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**The Government's mid-term (2007-2013) science, technology  
and innovation policy (STI) strategy**

Budapest, March 2007



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## 1. Summary

The formation of a knowledge-based society and economy demands a high level of knowledge, which appears in new, marketable products and services. Science and innovation are essential factors in competitiveness and sustainable growth. At the same time, knowledge has become an important factor in quality of life.

Knowledge is an essential competition factor

The Hungarian economy and society must step into new fields of development based on knowledge and innovation in order that Hungary can with knowledge-intensive and innovative activities, giving to its products the greatest added value, become connected with the world economy. Sustainable development of the Hungarian economy can only be realized in an environment that stimulates innovation.

Innovative Hungarian economy

The general goal of the strategy is that in the mid-term Hungary shall become a country where knowledge and innovation are the driving engines of the economy and companies appear on the global market with competitive products and services.

Strategic goals

The mid-term goals:

- Expansion of companies' research and development activities
- Establishment of internationally recognized research & development-, innovation centres and research universities
- Enhancing of the regions' research & development & innovation (R&D&I) capacity
- Establishing a knowledge market which works on the principles of performance recognition and competition through the globalization of knowledge production and dissemination, ,
- Investment in large scientific facilities, primarily in the regional centres and the development poles, reducing regional differences (regional cohesion).
  - The dynamic increase in yearly R&D expenditure, above all as a result of growth in corporate expenditure

Principles of realizing the strategic goals:

Strategic principles

- Focusing of intellectual and financial resources, optimization of utilization.
- Increased economic and societal implementation of R&D results.
- Strengthening of regional innovation.

The strategy designates tasks in the following priority areas:

Strategic priorities

- A culture of acceptance and utilization of scientific research results.
- Quality-, performance-, and utilization-driven efficient national innovation system.
- Well-honoured creative and innovative workforce suitable for the demands of knowledge-based economy and society.
- Economic and legal environment with incentives for creation and utilization of knowledge.
- Domestic companies, products and services that are competitive on the global market.

The current strategy was prepared in harmony with the objectives of the National Development-policy Concept (NDC), National Action Program (NAP) and the New Hungary Development Plan (NHDP). The situation-analysis can be found in the Appendix. The details of implementation (operative goals, tasks and schedules) are described in the STI action plan.

Connection with other strategic documents

## 2. Context of strategy goals

### 2.1. Long-term positive vision - 2025<sup>1</sup>

Should the internal and external circumstances be favourable, by 2025 Hungary will be one of the innovative and competitive countries of Europe with a high-quality knowledge-based economy, and an attractive target for intellectual and material investments. Internationally competitive companies will operate in a corporate-friendly and innovation-conducive environment built on the developed human and physical infrastructure. In some segments the presence of Hungarian companies will be defining on the international market, and their competitive advantage will be built upon domestic R&D&I. The elements of the national innovation system shall be developed proportionally and shall ensure efficient realization, from the idea conception right up until wide-ranging economic use. This system cannot be closed in national frameworks. World standard research takes place in the Hungarian research bases, where the research conditions are also of a high standard. We are already equipped with some internationally recognized research universities and research institutes. Science and innovation parks, which serve as the base of numerous innovative companies, are being built around regional knowledge centres. The majority of the Hungarian workforce is skilled and competitive: it is characterized by creativity, entrepreneurship, readiness for teamwork and cooperation, and life-long learning.

*By 2025, Hungary will be a knowledge-based, highly developed country*

### 2.2 New roles and tasks of science

The role and tasks of science have changed significantly as of the beginning of the 21st century.

The strengthening societal role of science

Society demands that science should continuously aid the solving of societal problems, the successful adaptation of the country, in all parts of the nation, development in harmony with the environment, development of technology, and thus the economy. Sciences promote the recognition of rules moulding society, the formation of procedures guiding society, the reduction of tensions and conflicts, the growth of efficiency of administration, and thus similarly contribute to societal prosperity.

Natural science, social science

Domestic scientists must undertake a role in the maintenance and development of national identity, through the cultivation of the language, national values, the national heritage, in the research of everyday culture, and in making national self-awareness organic. It is the task of the domestic humanities to research and refine our national cultural heritage, its digital representation, cultivation and publication.

National identity, national cultural heritage

Research & development –primarily basic research – has major importance in the training of highly qualified, creative workforce and the development of a readiness to work together. The cultivation of science promotes abilities and skills that are essential for the knowledge driven society.

The role of science in training

The core element of scientific activity is the interpretation of phenomena in comprehensive theoretical frameworks. From these characteristics, scientists have the unavoidable responsibility of gathering information on the widest pub-

*The opportunities and responsibility of science*

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<sup>1</sup> During the first domestic technology foresight exercise, experts draughted up four visions. Among these, the vision of knowledgeable, harmonised state action while at the same time, presuming favourable external economic circumstances, was the most favourable. This subchapter represents the optimal (however not just depending on Government policy) vision as the desired direction.

lic opinion and helping inform decision-makers.

Pure basic research, beyond bringing new knowledge into existence, contributes to the creation of the most up-to-date methodology and the international portability and parity of Hungarian science; while targeted basic research, besides this, also contributes to technological innovation, sustainability and societal adaptation.

The role of basic research

Domestic scientists – among the framework of their disciplines – must be able to understand, master and relay the latest scientific results and enrich these with new scientific results.

The role of researchers

From the perspective of competitiveness, the results of scientific research – and within this, basic research – comprise the relevant source of knowledge, the identifications relevant to man and human society included. The competencies necessary for their application include the management of knowledge: to the readiness related to intellectual property management as well as corporate and market knowledge.

New knowledge and knowledge management

### 2.3 Common strategic goals with the EU

Reaching Europe's common competitiveness goals demands a harmonized strategic approach in the whole of the EU and individual member countries. The EU's main policy documents<sup>2</sup> place the emphasis on the goals of competitiveness, cooperation, concentration of sources, the utilization of the results of science and technology, as well as the coordination of science and technology policy.

Reaching competitiveness demands a comprehensive strategic approach

The EU has recognized that in the area of basic research outstanding performance is not adequately paired with the economic utilization of the results. Thus in 2000 the Lisbon summit drew up an ambitious goal: by 2010 the EU should be the world's most competitive, most dynamic and knowledge-led economy. In 2002 the European Council set out at its Barcelona session a further goal: By 2010, the average EU expenditure on R&D should reach a proportion of 3% of GDP, and two thirds of this investment should derive from enterprises. According to the half-time assessment of the Lisbon strategy, in 2005 R&D&I remained a priority in the refocused goal system, keeping to its 3% objective. According to the declaration of the Lahti summit in October 2006, by 2010 Europe's R&D expenditure will reach 2.6% of GDP. It is Hungary's primary interest that taking into account its own situation, financial opportunities and endeavours, it should contribute to the realization of the common European goals, besides defining its own national interests and strategic goals.

By 2010 the EU should be the world's most competitive, most dynamic and knowledge-led economy

Prior to EU membership, Hungary already took part in the EU's Research & Development framework programs and other European R&D programs (EUREKA, CERN, COST, etc.). In order to reach the restated Lisbon competitiveness goals, from 2007 the EU also launches a new program, the Competitiveness and Innovation Program (CIP), alongside the 7th Research and Technology Development Framework Program (FP7). In the future the CIP will put

Participation in EU R&D programs

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<sup>2</sup> Towards a European Research Area COM (2000) 6; The Regional Dimension of the European Research Area COM (2001) 549; Innovation policy, updating the Union's approach in the context of the Lisbon strategy COM (2003) 112 final; Investing in Research. An Action Plan for Europe COM (2003) 226 final; Science and Technology, the key to Europe's future COM (2004) 353 final; Working together for growth and jobs. A new start for the Lisbon Strategy COM (2005) 24 final; Integrated guidelines for growth and jobs (2005-2008) COM (2005) 141; More Research and Innovation – Investing for Growth and Employment: A Common Approach COM(2005)488 final; Putting knowledge into practice: A broad-based innovation strategy for the EU; COM(2006)502 final.

the Community's competitiveness and innovation activities in a coherent framework and from a competitiveness side shall supplement the research-oriented programs of the FP7. During both the FP7 and the CIP we must strive for the successful participation of Hungary, giving incentives for the Hungarian participation, and for the domestic utilization of the results.

The resources of the Structural Funds promote the decrease of regional differences within the EU. The planning of the usage of the sources takes place within the framework of the New Hungary Development Plan<sup>3</sup>. R&D&I is one of the priorities of the Economic-development Operative Program, but R&D and innovation play also important role in other operative programs. The planning of this program, in harmony with the current strategy, is aimed at the 2007-2013 planning time-period.

Structural Funds, 2nd National Development Plan

#### **2.4. Scientific policy tasks deriving from the international research system**

Modern, globalized research demands new, large-scale infrastructures. The special large European infrastructures are like this too, including e-infrastructures and research networks. The Government's goal is to fit the domestic research network into the European research infrastructures, and at the same time, into the EU's common research policy. European adaptation also justifies continuous access to the most important international scientific databases for the domestic research sphere; the strategic action plan contains the explanation of this.

Adaptation to the European Research infrastructures

The international science system has formed the individual and organizational performance assessment and evaluation standards which are also valid for domestic scientists. This is non-transferable and is a function of creating value and culture that cannot be taken away from scientists and at the same time is an indispensable condition of their connecting to international science.

International norms of performance evaluation

In the interest of moderating the disadvantages of Hungary's economies of scale there is a need for the optimal utilization of international cooperation opportunities, maintaining and expanding the international cooperation, and undertaking an active role in scientific diplomacy. Domestic governmental and non-state actors alike have an important role in the forming of the EU's common research policy. The knowledgeable, harmonized work of these actors aids most efficiently the realization of domestic science-, technology- and innovation policy objectives.

Harmony in the interest of optimal utilization of opportunities derived from international cooperation

The professional and financial advantages of international cooperation can be exploited if the state considers participation in the work of international research institutes, organizations and infrastructures as a long-term strategic investment, and in compliance with this covers membership fees, supports the research work carried out abroad by Hungarian researchers, provides incentives for the employment of foreign researchers in Hungary, and aid in the procurement of funds necessary for EU tenders.

State support of international research cooperation is a strategic investment

In each case, it is a task demanding state help – with special respect to protecting intellectual property and domestic-interest utilization of the results derived from international cooperation – that in the interest of the domestic actors taking part in the international cooperation they should have access to suitable representation in the relevant contracts, and professional (primarily legal) advice for the enforcing of the contractual provisions.

Protection of intellectual property at national level

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<sup>3</sup> The plan is built on the principles of the National Development-policy Concept and the National Regional Development Concept. The strategic framework document for utilisation of the Structural Funds is the National Strategic Reference Framework (NSRF), The Operative Programs contain the program level tasks.

## 2.5 The strategic role of the state in science, technology and innovation

The aim of state intervention is the adjusted, effective operation of the national innovation system<sup>4</sup>. In the matters of science policy the measures of the Government are built upon scientists and their autonomic organizations, whilst the issues of technology and innovation policy are built upon corporate stakeholders and their professional business federations.

State intervention is also justified in the development of the high-expenditure research infrastructure for establishing internationally competitive research-development centres. An important part of the infrastructure is the IT network, since in modern research the importance of virtual connections and the role of information access have increased. Access to the significant international research facilities must be supported to provide that Hungarian researchers and companies can use the results.

One fundamental reason for using state sources in research-development and innovation is the external and long-term effects of the investments in this area. (Generally results do not occur at once at the research and development organization, e.g.: the multiplication effect of the info-communication technologies and digital culture.) The state role undertaking is also justified because the more complex the solution of a problem is, the less a domestic organization is able to guarantee the costs of a project on its own. A further reason is the need of public utility research (related to flood-forecast, public safety, national defence, public proceedings, and sustainability of development, consumer protection, social policy, demographic policy, public health, the social effect and application morals of new technologies.)

Science requires continuity, stability, and calculable conditions to be able to produce, adapt and disseminate new knowledge.

An indispensable part of the active, initiating role of the state – beyond the mandatory legal, financial and accounting controls – is the ensuring of independent expert evaluation which increases the transparency of utilization and at the same time aids the studying and development of the national innovation system.

The task of the state is primarily to ensure the frameworks and research (mainly basic research) infrastructure; not active intervention. Where the chance of economic returns makes it possible, the participation of market actors is necessary. The state shall ensure a research infrastructure which has a proven necessity, but for the maintaining of which no single actor is capable itself.

One of the cornerstones of the strategies of countries that have successfully caught up in competitiveness (such as Finland, Ireland, Republic of Korea, China) is innovation based on advanced education and research and development and also open to world results. The state has an important role in the training of a highly qualified workforce within the framework of a school-

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<sup>4</sup> The National Innovation System (hereafter NIS), within the country, is the set of institutions, enterprises and other organizations, as well as resources, rules, conditions and measures that influence the generation, handing over, distribution and use of new knowledge and technology.

system and life-long learning, as well as in the establishing of a suitable training system and number of researchers. Only by taking into account the long term demands of economic actors through a modern education system will it be possible to prepare members of society for competition-based economic challenges.

Technological innovation can only be successful if the necessary organizational, management and market innovations are also introduced by the companies. State support that vitalizes innovative activity should be organically connected to fiscal and monetary policy, and should aid the spreading of knowledge and technology. Capital market tools which give incentives for innovation, as well as their legal conditions, need to be developed further. The risks can be shared through a combination of public and private capital. State aid mechanisms which significantly expand the market of projects that are attractive to private capital shall be introduced.

*Promoting the whole innovative process<sup>5</sup>*

Managing the R&D statistical data system and operation of methodology tools which serve the policy making and implementation (technological foresight, technology watch, technology assessment, etc.) is an important task of the state. The defining of objectives, program planning, control and feedback, as well as evaluation of quality and performance are more and more built on indicators. In many EU countries separate national science- and technology policy analyzing institutes (S&T observatories) coordinate these processes. The strengthening of expert activity that establishes strategic decisions is also necessary in Hungary. The Hungarian Academy of Sciences, as national adviser, can play a role in this.

*System of strategic background analyses*

### 3. STRATEGIC PRINCIPLES

In order to realize the goals, the Government shall enforce the following strategic principles:

*Strategic principles:*

- Scientific research (especially pure basic research) projects shall be financed from the public budget on the basis of quality criteria

*- quality*

- it shall distribute publicly financed support available for the goals of scientific activity following non (direct) economic goals – with the exception of servicing for the maintaining of infrastructure – through an open tender system,

*- open distribution*

- during the forming of financing models the convergence program, the financial framework system for the implementation of the strategy, and the state reform reorganizing the structure of the sources must be considered.

*- convergence, state reform*

- the handing down of knowledge and research at higher-education institutions shall be managed as an organic part of scientific activity

*- handing-down of knowledge*

- built on suitable expert knowledge it shall implement the regular control and independent evaluation of utilization of publicly financed support, and on the basis of this shall provide for the continual improvement in efficiency,

*- public control*

- in the frames of the budget opportunities, it shall ensure the necessary stable conditions for the research on national traditional values,

*- national traditions*

- it co-operates with the corporate sector in the development of the R&D infrastructure and institutions,

*- cooperation*

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<sup>5</sup> On the basis of the recommendations in the Science- and Technology-policy Advisory Board's "Science- and technology policy in Hungary: situation evaluation and breakthrough opportunities" document

- avoids the fragmenting of resources and improves efficiency, by focusing on intellectual and material resources and optimizing utilization, - *focusing*
- the increased economic and societal utilization of R&D results shall promote the production of marketable products and services, their market access, as well as high level public services, - *utilization*
- promotes the European catch-up of the regions by offering incentives for innovative activity of businesses operating in the regions and the building of networks serving innovation flexibly applicable to their demands. - *rationality*

#### **4. HORIZONTAL STRATEGIC ASPECTS**

The strategy takes the following horizontal aspects into account:

The increasing of employment and modifications in the structure of employment, the growth of productivity with the existence of new workplaces producing knowledge-demanding higher added value. *Employment*

A primary perspective is enabling new business growth of small- and medium sized enterprises (SMEs) and their competitiveness. *Small- and medium sized enterprises*

A suitably trained, flexible, creative workforce possessing up-to-date competencies and capable of regeneration should stand available in the structure and quality of economic demands alike. The number of people employed in research & development – dependent on financial opportunities – should grow by 10% by 2010, and by 20% by 2013 in comparison to 2005 levels. *Human resources*

The perceptible improvement of Hungarian society, the quality of life and chances for happiness of the disadvantaged third of the population. *Catch-up*

People's physical and mental health is one of the most important foundations of societal and economic development. This is contributed to significantly by – among others – life sciences and the innovative technology-based results of the pharmaceutical industry. *Healthy people*

Environmental friendly systems and technologies, and the development and diffusion of pure material- and energy saving procedures aid the safeguarding of health, natural values and biological diversity, economical usage of natural and human resources, and the enforcing of the principle of sustainability. *Sustainable development*

The availability of a suitable research, transport and IT infrastructure is one of the basic conditions for development. *Infrastructure*

In order to develop the ability and readiness of domestic research centres and companies towards international cooperation, international knowledge and technology transfer, as well as mobility, must be promoted. *International cooperation*

Science plays a special role in areas of security that are nowadays a high priority. The effects on society and ethical questions of using new scientific results constitute the new challenges of the future. *Security*

The enforcing of equal opportunities based on sex, age, location- and scientific areas for researchers is necessary. Positive discrimination shall be applied in order to raise the proportion of women in management positions. Research on the effect of scientific results on equal opportunities, differences in society and social cohesion shall be promoted. *Equal opportunities*

## 5. SCIENCE, TECHNOLOGY AND INNOVATION POLICY MID-TERM GOALS BY 2013<sup>6</sup>

The strategy serves the increasing of competitiveness of the Hungarian economy, and through this – in harmony with economic policy goals – the improvement in quality of life of Hungarian society. Its goal is that Hungary will become by 2013 a country where knowledge and innovation are the driving engines of the economy. Companies with domestic financial interest should appear on the global market with competitive products

General goal

Strategic goals:

### Mid-term strategic goals:

#### Objective I: Strengthening of companies' research & development and innovation (R&D&I) activities

Strengthening of Corporate R&D&I

The goal is that in the interest of Hungarian businesses creating and accessing the market with globally competitive products and services they should increase their innovation activities and significantly increase their R&D and industrial licensing expenditure. Total R&D expenditure in the function of available budgetary sources should possibly reach **1.4% of GDP in 2010**, then **1.8% of GDP in 2013**. In the interest of a more favourable R&D source structure it is a goal that every forint from the budget turned to R&D should attract at least one forint of corporate expenditure.

*Activation of corporate sources*

**Corporate R&D expenditure** within total R&D expenditure should reach **45% in 2010**, and **50% in 2013**<sup>7</sup>. It is desirable that Hungarian research centres carry out R&D activities for as many foreign company orders as possible. To this end, the Government is initiating from 2007 significant business co-financing generating programs from the funds of the New Hungary Development Plan and the Research and Technological Innovation Fund, alongside maintaining in the mid-term the corporate R&D incentives of tax- and contributions breaks.

### Objectives in figures:

Hungary's summary innovation index (SII) **should reach the EU average by 2013**<sup>8</sup>. For this to happen – beyond an increase in corporate R&D expenditure – we mainly need to improve on the proportion of young technical- and natural science professionals, industrial licensing activity in the corporate sector and the operating conditions of the capital markets. The goal-indicators (EU Innovation Scoreboard indicators; those in square parenthesis are EU categories) pertaining to the latter goals are as follows:

#### 1. Proportion of science and engineering graduates in the 20-29 age group [1.1]:

2005: 5.1%. **Objective: 5.5% by 2010, 6.0% by 2013.**

(the 2013 goal is roughly half of the 2005 EU average)

<sup>6</sup> We define the mid-term strategic goals and priorities for the time period stretching to 2013, in harmony with the National Development-policy Concept and the time-horizon of the National Strategic Reference Framework preparing for utilisation of EU Structural Funds, but besides this we also designate the objectives to be reached by the period's half-way mark of 2010.

<sup>7</sup> The 2010 expenditure goal – total expenditure of 1.4% of GDP and 55% coming from non-corporate sources – can be realistically fulfilled on the basis of point IV.A.11 on the convergence program, if (in harmony with the tasks set forth in point IV.A.10.) the size of foreign funds won by the domestic R&D&I sector grows significantly in the mid-term.

<sup>8</sup> Calculated on the basis of the EU Innovation Scoreboard data for 2005, the reaching of the EU SII average would demand a total expenditure of some HUF 360 billion per year. State expenditure would be HUF 40 billion, while corporate and other expenditure would come to HUF 320 billion. This data only appears as a comparison and does not represent the financial plan or any obligation.

2. Business R&D expenditure/GDP [2.2]:

2005: 0.37%<sup>9</sup>. **Objective: 0.63% by 2010, 0.90% by 2013**  
(the 2013 goal is three quarters of the 2005 EU average).

3. Sales of new-to-market products (% of all turnover) [4.3]:

2005: 4.2%. **Objective: 5% by 2010, 6.0% by 2013**  
(no EU average due to incomplete data).

4. EPO (European Patent Office) patents per million people [5.1]:

2005: 18.9. **Objective: 24 by 2010, 28 by 2013**  
(the 2013 goal is 20.5% of the 2005 EU average).

5. Share of early stage venture capital in GDP [3.4]:

2005: 0.004. **Objective: 0.005 by 2010, 0.006 by 2013**  
(no EU average due to incomplete data).

**Objective II: Building of internationally competitive R&D&I capacities and centres**

R&D&I capacities

Using up-to-date opportunities offered by IT, establishment of strong and competitive knowledge centres with business participation, and innovation clusters through increased modernization of the research infrastructure.

*Knowledge centres in the priority areas*

New research institutes and international-standard research universities should be established – according to up-to-date international scientific organization and management norms – which closely cooperate with businesses and react flexibly to economic demands. In the interest of improving the infrastructural conditions the Government is starting programs from NHDP and RTIF funds. Innovation management should be strengthened at R&D institutes and at businesses.

**Objective III: Strengthen knowledge supporting the competitiveness of society**

Strengthen knowledge founding competitiveness of society

The Government should ensure conditions for scientific research on the basis of excellence criteria. The main factor is quality in societal-economic challenges, research in national values and heritage, as well as in public-interest research not belonging to direct interest in the corporate sphere.

The requirements related to research directly utilized in the economy are defined by the corporate sector.

As many Hungarian researchers as possible should participate in the international cooperation networks and engage in research of new global challenges. The attracting force of the domestic R&D&I sector should increase for the young generation of researchers. Domestic research centres should attract as many foreign researchers and students, Hungarian researchers with recognition arising from their work abroad, foreign PhD students and post-doctorates as possible.

Attraction of foreign researchers and students to Hungary

Concentrating on the most important subject areas from the perspective of economic development, by depending on doctorate schools we should increase the number of researchers in public research centres.

Increase the number of researchers

**Objective IV: Strengthen the regions' R&D&I capacity**

Innovation strategy should be one of the defining elements of the regions' development strategies. Inequalities of the national innovation system should be re-

Strengthen the regions' R&D&I ca-

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<sup>9</sup> According to financing fund sector data, not utilisation sector data.

duced by strengthening the innovation capacities of development poles. Regional- capacity integrated expert centres, technology-transfer centres and innovation centres forming regional intellectual and R&D&I bases should be established. Innovation services, SME consultancy, education and training should develop in the regions and the development poles. Strong, innovative SMEs and innovation actors' co-operation clusters and networks should be established in the regions.

It is a condition for the fulfillment of the goals that the legal and economic environment should promote and offer incentives for research & development and innovation.

## 6. Priorities and tools serving the realization of strategy goals.

### 6.1. PRIORITIES

The following **intervention area – priorities** – serve the strategy goals:

Priorities:

- I. Culture of accepting and exploiting the results of scientific research.**
- II. Quality, performance and utilization driven efficient national innovation system.**
- III. A respected, knowledge-based creative and innovative workforce suited to the demands of society and the economy.**
- IV. Economic and legal environment with incentives to knowledge creation and utilization.**
- V. Domestic enterprises, products and services being competitive on the global market**

#### Detailed explanation of the content of the priorities:

Priority I.: Culture of accepting and utilizing the results of scientific research.

I.1) We provide incentives for **entrepreneurship, risk undertaking and innovative development willingness**. We promote the development of an **entrepreneurial culture** based on confidence and cooperation built on mutual advantages and the correct business contacts. The searching for new solutions and endeavours aimed at innovation should be the main characteristic of entrepreneurial behaviour. Development of an innovative entrepreneurial attitude

I.2) We support research into the complex solutions of **economic and societal challenges**, as well as into the effect of significant changes taking place in society on competitiveness, growth and quality of life. We support research which analyses the interdependencies between societal and economic factors accompanying innovation and influencing technological innovation, as well as research aiding the establishing of expert policies and supporting decision-making. Searching for solutions to the challenges of our age

I.3) We promote the further development of a **cultural environment** which accepts research, development and innovation and gives incentives. Acceptance of R&D&I in society

We support the public awareness and recognition of R&D&I in society, using all tools for the spreading of knowledge and communication (media, exhibitions, conferences, publications, forums, etc.). In order to arouse the interest of youth we support interactive tools (the House of Future, Palace of Wonders, technical museums, etc.) for popularizing science and technology. We support the activities of young people organised by themselves (e.g. Network of Research Students).

For the communication of science and technology we shall offer incentives for the active role-taking of researchers (e.g. the Mindentudas Egyeteme), the increasing of dialogue in society on the advantages and risks of applying new scientific results and technologies. We shall promote the acknowledgement of the economic and societal importance of researchers' work at all levels of education.

We shall establish and give awards and prizes, as well as support the already-existing societal recognition orders (Hungarian Academy of Sciences awards, Hungarian innovation grand-prize, Gábor Dénes-award, etc.). Besides arousing the interest of youth we shall also aid the already well-working talent-researching and talent-welfare programs (e.g. Youth Scientific and Innovation Talent-research Competition).

I.4) In harmony with the scientific policy priorities we support the **research on national values, traditions and heritage**, the better utilization of the results in education, culture and other areas of economy and society. To this end the Government establishes national research priorities. Research of national values

I.5) We support **research and development** serving the interests of society and not directly belonging to the interests of business (e.g. public security, defence, environmental protection, ecology, water management – flood defence, consumer protection, healthcare), as well as other research of importance – long-term but not motivated by short term economic interests – to the country and research founding official or other community activity. Public-interest research developments

## Priority II.: Quality, performance and utilization driven efficient national innovation system

### II.1. Mid-term governmental tasks related to the research network

II.1.1 The Government – also by relying on NHDP funds – **launches programs supporting** the establishment of technological innovation capacities **concentrated in strategic sectors** in order to create the necessary intellectual, infrastructural and economic background as well as the establishment and settling of knowledge- and technology intensive businesses. We shall support the construction of technological incubators, the establishment of technological platforms and the creation and strengthening of innovation networks and clusters nearby to strategic sector knowledge centres. We shall especially offer incentives for foreign capital investments in these areas. Taking into account trends and the current situation of Hungarian industry it is primarily **certain segments** of the following key technological areas and knowledge-based industry sectors that can represent a breakthrough point for Hungary. Strategic sector knowledge-centres, technological platforms, innovation clusters

#### *Key technology areas*

Info-communication technologies  
 life-sciences and biotechnology  
 medical equipment industry  
 material-science and nanotechnology  
 environmental technologies  
 energy-saving and regenerating,  
 alternative energy source technologies

#### *Knowledge-based industry sectors*

IT and electronic industry  
 machinery- and vehicle industry  
 Pharmacy industry  
 Chemical industry  
 Food industry  
 Innovative services industry  
 Environmental protection industry  
 and technologies

<p><b>II.1.2.</b> By establishing <b>development poles</b> we can reduce the regional differences in the national innovation system. We shall support the establishment of high level regional expert centres, technology-transfer centres, competence centres and regional innovation centres, primarily through infrastructural investments and the development of innovation services.</p>	<p>Regional innovation centres, innovation infrastructure</p>
<p><b>II.1.3</b> We shall support the establishing of the <b>innovation service environment</b> in the region in order to aid the innovation activities of SMEs. Relying on the experiences of regional innovation agencies we shall strengthen SME consultancy, education and training in the regions and development poles.</p>	<p>SME innovation services in the regions</p>
<p><b>II.1.4</b> We shall aid the <b>development of regional innovation capacities:</b> through the strengthening of the regional innovation institutional system, development of network cooperation, promotion of the geographical spread of innovation, operation of decentralized innovation programs and the improvement of regional innovation IT conditions and human resources. We shall develop <b>regional knowledge centres</b> organizing around universities and research institutes, to which technological centres, incubator houses specializing in advanced technologies, as well as industry and business parks, will be fitted. The Government shall aid the establishing of the legal and financial conditions for the realizing of knowledge- and technology-transfer in the regional knowledge centres.</p>	<p>Strengthening the institutional system of regional innovation</p>
<p><b>II.1.5.</b> The Government supports the establishment of <b>internationally significant domestic research centres</b>, primarily based upon existing knowledge centres but not excluding the establishment of new research centres. The Government – depending on financial funds – shall establish modern research organizations in which – in compliance with excellence criteria – the research groups from any part of the world may work for several years.</p>	<p>International-level research centres</p>
<p><b>II.1.6</b> The establishing of <b>flexible forms of cooperation</b> of research centres operating in the different organizational forms is a possible answer to the challenges of international competition, critical mass and quicker and quicker reaction. This is characterized by research units which are aligned on complex individual-basis interdisciplinary projects, and for a given time operate as elements of a large network. This network structure ensures flexibility and at the same time, permanent competition.</p>	<p>Implementation of research groups and complex large projects aligned into a flexible network</p>
<p><b>II.1.7</b> The Government shall by 2010 revalue publicly financed research institutes, as state property, with special respect to intellectual property as demanding different regulation from other elements of property, and – based on necessity – provide for the renewed defining and efficient operation of public tasks.</p>	<p>Strategic property management</p>
<p><b>II.1.8</b> With targeted programs the Government shall offer incentives for research &amp; development <b>mobility</b> so that researchers temporarily carry out work at other research centres or businesses. It will similarly offer incentives for the acquiring of experience of corporate developers, and the strengthening of expert contacts in public sector and public interest research centres.</p>	<p>Mobility between research centres and businesses</p>
<p><b>II.1.9</b> Scientific expert knowledge and professional management are simultaneously needed for the operation of research centres. In order to improve growth in efficiency the Government offer incentives for the strengthening of expert and scientific management at research centres, through <b>modern business, and entrepreneurial competencies.</b></p>	<p>Professional management in research centres</p>
<p><b>II.1.10.</b> Through the modification of Act XXXVIII. of 1992 on the state budget (Budget Act) the opportunity must be created as soon as possible that research centres may freely decide on their intellectual property having the right to sell it, to raise a mortgage on it, or assign the right of utilization to another body.</p>	<p>Preventing legal obstacles of utilization</p>

- II.1.11.** The Government shall give incentives for research centres so that in their regulations serving the protection and utilization of intellectual property they should encourage individual inventor activity and strengthen inventor interest. Individual interest
- II.1.12.** In the instance of international co-financing that provides suitable conditions for the establishment of European Technology Institute (ETI), European Spallation Source (ESS) operations, or **other key centres of excellence in Hungary**, the country wishes to participate in the domestic implementation thereof. *Acceptance of European R&D bases*

## II.2 Governmental tasks affecting public and non-profit research centres<sup>10</sup>

- II.2.1** The institutional education and training for **nurturing of talent**; outstanding talents and creative students in the process of independent problem solving, who in the comprehensive uniform system thereof shall receive support for development. Nurturing and motivation of talent
- II.2.2** The Government shall strengthen the expediency of **normatives** serving the support of **scientific** activity in the **higher-education** system, as well as the amount of support ensured on the basis of the normatives. Focusing and growth of normatives
- II.2.3** On the institutional level, the scientific normatives of higher education shall be distributed according to the number of researchers and performance. From the institutional level towards personal level increasingly it shall be distributed on the basis of performance. Acknowledging the differences that can be experienced in scientific performance, the Government shall award favour to those producing work of a high scientific standard. **The goal of support for higher-education researchers is not catch-up but excellence measured by international standards.** Giving incentives for performance and quality
- II.2.4** In order to **increase researcher capacity** the Government shall increase the number of researchers – first and foremost in the area of the science and technology – **coming from PhD training**, and within this – at the time of forming training proportions – shall take into account the expected demand for experts in each of the professional fields. Increasing the number of researchers
- II.2.5** The Hungarian Academy of Sciences (HAS) – within the framework of its reforms – shall audit its own performance and role in the development and representation of Hungarian science. On the basis of this audit the Government – in agreement with the HAS – shall, by the end of 2007, redefine the public tasks of the HAS and the system of conditions for the provision thereof. Auditing of MTA functions
- II. 2.6** The HAS – within the framework of its reform – shall upgrade its research institute network – as state property entrusted to the HAS – and on the basis of its public tasks, transformed when necessary, provide for the efficient operating thereof. During this, in the financing of research institutes, **competition** based on excellence and economic and social utilization, shall receive a greater role. Simultaneously it makes it possible that other research groups may utilize its structure from among suitable frames. *Strategic property management*
- II. 2.7** The Government shall examine questions related to the onetime original stock of the HAS in order that the HAS public body can restore its financial inde-

<sup>10</sup> Higher education research centres, HAS research centres, and research institutes working under the supervision of the ministries belong to the public sector research centre category. Public utility research centres usually operate in the form of foundations. Corporate research centres form the third large group of research centres (Priority V. deals with the latter).

pendence.

II.2.8 The Government – in proportion with the tasks – shall take part in the financing of the work of sectoral research institutes founding ministry expert policies. State financing shall be the market equivalent of the utilized research services.

Scientific founding of sectoral expert policies

II.2.9 The Government gives incentives to sectoral research institutes in order that they can provide an increasing amount of research and innovation **services** to businesses operating in the professional field.

Sectoral research institutes on the business market

II.2.10 The Government, through the establishing of research & development and innovation programs and tenders, shall ensure access and equal opportunities for public utility research institutes.

Public utility (non-profit) research centres

II.2.11 The Government shall by 2010 audit the necessity of the activities of non-profit research centres, and/or the optimal conditions for the continuation of these activities.

### II. 3. Governmental coordination of science-, technology- and innovation-policy

II.3.1 **The Government shall establish clear competencies and division of labour** in the governmental coordination of scientific research serving innovation as well as being carried out for indirect business goals, thus ensuring the harmony of the two areas, as well as the suitable level of HAS participation

Coordination of STI policy

We shall modify the sphere of influence of the Science- and Technology Policy College (TTPK) in a way that its operation shall promote the speeding up of government decision-making in this area, and furthermore, so that it should become applicable in decision-making representing **regional interests**.

The Government – to support the TTPK decision-preparation work – shall create the professional background which is capable of continually reporting on the utilization of state resources assigned to the strategy.

II.3.3. The Government shall enter and maintain **bilateral** intergovernmental agreements for the promotion of technological cooperation, so that as many Hungarian R&D partners may connect to international scientific and technological cooperation programs as possible. The Government shall support continued Hungarian participation in **multilateral** international research cooperation.

Bi- and multilateral international cooperation

### Priority III.: A respected, knowledge-based, creative and innovative workforce suited to the demands of society and the economy

III. 1 During cultivation of science, **skills and qualities** can be mastered through which the country's societal and economic competitiveness may be created, maintained and increased. The role of research & development – primarily basic research within this – is highly important in the training of a highly qualified, creative workforce and in the development of skills to collaborate.

The role of science in the training of high-level experts

III.2 The Government shall work out a **researcher career model** which gives opportunities for the keeping, designing, and value-proportionate respect of individual and institutional performance. As a part of this model, the system of **scientific awards, royalties and annuities** for individuals and financed by public funds must be modified so that – without harming the current utilization for goals

Researcher career model

in accordance with their original functions – they reflect scientific respect and make active researcher incentives as well as individual support for young talented researchers available.

The goal is that the research career model should not just spread to cover the beginning of the career but with suitable flexibility and scope, represent an attractive research career opportunity for those deserving of one.

III.3 The Government shall regularly measure the performance of **PhD schools**. In order to improve quality it should support the development of worthy doctorate schools and new doctorate candidate research centres primarily located in doctorate schools carrying out successful research and training. We shall also support the establishment of European standard research universities with scientific normative tools from the budget.

Development of PhD schools

III.4 The Government – in cooperation with the corporate organizations of the affected – shall establish and consequently apply a **performance evaluation system** for public and non-profit research centres.

Evaluation of researcher performance

III.5 The average time period in which PhD degrees are acquired must be brought into line with European practice so that degrees express the value and knowledge developed there. In the interest of this we shall make it possible for the **institutes of the HAS** – on the basis of agreements concluded with the institutes of higher education – **to participate** in doctorate training. We shall give **incentives** to the argument of more practice-oriented PhD training and the **participation of PhD students in research projects**. We shall increase – by **supporting and extending corporate scholarships** and **creation** of post-doctoral workplaces – the **number** of those **participating** in PhD training in science and technology.

PhD training

III.6 The Government shall offer incentives for the **spreading of post-doctoral employment**; it shall increase the employment of highly qualified researchers – taken as a part of employment policy and utilizing the tools thereof.

Post-doctorates in employment policy

III.7 Innovative businesses obtain suitable workforce if the educational and training system reflects the demands of the economy as regards both the structure and content. To this end we shall establish **labour market feedback and career monitoring systems**.

Taking into account the economic demands

III.8 The support of acquisition of **up-to-date competencies** shall continue in the whole of the educational-training spectrum (business and entrepreneurial knowledge, education aiding digital writing knowledge, language preparation courses aiding the knowledge of foreign languages, the development of the professional training preparation course in the frame of the Vocational School Development Program and the development of **problem-solving skills and creativity**, etc.). We shall support the expansion of the system for **nurturing talent**. We shall strengthen the further development of knowledge, further training serving renewal, and the system of **life-long learning**.

Acquisition of up-to-date competencies, nurturing talent, life-long learning

III.9 We shall give incentives for the **increase in time and proportion of practical training** within intermediate and higher professional training, the inclusion of knowledge acquired during professional training into higher education courses, as well as the spreading of opportunities for further studying after vocational training.

Professional training with structure and quality compliant with market demands

III.10 The establishing of a modern, innovative higher education system that reacts to the demands of the economy is essential from the perspective of dynamising research and development. We support **an increase in the proportion science and engineering-training**, the participation of students in research work, an

Modern higher education reacting to the demands of the economy

increase in the flexibility of training towards economic demands, an increase in the attractiveness (and frame numbers) of enrolling in these professions, rapid transferring of technological results into text books. A pre-condition of this is that through the education policy tools the development of teaching of the natural sciences should also strengthen in public education. We support the national and international mobility of students and educators, and an increase in the willingness of domestic institutes to accept foreign students.

III.11 Where justified, we shall support the participation of economic actors in education, the acquisition of practical experience for teaching faculties, as well as **regular contact between the education-training system and the business sphere**. We shall aid the participation of business professionals in education, and the strengthening of contact between the education institutions and businesses.

Strengthening of the relationships between the education and training system and the business sphere

III.12 We shall aid the strengthening of openness of higher education, the utilization of EU labour-market opportunities, and the domestic employment of foreign educators and researchers. We shall offer incentives for **acquiring international experience** (student, educator and researcher exchange programs, and scholarships). We shall aid in **the returning home and adaptation of Hungarian researchers working abroad** through the creation of favourable research conditions. We shall support mobility between businesses, as well as between higher education, academic and sectoral research centres.

Training and employment support and mobility of young researchers

III.13 We shall create **employment regulations which promote mobility** between research centres and between research centres and businesses, both at manager and researcher level.

Promoting flexibility and mobility

III.14 We shall promote the **connecting of Hungarian researchers into international networks**, as well as their access to large international research installations. We shall support connecting to EU and international R&D programs (tender preparation, processing and domestic utilization of results).

International research cooperation

#### **Priority IV.: Economic and legal environment giving incentives to knowledge creation and utilization.**

##### **IV. A). Mid-term governmental tasks in the area of research financing**

IV.A.1 In the interest of promoting transparency and efficiency and the innovation process, in the mid-term we shall ensure in the budget **the goals and sources of R&D expenditure and the exact volume thereof**, as well as ensure that for the planned utilization the structure according to the nature of the activity should be definable.

Transparent budgetary funds

IV.A.2 The Government shall **make the research and development support tender systems more simple and transparent** and shall create a decree on the regulation thereof. We shall settle the legal background of project-natured R&D cooperation (consortiums). In the publicly financed tender systems we shall alleviate the guarantee expectations and in case of ex-post financing shall discontinue them. The goal is making the processing period of tenders faster and reducing administrative burdens.

Tender systems for research and development support

IV.A.3 The Government shall modify the system and time-horizon of public sector R&D financing so that – also including the necessary pre-financing and ordering – **they conform to the multiannual nature of scientific research activity**.

Project financing

IV.A.4 The Government shall build the recording, monitoring, control and

Monitoring, control,

<p>evaluation of tenders financed from public funds <b>on uniform principles</b>. It shall make regular the informing of opinion on the efficiency of usage of public money and of its utilization. In the institutional evaluation, critique, and judgement the awarding authorities shall strengthen the participation of international experts.</p>	<p>and evaluation</p>
<p>IV.A.5 The Government – depending on the budgetary opportunities – strives to expand the budgetary sources of the Hungarian Scientific and Research Fund (HSRF) <b>by at least 10% of the previous year’s appropriation yearly</b> from 2008, increasing the chapter main amount by at least this amount. In the long term the independence of the HSRF must be ensured.</p>	<p>Independence and increase of HSRF</p>
<p>IV. A.6 The Government, from the available R&amp;D&amp;I tender funds – including from the Research and Technological Innovation Fund sources – shall support the <b>targeted basic research</b> carried out in the areas detailed in chapter II.1.1 of the Strategy, which aids companies’ competitiveness and income producing abilities, and which shall likely form the basis of solving of recognized or expected, current or future problems.</p>	<p>Support of targeted basic research</p>
<p>IV.A.7 The Government, in the complete cross-section of scientific activity and taking the disciplinary characteristics into account – besides its public control –, shall <b>audit the practice of institution- and task-financing</b>. On the basis of the professional consultations and effect-evaluations carried out with those affected – differentiated by scientific area – the Government shall define the content of institute- <b>and task-financing, increasing the proportion of the latter</b>. In order to increase the efficiency of the used budgetary tools – as necessary – it shall modify these and eliminate the non-research budgetary solutions.</p>	<p>Auditing of the efficiency of institutional and task-financing</p>
<p>IV.A.8 The Government shall align operational principles of budgetary research institutions and public scientific performance criteria of such institutions, and shall simultaneously ensure equal opportunities for them to access budgetary sources assigned for financing tasks by taking into account specialization.</p>	<p>Public, uniform performance criteria</p>
<p>IV.A.9. In the instance of publicly financed research centres carrying out research tasks as basic activities, the Government – by analyzing the task structures thereof – shall establish the financing system for them in order to enforce their <b>successfulness, accountability and transparency</b> requirements. The goal is the replacing of discipline- and institute-oriented financing by a <b>financing system that stimulates the project- and network arrangement of research work</b>.</p>	<p>Reform of institutional financing</p>
<p>IV.A.10 The Government shall give incentives – based on and harmonized with existing national and EU funds – to businesses’ R&amp;D&amp;I cooperation with public sector and public utility research centres.</p>	<p>Cooperation with businesses</p>
<p>IV.A.11 The Government – primarily from funds of the Research and Technological Innovation Fund – shall, by <b>complementary-measures</b> (e.g. consortium building, pre-financing) give incentives for the utilization of EU R&amp;D&amp;I tender opportunities, primarily in the area of the R&amp;D Framework Program and the Competitiveness and Innovation Program (CIP).</p>	<p>Helping measures</p>

**IV. B) Mid-term tasks of the state in order to create a research & development and innovation-stimulating atmosphere<sup>11</sup>**

<p>IV.B.1 The Government simplifies the <b>regulation system of enterprise-establishment and capital investment</b>, and supports the <b>development of one-stop services</b> of enterprise-promotion with innovation services.</p>	<p>Establishing enterprises</p>
<p>IV.B.2 We shall create a legal environment which aids and gives incentives to</p>	<p>Stimulating capital in-</p>

<sup>11</sup> In order that their effect be properly explained, and endeavouring so that as many legal modifications as possible are implemented in the early years of the time period. The details are contained in the action plan

capital-investment. We shall initiate **support mechanisms**, with the financial investment obligation of the state, which significantly develop the market of projects attracting private capital. We shall support the creation of a research-exploiting guarantee-institute for the SMEs.

IV.B.3 We shall eliminate the difficulties in the establishment of **spin-off enterprises** for academic and publicly financed research-institute workers. We shall strive to develop further the subsidy- and allowance-system for new, innovative enterprises. Spin-off enterprises

IV.B.4 In harmony with the new EU tendencies we aim at the modification of Hungarian and EU public procurement and competition rules, which makes possible the support of domestic innovation. **Within the framework of this the aim of the state is to be present as a long-term, conscious customer in the market of innovative products and services.** The state as a deliberate customer

IV.B.5 We shall further develop the regulation system of intellectual property evaluation and management. Intellectual property evaluation

IV.B.6. We shall stimulate the strengthening of publicly financed research-centres` interest in intellectual property utilization. **With the updating of the legal environment, all public research centres shall create their own intellectual property management strategy.** Intellectual property management

IV.B.7 The Government shall stimulate **IPR awareness** among SMEs; the economic, business and utilization skills and knowledge. We shall support the development of **services** connected to intellectual property. We support the procurement, maintenance and renewal of domestic and foreign **industry licensing protection**, which facilitates the market-launch of new, original products and the market-utilization of the results of innovation. Industrial law protection measures of SMEs

IV.B.8 We shall support the reception and adaptation – in harmony with intellectual property protection – of **foreign technologies** which are important for domestic SMEs. Technology import

## **Priority V: Domestic enterprises, products and services being competitive on the global market**

V.1) We shall initiate **programs which stimulate demand increases** and investment the R&D activity of enterprises, and which concern themselves with the establishment of **capital institutes** and the interest- and credit-guarantee conditions **of innovation- and customer-friendly credit products**. We shall stimulate the **creation of interest of private capital**, distribution of risk, improvement of the participation conditions in R&D investments (risk capital, business angels, developing capital). Developing R&D enterprise-investment supporting capital market tools

V.2) In order to stimulate the R&D&I activity of enterprises – as a function of available sources — we shall further develop the establishment of programmes creating **corporate R&D workplaces, and research units**. We shall support the **mobility of the research workforce** between research centres and enterprises. Creating R&D jobs at enterprises

V.3) We shall start **programmes which support foreign direct R&D investments** in Hungary. We shall stimulate the interaction between foreign enterprises and Hungarian corporations and research centres. We shall link the special allowances of international corporate investments to research-development and technology innovation investment and activity, according to EU state aid regulations. We shall stimulate the technology co-operation between international corporations and the domestic SME-sector, based on a long-term partnership (e.g.: within the scope of subcontractor networks). FDI initiatives in R&D

- V.4) We invite tenders to strengthen the **Hungarian participation** in the strategic **EU and international R&D co-operation programmes**. We shall stimulate international research and business co-operation and the **domestic exploitation of the research results** thereof. We shall create bi- and multilateral international innovation funds. International research and technology co-operation
- V.5) We shall facilitate the international participation and expansion of Hungarian enterprises in the science-based sectors. We shall stimulate **the market access of original domestic products and services**, and the development of Hungarian, multinational corporations with a significant regional market share. The international participation of Hungarian enterprises
- V.6) By concentrating on the available financial resources, we shall start incentive programs supporting **business research and development and innovation**, with special respect to regional perspectives. We shall further develop incentive programs for the research and development of SMEs carrying out supplier activities, with the help of the interested businesses. We shall start incentive programs aimed at the establishment of R&D&I clusters. We shall further develop our programs which aid the innovation activities of SMEs. We shall support SMEs in the utilization of R&D&I services. Supporting business R&D activity
- V.7) We shall strengthen research activities aimed at the societal and economic **exploiting** of research results and those built on cooperation in the business sector. We shall further develop our application-oriented R&D programs which demand concentrated resources and are significant from the perspective of the national economy. We shall start **programs supporting innovative solutions and inventions worth** implementing, spreading across the whole innovation chain. We shall support **cooperation between the business and R&D sector (universities, research institutes)**. In areas of S&T cooperation important from a domestic exploiting perspective we shall support **large new international R&D projects** and strengthen **international technology agencies**. Support of utilization-oriented research activity founded on cooperation
- V.8. The Government shall attribute differentiated roles in the promotion of industrial competitiveness to those management and organizational structures through which **technology-transfer** can be made more efficient. **Industry, business, science and technology parks, logistical centres and technology centres** are important tools in getting small and medium sized enterprises to settle and end up in a supplier position, and – in order to keep step with developed technologies and business solutions – obtain the advice, laboratory and other services necessary for this. It is important that the Government – depending on the prevailing material opportunities – should provide comprehensively for the further development of these structures. Infrastructural conditions of technology-transfer
- V.9) We shall strengthen R&D&I activities in the area of **services**. We shall support the raising of technical/technological standards of innovative services which significantly contribute to the formation of national income and employment. We shall support services that promote the start-up of **new companies founded on the utilization of intellectual property** and consultancy preparing for capital market financing. We shall give preference to constructions and institutional solutions which **systematically and in a complex manner, promote professional and market screening of projects, industrial licensing consultancy, business start-ups, obtaining of capital and incubation**. Tenders, capital programs and complex services can together efficiently aid the realization of innovations. Innovative services, incubation and capital

## APPENDIX: SITUATION ANALYSIS

At national level Hungary spent HUF 207.8 billion on R&D activities in 2005, which constitutes 0.95% of GDP (Figure 1.). This is half of the EU average (1.9%). Hungarian governmental R&D expenditure as a proportion of GDP approaches the EU average (0.54% and 0.69%, respectively), but business expenditure falls substantially short of the EU average (0.37% compared to 1.07%). The trend is favourable however: within R&D expenditure the corporate share was 29.7% in 2002, 30.7% in 2004, and 39.4% in 2005. The proportion of corporate and state R&D expenditure in Hungary is thus only 0.71:1, the EU average being 1.6:1.

According to comparative EU data Hungary's summary innovation index (SII) was 0.31 in 2005, some 72% of the EU average. **With this, Hungary stood in 15th place out of the EU 25.** This combined index summarizes the results of five indicator groups<sup>12</sup> consisting of 26 indicators in total. The 15th place is in line with Hungary's current relative level of development but in the mid-term it must be taken into account that most EU countries handle R&D&I as a key priority, thus maintaining the current position will also require significant endeavours.

According to CSO (Central Statistical Office) data 749 companies were involved in R&D activities in 2005. There is a large concentration: 17 large companies account for half of R&D expenditure, this is 1.3% of their return from sales and meaning that by international standards these firms cannot be considered as large research-intensive companies. 75-80% of domestic corporate R&D expenditure comes from firms with foreign majority ownership, from which 38 operated research & development units in Hungary in 2006. R&D human resources are insufficient: the number of researchers per 1000 employees is 3.9 persons in Hungary, while the EU-15 average is 6.1. – meanwhile, in Hungary the number of those in employment in relation to the whole population is also below the EU average.

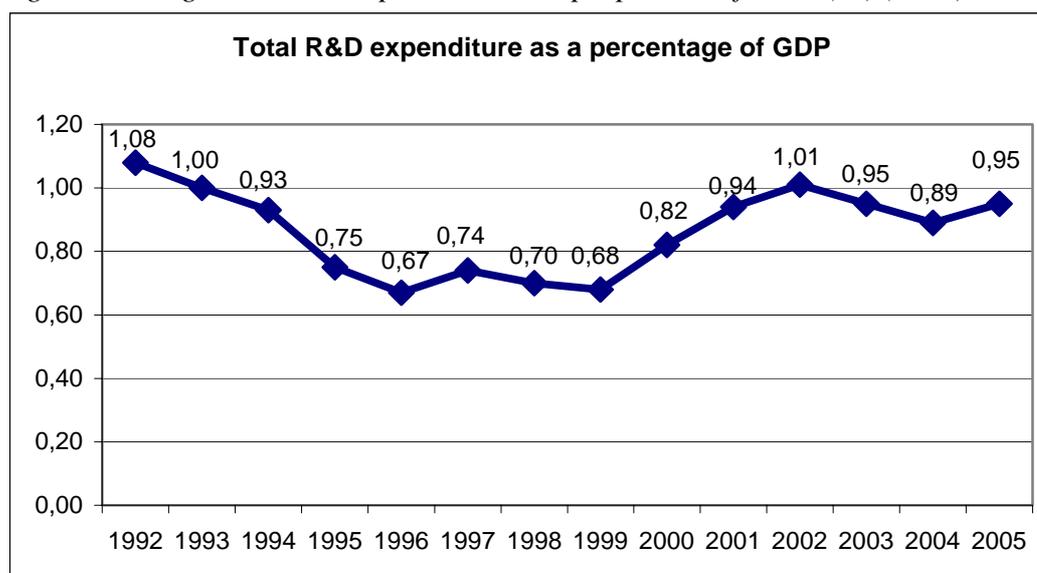
The domestic R&D financing frame is disproportional; the corporate share is low

Hungary's complex innovation indicator is 72% of that of the EU average

Corporate R&D expenditure is low

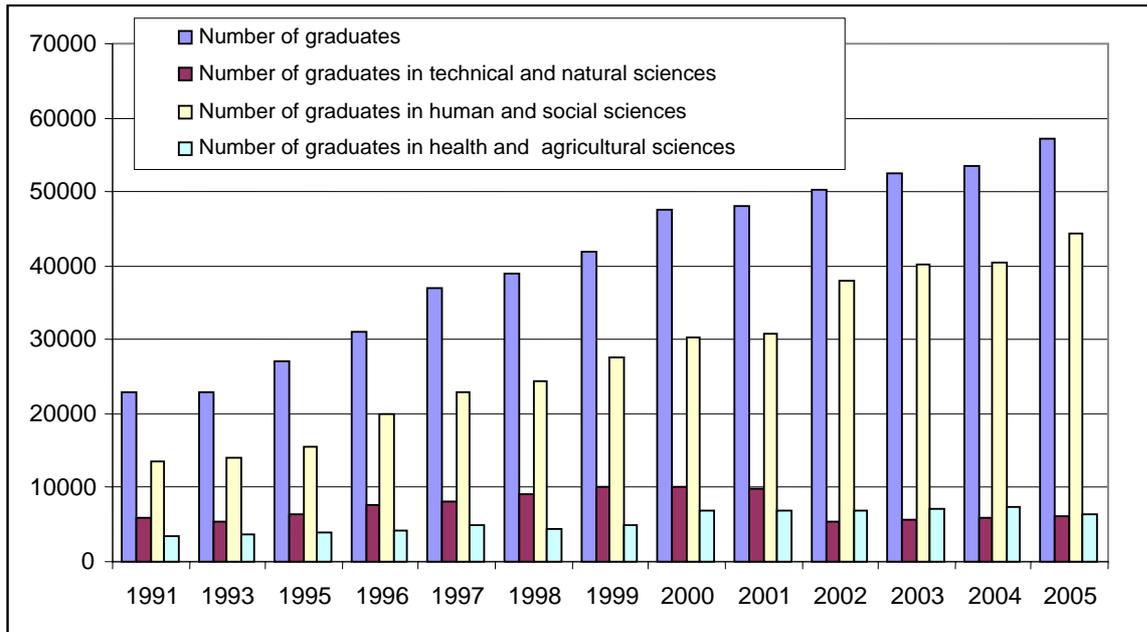
Few researchers

Figure 1. Hungarian R&D expenditure as a proportion of GDP (%) (CSO)



<sup>12</sup> Three input indicator groups: indicators showing the driving force of innovation, the producing of knowledge, as well as innovativeness and company readiness. Two output indicator groups: indicators related to economic utilisation and intellectual property. (European Innovation Scoreboard, 2005)

Figure 2. Acquired higher-education certificates



The predominant part of corporate R&D activity is concentrated in engineering areas; however, the low number of fresh graduates in the engineering and natural sciences is hindering development (Figure 2.). In the above-30 age group their proportion per 1000 persons doesn't even reach half of the EU average, and only Cyprus, Malta and Luxembourg are behind Hungary. There is also a significant shortage shown in terms of technicians and skilled workers with competitive knowledge.

The number of fresh graduates in the engineering and natural sciences is low

During analysis of the reasons for the current situation the time period at the end of the 1980s and the beginning of the 1990s is determining. In a period of mass market losses companies generally did away with their R&D divisions first. Privatization often came hand in hand with cessation of R&D activities, since the new owners generally had more developed "ready" technologies. In certain industry sectors the medium- to large company sector practically ceased to exist, and small companies lacking capital were primarily concerned with day to day survival rather than development (and especially research) ideas. This process almost automatically led to the bankruptcy of applied industry research institutes (the number of researchers in these fell from 10500 to 1500 between 1990 and 1995). It is true that the same workforce made it possible that in the 1990s the foreign companies settling in Hungary found in the former researchers the innovative, multi-lingual workforce they demanded. Since then this source has become exhausted.

What reasons lie behind the above problems?

From the end of the 1990s onwards Hungarian scientific life has also undergone a process of development and restructuring in certain areas. The result of this has been the expansion of higher education, the expansion of graduate schools, the university integration program and the consolidation of academic institutes (HAS).

Research activity has disintegrated; the critical mass for research groups essential for efficient work has not been established. 144 research themes came to 100 research & development experts in 2005, which is ten times the international average. In the area of foreign patents, especially European and US high-tech patents, Hungary remains far behind the EU average (Figure 3.). The number of publications per a million people is half of the EU-15 aver-

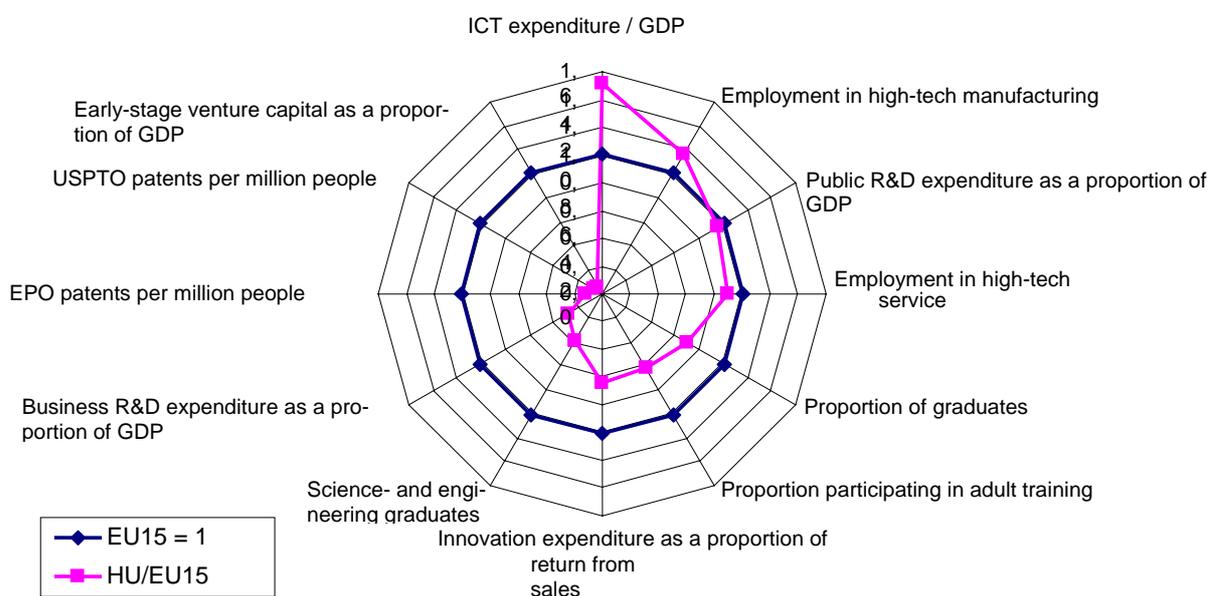
Research activity has disintegrated, no critical mass

age; the number of publications per one researcher however is approaching the EU average.

The knowledge flow between the research and economic sectors is not adequate. Economic perspectives do not appear in the management work of public research institutes, neither in the selection of research themes or the evaluation of researchers. In some instances rigid, authoritarian structures impede dynamic development; a large part of public sector research institutes require reform. There is hardly any swapping of experts between the public and the private sector research institutes, but mobility of researchers in the different institutions and subject areas is not sufficient either. Between 2000 and 2004 the average total of job changes per researcher was 0.11. Incentives and support for the return of young researchers from abroad hasn't been solved either.

An open view of the market and the economy is missing

Figure 3. Innovation indexes in Hungary compared to EU-15



Innovation activity in the domestic SME sector falls short of that experienced in more developed economies. There are few spin-off companies. Technological incubation serving the strengthening of innovative SMEs is undeveloped. Institutional and network structures (innovation centres, technology transfer centres, technology incubators) that connect research & development institutes with companies are lacking or are weakly developed. There are no efficient mechanisms for directing capital to innovative businesses; capital market tools supporting innovation are undeveloped.

Shortcomings in the innovation system damage competitiveness

The North-Western quarter of the country has been successful in attracting working capital, and due to imported technologies its innovation situation is good, due to a weakness in R&D capacities however there is little innovation built on in-house research. Budapest and the larger university towns in the eastern part of the country that has low innovation capacity have significant research centres but these institutes – with the exception of Budapest – have as yet been unable to become real innovation centres of the regions. Indicators show a 2/3 central Hungary concentration of regional division of R&D resources (Table 1.).

There is a significant difference between the research and innovation capacities of the domestic regions

Table 1. Regional division of R&D resources (2005)

AREA	Number of R&D places	Converted number of R&D staff (persons)	R&D expenditure (HUF million) %
1. Central-Hungary	<b>1 204</b>	<b>14 740 (63.4%)</b>	<b>138 790 (66.8%)</b>
2. Central-Transdanubia	<b>161</b>	<b>1 158 (5.0%)</b>	<b>9 673 (4.7%)</b>
3. West-Transdanubia	<b>188</b>	<b>966 (4.2%)</b>	<b>6 737 (3.2%)</b>
4. South-Transdanubia	<b>206</b>	<b>1 342 (5.8%)</b>	<b>6 459 (3.1%)</b>
5. North-Hungary	<b>141</b>	<b>961 (4.1%)</b>	<b>5 890 (2.8%)</b>
6. North-Great Plain	<b>300</b>	<b>1 946 (8.4%)</b>	<b>17 913 (8.6%)</b>
7. South-Great Plain	<b>316</b>	<b>2 126 (8.2%)</b>	<b>14 658 (7.1%)</b>
Not classifiable by area			<b>7 644 (3.7%)</b>
Hungary total	<b>2 516</b>	<b>23 239 (100%)</b>	<b>207 764 (100%)</b>

Central innovation initiatives based on a wide-ranging cooperation, promoting networking and integration have recently appeared. These are regional university knowledge centres, cooperative research centres, large international programs, and regional innovation agencies. Our support system places a large emphasis on the uniform and harmonized planning of R&D and innovation sources. An important goal is the support of cooperative research activities, concentration of resources, economic and business-based utilization of R&D results, and the establishing of a system of institutions for regional innovation.

In terms of resources and abilities influencing R&D and innovation activities the sectors show a very different picture. The manufacturing industry supplies more than a third of the return from sales. The share of the other production sectors is below 8%. Manufacturing companies supply more than 70% (73%) of corporate R&D expenditure. The construction, foodstuff industry, energy supply, postal services and communications sectors' economic role in the area of R&D expenditure lags far behind their role in manufacturing.

Within the manufacturing industry, besides pharmaceuticals production, dynamically growing R&D expenditure can be measured in the communications equipment production and the public road-vehicle production industries is in line with their significance, and R&D expenditure is also considerable in the area of electrical goods production (Figure 4.).

The pharmaceutical-, environmental protection-, biotechnology- and information technology industries have significant R&D expenditure (capacity), dynamically developing sectors, and development opportunities in an international context. Small and medium-sized enterprises (SMEs), and from a human resources perspective, the vehicle production (vehicle steering- and sensor technology) and the food industry have development potential. Development of the public-roads vehicle production and telecommunications equipment production sectors is encouraging.

In recent years the Hungarian tax system has developed much from the perspective of R&D incentives. According to the OECD comparative examination by 2005 Hungary was in the leading pack in terms of R&D incentives and applied tax-allowances. Significant tensions can be seen however in the area of contributions paid by the practically working labour force. Knowledge-based firms (for example, software industry, content industry, research intensive activities) characteristically create added value through intellectual work demanding high levels of skill, thus within their costs the proportion of

New programs for the widening of R&D activities in the sphere of business

Sector analyses, corporate R&D expenditure by sector

R&D expenditure in the manufacturing industry

Development potential

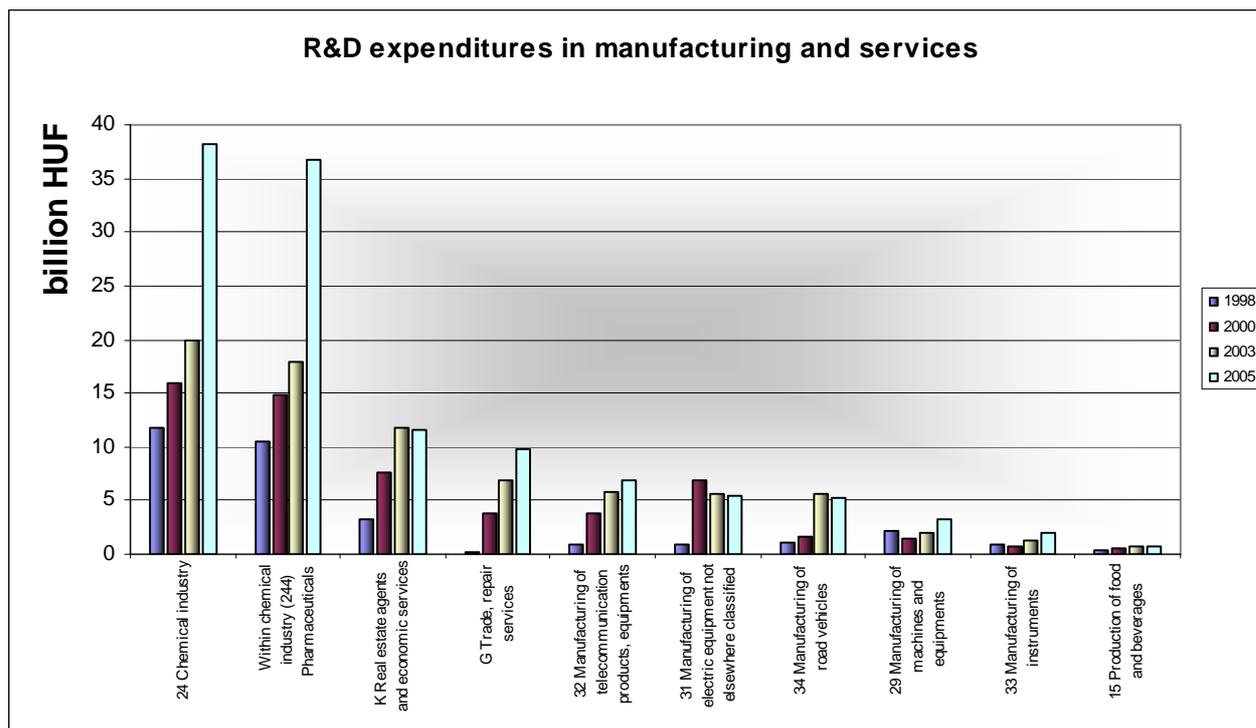
Indirect R&D incentives

wages is large. Contributions on wages however hit those companies the most (companies selling not material products, but intellectual content and performance), which from an innovation point of view should especially have incentives.

Act CXXXIV. of 2004 on research and development- and technological innovation was accepted by Parliament on 20 December 2004, and became effective as of 1 January 2005. This is the country's first innovation act which comprehensively defines, and through numerous measures, promotes research and development, technological innovation, and the economic and societal exploitation of the results thereof. Its main measures are aimed at the financing of R&D and technological innovation, as well as the utilization of achievements in research and the consequent intellectual creations, the establishing of innovative companies, the facilitating of SME's innovative activities and the strengthening of the human resources of innovation. One of the act's most important measures is that it alleviates the limitations on enterprise establishment of public sector researchers and creates direct interest of those involved in research work in that researchers with civil servant status may participate in the work of spin-off companies in order to directly make use of the research results.

Innovation act

Figure 4. R&D expenditure in manufacturing and services (HUF billion) (CSO)



[According to the uniform sector classification system of economic activity – TEAOR –R&D services and IT activities also constitute a part of the “K – real estate agents and economic services” named sector of the national economy. This explains why after the chemical industry the largest R&D expenditure and dynamic growth comes from this sector. According to TEAOR the drugs industry (244) constitutes a sub sector part of the “24 – chemical” industry. Due to high R&D expenditure the pharmaceutical industry is displayed separately in Figure 4.

*Methodology note: the strategy uses many types of – in-part overlapping – phenomena, thus applying the concepts of science and technology (S&T), research and development (R&D), as well as that of research and development (technological) innovation (R&D&I). These phenomena overlap in international practice too, and are related to numerous different national and international*

*policies, statistical, accounting and competition policy documents as well as legal regulations. The editors aimed at the consequent use of the phenomena, and hope that the overlaps (indeed, between the European Commission and the different DGs) also traceable in international practice do not impede the clear interpretation of the strategy's policy messages.*