoft Co.	multi	character recognition	<http://www.scansoft.com>

6 See <http://www.artemis-office.org>.
7 BME = Budapest University of Technology and Economics

Finally, the establishment of R&D units of multinationals in Hungary and the RTDI co-operation between multinationals and Hungarian institutes of higher education should also be mentioned. Here are a few characteristic examples:

- As one of the first multinationals, Ericsson set up a large R&D facility in Budapest, employing several hundreds of engineers, specialised in networking and in software engineering for telecommunications. Their research laboratory, the Inter-University Centre for Telecommunications and Informatics, operated jointly with the Budapest University of Technology and Economics and the Eötvös Loránd University, was used as a pattern when the concept of the co-operative university centres was elaborated by the predecessor of NKTH at the end of 1990's.

- Later Nokia, Knorr-Bremse, and then Bosch established ICT-related research centres in Hungary (Bosch e.g. in embedded systems), and contributed to the establishment of specialised research laboratories at several universities of technologies in Hungary.

- Several multinationals, among others Hewlett-Packard, Nokia, Cisco, Oracle, SAP and Intel set-up competence centres at the John von Neumann School of Informatics of Budapest Polytechnic.

- One of the newest developments is the opening of an *IBM Center of Advanced Studies* in Budapest, in co-operation with the Budapest University of Technology and Economics. The new unit is the member of IBM's worldwide network of 16 similar centres. The Budapest Centre is the sixth one in Europe after Amsterdam, Barcelona, Böblingen, Dublin and Rome.

Appendix

Hungarian abbreviations used in the text

Abbrev.	*Full name in Hungarian*	*Full / abbreviated name in English*
ECDL	Európai Számítógép-használói Jogosítvány	European Computer Driving Licence
EKK	Elektronikus Kormányzati Központ	Electronic Government Centre
GKM	Gazdasági és Közlekedési Minisztérium	Ministry for Economy and Transport
GVOP	Gazdasági Versenyképességi Operatív Program	Economic Competitiveness Operative Programme / ECOP
GVOP IH	GVOP Irányító Hatóság	ECOP Managing Authority
IHM	Informatikai és Hírközlési Minisztérium (existed to Mid 2006)	Ministry of Informatics and Telecommunications (existed to Mid 2006)
IT Kht.	IT Információs Társadalom Kht.	IT Information Society Public Co.
IT3	Az Információs Társadalom Technológiai Távlatai	Technological Prospectives of the Information Society
KET	Közigazgatási Eljárási Törvény (CXL/2004)	Act on the Procedures in the Public Administration
KPI	Kutatás-fejlesztési Pályázati és Kutatáshasznosítási Iroda	Research Fund Management and Research Exploitation
KSH	Központi Statisztikai Hivatal	Central Statistical Office
KTIA	Kutatási és Technológiai Innovációs Alap	Research and Technology Innovation Fund
KTIT	Kutatási és Technológiai Innovációs Tanács	Research and Technology Innovation Council
MEH	Miniszterelnöki Hivatal	Prime Minister's Office
MITS	A Magyar Információs Társadalom Stratégiája	Hungarian Information Society Strategy
MTA	Magyar Tudományos Akadémia	Hungarian Academy of Sciences
NAVA	Nemzeti Audiovizuális Archívum	National Audio and Visual Archive
NDA	Nemzeti Digitális Adattár	National Digital Archive
NFT	Nemzeti Fejlesztési Terv	National Development Plan / NDP
NFÜ	Nemzeti Fejlesztési Ügynökség (since Mid 2006)	National Development Agency (since Mid 2006)
NHH	Nemzeti Hírközlési Hatóság	National Communications Authority
NHIT	Nemzeti Hírközlési és Informatikai Tanács	National Council for Communications and Information Technology
NKTH	Nemzeti Kutatási és Technológiai Hivatal	National Office for Research and Technology
OM	Oktatási Minisztérium (before Mid 2006)	Ministry of Education (before Mid 2006)
OKM	Oktatási és Kulturális Minisztérium (since Mid 2006)	Ministry of Education and Culture (since Mid 2006)
OTKA	Országos Tudományos Kutatási Alapprogramok	Scientific Research Fund Programmes
TTPK	Tudomány- és Technológiapolitikai Kollégium	Science and Technology Policy Council
TTTT	Tudomány- és Technológiapolitikai és Versenyképességi Tanácsadó Testület	Science and Technology Policy and Competitiveness Advisory Board
ÚMFP	Új Magyarország Fejlesztési Terv	New Hungary's Development Plan

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11. KSH on the web: <http://www.ksh.hu>
12. OTKA on the web: <http://www.otka.hu>