Innovation policy in six candidate countries: The challenges
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Innovation Policy Profile: Hungary

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Section 1 - The Innovation Policy Framework

1.1 Issues for innovation policy arising from the process of economic transition and accession

No major economic or financial market reforms have been necessary since 1996. A new legislation on venture capital funds, passed in March 1998

The first phase of the transition process in Hungary is over by now. The most important political and economic institutions have been re-established, e.g. a parliamentary democracy based on a multi-party system, private ownership of assets, free factor and commodity markets and the stock exchange.[1] Some crucial economic institutions – e.g. a two-tier banking system, a 'Western-type' taxation system (VAT, personal income tax) – were introduced as early as 1987, that is even before the political changes. Most firms and banks have been privatised by the mid-1990s. Hence no major economic or financial market reforms have been necessary since 1996. A major change concerning the framework conditions for innovation is a new legislation on venture capital funds, passed in March 1998.[2]

The absolute and relative position of the country – reflected by the main economic indicators – has been improved considerably since 1996. Decreasing inflation and unemployment rates together with accelerating GDP growth characterised the last 4-5 years. (Tables 1-3)

Table 1 - GDP in Central Europe, 1990-1999 (1989 = 100)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Croatia	92.9	73.3	64.7	59.5	63.0	67.3	71.4	76.0	78.1	..
Czech Rep.	98.8	87.4	84.6	85.0	87.8	93.4	97.0	98.0	95.8	92.4
Hungary	*96.5*	*85.0*	*82.4*	*81.9*	*84.4*	*85.6*	*86.8*	*90.7*	*95.3*	*99,3*
Poland	88.4	82.2	84.4	87.6	92.1	98.6	104.5	111.7	117.1	121.3
Slovak Rep.	97.5	83.3	77.9	75.1	78.7	84.2	89.7	95.6	99.8	98.8
Slovenia	91.9	83.7	79.1	81.4	85.7	89.3	92.4	96.6	100.4	..

Source: Economic Commission for Europe: Economic Survey of Europe, No. 3 and press reports (1999)

[1] The stock exchange was re-opened in 1989, i.e. before the political transition.

[2] It might be regarded as a "practical critique" of the new Act that not a single new venture capital fund has been established since then. Some funds, however, had been founded before 1998. Further details of this Act are discussed in Section 1.5.

Table 2 – Main economic indicators, 1990-96 (previous year = 100)

	1990	1991	1992	1993	1994	1995	1996
GDP	96.7	88.1	96.9	99.4	102.9	101.5	101.3
Exports	95.9	95.1	102.1	89.9	113.7	113.4	107.4
Imports	94.8	105.5	100.2	120.2	108.8	99.3	105.7
Consumer price index	128.9	135.0	123.0	122.5	118.8	128.2	123.6
Trade balance ($ bn)	0.9	-1.2	-0.4	-3.6	-3.9	-2.6	-2.4
Current account balance (Euro bn)	0.1	0.2	0.2	-3.0	-3.3	-1.9	-1.3
Foreign direct investment[a] (Euro bn)	..	1.2	1.1	2.0	1.0	3.5	1.4
International reserves (year end, Euro bn)	..	3.0	3.6	6.0	5.5	9.4	7.8
Registered unemployed (year end, thousands)	80	406	660	632	520	496	478
Budget balance/GDP (%) (without privatisation proceeds)	0.3	-2.9	-7.0	-5.6	-8.4	-6.8	-3.1
Net foreign debt (including loans provided by parent firms for subsidiaries, Euro bn)	11.8	10.9	10.8	13.4	15.4	12.7	11.7

Source: CSO, Ministry of Finance, National Bank of Hungary
[a] Equity capital
** Without extraordinary, consolidation-type expenditures*

Table 3 - Macro economic indicators, 1997-2000 (previous year - 100)

	1997	1998	1999	2000
GDP	104.6	104.9	104.4	105.2[b]
Exports	129.9	122.5	115.9	121.7
Imports	126.4	124.9	114.3	120.8
Consumer price index	118.3	114.3	110.0	109.8
Trade balance ($ bn)	-2.1	-2.7	-3.0	-4.0
Current account balance (Euro bn)	-0.8	-2.0	-1.9	-1.9
Foreign direct investment[a] (Euro bn)	1.6	1.3	1.5	1.5
International reserves (year end, Euro bn)	7.6	8.0	10.9	12.1
Registered unemployed (year end, thousands)	464	404	405	372
Budget balance/GDP (%) (without privatisation proceeds)	-4.6	-6.3 (-4.6 [c])	-3.7	-3.4
Net foreign debt (including loans provided by parent firms for subsidiaries, Euro bn)	10.7	11.0	11.2	12.2

Source: CSO, Ministry of Finance, National Bank of Hungary
[a] Equity capital
[b] Preliminary data
[c] Without extraordinary, consolidation-type expenditures

After a sharp decline in the early 1990s the Hungarian economy is 'bouncing back', GDP has reached the 'pre-transition' level, that is, 1989, by 1999. In the last few years economic growth exceeded the EU average

To sum up, after a sharp decline in the early 1990s the Hungarian economy is 'bouncing back', the GDP has reached the 'pre-transition' level, that is, 1989, by 1999. In the last few years economic growth exceeded the EU average considerably, reaching about the double level of the EU average (2.5% and 3.4% for the EU-15 in 1999 and 2000, respectively). Foreign direct investment is the highest per capita in the CEE region (over 2000 USD). Privatisation has been nearly completed by 1999 and therefore foreign capital inflow is becoming slower. Due to some 'green field' investment projects and re-invested profits of foreign-owned firms, it was still 1.5 billion euros in 2000.

Forecasts for 2001-2002 suggest that the current trend of economic growth would continue, and unemployment rate would further decrease: it was 6.4% in 2000 on average, and forecast to be 6.2% and 6.0% in 2001 and 2002, respectively. In other words, the number of registered unemployed people would decline to 335-340 thousands by the end of 2001, i.e. by almost 10% percent. Inflation would also continue to slow down. Budget deficit, trade and current account balances, however, are going to deteriorate. (Table 4)

Table 4 - Economic forecasts, 2001-2002 (annual percentage change)

	2001		2002	
	Hun. govt.	**EU**	**Hun. govt.**	**EU**
GDP at constant prices	5 - 6	4.6	5 - 6	5.0
Inflation (CPI)	8 - 9	9.0	6 - 7	6.8
Budget balance/GDP (%)	-3.4	-3.3	-3.1	-3.2
Trade balance (% of GDP)	..	-3.9	..	-3.7
Current account balance (% of GDP)	-4.5	-4.2		-4.5 – -5.0

Source: Ministry of Finance (www.meh.hu), Economic Reform Monitor, 2001/2 (EU DG Economic and Financial Affairs)

The share of the private sector in the output reached 85% by 1998

The share of private sector in the output reached 85% by 1998. Industrial productivity shows considerable growth since 1993, around 10% a year. Real wages did not follow this trend; therefore, international competitiveness of the economy has been improved considerably since 1995.

Macro- and microeconomic developments and trends are favourable on the whole from the point of innovation and building capacities to innovate

The above macro- and microeconomic developments – a liberalised, stabilised, growing market economy with a strong presence of multinationals and other foreign investors – and trends are favourable on the whole from the point of view of innovation and building capacities to innovate, although inflation is still too high. It is also important that the physical infrastructure is developing quickly in some fields, especially in telecommunications (at least 300% growth of telephone lines in some years etc.). Further, the number of university students has grown from 102 thousand to 280 thousand in eight years. (Table A2, see also Section 2.1 on human resources)

FDI has brought about new products, processes and management techniques with access to new markets on the one hand, and a strong pressure to introduce these technological and organisational innovations – otherwise there is no chance to survive the loss of former (CMEA) markets and harsh competition in the new ones, either in the export markets or in the open, liberalised domestic one. Trade data show a rather radical restructuring both in terms of the main export markets – a swift move towards the EU with a share close to 80% (Table 5) – and in the composition of exported goods, that is, a successful adjustment and a move towards higher value-added products. (Table 6).

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Table 5 - Share of the EU/EC countries in the foreign trade of Hungary

	Export (%)	Import (%)
1989	24.8	29.0
1994	51.0	45.0
1999	76.5	64.0

Source: Central Statistical Office

Table 6 - Share of the TOP 10 commodity groups in the Hungarian exports (1990, 1999)

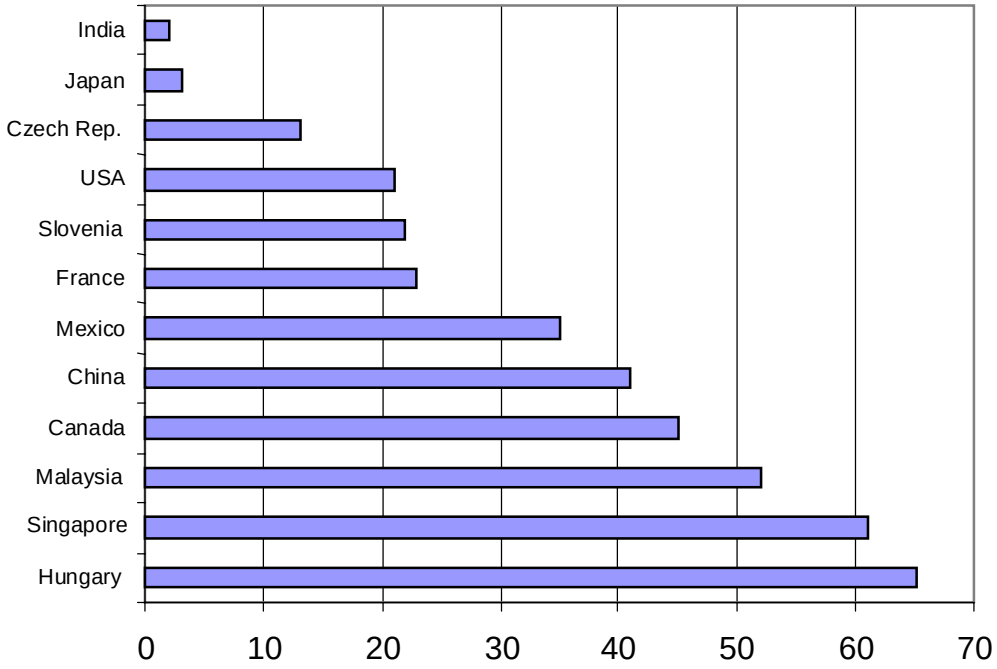
1990		1999	
Commodity groups	**%**	**Commodity groups**	**%**
Meat products	10.1	Office machinery	13.2
Chemical semi-finished products	8.6	Energy production machinery	11.6
Steel semi-finished products	7.1	Electric machines	11.2
Clothing	6.8	Road vehicles	9.0
Vehicles	4.8	Telecommunication equipment	7.9
Metallurgical raw materials	4.2	Clothing	5.3
Canned fruits and vegetables	3.3	Metal products	2.5
Chemical raw materials	3.2	General machinery	2.4
Metal semi-finished products	2.3	Meat and meat products	2.2
Pharmaceuticals	1.7	Furniture	2.1
Total	*52.1*	*Total*	*67.4*

Sources: Foreign Trade Statistical Yearbook, 1990 and Quick Information on Foreign Trade, January-December 1999, Ministry of Economic Affairs

FDI has played a crucial role in re-structuring and re-orienting foreign trade, too: the share of transnational corporations (TNCs) in the industrial export exceeded 65% by 1999. Currently nine of the top 10 exporters are foreign-owned firms: IBM, Audi, Philips, GM Opel, GE – Tungsram, Magyar Suzuki, Alcoa-Köfém (aluminium products), Tisza Chemical Works and Neutronics (electronics components).[3]

[3] Three of them are former Hungarian firms acquired by foreign investors, while six of them are green-field plants.

Figure 1 - Share of transnational companies in the industrial export of some countries



Source: World Investment Report, 1999, UNCTAD

The government aims at attracting knowledge-intensive and high value-added activities and branches, given the skilled and motivated labour force

The Hungarian government aims at attracting knowledge-intensive and high value-added activities and branches, given the skilled and motivated labour force at relatively low cost and the geographical proximity of one of the major markets of TNCs, namely the EU.

As for R&D, the picture is rather gloomy. R&D expenditures have significantly dropped since the late 1980s. Whereas 2.3% of GDP had been devoted to R&D in 1988, this ratio fall to 0.7% by 1996 and has remained at that level since then.[4] Given that GDP only reached its 1989 level in 1999[5] and rather high rate of inflation prevailed in this period,[6] it is a dramatic drop in real terms, indeed. According to CSO estimations, using the so-called pur-

[4] It should also be added that OECD methodologies to collect and interpret R&D data have only been applied since 1992. Thus direct comparison between the periods until 1992 and from 1992 should be taken with a pinch of salt. The sharp decline in the figures for R&D spending, however, has not been caused by the application of the new methodology. In other words it is a genuine phenomenon, not just a misleading statistical observation.

[5] In real terms GDP dropped by almost 20% by 1992 compared to the 1989 level due to the so-called transformation recession (using the term coined by Kornai [1993]. Although the late 1990s saw significant growth (around 4-5% in 1997-2000), the GDP has only reached its 1988 level in real terms in 1999. (Tables 1, 3)

[6] The rate of inflation (consumer price index) had fluctuated between 23-35% a year until the mid-1990s, and was still around 10% in 1999 and 2000. (Tables 2-3)

chasing power parities method, R&D expenditures in real terms in 1996 were a mere 36% of those in 1990. (OMFB [1997], p. 27).

Using the purchasing power parities method, R&D expenditures in real terms in 1996 were a mere 36% of those in 1990

To compare, EU countries on average spend around 1.8-2% of their GDP on R&D.[7] This is already a huge difference, moreover, their GDP per capita is three times higher than the Hungarian one.

Table 7 - Gross domestic expenditure on R&D (GERD), 1990-1999, current prices

GERD	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
billion forints	24,5	23,4	26,4	28,6	36	39,7	44,4	57,2	67,6	74
GERD/GDP (%)	1,61	1,09	1,08	1,00	0,93	0,75	0,67	0,74	0,70	0,68

Source: Central Statistical Office, Tudományos kutatás és kísérleti fejlesztés, various years

It is a declared objective of the government that GERD should reach 1.5% of the GDP by 2002. Most experts are sceptical, however, about the feasibility of this goal. Their main reservation is if it is possible to more than double R&D expenditures in an efficient way in the space of 2-3 years.

Inevitably, R&D personnel have also been cut quite drastically, by some 55% compared to 1988. Aggregate figures, as always, hide important differences. In some cases this cut has meant the necessary streamlining. In some other cases, however, it has represented a severe loss of useful knowledge (including tacit one) and skills developed and accumulated over time. In other words, it would not be possible to reproduce these intangible assets immediately once funds were made available. There are no reliable estimates readily available on the share of necessary streamlining and severe loss.

The composition of the total R&D personnel has also changed so that the number of researchers and engineers exceeded that of the supporting staff. Again, the overall picture is mixed. In some cases it is a step towards increased efficiency, but in other cases it causes inefficiency at a social level. When highly qualified scientists have to perform simple tasks, instead of spending their time on resolving scientific problems as they are trained for because of the lack of supporting staff, that is obviously a waste of scarce and expensive resources.

[7] The European Commission urges them to increase this ratio in order to catch up with the US and Japan. (EU 1996) The latter two countries spent 2.5-3% of their GDP in 1985-1999. (OECD [1998], [2000])

Table 8 - R&D personnel in Hungary, 1988-1999, full-time equivalent

	1988	1992	1994	1996	1997	1998	1999
Total R&D personnel	45,069	24,192	22,008	19,776	20,758	20,315	21,329
***of which* Scientists and engineers**	21,427	12,311	11,752	10,408	11,154	11,731	12,579
Other staff*	23,642	11,881	10,256	9,268	5,205	4,907	5,037

Source: Central Statistical Office, Tudományos kutatás és kísérleti fejlesztés, various years
** Includes technicians, assistants, administration, etc.*

Observers and politicians expected enterprises to play a decisive role in financing and executing R&D, and, in turn, the government to withdraw. Quite the opposite shift has occurred

Given the underlying principles of a market economy, some observers and politicians have expected enterprises to play a decisive role in financing and executing R&D, and, in turn, the government to withdraw. Quite the opposite shift has occurred for obvious reasons, and hence not really surprising. Two major elements of the relevant arguments are discussed here.

Most Hungarian companies are suffering from the loss of markets for two principal reasons, namely the collapse of CMEA, their former major market, and swift import liberalisation. Hence their sales had dramatically declined (by 15-75% in various industries) by the early 1990s compared to the last pre-transition years, 1988-89. Shrinking revenues, in turn, prevent them from generating adequate funds for R&D (see Table 9) and investment.

Another element of the explanation is that privatisation only started in 1990, and it has taken time to find investors. In most cases radical re-structuring was necessary both in the organisational set-up and in the product-market mix of these companies in order to prepare for privatisation. Therefore managers were not really in the position to make decisions on long-term issues, including the design and implementation of innovation strategies, for two reasons. First, it would have been somewhat hostile to the would-be owners to tie their hands, which, in turn, would have made the relationship between the (prospective) owners and managers somewhat uneasy. Not surprisingly, managers did not want to cause these types of conflicts. Second, managers were overwhelmed by the preparation for privatisation (re-structuring, cost-cutting, etc.), i.e. by short-term issues. In brief, uncertainties related to the would-be privatisation of companies also hindered innovation until the mid-1990s.[8]

One might find an apparent paradox here: firms do not spend a lot on R&D, yet, fierce competition – loss of former markets, import liberalisation – compels them to introduce new products and/or processes. Indeed, they do so – otherwise would not survive – but in most cases these innovation are not based on their

[8] For a detailed analysis of these issues see e.g. György and Vincze [1992], Havas [1997b], Havas and Inzelt [1994], Inzelt [1994], Inzelt *et al.* [1991], Tóth, G. L. [1994] and Vincze [1991].

own R&D projects. Quite often they rely on technologies provided by parent companies or other foreign partners, e.g. in a subcontracting agreement. Foreign firms not only encourage their Hungarian suppliers to introduce new products, processes and managerial techniques, but sometimes they even provide licences and know-how free of charge.[9] In other words, R&D expenditures cannot be used as a proxy variable for innovation.

R&D expenditures cannot be used as a proxy variable for innovation

Finally, the significant differences behind these aggregate figures should also be noted. Foreign-owned firms do spend more on R&D than indigenous ones,[10] moreover, they can also rely on the R&D results achieved, or purchased, by their parent company.

Table 9 - Breakdown of GERD by sources, 1990-1998, per cent

Funding sources	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Business	38.8	40.3	31.3	28.6	28.7	36.1	37.4	36.4	37.8	38.5
Government	58.6	55.8	62.9	65.1	63.0	55.1	51.2	54.8	54.7	53.2
Other domestic		2.1	2.9	3.9	4.7	4.1	6.9	4.6	2.8	2.7
Foreign, int'l		1.8	2.9	2.4	3.6	4.7	4.5	4.2	4.7	5.6

Source: Central Statistical Office, Tudományos kutatás és kísérleti fejlesztés, various years

Short-term issues, that is, radical cost-cutting to avoid insolvency and preparation for privatisation, prevent companies from elaborating and implementing mid- and long-term actions, such as innovation and investment. The number of R&D units operated by firms, therefore, sharply decreased in the early 1990s, yet, considerably increased since the mid-1990s.[11] In 1997-98 a number of large, foreign-owned firms have either substantially increased R&D spending at their existing R&D units or decided to set up new R&D facilities.

Some examples of foreign-owned companies carrying out R&D in Hungary are listed below by industries:

- Lighting: GE-Tungsram;
- Medical equipment: GE Medicor;
- Pharmaceuticals: Sanofi-Chinoin, Astra, Teva-Biogal;
- Household chemistry: Unilever;
- Information and communication technologies: IBM, Ericsson, Nokia, Philips, Siemens, Mannesmann/Rexroth,

9 For such cases in the automotive industry see Havas [1997a].

10 According to a recent CSO census, cited in Inzelt [1998], manufacturing firms located in Hungary spent on average 0.86% of their revenues on R&D in 1995. This ratio was 0.97% for (partially or wholly) foreign-owned firms on average, but 1.59% for firms in which foreign ownership was above 75%. Fully Hungarian-owned manufacturing firms, however, only spent 0.64% of their revenues on R&D.

11 Besides economic reasons behind these changes, there might be some methodological ones, too. Given the organisational and ownership changes occurring on a massive scale, quite a few companies might have not been reached by the Central Statistical Office. Moreover, a number of those reached by the CSO survey might not have answered. The situation has become more settled by the late 1990s, and CSO has also learnt important methodological lessons. Thus more recent statistics provide a more sound base for analysis.

Motorola;
- Automotive: Audi, Knorr-Bremse, Michelin, TEMIC, ZF;
- Agriculture: Novartis/Sandoz Seeds;
- Materials: Zoltek, Furukawa.

The expanding number of R&D units in higher education is also worth noting. (Table 10)

Table 10 - Number of R&D units, 1990-1999

Type of organisations	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Research institutes	69	68	68	68	63	61	73	80	74	66
Higher education	940	1,000	1,071	1,078	1,106	1,109	1,120	1,302	1,335	1,363
Firms	174	124	98	178	183	226	220	246	258	394
Other*	73	65	50	56	49	46	48	51	58	64
Total	1256	1,257	1,287	1,380	1,401	1,442	1,461	1,679	1,725	1,887

Source: Central Statistical Office, Tudományos kutatás és kísérleti fejlesztés, various years
** Includes R&D units operated at/by national and regional archives, libraries, museums, hospitals and ministries*

Foreign aid projects have also eased the severe financial situation to a certain extent. Although foreign funding has increased significantly in relative terms (see Table 9), these grants have not been able to counterbalance the aforementioned dramatic drop in R&D expenditures, given their low weight. Nonetheless, they have made a significant impact via diffusing new methods to allocate grants (e.g. emphasis on individual projects rather than financing institutes, the importance of project assessment and monitoring). It is also of importance that some vital projects have been continued and significant new ones could be started due to these funds.[12]

Utilising the potential in international S&T co-operation is an important chance for catching up. Since 1999 Hungary, among other CEE countries, participates in the 5th RTD Framework Programme of the European Union. This is a further impetus for the development of the domestic R&D institutions and for fostering the international networking. Taking into account that Hungary, among other candidate countries, pays (currently a reduced) participation fee in the Framework Programme, it is an urgent task to strengthen the R&D infrastructure and improve the potential Hungarian participants' skills to write successful project proposals. Networks of EU liaison offices and National Contact Points support applicants.

Bilateral international S&T co-operations are also of special importance. At present, Hungary has 29 inter-governmental S&T

[12] As the Cold War ended, radical changes have also occurred in international scientific and technological relations. Hungarian researchers and R&D institutes can now join mutually advantageous international projects. Hence basically all major international programmes and organisations, such as the 4th and 5th EU RTD Framework Programmes, COST, PHARE ACCORD, EUREKA, CERN, OECD, NATO Scientific Projects and ESA are now open for Hungarian participation.

agreements with 630 ongoing projects, involving at least 20% of the Hungarian R&D community.

Regarding the output of innovation process, the number of patents registered in the United States can be used as a reliable and comparable indicator. One also has to bear in mind, however, that certain innovations cannot be patented, and some innovators do not bother to register even patentable results either because shear ignorance (lack of knowledge about the importance to patent or about how to do it) or for lack of funds. Several former states were split, therefore, to save data for comparison, figures for the former Czechoslovakia and URSS are also included.

Table 11 - Central European and Russian patents granted in the USA

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total
Croatia	0	0	0	0	2	4	0	0	4	5	3	**18**
Czech Rep.	0	0	0	0	0	1	1	5	14	17	25	**63**
Hungary	*130*	*93*	*86*	*89*	*62*	*48*	*51*	*43*	*25*	*52*	*39*	***718***
Poland	14	17	8	5	8	9	8	16	11	19	20	**135**
Slovak Rep.	0	0	0	0	0	0	0	1	3	2	6	**12**
Slovenia	0	0	0	0	3	11	5	13	7	20	13	**72**
Russian Fed.	0	0	0	0	3	28	99	118	112	194	185	**749**
URSS	162	177	182	67	67	57	12	16	4	6	3	**753**
Czechoslovakia	34	39	27	18	15	20	15	9	10	9	5	**201**

Source: United States Patent and Trademark Office

Table 11 shows interesting trends and ratios. In 1989 practically two countries performed relatively well: URSS and Hungary. By 1999, the Russian Federation took the same role as URSS in the region: despite the reduction of population and resources in 1991, the Russian Federation is still doing well. If the size of the countries compared is also considered, two CE countries can be highlighted: Hungary and Slovenia. Slovenia, however, has considerably higher R&D expenditures per capita (115 euro in 1997) than Hungary (30 euro in 1997).

Issues and challenges:

- The first phase of the transition process in Hungary is over. The most important institutions of a democratic political system and a functioning market economy have been re-established.
- The absolute and relative position of the country – reflected by main economic indicators – has been improved considerably since 1996. Thus the macroeconomic conditions are not inhibiting the innovation process any more.
- The rate of inflation, however, is still poses a challenge.
- R&D expenditures and employment have not recovered from the severe transformation crisis yet.
- Companies, in the meantime, had to be innovative to survive the intense competition both in their local and export markets. Therefore they mostly relied on foreign technologies and methods when introducing new products, processes as well as organisational and managerial innovations.

1.2 Main developments in innovation policy

No systematic science and technology, innovation or industrial policies have been implemented since the early 1990s

Although transition has brought about a number of crucial political and economic changes effecting the S&T system, no systematic science and technology, innovation or industrial policies have been implemented since the early 1990s.[13] For methodological reasons it is practically impossible to establish who have blocked various initiatives or why: policy-makers would not disclose any details of these day-to-day negotiations as some important details are confidential, while revealing other details would adversely effect their future 'battles' for funds and influence.[14]

One important reason must have been the lack of adequate funds. Most long-term policies, such as education, infrastructure, innovation, industrial, SMEs, regional, health care, and environment ones, would require either substantial investment projects or generous subsidies, or even both. The transition process, however, has hit most of Central European countries: instead of facing the 'problem' how to spend abundant financial resources they have to cope with significant budget deficits plus find means to tackle more urgent needs, such as rocketing unemployment. One might add, however, that lack of fund would require redoubled efforts to devise policies how to spend scarce resources, rather than not thinking at all on setting priorities.

Sometimes lack of knowledge about up-to-date policy principles and methods – or a shear ignorance of them? – also poses a significant problem, and hence prevents the introduction of them.[15]

As for S&T policy, OMFB [1995] even summarised and published the most common arguments put against a more pro-active S&T policy, together with counter-arguments, in an attempt to convince politicians and government officials that OECD and EU member countries are not following an extreme 'laissez-faire'

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[13] Policy proposals, however, have been drafted, see, e.g. IKM [1993], IKM, OMFB, PM [1993], OMFB [1995], OMFB [1999]. Some of them are discussed briefly in this subsection.

[14] It would go beyond the scope of this paper to speculate about political reasons. At a rather general level, however, some, mostly ideology-driven, arguments can be summarised. Given the political and economic legacy of central planning most politicians have been either against any sort of strategic thinking conducted, and actions taken, by the government, or not wanted to 'fight' hopelessly for these ideas, even if they believe in them. Policy-makers, for obvious reasons, have followed these lines. Ironically, though, quite a few politicians, as ministers, pursued rather etatist policies in their day-to-day decisions, sometimes with rather long-term repercussions, both in 1990-94 and 1994-98 when the two governments in power had rather different political backgrounds. A more detailed analysis of their economic policies, declared and actual ones, would, obviously, require a separate paper.

[15] For example a recent study, Glatz [1998] still treats 'science' as a separate entity, i.e. not in the broader context of innovation.

ideology.[16] Even this type of rather unusual reasoning has not been powerful enough.

As already mentioned, there have been several innovation policy documents since the mid-90s having different views and emphases, reaching different but generally a low level of perception and acceptance. The most important ones are briefly described below.

In 1995, OMFB (National Committee for Technological Development) elaborated an innovation policy document entitled *"The Government's Concept for Technical Development"*, formulating theses, providing a vision and listing government tasks both in the short and long run. OMFB Council, the advisory body of the Government in innovation related issues that time accepted it and gave its full support. Unfortunately, the further advancement of this document in the government approval process was blocked by the Prime Minister's Office (MeH) and the document never reached the cabinet.

There was no real political will and support for an innovation policy. Financing of R&D and innovation reached its lowest level ever in 1995 and 1996

In 1996, a *"Modernisation Programme"* of the then coalition was formulated, 'recycling' some elements and ideas from the above-mentioned document (OMFB, 1995), but again, there was no real political will and support for an innovation policy. Just after the drastic austerity programme implemented in 1995 there were no extra funds to promote R&D and innovation. In fact, finance for R&D and innovation reached its lowest level ever in these two years: 1995 and 1996. Some R&D schemes were even ceased and not a single new one was launched that time.

After the 1998 elections a new government took office and, in the meantime, the internal and external conditions of the economy became significantly better. The harmful macro economic trends stopped in 1995-96 and a healthy growth started from 1996-97. In January 1999, the minister of economy gave the new OMFB President a task to elaborate a new innovation policy. After several months of collecting opinions, analysing the policies of a dozen of advanced countries, a new policy document has been completed by November 1999, entitled *"Innovation strategy for competitiveness"*. Before any attempt to implement this strategy, by a surprising political decision on 31 December 1999, OMFB was merged into the Ministry of Education (with effect from 1 January 2000, see a more detailed description below). The new political leaders who took control of R&D and innovation policy have not

In January 1999, the minister of economy gave the new OMFB President the task to elaborate a new innovation policy

[16] The prevailing arguments against a more pro-active S&T policy were as follows: 1) Government actions in, or subsidies for, technical development is part of the 'socialist past' (i.e. should be discontinued). 2) Scientific results automatically generate technological development. 3) Know-how and other R&D results should be purchased from abroad (in other words, economic results cannot be expected from indigenous research). 4) We should wait for economic successes that generate resources for technology-intensive development. Both the practice of advanced countries and the literature on S&T and innovation policies strongly reject these views.

considered that document at all.[17] It was printed in December 1999 but its circulation was stopped in early January 2000.

The latest R&D policy document entitled* "Science and Technology Policy – 2000"*. This document is a sharp return to the 'good old' linear model of innovation

The latest R&D policy of the government is set out in a document entitled *"Science and Technology Policy – 2000"*. This document has been drafted by some civil servants of the Ministry of Education, and the Science and Technology Policy Council (TTPK) approved its first version in March 2000. The final version was confirmed by a government decree in May 2000. The main line of this document is, roughly speaking, the wish list of the academic research community and can be seen as a sharp return to the 'good old' linear model of innovation. The systemic, complex nature of innovation (even the basic concept of demand for innovation, let alone the need for a rich institutional systems, various networks, etc.) is not considered. Instead, the 'politician policy-makers' at the top level – working for decades as respected scientists – have shown a deep empathy towards 'basic research'.[18]

Research, development and innovation is one of the seven programmes outlined in a new national development strategy, the "Széchenyi Plan". It has been revised several times since its first version was published in March 2000. The current Széchenyi Plan consists of the following broad programmes:

- Enterprise Development
- Housing Programme
- Tourism Development
- *Research, Development and Innovation*
- Information Society and Economy Development
- Highway and Related Infrastructure Development
- Regional Economy Development.

The new national development plan outlines a move towards a broader concept of innovation

This version of the Széchenyi Plan signals a move towards a broader concept of innovation, yet, there is room for some non-negligible improvement; e.g. the objectives of innovation and means to promote it are still somewhat mixed.

[17] Civil servants – who wish to be remain unnamed – also recall that even the term of 'innovation' was 'banned' at least in the first few months in 2000, just after the absorption of the former OMFB into the Ministry of Education.

[18] It is a commonplace both in the practice of leading companies and other knowledge producing organisations and in the literature that the boundaries between basic and applied research are blurred, and we are in the age of "Mode II" of knowledge production (Gibbons *et al.* [1994]).

Other policy documents

TEP, Technology Foresight Programme

Hungary launched TEP, its first foresight programme[19] in 1997 practically for two reasons. First, as the country is undergoing fundamental economic and social changes – that is, the transition towards market economy – major institutions are currently being shaped. Second, the so-called transition decline has turned into economic growth in the last few years; therefore, it is high time to think about medium and long-term issues. In other words, now it is possible to devise strategies aimed at improving the quality of life and the long-term international competitiveness – the major goals of TEP.

Hungary launched TEP, its first foresight programme in 1997. Foresight seemed an adequate tool to bring together business, the science base and government in order to identify and respond to emerging opportunities in markets and technologies

Foresight has seemed an adequate tool to bring together business, the science base and government in order to identify and respond to emerging opportunities in markets and technologies. In short, TEP should contribute to the design and implementation of a national innovation strategy based on a comprehensive analysis of:

- World market opportunities (new markets and market niches)
- Trends in technological development
- Strengths and weaknesses of the Hungarian economy and R&D system

The above, demanding, aim can only be achieved if researchers, business people and government officials join intellectual forces to assess Hungary's current competitive position and impacts of likely global market and technological trends. Hence their re-aligned and re-invigorated relationships can be regarded as a means of the principal goal. However, the process in which these experts with different backgrounds communicate and share ideas about longer term issues, generate consensus, and co-operate with increased commitment in devising and realising a national strategy, seems to be so crucial that it is an end in itself. In other words, the programme is also aiming at strengthening the formal and informal relationships among scientists and engineers, managers and civil servants, alike spreading the co-operative and strategic thinking.

Accession to the EU is a major challenge since it is likely to shape Hungary's future to a significant extent. It requires a clear and

[19] Technology foresight can be defined as a systematic means of identifying scientific and technological developments that could have a strong impact on industrial competitiveness, wealth creation and quality of life. Most foresight programmes also promote – and rely on – networks of business people, researchers and government officials. On the other hand, exploitation of science and technology largely depends on effective networking between business, academia and government. Many governments have realised the importance of foresight activities from this point of view, too, and thus this relatively new, and innovative, technology policy tool is spreading across continents.

sound vision about Hungary's role and opportunities in the enlarged European socio-economic system. TEP activities and results can contribute to the success of the integration process.

Written TEP results are comprehensive analyses of strengths and weaknesses, scenarios based on these inquiries and likely global trends, as well as recommendations for public policies regarding how to realise the most desirable scenario. These analyses and information should also assist Hungarian firms in devising and implementing their strategies to improve their competitiveness.[20]

TEP is a holistic foresight programme, based on both panel activities (scenarios, SWOT analysis, recommendations, policy proposals, etc.) and a large scale Delphi survey. TEP is being conducted in three stages, namely pre-foresight (October 1997 – March 1998), main foresight (April 1998 – May 2000) and dissemination (June 2000 onwards) stages.

The first round of the Delphi survey has been completed by May 1999, the second one by November 1999, and then data have been processed and analysed. By May 2000 panels have completed their reports, consisting of a critical description and assessment of the current situation, alternative futures (visions) and recommendations (policy proposals) to 'prescribe' the way leading to the most desirable – and feasible – future. Around 100 workshops have been organised to discuss the preliminary results and disseminate the final recommendations.

Policy proposals are currently being discussed by the relevant standing committees of the Parliament and experts of various ministries and government agencies, who can also exploit these ideas when devising their own policy documents, and thus can contribute to the implementation process.[21]

TEP is going to be evaluated by an international group of methodology and innovation policy experts later in 2001.

Major influences on the development of policy

The major factor influencing the innovation policy has always been the agenda of the ministry actually supervising (the former) OMFB, especially the process of devising financial schemes and their application. Services of innovation policy researchers or think tanks have not been used institutionally.

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[20] Various reports by the panels and the Steering Group have always been made available through the Internet since their first versions have been drafted. The final reports can be found at www.om.hu/j6.html, clicking on 'TEP' in the menu (currently only in Hungarian, their English translation should be completed in a few months).

[21] By the end of May 2001 3 parliamentary committees have discussed and endorsed the relevant panel reports, and experts working for 5 ministries have also expressed their willingness to incorporate at least some of the ideas into their own policy documents.

Until the end of 1999, the Ministry of Economic Affairs, itself pursuing a rather restrictive policy for some years, had supervised the formulation and implementation of innovation policy. All the major decisions, however, had also to be approved by the OMFB Council, consisted of high-ranking representatives of interested ministries, professional associations, business people and independent experts. In the period of 1994-1998 – as OMFB staff members recall – innovation policy was not really in the mind of decision-makers in the Ministry of Economic Affairs. KMŰFA, the fund allocated to finance applied R&D was drastically cut to 2000 million HUF in 1995, reaching its deepest value ever. This value was about 10% of the 1988 value in real terms. The relation between the Ministry of Economic Affairs and OMFB was explicitly 'reserved' - according to some interviewees.

Under the current government, in 1998-1999 the Ministry of Economic Affairs devised a complex development plan, taking several innovation-related aspects and priorities into account. This plan was also a preparation for the future EU co-operation, with special attention to the eventual access to the Structural and Cohesion Funds. The relation between the Ministry and OMFB became suddenly very good.

In December 1999 a new Minister of Economic Affairs took office, advancing somewhat different priorities. The aforementioned Széchenyi Plan shows that different way of thinking. As mentioned already, in the meantime there was an organisational change in the government: since January 2000, the Ministry of Education took control of R&D and innovation policies. The new science policy document of the Ministry of Education puts more emphasis on science than on technology, that is, the exploitation of S&T results.

As already shown, there is no coherent innovation policy, it is just subordinated to the ideas and political agenda of the politicians actually in charge. A few experts and some civil servants of OMFB/OM, however, try to follow international developments (e.g. OECD and EU policy documents and practice), and have made efforts to include some economic and innovation-related aspects in the currently more 'fashionable' science policy – with not much success so far.

Table 12 - Main policy documents and consultative papers since 1996

Title of document and date of approval	Organisation responsible	Legal status	Comments
Modernisation Programme (1996)	MeH (Prime Minister's Office)	Government decision, based on the election programme of the Socialist Party (1994)	No real implementation, just formal control of deadlines
Innovation strategy for the competitiveness (1999)	OMFB (National Committee for Technological Development)	Consultative paper, accepted by the OMFB Council, published in December 1999	Informally rejected by politicians taking charge of innovation policy in January 2000
Science and Technology Policy – 2000	OM (Ministry of Education) and TTPK (Science and Technology Policy Council)	Consultative paper, accepted by the TTPK and the Education and Science Committee of the Parliament	Science-oriented document based on wishes of scientists. It is the base for National R&D Programmes.
Széchenyi Plan (2000)	Ministry of Economic Affairs	A constantly revised consultative paper with strong political support, trying to channel public and private funds towards some priority directions.	A mixture of a development programme and political declarations. Some public funds have been allocated to various sub-programmes, but its huge financial requirements are not secured yet.

Table 13 - Major government funded programmes and initiatives in favour of innovation (2000)

Name of programme, initiative	Government body responsible	Objectives of programme	Funding available
1. OTKA (National Research Programme)	OTKA Office, supervised by the Academy of Sciences	Promoting basic research in any field	State budget
2. GFC (Economy Development Programme)	Ministry of Economic Affairs	Promoting company investments	State budget
3. KMÜFA (Central Technological Development Fund)	OM KFHÁ[22]	Promoting applied research and experimental development	State budget and reimbursements from former soft loans
3.a Applied R&D Programme	OM KFHÁ	Development of new products, services and processes	National budget (KMÜFA[23])
3.b. Competitive Product Programme	OM KFHÁ + GM	Improving the competitiveness of exiting goods by R&D	KMÜFA, co-financing with the Ministry of Economic Affairs
3.c. "Maecenas" Programme	OM KFHÁ	Conference participation, conference organising, membership fee in international S&T organisations	KMÜFA
3.d. Information and Communication Technology Programme (IKTA)	OM KFHÁ	R&D in five specific areas of Information and Communication Technologies	KMÜFA
3.e. Environment Protection Programme	OM KFHÁ	Developing passive environment protection technologies and clean technologies	KMÜFA
3.f. Regional Innovation Programme	OM KFHÁ	The applicants are county Chambers of Commerce or their consortia to promote local R&D in SMEs	KMÜFA, co-financed by the county Chambers of Commerce
3.g. Special Innovation Programme for three counties	OM KFHÁ	Improving the innovation skills of SMEs in 'cohesion' areas	KMÜFA, initiated by the yearly Budget Act
3.h. TECH-START Programme	OM KFHÁ	Helping the growth of innovative SMEs	KMÜFA
3.i. Liaison Office Programme	OM KFHÁ	Helping Hungarian participation in the EU 5th RTD FWP	KMÜFA
3.j. Consortium Building Programme	OM KFHÁ	Helping Hungarian participation in the EU 5th RTD FWP	KMÜFA
3.k. Participation in the NATO Science Programme	OM KFHÁ	International co-operation	KMÜFA

[22] National Committee for Technological Development (OMFB) until 31 December 1999, R&D Division of the Ministry of Education (OM KFHÁ) since 1 January 2000

[23] Its sources are the national budget and the reimbursements from earlier favourable loans.

Assessment and evaluation of programmes

Hungarian R&D programmes were fully reorganised in 1990, following the political changes. Open and transparent programmes were launched based on West European examples, using independent evaluators and expert panels. The list of granted supports was published. At project level, evaluation was obligatory, including a site visit of independent experts, checking the results of the project.

At programme level, the evaluation and assessment activities began in 1995. An OMFB expert joined the Evaluation Task Force of TAFTIE (www.taftie.org). This co-operation has brought personal contacts, theoretical and methodological knowledge, and served as a basis to adopt evaluation techniques in Hungary. This culture has mainly originated from the Nordic countries, therefore there is more emphasis on performance indicators and learning effects and less on formal cost and benefit analyses.

The first programme evaluation was carried out in 1995-96 focussing on the largest OMFB programme, the Applied R&D Programme. A Swedish expert from NUTEK helped in defining the goals and methods, and also participated in the final phase of evaluation. The further evaluations were carried out with Hungarian experts, provided with information, methods and examples obtained via the TAFTIE co-operation. All programme evaluations are published in Hungarian and in English, and the main findings are disseminated in conferences and workshops. In 1999 OMFB organised the 3rd TAFTIE Evaluation Seminar in Budapest, with several foreign guests, including a representative from the EC DG XII (Research, more recently).

The list of OMFB evaluation projects is as follows:
1. Evaluation of the Applied R&D Programme (672 projects, 1995-96).
2. Evaluation of the Hungarian participation in the EUREKA Co-operation (52 projects, 1996-97).
3. Evaluation of the Programme for the Development of R&D Infrastructure (3138 projects, 1997-98).
4. Evaluation of the "BALATON" French-Hungarian bilateral co-operation (74 projects, 1998).
5. Evaluation of the Programme for Developing Competitive Products (202 projects, 1998).
6. Evaluation of the Hungarian participation in the COST Co-operation (102 actions, 1998).
7. Evaluation of the Hungarian participation in the ESA/PRODEX programme (1999).
8. Evaluation of the SME Policy of the OMFB (1999-2000).
9. Evaluation of the activities of the Hungarian EU Framework Programme Liaison Offices (14 offices, 2000).

10. Evaluation of the Hungarian Participation in the EU 4th and 5th RTD Framework Programmes (2001).

The evaluation reports are published in some hundred copies, available for any partner. There have been several examples when programme rules have been modified due to the recommendations produced by the evaluation (based on participants' opinion).

Emerging issues:

- No systematic science, technology and innovation (STI) policies have been discussed and approved by the government since the early 1990s although several documents have been drafted. An 'implicit' STI policy, however, has been implemented through various schemes operated by the former OMFB, via financing the research institutes of the Hungarian Academy of Sciences, as well as by other schemes and grants funded by public money.
- Various policy tools have also been applied, e.g. foresight and evaluation of programmes, but their impact is far from their potential. As innovation policy is still not in the forefront of policy discussions (and decisions), and frequent organisational changes have prevented the formation of a group of well-informed, 'receptive' policy-makers, these new policy tools are not regarded as essential elements of the broader policy formulation process, and far from being fully exploited.
- The most recent developments are somewhat mixed: a current policy document represents a return to the linear model of innovation, while the national development plan signals a move towards a broader concept of innovation. Yet, it is still not clear what significance policy-makers attach to innovation. Aims and tools of innovation policy do not constitute a coherent system in this latter document either.
- Firms, in the meantime, are under tremendous pressure to innovate by market forces. In their efforts they have utilised both the available policy schemes and other sources of innovation.

1.3 The innovation policy community

Political representation

The Education and Science Committee of the Parliament is the highest level political representative of the science and innovation in Hungary.

Science and Technology Policy Council (TTPK) and its Scientific Consulting Body (TTT)

TTPK is the highest level consulting and co-ordination body in the field of science and technology in the government, headed by the science and technology policy advisor of the Prime Minister. TTPK assists the government in science and technology policy issues and in the preparation of strategic decisions. The TTPK secretariat is a unit of the Ministry of Education. TTT is an expert committee of TTPK, chaired by the parliamentary secretary of state of the Ministry of Education.

Ministry of Education (OM)

The ministry plays a key role in formulating and implementing science and education policies. OM supervises the whole state education system from elementary schools to universities, except of the defence and police education institutions, thus it has full responsibility in providing human resources for the economy. Universities enjoy broad autonomy. In 1998-2000 a so-called higher education integration programme was completed, merging several universities in order to optimise the use of their resources.

In January 2000 the Ministry of Education took over the former OMFB (National Committee for Technological Development) and it became a new R&D Division of the ministry responsible for the government's technology policy, for R&D and innovation programmes

As already mentioned, in January 2000 the Ministry of Education took over the former OMFB (National Committee for Technological Development) and it became a new R&D Division of the ministry. The responsibilities of the former OMFB Council substantially diminished. It is not a decision-making body any more, it is an advisory board for the minister of education.[24] The new R&D Division, being a legal successor of OMFB, is still the major government unit in the field of R&D policy and support. The Division is responsible for the government's technology policy, for R&D and innovation programmes, for the international R&D

[24] Yet, its members are still appointed by the prime minister as it has been stipulated by the former legislation. It clearly shows that (i) it was a rather hasty decision – without the due professional and even legal preparation – to 'downgrade' the status of the former OMFB from being a government agency to become a division of a ministry, and (ii) the government most likely wanted to avoid a proper parliamentary debate required to pass any amendment of the legislation concerning the former OMFB and OMFB Council. Thus the name of the Ministry of Education has not been changed either – it would have also required to amend another law, and hence a parliamentary debate – despite its considerably extended responsibilities.

co-operation in bilateral and multilateral relations as well as for supervising the network of Hungarian science and technology attachés. The R&D Division manages the KMÜFA (Central Technology Development Programme), and pays the membership fee charged to Hungary for joining the EU 5th RTD Framework Programme. It also runs direct and indirect accompanying measures promoting Hungarian participation in the Framework Programme.

The head of the R&D Division supervises OMIKK (National Technical Information Centre and Library). OMIKK collects and processes scientific, technical and economic information and provides information services based on its primary and secondary sources, partly as business, partly as non-profit activity. OMIKK operates also a nation-wide R&D information system.[25]

Further ministries

All ministries have some role in science and technology, at least in their own field, financing R&D institutions, research and innovation programmes, education and training actions. The Ministry of Economic Affairs supervises the government offices responsible for quality management, intellectual property, standardisation, metrology, energy and consumer protection. Other ministries (FVM – Ministry of Agriculture and Rural Development, KM – Ministry of Environment Protection, KVM – Ministry of Transport and Water Management, EüM - the Ministry of Health) also carry out considerable R&D and innovation tasks. Some ministries supervise their own research institutes.

The Ministry of Economic Affairs supervises the government offices responsible for quality management, intellectual property, standardisation, metrology

Hungarian Academy of Sciences (MTA)

Based on the Academy Act in 1994 (XL 1994) the Hungarian Academy of Sciences is a legal entity, a public body having self-government rights. It has a high degree of independence in scientific, political and financial respects. Its task is to develop, promote and represent science. MTA gives its expert opinion to the Parliament or the Government upon request in any topic. MTA supervises the ethical norms in science and publishes scientific journals. MTA has the right to establish and operate research institutes, libraries, archives, information services, etc. In 2000, after a merger of several smaller research institutes, MTA had 33 research institutes, 5 of that have been recognised by the EU as centres of excellence.

The General Assembly of MTA elects the president, the vice presidents, and the secretary general and further delegates. The

[25] At the time of writing the final draft (early June 2001) there is a heated debate – even including strikes and demonstrations organised by librarians and readers – about the future status of OMIKK. It might be acquired by the Budapest Technical and Economic Sciences University's Library. Some observers say the main reason is to make available OMIKK's precious building for other users.

president of MTA, being elected for five years, has to report to the Government every year and to the Parliament every second year on the activities of MTA and on the general conditions of science in Hungary.

National Scientific Research Programmes (OTKA)

MTA supervises OTKA (National Scientific Research Programmes) that support basic research projects, young researchers' projects and R&D infrastructure development on a tender and contract base. OTKA was established in 1991.

Higher Education Development Programmes (FEFA)

FEFA used to be the "Fund for Catching up with the European Higher Education" since 1991 as an independent financial fund, allocating mainly international loans. FEFA was reorganised in 1996 with a new name but with the same acronym. FEFA now promotes the development of new higher education curricula and infrastructure, especially hardware, software and network investments. Recently, FEFA plays an important role in promoting university and college mergers, the aforementioned higher education integration. The Ministry of Education supervises the activities of FEFA.

Other stakeholders active in the field of innovation policy

Hungarian Rectors' Conference (MRK)

The Hungarian Rectors' Conference is a representative body of higher education institutions, having the right to give opinions and declarations in any question related to the higher education. The body consists of the university rectors, keeping informed their institutional councils on the activities and decisions of MRK.

Higher Education and Scientific Council (FTT)

FTT is an advisory and decision-preparatory body, consisting of a chairman and 21 members. The relevant ministries, higher education institutions, MTA, MRK, research institutes, the students, professional organisations, employers and local governments are represented in FTT. The Prime Minister appoints the members for three years.

National Accreditation Committee (OAB)

The National Accreditation Committee plays a key role in the control and documentation of quality in higher education. Its members represent higher education institutes and research institutes on a parity base. The accreditation is granted for eight years. The Committee and the accreditation process have a strong im-

pact on the number and feature of research programmes at the accredited universities.

Hungarian Patent Office (MSzH)

The Hungarian Patent Office is a government body of intellectual property, carrying out official procedures in the fields of patents, utility model protection, industrial design protection, trademark grant procedures and geographical indications, official registration and administration. The Office provides also information, publishing, training and documentation services. MSzH participates in the domestic legislation process and operates professional bodies and plays an active role in the work of WIPO, in the TRIPS Council, in the EU accession process and maintains active bilateral relations.

Chambers of Commerce

Three large Chambers were established by the 1994/XVI Act, having obligatory membership for all companies, farmers and craftsmen. Their tasks include the promotion of technological development and innovation, the development of R&D infrastructure and the related PR activities: organising fairs, exhibitions and conferences. Chambers began to strengthen by 1997-98, accumulating own resources for launching regional innovation programmes, partly as own initiatives, partly co-financing actions of ministries and other government organisations. The present government is not in favour of Chambers. Therefore they have changed the previous legislation, and thus membership in Chambers is not obligatory any more. It has been a popular move for some hundred thousands of small business, and it is also suitable to weaken these non-desired organisations. It is still not clear how this decision will influence the existence of chambers and the involvement /representation of firms in policy formulation.

Non-profit R&D organisations

Non-profit organisations play an increasing role in research and higher education. There are several foundations aiming at promoting research in general and young scientists in particular.

The most important foundation is the Zoltan Bay Applied R&D research institute network, established by OMFB, with the support of the German government. The idea of the Bay network has been based on the experience of the German Fraunhofer Gesellschaft. The mission of these institutes is to convert university R&D results to marketable products and services. No major success has been achieved so far.

Further non-profit R&D organisations are some research institutes formerly financed and supervised by various ministries, first transformed into companies in the early 90s, and then reorganised as having non-profit legal form in the late 90s.

Professional and scientific associations

There are a large number of professional and scientific associations in Hungary. The most important ones are MTESZ and MMK.

MTESZ, the Association of Technical and Scientific Organisations is an umbrella organisation, comprising 43 professional organisations with altogether 100 thousand engineers, researchers, agricultural and economic experts as members. There are also companies being members of MTESZ. MTESZ member organisations are active in organising lectures, workshops, excursions and social events.

MMK, the Hungarian Chamber of Engineers is a professional organisation with more power than MTESZ, having about 10 thousand members. A series of independent engineering jobs (design, expert, technical controller) need to be approved by MMK and a yearly payment for being registered. MMK plays important role in the protection of common interest and puts considerably emphasis on engineering ethics and fair competition.

Organisations promoting entrepreneurship

Organisations promoting entrepreneurship play important role in the implementation of technical innovations. The largest one is MVA, the Hungarian Enterprise Development Foundation, established in 1991 by PHARE aid. MVA created an active and dense nation-wide network of consultancy and information offices.

There are several other consultancy offices, SME networks, incubator houses, and technology centres, some of them set up by at local or regional initiatives. All counties established Development Agencies in the recent years, channelling and co-ordinating the utilisation of all the available local, regional, national and international financial sources and distributing information and advice. There are also consulting fora where these agencies exchange information.

Organisations of business sector

The following business organisations deal with innovation related questions regularly: Hungarian Association of Industrialists (Magyar Gyáriparosok Országos Szövetsége, MGYOSZ), National Association of Entrepreneurs (Vállalkozók Országos Szövetsége, VOSZ), National Association of Craftsman (Ipartestületek Országos Szövetsége, IPOSZ). The role of Hungarian Innovation Association (Magyar Innovációs Szövetség, MISZ) is especially visible, running its own incubator house and weekly periodical, and maintaining a permanent and active presence in the press in all innovation-related questions.

The two most important government bodies responsible for technology and innovation policy are the R&D Division of the Ministry of Education and the Ministry of Economic Affairs. However, other ministries and various committees also play a non-negligible role. Business and professional associations also try to shape the policy formulation process by being active in the relevant committees and at other fora (e.g giving presentations at workshops organised and attended by government officials).

1.4 Assessing innovation potential: data collection, surveys and indicators

There is a reliable and consolidated data collection and documentation system run by the Central Statistical Office (KSH), based on OECD methodologies. The yearly reports contain a separate chapter on scientific research and development, publishing the following figures:

a) Principal data of R&D units

- Number of units by type
- Staff number and distribution by type of institution
- Staff distribution by qualification
- Costs
- Investments
- Number of projects (all)
- Number of projects in international co-operation
- Published books (in Hungarian, in other languages, all)
- Published articles in journals (domestic, foreign)
- Patent applications (domestic, foreign)
- Granted patents (domestic, foreign)

b) Data of R&D units by types of organisation (R&D institutes, R&D units of higher education, R&D units of enterprises, other research units, total)

- Staff (FTE) (of that: scientists and engineers, support staff)
- Current expenditures
- Wages and incomes
- Material costs
- Capital expenditures

c) Data of R&D units by branches of science

Natural sciences, of which:

- Mathematics
- Physics
- Chemistry
- Geology
- Biology

Engineering and technology, of which:

- Architecture
- Mining
- Metallurgy
- Power generation
- Chemical industry
- Engineering, electrical industry
- Electronics industry
- Light industry
- Food industry
- Transport and telecommunication

Medical sciences

Agricultural sciences, of which:

- Crop production
- Horticulture
- Mechanisation, building, electrification of agriculture
- Animal husbandry
- Veterinary sciences

Social sciences, of which:

- Philosophy
- Pedagogy
- Political sciences and law
- Economics
- Organisation science
- History, archaeology, ethnography
- Linguistics, literature
- Research of arts

d) Financial sources of R&D expenditures

- Expenditure of enterprises
- State budget
- Allocated state funds
- Other domestic sources

- International organisations

e) Utilisation of R&D expenditures

- For scientific research,
  of which:
    - for basic research
    - for applied research
- For experimental development
- Expenditures as a percentage of GDP

f) Data of R&D units by industries

- Agriculture
- Manufacturing
- Electricity
- Construction
- Trade
- Transport, post and telecommunication
- Business activity related services
- Public administration
- Education
- Health and social work
- Other community service activities

g) Persons with scientific degree

- Hungarian members of the Academy
  of which:
  - ordinary member
  - corresponding member
- Number of foreign members of the Academy
  of which:
  - external member
  - honorary member
- Number of scientific degree holders
  - doctor of sciences
  - PhD

h) Persons with scientific degree by age

- Ordinary and corresponding members of the Academy
- Those with scientific degree
- Doctor of sciences
- PhD

i) Number of scientific researchers and engineers with scientific degree working at R&D units

- R&D institute
- R&D units in higher education
- R&D units in enterprises
- Other research units

j) Data of R&D units by regions and counties

- Number of R&D units
- Total staff number
- Of which scientists and engineers
- Expenditures

KSH publishes the above mentioned indicators regularly, generally by September in the following year. A pilot survey using an adapted questionnaire of the Community Innovation Survey (CIS) was run in 1995-96, the first full-scale CIS survey was scheduled to start in autumn 2000.

The R&D Division of the Ministry of Education (ex-OMFB) has co-ordinated and financed several projects to collect and analyse innovation-related indicators. Some of these are as follows:

aa) OECD Technology Audit

The OECD published a country study on the Hungarian science, technology and innovation policies in 1993. One of the main recommendations was to carry out a technology audit project to map the technology level, competitiveness and market situation of some industrial sectors. Under the umbrella of OECD and with the participation of four OECD countries (Austria, Germany, Finland and France) a technology audit project was conducted in 1994-95. Companies and research facilities in four industries: medical equipment production, packaging material production and packaging machine industry, plastic processing and agricultural machine production were examined by foreign experts. The results were discussed at a workshop in early 1996.

bb) Studies on TBP

There have been pilot studies conducted on the feasibility of constructing a Technology Balance of Payment for Hungary. In a transition phase, together with the erosion of the domestic R&D base and with the intensive inflow of foreign direct investment, a strongly negative technology balance of payment has been found. It has been assessed as an inevitable phenomenon for catching-up economies utilising foreign resources and knowledge.

cc) Analyses based on input-output models

Macroeconomic indicators have been used to trace the path of new technologies in the economy. The influence of foreign direct investments has also been analysed.

dd) Investigation on the Hungarian National System of Innovation

The features of the national innovation system in Hungary have been analysed relying on OECD methodologies.

ee) Investigation on engineers' careers

There is an on-going study to trace the career of some thousands of engineers from different cohorts. The main indicators are the numbers of jobs during the career, the ratio of leaving the original professional area, the income and personal rating of success. Researchers come back to the same persons in ten and twenty years, following their career further.

ff) Innovation in services

Services exceeded 60% of the GDP in Hungary while in the past all innovation services had been focussed on manufacturing industry and agriculture. A pilot study has been conducted recently analysing the innovation needs and behaviour of small and large companies in some important service sectors, including information technologies, banking, insurance, health care and education. This project is being continued.

A pilot study has been conducted recently analysing the innovation needs and behaviour of small and large companies in some important service sectors

gg) R&D infrastructure survey

A pilot survey was run in 2000 on the infrastructure of the Hungarian R&D sector, by type of the higher education institutions and research institutes. The main focus was the stock, age and value of measuring equipment, size and quality of laboratories and other physical infrastructure. This study should serve as reference information for a planned new R&D infrastructure development programme.

There are several further completed and on-going studies on different aspects of R&D and innovation. All studies are discussed at workshops, attended by 30 to 50 experts from different fields. There are lively and open discussions at the workshops. Some studies of even more general interest are also published as books in a larger copy number, up to 1000 copies and distributed to ministries, agencies, universities, companies, professional associations, trade unions and libraries.

Issues and challenges

- Reliable and internationally comparable R&D data have been available since 1992.
- The Community Innovation Survey, however, has not been conducted yet in Hungary, only a pilot survey.
- Some other methodologies have also been piloted, but then not implemented or fully utilised either.
- All these incidents signal the lack of interest of decision-makers. Lack of reliable data, however, poses a significant threat: policies are more likely to be influenced by pressure groups and short-term political considerations than by a sound understanding of the current situation, a thorough analysis on the impacts of former policies and socio-economic needs.

1.5 Legal and administrative environment for innovation

Major laws influencing the potential for innovation directly or indirectly have already been summarised in Section 1.1. This section first provides a short description of the administrative procedures required to establish SMEs, then major acts influencing the potential for businesses to engage in innovation are listed.

The cost of establishing a small business in Hungary amounts to around 100-150 thousand HUF

Establishing a small business in Hungary takes some days. A solicitor shall prepare a contract of association (or articles, depending on the legal form of the company in question) or an advocate shall countersign it. Various forms (signatures) should be certified by a notary, that is, various forms of legal fees should be paid. Firms have to be registered by the Company Court and the Tax Authority[26] as well as by the Social Security Service.[27] Firms must also open a bank account.[28] In sum, the cost of establishing a small business in Hungary amounts to around 100-150 thousand HUF, including the fees for the incorporation, notification and the notary fees for signature certification, depending on the fee asked by the advocate.

In the case of sole and limited partnerships there is no minimum amount of capital, however, in the case of limited liability companies the minimum amount is currently 3 million HUF. Sole and limited partnerships are not obliged to use double accounting methods, as opposed to limited liability and joint stock companies.

[26] Tthese two steps are combined now, i.e. this a "one-stop shop", yet, it still means another half a day of queuing, plus paying a registration fee.

[27] Further forms to be filled in, but these ones can be mailed, i.e. no queuing in this case.

[28] Banks charge rather high fees, even when they practically do nothing because there is hardly any transfer through a particular account.

The Company Act (CXLIV. of 1997) changed the status of new companies. (Beyond further modifications, this Act raised the minimum amount of Ltd capital from 1 million HUF to 3 million HUF). Its §14 introduced a new term of 'pre-company', i.e. the company may act as a pre-company immediately after notification for incorporation at the Company Court, whereas the Company Court has now an obligation to incorporate all new companies within 60 days. Pre-companies may obtain limited rights, e.g. they are allowed to contract, to open a bank account, to operate, but it is not worth invest since they are still not allowed to reimburse value added tax.

After incorporation but maximum within 60 days the company is transformed from a pre-company to a company and will have all the rights, including VAT reimbursement. The Company Act has been effective since June 16, 1998, replacing the earlier Company Act (VI. of 1988).

Personal Income Tax (Act CXVII of 1995)

Twenty-five per cent of the income of individuals earned by *intellectual activities*, but no more than 50 000 HUF, may be deducted from tax. For the purpose of this provision, intellectual activities are defined as follows: activities result in the implementation of a patented article or a work subject to copyright law in accordance with the provisions of the Act Patenting Inventions or is protected by the Copyright Act.

A private entrepreneur using the entrepreneurial income based taxation method may deduct from the entrepreneurial revenues 20 per cent of the amount accounted as costs of *research and development* activities. It is valid if not accounted against revenues received as subsidies. For the purposes of this provision, the invoiced amount of material costs and work performed by others shall be regarded as expenses on semi-finished or finished products of own production.

Customs Law (Act C of 1995)

Objects used for *educational, scientific or research* by educational, scientific and medical institutes as well as by other foundations, public foundations and public bodies pursuing educational, scientific or health care activities, shall be free of duty, provided that the head of the institution verifies registration. These goods cannot be sold within five years (otherwise the deferred duties should be paid).

Corporate Tax and Dividend Tax (Act LXXXI of 1996)

A reduction in pre-tax profits is granted for 20 per cent of the amount incurred in the tax year on the grounds of research and experimental development

A reduction in pre-tax profits is granted for 20 per cent of the amount incurred in the tax year on the grounds of research and experimental development (SZJ 13) and accounted for as own, direct costs of research and experimental development, pursuant to Accounting Act regulations, reduced by the amount of subsidies received and allocated thereto, irrespective of whether or not such has been entered in the inventory as the capitalised value of experimental development (applicable since January 1, 1997).

A 100%-rule may be applied for research and development contracts with universities, public research laboratories or other non-profit research organisations

The Act LXXXI of 1996 has been modified on 7 November 2000 by the Parliament and a new subparagraph as 7 § (1) t) defines a higher pre-tax profit reduction: instead of 20%, 100% of the amount incurred in the tax year on the grounds of basic research, applied research and experimental development may be taken into account, reduced by the amount of subsidies received and allocated thereto, irrespective of whether or not such has been entered in the inventory as the capitalised value of experimental development. A further favourable incentive is that this rule may be applied for purchased research and development as well, provided it is not carried out by another company. That means, the second-100%-rule may also be applied for research and development contracts with universities, public research laboratories or other non-profit research organisations (applicable from January 1, 2001). Hungarian research and development policy-makers expect that company research and development expenditures will grow substantially due to this new regulation as well as due to the increased co-financing of the new government R&D programmes.

Venture Capital Act (XXXIV of 1998)

In order to help the creation of new competitive enterprises, the Hungarian Parliament passed an Act on Venture Capital Investments, Venture Capital Enterprises and Venture Capital Funds. This Act regulates the foundation, establishment, operation in the Republic of Hungary, and state supervision of venture capital enterprises, venture capital funds and venture capital fund management companies and of Hungarian branch offices of foreign-registered companies.

The titles "venture capital enterprise", "venture capital fund management company" and "venture capital fund" may be used solely by associations licensed in accordance with the provisions of this Act or by funds registered in accordance with this Act. These provisions shall not apply to foreign-registered business associations and other legal entities if such are authorised to use the title "venture capital enterprise", "venture capital fund management

company" or "venture capital fund" based on the law of the country of registration.

The duration of operation of venture capital companies shall be at least six years and may not be terminated by voluntary dissolution within six full calendar years. Funds may only be established for a specific duration of no less than six full calendar years.

Venture capital companies may only operate as companies limited by shares having registered shares, or as branch offices. The subscribed capital of a venture capital company or fund shall be at least five hundred million HUF. Funds may only be established as closed-end funds.

A share paid for from the assets of a venture capital company or a fund, may not amount to over fifteen per cent of the equity capital of the venture capital company or the fund at the time of the investment.

The venture capital investments of a venture capital company or fund shall, on the average of the first six full calendar years reach at least fifty per cent of the equity capital and at least seventy per cent of the equity capital during three years within such six year period.

Venture capital companies and funds may extend loans only to enterprises in which they have an ownership share of over twenty-five per cent. A loan granted to an enterprise may not exceed the capital amount invested by the venture capital company or the fund in the enterprise or in other enterprise(s) controlled by such enterprise. The aggregate sum of all loans granted by a venture capital company or a fund, including debt securities, shall not exceed twenty per cent of the equity capital.

Venture capital companies and funds may not be engaged in activities other than the capital investment and lending activities described in this Act, and shall keep all liquid assets in domestic government securities, in sight deposits or deposits fixed for a maximum of six months. Funds may not acquire real property from their assets. Venture capital companies and funds may not acquire shares listed on the stock exchange.

The State Banking and Capital Market Supervisory Authority shall exercise state supervision of venture capital companies, fund management companies and funds.

Summary: Legislative measures in favour of innovation

Title of legislative acts or regulations	Date of adoption and application	Specific measures in favour of innovation	Comments
Personal Income Tax Act (CXVII of 1995)	1995 – adoption, applicable since 1 January 1996	25% of the income of a private individual engaged in intellectual activities, earned by such activities, but no more than 50 000 HUF, may be deducted from the tax.	It is a fairly low amount with limited effect. Before 1996, this sum was limited to 200 000 HUF.
Customs Law (Act C of 1995)	25 March 1995 –adoption, applicable since 1 July 1996	Objects used for educational, scientific or research purposes by educational, scientific and medical institutes as well as by other foundations, public foundations and public bodies pursuing educational, scientific or health care activities, shall be free of duty, provided that the head of the institution verifies registration.	It works, tariffs, however, became much lower in the meantime.
Corporate Tax and Dividend Tax (Act LXXXI of 1996)	1996 –adoption, applicable since 1 July 1997, important modification on 7 November 2000, applicable since 1 January 2001	100% of the amount incurred in the tax year on the grounds of basic research, applied research and experimental development may be taken into account, i.e. R&D expenditures may be accounted twice (with the limitation described above).	The 20% rule did not bring too much, only 200 to 300 companies used it. It is a general view that the 100% rule and its expansion to the purchased R&D will bring a breakthrough.
Venture Capital Act (XXXIV of 1998)	31 March 1998 – adoption, applicable since 16 June, 1998	Several rules and limitations but practically no real incentives to promote venture capital activity.	According to the opinion of experts, this Act has not achieved its goal, venture capital activities are still weak in Hungary.

Section 2 - Measures to Foster Innovation in Business

2.1 Training and human resource programmes in favour of innovation

Supply and demand for skilled human resources

Data stemming from regularly conducted labour surveys do not permit the description of major trends in the supply and demand for skilled human resources in the key business sectors (as requested by the report template). The two major limitations are as follows:

- Data are processed published by occupation rather than by level of education.
- Data are not processed and published by sectors.[29]

A further fundamental methodological limitation also prevents a thorough, reliable statistical analysis. According to expert opinion the majority of labour demand is not registered at the state-run employment offices: the estimated share of registered labour demand is only some 40 per cent on average. The share of registered demand for degree-holders is likely to be even lower, given the importance of trust and non-(easily-) measurable aspects of qualifications for these jobs. In other words, personal contacts – written or oral recommendations – are crucial in this segment of the labour market, and thus most employers do not even turn to state-run employment offices when they want to hire highly skilled personnel. In these cases they prefer private HR services ('head-hunters') or advertisements in the printed press and at the Internet.

Private recruitment and other HR services are mushrooming, yet, they do not process and publish data what can be used as input for our study.[30]

[29] Data procession by level of education and by sectors is possible but our budget has not permitted to order these tailored calculations. Moreover, given other methodological limitations (see later), it would be a questionable exercise.

[30] It would be a rather time-consuming and costly exercise to interview at least a dozen of them to establish some trends.

In sum, current labour surveys are not geared towards measuring supply and demand trends from the point of view of innovation. The following paragraphs present what can be learn from these surveys, bearing in mind the methodological limitations, and some lessons from other sources, e.g. job offers in the printed press and at the Internet as well as available studies.

General overview: employment and skills (educational qualifications)

Current labour surveys are not geared towards measuring supply and demand trends from the point of view of innovation

The Central Statistical Office (CSO) has run a representative labour survey – using a sample of 0.8 per cent of the population aged 15-74 years – since 1992, following ILO standards. A simple comparison of 1995 and 1999 data reveals that the share of degree-holders slightly increased both in the group of employed and unemployed people. (Table 14).[31]

Table 14 - Employed and unemployed people by their highest educational qualification, 1995-1999, per cent

Highest educational qualification	Employed		Unemployed	
	1995	1999	1995	1999
less than 8 grades of primary school	1.3	0.7	7.5	3.1
primary school	22.3	16.3	34.8	31.2
apprentice school	29.1	31.9	33.4	36.4
vocational school	1.1	1.7	2.2	2.3
grammar school	11.3	10.0	7.9	8.9
other secondary school	19.5	22.9	12.0	14.9
college	9.2	10.0	1.5	2.3
university	6.2	6.5	0.7	0.9
Total	*100.0*	*100.0*	*100.0*	*100.0*

Source: CSO

Another source (see Table 14a) give even higher figures for the share of degree-holders among employed people in 1999, namely 12.5 per cent for college degree-holders and 7.9 per cent for university graduates – practically at the expense of the share of skilled labour (or apprentice school qualifications). These differences might be the result of different methodologies or sampling. However, they also show that it is not easy to obtain data in this field either.[32]

[31] The overall employment – unemployment figures for 1995-2000 are presented in Table A1 in the Appendix.

[32] Yet another source – a study sponsored by the World Bank – provides rather different figures for 1995: a significantly higher share of unskilled labour (38.2%), similar data for skilled labour (29.8%), much lower shares for those with secondary school qualification (18.5%) and somewhat smaller figures for degree-holders (8.1% and 5.4%, respectively).

Table 14a - Distribution of employment by skills, 1999, per cent

Highest educational qualification	Share, per cent
primary school 1-7 grades	0.8
primary school	20.7
apprentice school	27.5
secondary school	30.6
College	12.5
University	7.9
Total	*100.0*

Source: Labour Data, Vol. 2000, No. 1

A recent CSO study has analysed the changes in the structure of employment in 1994-1999 using nine groups of occupations. That study reveals that the number of engineers increased from 39.1 thousand in 1994 to 52.5 thousand in 1999, while the number of IT degree-holders grew from 6.9 thousand to 13.5 thousand in the same period.

Labour demand

Regional labour offices have conducted regular surveys, based on a face-to-face interview following a standard (structured) questionnaire and tables – two times a year since 1991. All large firms are included, and for SMEs (with a legal entity) it is a representative survey, while entrepreneurs (without legal entity) are not included at all. The main purpose of this survey is to collect data for the national short-term labour market prognosis, produced by the National Labour Centre. As already mentioned, these surveys do not process and publish data by level of education, only by type of jobs. Table 15 presents data for 1995, 1999 and 2000.

Table 15 - Registered labour demand by type of jobs, 1995-2000, per cent

	Skilled labour	Semi-skilled labour	Unskilled labour	*Subtotal* (blue-collar)	White-collar	*Total* (heads)
Dec. 1995	52.1	24.3	11.8	*88.2*	11.8	*26,780*
Dec. 1999	47.0	30.3	11.9	*89.2*	10.8	*42,579*
April 2000	39.7	32.9	17.2	*89.8*	10.2	*48,841*

Source: National Labour Centre, Short-term Labour Market Analysis, various issues

State-run employment offices are mainly used by large foreign investors, who set up green-field plants, and therefore seek at least a few hundred, sometimes a few thousand employees practically at once. These are usually job offers requiring skilled and semi-skilled labour, i.e. not higher education degree-holders.

Another important source of information is job advertisements placed at the Internet. Both private recruitment services and firms (would-be employers) themselves use extensively this medium.

Most job offers at the Internet are for IT specialists, marketing experts/managers, sales agents, manager assistants and secretaries.

Those firms which advertise job offers themselves at the Internet – i.e. not through recruitment agencies – are mainly ICT and electronics companies, like Ericsson, Nokia, Siemens (telecom equipment and software), Matáv, Vodafone and PanTel (telecom service providers), Philips, Videoton (electronics components) as well as supermarkets (Auchan, Cora).

As for IT specialists, even a new term has been coined in Hungarian for a special segment: "labour market for the Internet economy", that is, more or less the labour market for IT experts specialising in the skills required by the 'new economy'. Based on experts' opinion, some estimations for this segment have also been published at the web. Table 16 shows that the usual international trends can be witnessed in Hungary, too, i.e. demand is significantly higher than supply in this segment of the labour market.

Table 16 - 'New economy' labour market, 1998-2002 (heads)

	1998	1999	2002
Supply	5,000	6,000	8,000
Demand	8,000	9,500	17,500

Source: Experts' estimations, www.multijob.hu/munka/m_stat.htm

Labour supply

There are two major sources of labour supply: those who are unemployed and those who enter the labour market for the first time, that is, school-leavers. As for the highly skilled labour, 3.2 per cent of unemployed persons in 1999 had a higher education degree and 2.6 percent in April 2000. Some 31 thousand 'fresh' graduates entered the labour market in 1999. In the meantime the registered demand for white-collar employees – that is, including job offers for non-degree-holders, too – was only around 5 thousand. (Table 17) However, as already mentioned, a majority of these types of jobs are not registered at the state-run employment offices.

Table 17 - Registered labour demand and supply by type of jobs, April 2000, per cent

	Skilled labour	Semi-skilled labour	Unskilled labour	*Subtotal* (blue-collar)	White-collar	*Total* (heads)
Demand	39.7	32.9	17.2	89.8	10.2	48,841
Supply	35.7	25.4	21.9	83.0	17.0	411,066

Source: National Labour Force Survey

The World Bank sponsored a study entitled "Medium and Long-term Labour Forecast" in 1995-96. The study pointed out a major methodological difficulty in forecasting labour market trends:

while supply can only be measured in terms of educational attainments (qualifications), demand can only be expressed in terms of occupations. Therefore supply and demand can only be related (connected) on the basis of assumptions, i.e. on 'representative' occupations. The study concluded, that if the 1995 structure of higher education was maintained, on the whole there would be a 10 per cent surplus in the labour market segment of degree-holders in 2010. There would be 25 per cent more people with college degrees than demanded, and 11 per cent less university graduates than jobs offered for them. In terms of major fields of occupation, technical, agricultural and educational labour market segments would be characterised by surplus, while a shortage of skilled people can be envisaged in the case of economic and trade jobs.

A more recent study by ECOSTAT has forecast a similar disequilibrium in various segment of the market of degree-holders. (Table 18).

Table 18 - Labour market shortage and surplus by various degrees, 2010, thousand heads

Qualification	Technical	Agricultural	Healthcare	Pedagogical	Legal	Economic, Trade	Others	Total
non-university degree (college, other HE)	25.0	11.2	-5.5	146.8	-8.3	-47.8	1.8	124.4
university degree	4.8	16.4	-6.0	-24.2	2.1	-12.6	-14.2	-35.9
Total higher education degree	*29.8*	*27.6*	*-11.5*	*122.6*	*-6.2*	*-60.4*	*-12.4*	*88.5*

Source: Fülöp E. - Krekóné Kupa I.: Labour Demand and Supply Forecast, ECOSTAT, October 1999

The Higher Education Scientific Council yearly sets the number of publicly financed students at universities, colleges and other HE institutions. The Council also publishes its assessment on the so-called subjective labour market position of degree-holders by fields of studies, using three categories: above average, average, below average. In their view demand has been above average for graduates of technical universities with certain specialisation, as well for economic and legal degree-holders in 2000.

The Ministry of Education has commissioned the Human Resources Department at the Budapest Economics University to analyse the career path of young degree-holders. The study covers students who graduated in 1996 from 7 universities and 7 colleges in four fields: economics, engineering, agriculture and pedagogy. The final report has not been published yet. Some preliminary results are as follows:

- On the whole some 80 per cent of the 1996 graduates was employed in 1997, 5 per cent of them unemployed, while 9 per cent inactive.
- Agricultural college degree-holders had to face the harshest situation: only 46 per cent of them were employed.

- Banks, insurance companies as well as other financial and economic service firms are offering a large number of jobs for young degree-holders, while the public administration is not a significant employer of them, although ministries and other public agencies do employ a large number of degree-holders.

There are strong intentions to repeat this study yearly, and then there would be a possibility to analyse longer-term trends, too.

The above statistics and studies do not say a lot about the prospects of innovation from the point of human resources. Press reports, discussions with researchers and industrialists as well as other pieces of 'soft' information suggest, that on the whole the availability of skilled people is not a major obstacle to innovation. The former, somewhat over-sized, R&D and higher education sector – including colleges, universities, R&D institutes and units of the Hungarian Academy of Sciences, ministries and large companies – has provided and ample supply of skilled scientists, engineers and other specialists when new investors – especially foreign-owned firms or their suppliers – needed them. In other words, this is the probably unintended, but favourable, consequence of the 'down-sizing' of the former R&D sector (described already in Section 1.1; see Table 8).

On the whole the availability of skilled people is not a major obstacle to innovation

In certain fields – and/or certain regions of Hungary –, however, there is already a pronounced shortage of skilled labour for innovative activities, especially in IT. Therefore ICT firms – who have invested in Hungary partially in order to 'escape' the short supply of specialists in their home country – now are establishing very close contacts with universities in an effort to secure a large – and, of course, good – enough supply of skilled personnel. (for further details see later). They even offer part-time jobs for students, and run regular shuttle services between their plants and campuses. In this way they are able not only to ease the shortage, but also 'test' their would-be employees before entering into biding contracts with financially or administratively/legally expensive commitments.

In certain fields there is already a pronounced shortage of skilled labour for innovative activities, especially in IT

Another severe problem is that R&D has become a far less attractive occupation, therefore less young, talented people opt for this career, and hence the R&D personnel are ageing. (Table 19)

Table 19 - Distribution of R&D personnel by age groups 1982-1998, per cent

Age groups	1982	1987	1995	1998
– 29 years	16.0	12.7	12.0	12.8
30 – 49 years	62.8	64.7	55.0	52.2
50 – 59 years	18.7	18.8	25.5	27.6
60 years and older	2.5	3.8	7.5	7.4
Average age (year)	40.1	41.3	43.9	43.5

Source: Central Statistical Office, Tudományos kutatás és kísérleti fejlesztés, various years

The number of R&D personnel employed by firms has slightly declined by 1999 compared to 1992, but increased since 1995

The number of R&D personnel employed by firms has slightly declined by 1999 compared to 1992, but increased since 1995. However, the share of R&D personnel at firms in the total R&D personnel shows an opposite pattern: it has increased by 1999 compared to 1992, but slightly shrunk since 1995. As for scientists and engineers working for firms, both their absolute number and their share in the total number of scientists and engineers have increased by 1999 compared to either 1992 or 1995. (Table 20)

One can interpret these data in several ways. Most likely it is a favourable development from the point of view of innovation that firms employ a growing share of scientists and engineers. On the long run, however, it might mean that other sources of knowledge generation are drying out.

Table 20 - R&D personnel at R&D units of firms, 1992-1999 full-time equivalent

	1992	1995	1996	1997	1998	1999
R&D personnel (heads)	6,040	5,536	4,138	4,682	4,939	5,899
Share of firms in total (%)	25.0	28.3	20.9	22.6	24.3	27.7
Scientists, engineers (heads)	2,576	2,550	1,995	2,394	2,725	3,261
Share of firms in total (%)	20.9	24.3	19.2	21.5	23.2	26.0

Source: Author's calculation based on CSO data

Education and training systems

A number of studies have recently assessed the Hungarian education system, i.e. the ones sponsored or conducted by the OECD, the World Bank and TEP, the Hungarian Technology Foresight Programme. Most of the findings are not directly relevant for this study. More generally, however, there have been some important developments in the Hungarian education system. These changes might indirectly contribute to put in place a more effective national innovation system. Some of the recent changes are briefly summarised below:

- New (private) institutions have appeared at all levels of the education system introducing new teaching methods and curricula.
- New types of primary and secondary schools have been introduced (e.g. besides the previously predominant 8-year primary + 4-year secondary structure both 6+6-year and 4+8-year schools have been opened).
- Schools have been given much more autonomy (developing curricula, writing or selecting new textbooks, etc.).
- The above changes induced some reforms in the traditional schools as well, e.g. in terms of curricula and teaching methods.
- Post-secondary courses – as a new form of education in

Hungary – have been launched. The most popular ones are on IT, economics and trade, i.e. in fields highly relevant for innovation (broadly defined).
- Perhaps the most noticeable development is the dramatic increase in the number of students in the higher education sector. (Table A2 in the Appendix).
- New higher education institutes have been established, some of them based on distance learning exclusively.
- There are much more international exchange programmes – both for students and teachers –, especially in the higher education sector, but also for secondary school students and teachers.
- A formerly unknown possibility – and necessity – the large number of courses to retrain the unemployed people.
- A new system of Regional Human Resource Development and Training Centre has been put in place (8 brand new centres with a capacity to train 10 thousand people a year).
- Private firms offering various courses for adults are mushrooming. (Some of them go after 'easy money', capitalising on various aid programmes.).
- Civil associations and a number of foundations are also organising training courses for adults (altogether some 30 thousand organisations).

Innovation has been a main concern for the *Human Resources* panel of TEP, and thus some results and recommendations are worth recalling. In spite of the aforementioned achievements the Hungarian (public, i.e. state-run) education system is still a 'Prussian-type' one: it is not flexible enough, and it is mainly about teaching facts in a 'top-down' manner. There should be much more emphasis on developing skills required in the global, knowledge-driven economy, e.g.

- Creativity
- Recognising and solving complex problems
- Selecting, processing and making use of relevant pieces of information
- Learning skills (learning by doing, by interacting, by using ICT and traditional means, etc.)
- Co-operation in (increasingly multi-cultural) teams.

These are obviously important skills to promote innovation, too.

Both vocational schools (a special type secondary school providing both general and vocational education) and higher education institutions should develop more close and lively co-operation with businesses in order to:

- Be exposed to real-life problems
- Learn from practical experience via various placement schemes as well as continuous exchange of ideas, and
- Last, but not least to obtain extra funding and equipment.

Practically all HE institutes have launched courses aimed at developing human resources for innovation, especially in technology management and quality control

Initiatives, courses aimed at developing human resources for innovation

Practically all HE institutes have launched courses aimed at developing human resources for innovation, especially in technology management and quality control. (Table 21) The most visible change is that even new pairs of specialisations have been launched e.g. at the Kossuth Lajos University in Debrecen (traditionally a university specialising in the humanities): IT and Hungarian grammar and literature, IT and chemistry, communications and ethnography.

Table 21 - Types of organisations involved in, and courses for, HR development for innovation

Higher or further education organisation	Examples of innovation related courses or advisory services	Commentary
Undergraduate courses at universities'		
▪ **Miskolc University, Economics faculty**	Entrepreneurship, Innovation mgmt	
▪ **Budapest Technical University**	Introduction into innovation research EU innovation policy Innovation and R&D techniques	Close co-operation with businesses Involvement in many TEMPUS projects
▪ **Budapest Economics University**	Innovation and value engineering techniques R&D and innovation mgmt techniques in the EU-context S&T policy in the EU	Close co-operation with businesses Involvement in many TEMPUS projects
Postgraduate courses at universities		
▪ **Veszprém University**	Technology and innovation mgmt (a second degree for engineers)	Close co-operation with businesses
Short (further training) courses at universities		
▪ **Budapest Technical University**	Being innovative in a global society Introduction into EU S&T policy, drafting project proposals MNEs' technology strategy	
Colleges (including distance learning)	Similar courses	Close co-operation with businesses
Regional Human Resource Development and Training Centres	Courses on similar issues	
Regional chambers	Short courses and information days on similar issues	
INNOSTART (innovation and business incubator)	Information days on innovation related issues Innovation brokerage (5x2-day course)	In co-operation with the British Know-How Fund and Segal Quince Wicksteed Ltd.

Source: interviews

A PHARE project, entitled Technological Development and Quality Management (TDQM) has been instrumental in developing innovation related courses: 16 textbooks have been written in Hungarian for universities and colleges on economics of innovation, technology management, intellectual property rights, etc. These textbooks are also used at various further education courses run by various other organisations.[33]

Other EU-programmes, such as ERASMUS, TEMPUS, Leonardo and Comenius 2000 have also been widely used by Hungarian education institutes for curriculum development, staff and student exchange, and support the introduction of quality management techniques.

Higher education – business co-operation

As already mentioned, there are close contacts between HE institutes and businesses both for professional and financial reasons. Businesses need the services of HE staff and students, while for HE institutions it is favourable to be exposed to real-life problems. Moreover, they badly need funds and contribution in-kind from businesses. Some examples of various forms of co-operation are summarised below:

- Universities, colleges organise 'senates' or roundtables of business leaders as advisory bodies in order to regularly discuss curricula, initiate joint research and PhD projects, and secure extra funding from firms (e.g. Budapest Technical and Economic Sciences University).
- R&D labs of firms are established at universities or close co-operation between firms' R&D units and university labs, sometimes involving several firms, e.g. Erisccson, Nokia, Westel (all telecom), Sony (electronics), Knorr-Bremse (automotive) at the Budapest Technical and Economic Sciences University, EGIS lab (pharmaceuticals) at the Semmelweis University.
- Joint curriculum development, e.g. Gábor Dénes College (distance learning HE) and Matávcom (telecom), Széchenyi College and Rába (automotive, both partners are located in Győr), Kandó Kálmán College and Siemens, Budapest Technical and Economic Sciences University and MOL (oil).
- Business people give lectures occasionally and attend final exams (when diploma works are defended).
- A few month (half a year at maximum) on-the-job training organised with firms, e.g. Dunaferr (steal) and Budapest Technical and Economic Sciences University, Bábolna (agribusiness) and Modern Business Studies College.
- Jointly selected PhD projects, professionally supported and co-funded by firms, practically at all universities.
- Dozens of foundations have also been set up to support re-

[33] See also Section 2.2

search, conference participation and exchange programmes for HE staff and students.

Main government initiatives taken in favour of human resources development for innovation

- A number of schemes operated by the R&D Division of the Ministry of Education serve this purposes, especially those aimed at promoting SMEs and participation in EU projects. (for details see Section 1.2, especially Table 13).
- Government-financed grants for students and researchers can also be used for this purpose, namely:
  - Grants for students to cover living costs while studying in Hungary.
  - Grants for students to cover living costs while studying abroad.
  - Grants for researchers to cover living costs while working abroad.
- The Ministry of Economic Affairs together with the R&D Division of the Ministry of Education is planning to launch a new scheme for firms who would employ 'fresh' graduates and PhD students for R&D purposes. Wage costs would be covered by the scheme.

Firms' initiatives taken in favour of human resources development for innovation

Firms, especially large, foreign-owned ones, for whom innovation is a crucial success factor, operate probably even more important schemes than the government in order to develop human resources development for innovation. Their efforts include (i) on-the-job training both in Hungary and abroad as well as (ii) formal courses organised by themselves or tailored ones delivered by universities, colleges or private HR development services, management consultancies. It has been an expanding market in Hungary recently.

Issues and challenges:

- Current labour surveys are not geared towards measuring supply and demand trends from the point of view of innovation. Relying on several methods and sources, however, one can conclude that the availability of skilled people is not a major obstacle to innovation.
- In certain fields – and/or certain regions of Hungary –, however, there is already a pronounced shortage of skilled labour for innovative activities, especially in IT.
- R&D has become a far less attractive occupation, therefore less young, talented people opt for this career. Hence the R&D personnel are ageing.
- In spite of some significant achievements in the Hungarian education system there should be much more emphasis on developing skills required in the global, knowledge-driven economy, e.g. creativity, problem-solving, learning, communication and co-operation.
- Both vocational schools and higher education institutions should develop more close and lively co-operation with businesses in order to:
  - be exposed to real-life problems
  - learn from practical experience
  - obtain extra funding and equipment.

2.2 Awareness and use of innovation management techniques

Main government initiatives taken in favour of IMT diffusion

Hungarian National Quality Award

One of the most important initiatives for awareness building and developing business mentality is the launching of Hungarian National Quality Award.

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The Hungarian Quality Award was founded in 1996 by the Prime Minister to recognise the excellence of quality management at Hungarian companies. It is based on the model of the European Quality Award as in other countries. Therefore the Award can compare the Hungarian companies not only with other local ones but also with foreign firms. In the framework of this model not the quality of certain products or services is assessed, but an organisation's activities and results in reaching business excellence. The underlying assumption of the model of Hungarian Quality Award is that customers' satisfaction and an overall positive impact on society can be achieved by the right mix of various tools:

appropriate business strategy, efficient management of people and resources, application of processes for Business Excellence.

It is the task of the **Hungarian Quality Development Centre** to disseminate the model of the Hungarian Quality Award as well as TQM methods, tools and techniques. The winners are entitled to use the appropriate logo in their letterhead and other publications.

Applicants can obtain a useful assessment of their organisation due to the feedback report prepared by independent assessors. The regular self-assessment element of the procedure motivates continuous improvement and promotes the regular application of TQM methods, tools and techniques. The challenge of preparing an application for the Award brings substantial benefits to the applicants' organisation.

In the first four years 62 companies applied for the Hungarian Quality Award, i.e. there has been a significant interest in the competition.

PHARE Technological Development and Quality Management Programme

The initiatives of the European Commission in the frame of PHARE Programmes are linking Hungarian efforts and measures to comply with the various EU requirements to up-to-date way of thinking and practice in the European legislation, institutional reform, technical harmonisation and quality infrastructures. Hungary has used the possibilities in the frame of PHARE Programmes linking to the Quality and related fields and Technological Development since 1989. These activities have been accelerated from 1995 thanks to the economic progress achieved as well as the reinforced political efforts on both sides.

The first programmes have supported the establishment of appropriate institutional systems and infrastructure development projects. The Technological Development and Quality Management Programme (TDQM) – as a National PHARE Programme – targeted the higher education sector and firms. Under this TDQM Programme Hungarian experts have developed a new nationally available curriculum on Quality issues (as already mentioned). Financial support has also helped the introduction of ISO and modern quality systems, the modernisation of laboratories, consumer protection, development of the accreditation and the basis of the testing and certification procedures.

PHARE PRAQ III Regional Programme on Quality Assurance

The PHARE PRAQ III Regional Programme on Quality Assurance and related fields – launched in 1995, practically started in 1996 – has put in place a complex structure, including technical

regulation, standardisation, market surveillance, conformity assessment, testing and certification, accreditation, metrology and total quality management. This Programme supported 13 PHARE partner countries in their efforts in introducing Community Technical legislation between 1996-2000. The major challenge lies not only in the adaptation of legislation but also in the introduction of framework conditions necessary to make the legislation work as well as in adapting institutions, day-to-day practice, administrative procedures and the society as a whole to these new conditions and way of thinking. This has proved to be a difficult process, as it requires both institutional and cultural changes.

The PRAQ III Programme has had an important impact on the process of preparation to fulfil the requirements of the EU and specially the White Paper for Eastern and Central European countries.

The most important value of PRAQ III has been to transfer the norms, rules and the approaches of the Western European bodies and experts through actions. Some people in responsible positions have expected and obtained detailed knowledge about Western European practices and experience. The most important results of PRAQ III have been to promote the understanding of the underlying principles and mentality of the EU technical legislation, the structure and requirements of the new directives, to obtain knowledge on the global approach, the modular systems and the policy and principle of the conformity assessment basis and practice. PRAQ III has strengthened the professional community with experts who think along similar lines than EU experts.

After the PRAQ III Programme the most of the new Approach Directives are inserted into the Hungarian legislation. The Hungarian Standards Institution is prepared (by 80%) for the membership of CEN/CENELEC/ETSI, and the Hungarian Accreditation Board is prepared for the EA membership. Most of the Certification Bodies and Laboratories and Inspection Bodies can meet the needs of industry and work in accordance with EU practices.

More than 500 people have been trained by this programme. As PRAQ III Programme runs out, the main purpose is to disseminate the knowledge acquired, especially the methods and practical knowledge.

Main private initiatives taken to apply IMT

Most foreign firms offer technical assistance and training for their Hungarian partners to introduce up to date management techniques

Large foreign-owned firms have brought IMT in and applied them in their Hungarian subsidiaries. Their Hungarian suppliers must also use these techniques, otherwise they would not get any business. The other important markets for local firms are the advanced countries (see section 1.1), and hence there are again

strong incentives to apply IMT. Most foreign firms offer technical assistance and training for their Hungarian partners to introduce these up to date management techniques (TDQM, JIT, etc.).[34] Most likely these market-type pressures and assistance are at least as important and useful as the various government initiatives.

Issues and challenges:

- The use of quality management techniques is widespread partly due to market pressures, partly as a result of various national and EU policy initiatives.
- There is hardly any systematic research on the diffusion of other tools of innovation management. Case studies touching upon this issue do suggest, however, that FDI plays a crucial role in diffusing IMT.

[34] Case studies clearly show the impacts of these factors in the two largest exporting sectors, that is automotive and electronics components (see e.g. Havas [1997a], [1998], [2000]).

Section 3 - Business innovation interfaces and support measures

3.1 Research community - Industry co-operation

The poor links between academia and industry is a well-known weakness of the planned economies. In the beginning of the transition period most local businesses did not have the necessary funds to intensify their co-operation with R&D institutes, although they were under pressure to introduce new products and change their production methods to cut costs. In that period foreign firms had not made serious efforts either to link up with Hungarian researchers either. First they had to learn about the more basic characteristics of their new environment, e.g. prices and regulation concerning the factor markets, other legislation and institutions. Moreover, quite a few research institutes were not geared to work closely with businesses, their former objectives and norms had been set in a completely different socio-economic system.

In other words, it has been a learning process on both sides before establishing research partnerships. Obviously this mutual learning and adjustment cannot be a rapid one for a number of reasons.[35] First, R&D is one of the most sensitive strategic issues for any firm, and thus they are very careful when selecting partners for this kind of co-operation – even in a well-known environment. Because of the specific context – legacies and images of a planned economy; lack of intense R&D links between the 'West' and 'East' in the previous decades, etc. – there might have been an another factor at work to slow down this process. First, lack of information on the actual performance and knowledge of Hungarian researchers has made it more difficult even to consider that kind of collaboration in the very beginning. Second, norms and attitudes – especially those of the potential Hungarian partners who have not worked in a market economy, but also those of the potential foreign partners who have not been familiar with some important elements of the Central European working culture – cannot be changed overnight. However, without establishing trust, i.e. finding some common ground including norms and attitudes, too, one would not enter a long-term, strategically vital

[35] The overall economic, legal and institutional environment is described in Section 1, while issues related the human resources are dealt with in Section 2.

co-operation. Third, the re-organisation of R&D institutes up to the mid-1990s has been yet another hurdle on the road to establish research – industry collaboration.

The situation has changed rather considerably by the second half of 1990s. As already discussed in Section 2.1, practically all higher education institutes have established various forms of co-operation with business, including jointly financed and designed PhD projects, application-oriented and somewhat more general research projects, setting up joint laboratories, etc. Business people have also been asked to attend final exams, comment on curricula as well as take part in the strategic decision-making process of universities (as members of the so-called senates). Moreover, for some foreign companies the availability of highly skilled people for innovation projects – as also discussed in Section 2.1 – has become one of the most important motivations to invest in their Hungarian operations. In short, recently a rather intense academy – industry co-operation can be witnessed.

The government has also realised the importance of that kind of partnerships. Therefore most of the schemes operated by OMFB/ OM KFHÁ have been explicitly (re-)designed to promote academia – industry collaboration as one of their objectives (among the more specific ones) in the last few years.[36]

The remainder of this subsection would focus on a new scheme where the main aim has been to facilitate research – industry co-operation. The main government initiative taken to promote interactions and co-operation between research institutes/ knowledge providers and the business sector is the so-called *Co-operative Research Centre* (CRC) scheme.

Description of the CRC scheme

This scheme was launched in 1999 largely following a similar US policy instrument. It has been prepared for quite a long time, for around 2 years. Its main characteristics are described below.

Its **major aim** is to promote the establishment of Co-operative Research Centres (CRCs) in order to foster strategic, long-term co-operation between higher education institutions, other non-profit R&D units and businesses, and through the activities of CRCs to:

- facilitate technological breakthroughs, introduction of innovative products and services
- foster competitiveness

[36] Section 1.2 has given a more detailed account of the policy tools, and Table 13 has summarised the most important current schemes. Schemes 3.a-b, 3.d-g are the most prominent examples to promote academia – industry relationships besides their main objectives. Applicants who form that kind of partnership – and of course working on projects aimed at the specific objectives of a given scheme – enjoy preferential treatment.

- promote the integration of business-oriented, applied R&D into the various activities of higher education institutions (HEI)
- adapt market-oriented, entrepreneurial attitudes at HEIs
- integrate economic and social needs into education activities of HEIs
- application of high-tech at HEIs
- prepare for joint R&D projects aimed at solved specific problems of the business partners
- create appropriate jobs for graduates and post-docs
- contribute to build knowledge-building capabilities at HEIs
- prepare HEIs for participation in various international co-operative projects due to their accumulated experience in managing large-scale projects.

As part of their tenders, would-be CRCs are required to submit:

- a *vision* on technological breakthroughs – underpinned by multidisciplinary research – they aim at,
- a strategic plan – at least for 3 years, preferably for 6-9 years – outlining the integration of goal-oriented research and education,
- a *plan of R&D activities* (project proposal) combining basic and applied research activities in various S&T fields and business activities,
- a *plan of education activities* presenting the circumstances for integrated, multidisciplinary education as well as the mechanisms for a broader knowledge transfer process (e.g. from research carried out at the CRC to graduate and/or undergraduate courses).

Financial contribution from the partners establishing a CRC should reach HUF 50 million (roughly USD 160 thousand), and they can be awarded a *grant* of HUF 50-250 million.

Progress report

The programme was first launched in July 1999. 23 applications have been received in the first, so-called pre-selection round, when not fully-fledged project proposals, just detailed 'letters of intent' have had to be submitted. Then 8 consortia have been invited to prepare full project proposals, and finally 5 of them have been awarded altogether HUF 1083 million (on average HUF 216.5 million). Partners have committed to contribute HUF 1278 million (usually 5-6 companies joined a consortium). Three projects are set up for 3 years, the remaining two for 4 years.

Assessments and evaluations

Individual applications have been assessed, and a number of week points have been identified even in the case of the 'winners'. However, these are confidential remarks. Formal, fully-fledged evaluation of the programme has not been conducted for obvious

reasons: it would be too early at this stage. An internal assessment of the scheme – relying on the structured discussion of the insights of civil servants, rather than on findings stemming from a proper evaluation exercise, and carried out when all the schemes run by of R&D Division of the Ministry of Education (RDD ME) were revised in October 2000 – concluded that the programme should be continued. That is, a new call for tenders should be published with some slight clarifications and modifications.

Rationale and motivation for the programme

CRC wants to address the insufficient level of co-operation between university departments, non-profit R&D institutes and enterprises. Thus it is aimed at promoting close, strategic, formalised academy-industry co-operation to promote innovation and competitiveness on the one hand, and 'injecting' practical, business aspects into education, on the other.

Perceived benefits

Scale and scope of activities. It is expected that the curricula, and more generally the overall activities, of participating HEIs are going to be extended, or 'flavoured', by market-oriented, entrepreneurial type attitudes and activities. Firms' capabilities might also be extended given the potential to achieve synergies between different technological competencies gained through their activities in CRCs.

Shared costs and risks. CRC partners share costs of the planned major innovations, especially intellectual burden. Participating companies also benefit from the financial support provided by the state for CRCs, and thus their costs are lowered.

Improved ability to deal with complexity. CRCs should facilitate learning by co-operating, i.e. partners bring expertise from different technological fields to tackle complex problems, e.g. how new chemical technologies can serve sustainable development, how to apply lasers to solve industrial and medical problems. (Laser technology in itself draws on a number of fields, such as precision engineering, optics, electronics plus the field where a practical problem should be tackled.)

Enhanced learning effects. CRCs are intended to facilitate mutual learning. HEIs are generally week in project management, in addressing practical socio-economic needs in their curricula and research activities, or more generally, in incorporating business attitudes into their way of thinking, organisational approach and overall activities. Firms are supposed to bring all these skills, attitudes and types of knowledge, what HEIs, in turn, can appropriate during this close co-operation. In other words, partners from HEIs attend a kind of 'on-the-job' training on these issues. (Note that a large part of what they are supposed to learn is tacit knowl-

edge and various skills, and hence formal training on these subjects would be less appropriate.) Firms, on the other hand, can learn about new technologies, can shape the process and direction of the generation of knowledge, and learn immediately both from success and failure of this attempt.

Welfare effect. It is hardly possible to establish if participating firms would have spent the amount of their financial contribution on R&D without having the opportunity to join a CRC.

Speed. CRCs are intended to speed up product and process development projects, however, it is too early to assess them in this respect. Moreover, it is difficult to establish if these projects would be conducted more slowly or quickly without establishing – or joining – CRCs.

Problems already identified, likely future (or built-in) failures

Given that the first CRCs are just being set up, it would be too early to discuss problems that already identified. One might speculate, however, that this scheme is probably over-ambitious in terms of the sheer number of the problems it tries to address. Thus lack of focus might lead to problems in terms of co-operation among the partners, and possibly in a more visible manner in terms of programme management, monitoring and assessing the performance of CRCs on the side of RDD ME.

Emerging issues:

- Academia – industry links were rather weak both in the planned economy period and in the early 1990s, for different reasons.
- This type of co-operation has become significantly more intense by the second half of 1990s, mainly due to the best interests of these parties, but also promoted by a number of schemes devised to promote technological development.
- Given the importance of knowledge as major source of competitive advantage, continued efforts seem to be necessary to promote mutually beneficial academia – industry partnership. This way not only firms' competitiveness can be improved, but also human resource development and knowledge generation at universities and research institutes.

3.2 Support for start-ups and new technology based firms

Besides academia – industry co-operation, start-up firms also enjoy preferential treatment in all relevant schemes – i.e. where firms can apply for support – reported in Section 1.2 (Table 13). However, there is also a specific programme devised to promote

the creation of technology-based firms in new growth areas, called TECH-START.

Tech-Start

This scheme started in 1999, run by OMFB in 1999 and its successor (R&D Division, Ministry of Education) in 2000 to support certain types of start-up firms in their efforts to commercialise their innovative ideas. Technology-based micro enterprises – that is, firms with less than 10 employees –, co-operatives and individuals are eligible to apply. (Start-up defined as businesses started within five years.) The duration of the supported projects cannot exceed 2 years, and the grant can be up to 65% of the net project budget (defined as total costs less VAT), but maximum 5 million forints (roughly equivalent to 200 thousand euros).

In 2001, however, no call was published for this scheme, but it is planned to be continued in a larger scale from 2002 on, as a part of a new, large programme promoting regional technology development, spin-off firms and building clusters.

As for the rationale of the Tech-Start programme, it has been prepared for months, including several discussions with stakeholders (chambers of commerce, technology transfer institutions, the Hungarian Innovation Association), and there has been a general consensus that such a programme is necessary for companies. OMFB/OM civil servants, thanks to their activities in international organisations, e.g. OECD CSTP and TIP groups, have found several international examples for similar programmes, with special focus on the growth phase.

There have been some proposals to launch a similar programme assisting SMEs in their so-called seed phase, too, but given the reorganisation of OMFB in 2000 these ideas have not been put into a new scheme yet.

Related schemes in the Széchenyi Plan

In January 2001, the Government launched the first calls for the so-called Széchenyi Plan. As part of the enterprise development programme, there are several schemes for SMEs, but not specified for new technology firms. One of them, aimed at assisting SMEs in their efforts to be prepared for the EU accession requirements, has been designed for consulting companies offering structured knowledge-intensive services for SMEs. Another one supports investment activities of SMEs so as to become or remain suppliers in the fields of machinery, electronic, textile and furniture industries, services and trade, excluding wholesale. A third call aims at financing SMEs requiring credit above the HUF 3 million threshold of the so-called micro-credit programme. This programme offers favourable loan for the preferred SMEs (inter-

est would be up to 50% of the basic interest rate of the National Bank of Hungary). The other supportive element is a guarantee for 90% of the loan taken from the Credit Guarantee Co. (Hitelgarancia Rt.). There is an upper limit: the total support for an SME may not exceed 26 million HUF during three years, presumably calibrated to the *de minimis* rule for the state aid in the EU (this amount takes roughly 100 thousand euros). These three programmes are managed and financed by the Ministry of Economic Affairs.

There are no specific fiscal incentives oriented toward NTBFs in Hungary.

The venture capital market is developing in Hungary mainly through various private venture capital funds. A law was passed by the Parliament in early 1998 to regulate and revitalise the venture capital market in Hungary (discussed in Section 1.5 in detail).

Government Strategy for the Development of Micro, Small and Medium-Sized Companies

The most important – but general, not specifically innovation-oriented – policy initiative in respect of new firm creation is the *Government Strategy for the Development of Micro, Small and Medium-Sized Companies*. This strategy has been formulated by the Ministry of Economic Affairs. The main objectives of this strategy are discussed below.

Improving the working conditions of SMEs

Transparent and accountable economic environment, fair competition and enforcement of law are all required to improve competitiveness and enhance job creation. The government aims at providing favourable regulatory framework to promote the development of SMEs, to strengthen their self-financing and job creation capacity, as well as to reduce the share of 'grey economy'. High additional wage cost shall be cut, and the administrative requirements shall be simplified.

All official procedures (e.g. social security, V.A.T., car usage administration) shall be simplified, lump taxation and one-stop service shall be generally introduced. Investment and R&D activities of SMEs will be promoted, with the goal that the average tax burden of SMEs shall not exceed large companies' one. Public administration should be at service of the business sector.

Improved financing opportunities

Programme and project financing will be the norm, and improved financial discipline of SMEs is an important goal. All state aid will be entered into a monitoring system, and programme evaluation will be continuous. For the sake of transparency, co-ordination

and planning, a new SME budget line will be launched under the supervision of the Ministry of Economic Affairs for the following areas:

- financing micro-credit programmes,
- supporting SME development loans,
- supporting regional SME venture capital funds and innovation venture capital funds,
- supporting constructions for the technology development for SMEs,
- enhancing guarantee systems, re-guarantee and support for guarantee fee,
- promoting the international market access of SMEs,
- promotion of joining to franchise systems,
- initiatives to create logistic centres,
- promoting the creation of joint purchasing of SMEs,
- financing the supplier development programme,
- supporting the creation and maintaining of incubator houses,
- supporting infrastructure programmes for SMEs and the participation in SME European Community programmes;
- developing business information systems, SME research and PR activities,
- supporting accredited SME education and training programmes.

The bank system is suitable for financing SMEs, therefore, specific SME banks are not necessary. The government promotes SMEs through various schemes, favourable loans and by developing the financial institutional system. The start-up and micro-firm financing schemes will be improved by the supervised PHARE micro-loan programme, its co-funding and increasing the loan limit from 1 million HUF to 3 million HUF. Regional venture capital funds will be strengthened, partially by means of PHARE programmes. Voluntary guarantee organisations will be supported by re-guarantee schemes. Export pre-financing will be provided to ease market access for SMEs.

Enhancing innovation abilities of SMEs

Innovation activities are assisted by the establishment of further regional technology transfer institutions, innovation centres and parks, technology incubators and demonstration centres. The initiatives should come from chambers, local governments or universities. The government provides methodological assistance, promotes international co-operation, puts more emphasis on the innovation-oriented use of regional development funds, and introduces new target-oriented programmes. The co-operation of SMEs with jointly financed R&D units is crucial.

Developing the business information system

The information needs of SMEs shall be recognised and the information supply for the technical, legal and financial needs shall be promoted by:

- up-to-date information on the market trends by branch;
- quick access to all relevant catalogues, partner and competitor information and regulatory information;
- an information base to promote the participation of SMEs in the public procurement.

There is ample information on all government programmes in the so-called Resource Map, developed by the Ministry of Economic Affairs (http://www.gm.hu). The database includes information on firms, entrepreneurs as well as links to successful companies in the international markets.

Entrepreneurial culture and employment

The development of entrepreneurial culture based on technical knowledge is necessary to improve customer and entrepreneurial behaviour. The basic rules of market economy and the special entrepreneurial skills shall be brought to the SMEs. The main channel for this is more and more the regular school system, but adult education and life-long learning are also inevitable. It is important to involve SMEs in vocational training, offering same conditions as for the state training institutions. In order to increase the efficiency of the labour market, and to decrease structural unemployment, vocational training programmes will only be financed by the state if the curriculum responds to the actual market needs. The mapping of these needs will be carried out together with chambers of commerce.

Preparation for the EU accession

The EU accession poses formidable challenges to SMEs. An EU Programme provides legal base and budget sources for the development of SMEs, with five objectives:

- simplifying and improving the administrative and business environment of SMEs,
- improving access to finance,
- promoting international market access by developing information services,
- access to research results and training,
- enhancing the entrepreneurial spirit.

It is very important for the preparation that the EU has opened its SME Programmes for the candidate countries.

Developing the institutional system

The institutional system that is suitable for implementing the SME development programme has been developed during the 1990s. The main co-ordinator is the Ministry of Economic Af-

fairs. The Ministry co-operates with chambers of commerce, other interest groups, the Hungarian Enterprise Development Fund (MVA) as well as the Hungarian Development Bank (MFB). The main forum for strategy formulation and co-ordination is the Enterprise Development Council (Vállalkozásfejlesztési Tanács). Chambers assist firms with simplified processes, advisory and information services. Chambers also play an important role in preparing SMEs for the EU membership. Chambers participate in the macro-level social dialogue and the financing programmes directly. Professional associations are involved in designing and operating special programmes. Financing will be provided by the banks, guarantee companies and the government budget. The regional development companies of the Hungarian Development Bank (MFB) play an important role in financing catching-up programmes and operating venture capital funds.

Preparation of the Small Business Act

The government is preparing an Act on the main elements of support for micro, small and medium-sized firms. This act should provide a transparent and uniform framework for an enterprise friendly environment. It will define micro, small and medium-sized companies, priorities of the state aid policy, operation of the related budget line, and provides the co-ordination of various measures promoting SMEs. Before finalising the act, a thorough impact analysis will be carried out.

The main problems concerning fair competition can be found in the enforcement of ownership rights and contracts. The main obstacle in the law enforcement is the indeterminate, outdated and extremely slow real estate registration system, slow procedures for economic lawsuits at courts, and the slow implementation of verdicts. Urgent actions, including the deregulation of unnecessary and over-sophisticated rules are necessary to achieve effective law enforcement.

Table 22 – The main government scheme in favour of technology start-ups

Organisations responsible	Objectives	Target public	Funding
Ministry of Education, Research and Development Division	Supporting young technology-intensive micro enterprises in the implementation and economic utilisation of their innovative ideas, technology development plans**.**	Micro enterprises,* co-operatives and individual entrepreneurs who started business within five years.	Grant, for max. 2-year projects, max. 65% of the net project cost (without VAT), but not more than 5 million HUF. Paying after the acceptance of the fulfilment, based on the financial documents.

** Micro enterprise (XCV. Act of 1999): a company with maximum 10 employees and max. 700 million HUF net annual turnover. The share of the central or local government, or of another company cannot exceed 25%.*

Brief comments

On the venture capital funds: there are heated discussions at different enterprise development fora throughout the country on the cause of the lack of venture capital. Entrepreneurs blame venture capitalist, while the venture capital firms maintain to be financed, saying that there is as much capital as required, with practically no upper limit, but there are no promising projects.
The Act on venture capital has been discussed in Section 1.5. Experience accumulated in the last three years clearly shows that this Act has not fulfilled expectations at all. Based on this Act, it is possible to establish venture capital companies. There is only one (Regional Venture Capital Fund) set up in the frame of this Act, in which a series of rules have to be followed and an approval from the State Supervision of Financial Organisations (PSZÁF) is required. The others – 39 venture capital companies, having a total investment of 800 million USD by the end of 2000 – do not wish to belong to this Act. The reason of that is, according to the stakeholders, "over-regulated and artificial legal categories for economic phenomena, narrowing the degree of freedom for the companies". The tax allowance and extra financial source attracting opportunities offered by the Act cannot balance these problems.

In Hungary, most of the venture capital investments are still below 1 million USD. Investments between 5-10 million USD can be regarded as large ones. The typical exit strategy is selling stakes to strategic or financial investor (60%), in a less number of cases selling through open stock market action (IPO) or other techniques.

About half of the existing companies belong to large international funds, the others are active in Hungary only. The trend shows a shift toward the increasing weight of the international companies. The recent stock market problems, prompted by the free fall of the 'new economy' shares have not halted the development of the venture capital business in Hungary. On the contrary, low prices seem to be inspiring for investors thinking in the long run.

Emerging issues:

- SMEs in general and technology based start-up firms in particular can benefit from a rather large number of schemes.
- It is an especially good business for consultancy firms to advise SMEs how to apply for various schemes.
- To make SMEs' life easier as well as to improve the efficiency and transparency of spending public money on these purposes it seems to be necessary to harmonise the activities of various government agencies providing support for SMEs, and streamline the schemes themselves.

3.3 Business networks for innovation

As already discussed in Section 1, foreign-owned firms have made significant efforts to develop their supply base in Hungary (either serving their Hungarian subsidiaries or exporting to other plants belonging to their international production networks). Table 6 has shown that both electronics and automotive components account for a significant share of Hungarian exports. These are the two industries where the importance of international production networks is the most salient. Suppliers must introduce new products, processes and managerial techniques continuously, otherwise they cannot join these networks or cannot maintain their supplier status. Therefore these inter-firm networks are crucial in Hungary, too, initiated and organised mainly by businesses themselves.

It is worth mentioning that the first two 'formal' clusters have been established recently. Hungarian Suzuki Co., the Regional Development Holding, the Hungarian Enterprise Development Fund and Esztergom Municipality signed an agreement in December 2000 concerning the Central Hungary Vehicle Industry Cluster. In order to utilise resources in the region, and to cut costs, potential supplier SMEs and large companies in the region are organised formally into a cluster. It is aimed improving SMEs' chances for technology driven development. The Cluster can also be an efficient vehicle to co-ordinate applications for, and the actual use of, central and regional enterprise development funds.

Another similar organisation, the Pannon Vehicle Industry Cluster (PANAC) was also launched in December 2000. It was established to harmonise the activities of automotive components suppliers in western Transdanubia. SMEs should become active in producing machined parts for high quality requirements at large series. PANAC has been established by the West Transdanubian Regional Development Council, AUDI Hungary Motor Co., LUK Savaria Ltd., Opel Hungary Vehicle Ltd., Raba Co., Hungarian Suzuki Co., Citibank Co., Industrial Economy Research and Consultancy Ltd., and the Ministry of Economy. PANAC will be active in preparing co-operative projects.

The government – by listening to businesses – has also realised the significance of business networks for innovation, and has devised a specific scheme to promote it. The main government initiative to support inter-firm co-operation is the *Integrator* programme.

Integrator

Description of the programme

This scheme was initiated by large companies in early 1999 and launched already in the same year. The speed of the introduction of this scheme shows the importance attached to it.

Its **major aim** is to improve Hungarian SMEs' innovative capabilities and competitiveness, promote their networking activities, especially those aimed at conducting technological development projects, and as a result of all these to help them becoming suppliers of large firms. Further, indirect objectives include:

- to facilitate public-private partnership in financing innovative projects
- to improve the efficiency of the above investments
- to involve as many SMEs as possible in these joint projects.

Large firms and their potential suppliers can only apply jointly, as a kind of consortium. It should be consisted of an 'integrator', that is, a large firm with at least 250 employees and sales of HUF 5 billion in 1998, and two SMEs at least, who would become suppliers as a result of the joint technological development project. The minimum duration of these projects is 1 year, the maximum is 2 years. As part of their tenders, applicants are required to submit a business plan showing that as a result of the project the 'integrator' would purchase more input from local suppliers. An overall account of the integrator's supply strategy should also be given, describing the number of local suppliers, volume of their shipments, technological level (intensity) of suppliers and other performance indicators of suppliers.

Financial contribution from the partners should reach 50 per cent of the overall costs of the project, and the remaining 50 per cent can be covered by a *grant*. The grant is to be paid to the SMEs, the integrator is only eligible to cover its co-ordination costs, not exceeding 5 per cent of total costs, from the grant. The initial overall budget of the scheme was HUF 1500 million, of which HUF 500 million was allocated for 1999.

Progress report

The programme was first launched in August 1999, and then repeated quarterly. Fifty-nine applications have been submitted since then, 26 of them have been awarded altogether HUF 513 million (on average slightly less than HUF 20 million). A further 3 projects have also been approved, contracts are being prepared at the time of writing with a total value of HUF 13 million) in 2 cases, while 1 project proposal has been withdrawn (although accepted by the evaluators). Twenty-two applications are currently

being assessed (worth of HUF 791 million). Three project proposals have been rejected for professional (substantive) reasons (with a total budget of HUF 40 million) and another five because of formal mistakes (worth of HUF 144 million). The latter applicants can re-submit their revised project proposals.

Assessments and evaluations

Formal, fully-fledged evaluation of the programme has not been conducted yet as it was only launched just over a year ago. An internal assessment of the scheme was carried out when all the schemes run by the RDD ME were revised in October 2000. Relying on the structured discussion of the insights of civil servants – rather than on findings obtained from a proper evaluation exercise – a decision was made that the programme should be continued in 2001, too.

Characteristics of networks

Vertical vs. horizontal. These are vertical networks, connecting large firms (system integrators) and their would-be suppliers.

Geographic scope. These networks are national ones, but in quite a few cases the integrator is a foreign-owned firm, and thus the network might be linked indirectly to international networks. Moreover, in practice probably it is not always possible to make a clear-cut distinction between local and foreign pieces of information, knowledge and skills contributed by a foreign-owned integrator.

Organisational structure. These networks are established to conduct a given technological development project, and thus are likely to be in between the highly informal, sort of casual networks aimed at sharing experience and exchanging information at one end of the spectrum and the more formal and rigid ones at the other end.

Duration. These networks are set up at least for 1 year (support can be awarded for a maximum period of 2 years), but the scheme is also seen as a vehicle to build trust among the partners, and thus implicitly, indirectly encourage them to enter into a longer term co-operation. Some integrator firms even see it as a first step to develop new products or processes jointly – as it in the case of collaboration of the system integrators and the so-called first-tier suppliers in the automotive and electronics supply networks. In other words, then these networks would not only 'nurture' SMEs to become 'simple' suppliers, but to 'grow' into the role of more or less equal partners.

Boundaries. The membership of these networks is clearly set in a contract.

Architecture and balance of power. The internal structure of these networks is largely decided by the integrator, as would-be suppliers are dependent on them in most cases in terms of access to tech-

nology and markets. To some extent, though, integrators are also dependent on their (would-be) suppliers: there is a continuous pressure to cut costs, and thus it is a must to replace the former foreign suppliers by competent local ones, producing the required parts cheaper. Further, this balance over time might shift towards the suppliers once they are technologically competent to contribute to the development of certain components or even subsystems for the integrator.

Stability and trust. These networks are likely to be stable ones given the close co-operation required by the pressures of harsh international competition. In other words, both integrator firms and their would-be suppliers are investing in their somewhat shared future via entering these projects. It is not very easy to join global supply networks – most supply networks are global, almost by definition –, and thus there are strong incentives on both sides to keep the network together.

Rationale and motivation for the programme

FDI plays a crucial role in the Hungarian manufacturing industry in terms of sales, exports and employment. The most important sectors are automotive and electronics industries, both characterised by a sophisticated system of system integrators and (tiers of) suppliers. Therefore most of these foreign investors first relied on their existing, foreign suppliers – with whom they have had long-established relationships – when moved to Hungary. There have been strong traditions in these industries in Hungary, too, but local firms have been hit hard by the transition process (loss of former CMEA markets practically overnight, urgent need to restructure, strong pressure to find quickly new markets, products and fresh capital to adjust to the new environment, etc.). Most of them have also lacked the required managerial capabilities. In short, for all these reasons they have not been the first, obvious choice for foreign investors when they set up their operations in Hungary.

As mentioned already, these system integrators are also under pressure to find new suppliers, on the one hand. Promoting local SMEs to become suppliers (via improved technological capabilities) is of prime importance from a macroeconomic point of view (saving existing jobs and creating new ones to fight unemployment, improving the overall competitiveness of the Hungarian economy, broadening the tax base, etc), on the other hand. Hence the need for such a scheme.

The representatives of large multinational companies first raised the idea at a meeting with OMFB policy-makers in August 1999. They were asked why they had relatively few Hungarian suppliers, and they pointed to the technology and quality barriers faced by

SMEs. SMEs have also been consulted when designing the actual scheme.

Perceived benefits

Scale and scope of activities. SMEs' (would-be suppliers') capabilities are to be extended as a result of collaboration, and thus their markets should expand.

Shared costs and risks. Costs and risks are shared between the integrator, SMEs and the state in order to increase the local supply base of large firms (integrators).

Enhanced learning effects. SMEs (would-be suppliers) are expected to improve their learning capabilities as a result of collaboration. They can and should learn about new technologies, at a later stage, potentially, about methods to create new products jointly with the integrator and other partners, and also about managerial techniques required for becoming a reliable supplier (e.g. TQM, JIT).

Welfare effect. It is hardly possible to establish if participating firms would have spent the amount of their financial contribution on R&D without having the opportunity to set up these networks. Some companies might have continued to rely on their long-established, former foreign suppliers, that is, not to bother to find local ones. Others might have been forced to undertake these 'search and training' costs anyway, given the pressure of international competition. On the whole, however, a positive welfare effect is more likely than 'crowding out' private spending on R&D and innovation.

Speed. These networks are intended to speed up the learning process of SMEs.

Problems already identified, likely future (or built-in) failures

Preliminary experience and the growing number of applications suggest that this scheme is well designed, it does address an important issue. (In spite of the increasing number of project proposals some experts even say that this scheme should be better communicated.) Given the complexity of the basic problem, sometimes it is difficult to draw a clear borderline between general needs of SMEs in the bumpy road of becoming a successful supplier and the more specific technological ones. This scheme is obviously aimed – and given its source should be aimed – at supporting SMEs to participate in technological development projects, and not just easing, say, their financial situation so as to upgrade their production equipment. (Other schemes, run by another ministry, are in place to provide more general support for SMEs.) To sum up, this is not a policy problem, or a failure, given the design of this scheme, but a more general policy issue due to

the intertwining of two complex problems, namely how to promote SMEs, and how to tackle the complex process of innovation.

Table 23 - Main government initiative taken in favour of inter-firm co-operation

Organisations responsible	Objectives	Target public	Funding
Ministry of Education, Research and Development Division	1. Improving the innovation abilities of SMEs to become strategic suppliers 2. Enhancing technology co-operation between firms	Consortia consisting of a large company and at least two SMEs	Grant up to the 50% of the project cost for given purposes 95% of total support for the SMEs and 5% for the integrator company

Emerging issues:

- Business networks, especially final assembler – supplier networks play a crucial role in the Hungarian economy in terms of technological and organisation innovations, employment and exports. These networks are usually initiated and organised by firms themselves.
- Local firms, especially SMEs, do need support to become successful suppliers.
- It is a genuine policy challenge to distinguish various needs: supporting SMEs to participate in technological development projects vs. easing their financial situation so as to upgrade their production equipment.

Section 4 - Policy conclusions

Although innovation is a fairly complex, non-routine, non-foreseeable socio-economic process, and hence no panacea can be prescribed for how to foster it, some policy conclusions can be drawn from recent research results.

Evolutionary economics, based on thorough empirical analyses of the innovation process, has provided a new policy rationale, a different one from that based on neo-classical economics. This new approach is gaining ground in more and more advanced countries. Some important organisational and legislative changes have occurred in Hungary, too, on the whole in line with the recent international trends. Yet, a deliberate, systematic innovation policy is still lacking for a number of reasons. Until 1996-97 the most frequently mentioned argument was the dire state of the government budget. However, money is always a scarce resource, and when a country is in a particularly difficult situation then there are even more pressing reasons to devise and implement a sound strategy (be it innovation or any other strategy). From a broader perspective one might identify further – and somewhat more 'soft', yet more convincing – reasons. Heritage of the former socio-economic system (e.g. not particularly impressive performance in spite of the plethora of the so-called central development programmes), and partly ideological, partly socio-phycological stands against the apparently increased role of government all constitute obstacles on the road. Moreover, there are vested interests against concerted efforts, just as in many other countries where various government bodies prefer no to share their resources with other agencies even if it might lead to more efficient public spending. In short, there is a long way to go. There is a lot to learn from recent theoretical results and policy approaches applied in some advanced countries, and an even more demanding task is to devise and implement a coherent socio-economic strategy with innovation in its centre.

4.1 Methodology of policy making

History clearly shows the interdependence of technical, economic and social change. Policy decisions should, therefore, be based on an *integrated approach*, taking into account the systemic aspects of the relationships of technology, competitiveness and growth together with the importance of social, institutional and cultural factors in a country's ability to profit from technological change.

Policy decisions should be integrated in a technical (pragmatic) sense as well:

- innovation, industrial, investment, privatisation, competition, trade, monetary, fiscal, education and labour market policies must not be devised, implemented and evaluated separately since all have considerable impact on enterprise behaviour, and hence innovation;
- former and current actions should also be seen in an integrated way: (a) the legacy of previous measures simply cannot be ignored, moreover, (b) an extensive use of information on their impacts is inevitable when designing the new ones, i.e. regular *monitoring* and e*valuation* of all the major policy measures should be devised. Innovation surveys would provide vital background information to this.

4.2 Policy measures

Experience of successful countries suggests two major lessons: *(i)* it is the *firms'* task to undertake the bulk of innovative activities, however, *(ii) governments* can, and indeed should, also play a vital role by shaping the institutional characteristics of the *national system of innovation* and providing favourable *international relationships* within which it operates. The overall, twin, objectives are to improve international competitiveness of firms and the economy as a whole and to enhance the quality of life. The above '*networking' activities* can considerably contribute to achieving these ultimate goals via creating environments conducive to innovation. This includes the task *A)* to establish an appropriate physical and institutional infrastructure to advance the *generation of new technologies, skills and knowledge* as well as *B)* to facilitate the *diffusion*, that is, both adoption and adaptation, of technologies in order to improve the system's ability to take advantage of technological change. Recent analysis has, however, strongly indicated that innovation is an interactive process, and hence the earlier distinction between the creation of technologies and their diffusion cannot be held. It is, therefore, of utmost importance to devise and implement an integrated policy approach in this sense as well.

Transition poses specific challenges, too. A major one is that financial difficulties together with exaggerated market ideologies might lead to policy suggestions aimed at further 'marketisation' of R&D. It seems needless to stress that this would be a fatal misconception.

It is also of importance to learn from the mistakes made by industrialised countries' governments. Hence the Hungarian government should *avoid*: 1) policies that seek to pick winners, and 2) creating 'islands' of innovation through selective support of certain high technology industries.

Appendix

Table A1 - Economic activity of the population aged 15-74, 1995-2000, thousand heads

		Employed	Unem-ployed	Economically active popu-lation	Economically inactive popu-lation	Of which: passive unem-ployed	Activity rate (%)	Unemployment rate (%)
1995		3,678.8	416.5	4,095.3	3,724.4	106.7	52.4	10.2
1996		3,648,1	400.1	4,048.2	3,759.8	101.8	51.8	9.9
1997	**Q1**	3,604.0	372.1	3,976.1	3,821.2	101.4	51.0	9.4
	Q2	3,615.5	367.5	3,983.0	3,818.7	89.5	51.1	9.2
	Q3	3,654.7	345.9	4,000.6	3,800.1	89.6	51.3	8.6
	Q4	3,710.9	309.8	4,020.7	3,779.7	98.4	51.5	7.7
1998	**Q1**	3,641.1	346.6	3,987.7	3,776.2	117.6	51.4	8.7
	Q2	3,663.5	319.2	3,982.7	3,777.4	114.8	51.3	8.0
	Q3	3,716.3	302.8	4,019.1	3,734.8	105.0	51.8	7.5
	Q4	3,770.0	283.6	4,053.6	3,692.1	104.2	52.3	7.0
1999	**Q1**	3,764.6	301.7	4,066.3	3,668.0	118.5	52.6	7.4
	Q2	3,804.8	281.2	4,086.0	3,634.6	108.6	52.9	6.9
	Q3	3,832.9	287.2	4,120.1	3,590.0	102.8	53.4	7.0
	Q4	3,843.6	268.9	4,112.5	3,590.3	106.6	53.4	6.5
2000	**Q1**	3,797.9	274.0	4,071.9	3,617.1	116.9	53.0	6.7
	Q2	3,826.6	267.4	4,094.0	3,587.4	105.4	53.3	6.5
	Q3	3,874.7	260.2	4,134.9	n.a.	103.0	n.a.	6.3

Table A2 - Lecturers and students in the HE sector, 1990-2000, thousand heads

	1990/91	1991/92	1995/96	1996/97	1997/98	1998/99	1999/00
Lecturers	17.3	17.7	17.4	17.3	19.7	21.3	21.1
Full-time students	76.6	92.3	129.5	142.1	152.9	163.1	171.6
Part-time students*	25.8	25.2	56.9	80.7	80.9	95.2	108.2

Source: Central Statistical Office Students attending evening, correspondence and distance learning courses*

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