KNOWLEDGE FLOW BETWEEN RESEARCH UNITS AND COMPANIES IN HUNGARY COMPARING THE GKI CO. AND THE TUB EXPERIENCES

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Abstract

In 1999, with OMFB[1] support, GKI Co. studied the knowledge flow that corresponded to 17 innovations. In 2000, there was a similar research launched at the Budapest University of Technology and Economics (TUB) and 42 university R&D cases were analysed. This article compares the most important experiences of the two investigations. The Hungarian knowledge flow between the economic actors is not intensive enough, and this deficiency was explored by both researches. The results of comparison and conclusions for innovation and technology policy makers are summarised in this article.

Keywords: innovation policy, knowledge flow.

1. Approaching the Knowledge-Based Economy

Economists agree that the modern economy is based on knowledge and economic development depends on the extent to which professional expertise is used in production. In the third millennium globalisation and technological progress are the main factors of growth in the world economy. The revolution in information technologies and borderless micro-integration are the most important engines of growth in the developed countries. Today, the USA is the flagship of technological progression, where the statement that a 'New Economy' is born as a result of the process became fashionable. The European Union is forced to launch large R&D projects (e.g. in the 5th Framework Programme) to remain competitive.[2]

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[1] OMFB is the Hungarian abbreviation for 'National Committee for Technological Development', which was an independent government organisation promoting innovations. In 2000, it was subordinated to the Ministry of Education and given a new name (State Secretariat for Research and Development).

[2] See [4], [6], [10], etc.

In order to study the birth, diffusion and use of knowledge, many researches – of which the OECD efforts[3] have been rather influential – were launched in the past two decades. One of the research fields, which is important for science and technology policy (see e.g. [12]), concentrated on the relations between 'science' and 'practice', and showed that the flow of knowledge is the most important factor for the diffusion of innovations.

On the periphery of economic development – including Central Europe and Hungary – only the first steps have been taken towards the knowledge-based economy, as studies[4] have already shown. The Hungarian R&D performance is respected in many countries of the world (the number of Hungarian Nobel prize winners, which is high in international comparison, probably supports the positive judgement), however, we can barely reveal favourable effects of this performance. For instance, the representative GKI Co. surveys[5] also showed that competitiveness of the Hungarian products and services underwent significant improvement[6] in the past decade, but a substantial proportion is still not competitive on world markets.

Table 1. Distribution of sales by international competitiveness (%)

Competitiveness of products	1973* Total	2000** State-owned	Hungarian private companies	Foreign	Total
Competitive on foreign markets	18	41 (34)	45 (48)	83 (85)	51 (44)
Smaller development is needed for competitiveness	42	28 (20)	30 (27)	11 (11)	26 (21)
Cannot be exported	40	31 (46)	25 (25)	6 (4)	23 (35)
Total	100	100	100	100	100

*Unweighted averages of industry. Source: [18]

**Figures for all the three main economic branches. The figures without brackets are the unweighted averages (in brackets the averages are weighted with the number of employees in the responder company). Source: GKI Co. 2000 Spring Survey.

[3] [7], [11] etc.

[4] Among others, some of the more important studies include [19], [20], [21], [15].

[5] In the 'postal' EU-harmonised enterprise surveys of GKI Co., the longer term (1–2 years) expectations of the Hungarian companies asked two times a year. The targeted population is the group of active legal entity businesses that employ more than 20 people, which means about 50–60 thousand companies. Approximately 8000 companies are randomly sampled on each occasion. Sampling is stratified along the sectors of the national economy. The response ratio is around 10%, the responders' distribution of company size, sector, region do not differ significantly from the national proportions. The survey results are published in [1]. For an English language summary see [17].

[6] We must note that modernisation of the Hungarian economy was mostly the consequence of technology transfer and not national R&D. See: [9], [14], etc.

In the recent years GKI Co. and the Department of Economics (TUB) jointed forces to launch researches in order to explore the reasons for the emergence and remaining of the mentioned contradiction – namely the gap between Hungarian research and practice – and to show possible ways of narrowing the gap between science and production.[7] In 1999 GKI Co. reviewed 17 innovations that were introduced (or planned to be introduced) in Hungary; the innovation cases were recommended by selected research units.[8] In 2000 the department of economics (TUB) analysed 42 university R&D cases,[9] which also were recommended by the innovators. Most of the conclusions and statements in the two studies harmonised and seemed to be general. So we could distinguish three large groups of factors, which outline the most important obstacles and opportunities for Hungary's economic development with respect to innovation policy: (i) problems and possibilities of innovation diffusion, (ii) tasks of strengthening entrepreneurial behaviour, and (iii) increasing the efficacy of government support.

2. The Necessity of More Intensive Knowledge Flow

The majority of 'professional' researches – at the universities and individual R&D units – that we came to know during the 1999–2000 studies was found to be 'competitive'. In each of the research units, there were inevitable scientific successes as well.[10] In TUB for instance, the researches in the 'sample' contributed to the birth of many new products and technologies, moreover, much of the R&D experience was used in education and/or published. Scientific success is quite frequent in many other research units, too. These facts definitely support the above quoted views on the 'high standard' of Hungarian researches.

Despite the mentioned, 'knowledge flow' from the Hungarian R&D sector to the business sphere proved to be poorer than needed.[11] The quoted GKI Co. study showed that the many innovative Hungarian companies even today[12] do not rely on the local R&D capacities, despite the fierce competition. The innovative

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[7]Our research concepts correspond to the OECD recommendations. Therefore, the objective of R&D activities is to obtain new knowledge [7, p 29]. Innovation is a much broader activity with more practical connotation, the essence of which is the introduction of new products and technologies [ibid. p 19]. The main actors of the national innovation system include R&D units, companies and the state-owned institutes of the innovation policy administration [11].

[8]See [16].

[9]See [5].

[10]The statement does not mean that unsuccessful researches are rare in Hungarian research units, or less frequent in international comparison. The processed R&D cases were more successful on purpose, as most of the research units recommended successful cases to study.

[11]In international context, knowledge flow is often quantified as the mobility of people with high qualifications. The related Hungarian statistics also support our statement and prove the existence of poor knowledge flow. See: [15].

[12]For earlier references see [22] [15], etc.

'knowledge' is usually acquired from other 'producers' – often the foreign parent company – or developed 'in-house".
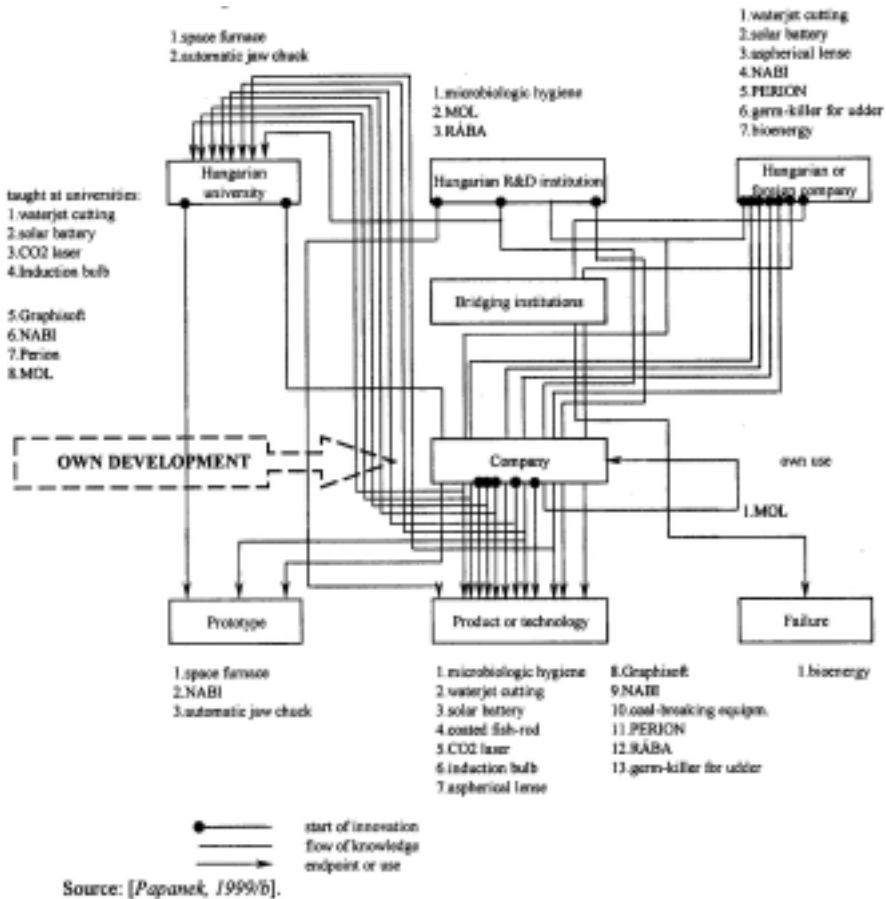

Source: [*Papanek, 1999/b*].

Fig. 1. Knowledge flow in the studied innovations

The TUB research confirmed the above mentioned. Most of the studied innovation projects showed the importance of outer (or 'outward') researches and also undertake the research for the solution of company problems. Consequently, many products and technologies were born. However, the users were usually limited to the large companies of some sectors.

Taking into account that in the first half of the 20th century there were close relationships between Hungarian companies and research units, today's poor knowledge flow stems in the 1950–1990 period, namely in the economic policy governance that artificially separated research and production. The favourable signs of

Table 2. The TUB projects by sectors (pcs)

Sector	Sale of R&D result		Introduction of new product		Introduction of new technology
	in Hungary	abroad	in Hungary	abroad	
Chemical industry	3	3	4	3	2
Engineering industry	1	–	–	–	–
Manufacture of instruments	1	3	2	1	2
Manufacture of bulbs	1	1	1	1	2
Motor vehicles	5	3	5	2	5
Energy industry	5	1	1	1	3
Construction	2	2	–	-	–
Telecommunication	3	4	2	2	2
Other branch	2	3	–	–	–
Universal utilisation	–	1	–	1	2
Total	23	21	15	11	18
%	55	50	36	26	43

Source: TUB research

turning back to the 'good' traditions can be seen to some extent, which underlines the actuality of the TUB research and the opening possibilities of solving some problems. Both the GKI Co. and the TUB researches showed that on the one hand, the two equally poorly performing channels of knowledge flows in the past became asymmetric by now. Flow from companies to universities intensified (the above figure also reveals that the accumulated innovation experiences are often used in education). On the other hand, restoring the backward direction of knowledge flow, a step needed for the efficient knowledge based economy, also seems possible.

3. Strengthening the Will to Innovate

In the developed economies when the possibilities of accelerating the knowledge flow are sought, usually the government measures to support the diffusion of information are studied. Our Hungarian experiences, however, revealed that wider scale efforts – which catalyse the micro-sphere – are needed for success. Neither the R&D units, nor the 'businesses' pay enough attention and put effort into innovation to make use of the available knowledge.

The international literature talks about 'spin-off' companies with respect to technology-intensive enterprises that were established by or in cooperation with higher education institutions, other government-financed research institutes or their employees. As the latest OECD investigations reveal, the number of spin-off companies and their ability to stay alive in the long run are important benchmarks of

knowledge flow between research units ('science') and the 'industry'.[13] Notably, in the Hungarian economy such companies rarely exist, and their number does not increase fast enough, although there were many spin-offs established in 1990–92 when the parent companies (or institutions) were in transition crisis. Spin-offs or spin-off-like companies are exceptional among the studied TUB cases as well.

As we have experienced, the marketing of R&D should also improve in the Hungarian innovation system. Marketing theories have been saying for 30 years that researches should start from market demand paying attention to the attributes of future products and technologies. It seems though, that many Hungarian researchers do not think about making business use of the research results achieved. According to the official statistics, basic research weighs much more and experimental development much less in the government expenditures on R&D (GERD) than in the developed economies. There are few applied researches targeting their corresponding 'industrial' sector. For instance, even the successful TUB projects exceptionally have estimates on the expected business profit of their R&D results. Patenting of the technological achievement is also less frequent than needed.

Table 3. Number of projects calculating the profit of R&D in the given way

Sources of data used for profit calculus	Basic research	Applied research	Experimental development	Technology transfer	Total pcs	%
Project plan	–	–	1	–	1	2
Books/Accounting	–	–	1	–	1	2
Estimates	–	3	4	1	8	19
No information	5	12	9	2	28	67
Profit not understandable	2	1	1	–	4	10
Total	7	16	16	3	42	100

Source: TUB research

There are further basic problems and tasks to be done among the potential users of the R&D results, i.e. the companies. The problem of the (mostly small and medium sized) companies is that the management does not want to proceed with modernisation. As the above cited GKI Co. survey proves, in international comparison – with respect to competitors – there are not enough Hungarian companies that undertake research, purchase patent or adopt new technology. Among the planned investments, enlargements dominate, and there are few developments that result in substantial modernisation. Reasons for these problems are well-known: in the Hungarian economy the financial sources of development are often scarce, and the prospects of return on innovation are also poor in many companies.

As the GKI Co. case studies reveal, the corporate innovation efforts – which are exerted more frequently among the companies with foreign ownership – are

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[13][2] [8].

Table 4. Share of companies planning significant actions to improvecompetitiveness (%)

Action	Companies employing			Total
	–50	51-300 people	301–	
Own research	36	35	44	37
Purchase of patent, know-how	6	7	16	8
Technology transfer	16	15	13	15
Larger investment	41	49	64	48
Of which: product development	·	·	·	30
improving technology	·	·	·	23

Source: GKI Co. 2000 Spring Survey

also problematic in some respect. As we mentioned, many innovative companies (approximately 1/3) are engaged in implementing their own development ideas. Another problem is that the companies rarely look after the direct sales possibilities of the acquired 'knowledge', which may explain some of the poor chances of return. The protection of R&D results is often inadequate. Patenting is very rare, the parties – which sell, buy or transfer know-how – frequently do not conclude confidential information agreement.

4. Innovation Policy Launched

Earlier researches have already condemned the absence of Hungarian innovation policy. The Széchenyi Plan under elaboration will probably make up for this deficiency. For the detailed programme points and measures of the Plan, we would recommend the following.

First of all, the 'monitoring' and statistics of innovation (R&D, technology transfer, mobility of the human resource devoted to science and technology, etc.) should be reformed.[14] This is also required as Hungary is member of the OECD and a candidate for EU membership.

As the general poor will to innovate demonstrates, the innovation policy should target the further stimulation of innovation with the help of efficient measures. The well-known recommendations on the establishment of an efficient financial system for innovation – which, among others, includes the 'business angels', venture capitalists, etc. who undertake the investment of seed capital for the early stage of innovation –, and on the substantial increase of the tax allowance for innovation (extending it for R&D purchased) were also supported by our empirical information. It was also shown that the ex-post control of expenditures is necessary

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[14]Nowadays, the Hungarian researchers of the field are 'only' able to present state-of-the-art reports, when they sometimes publish the results of their empirical investigations. The existence of frequent and reliable 'modern' innovation data, the acquaintance of the topic are both inevitably needed for the policy makers as well.

when there is a government support for any given innovation. The return on spending should also be verified by the grantee with the help of reasonable calculations and books. Again, the mentioned problematic issues called attention to the fact that the strengthening of intellectual property protection is an important condition to more intensive knowledge flow. We are convinced that as long as this problem of the Hungarian business culture is not solved, any other measure motivating innovative business behaviour will be less efficient than could be. Since many researchers and most of the companies are not prepared to protect their own intellectual property, the clue is partly education and further training. Nevertheless, the enforcement possibilities of rights pertaining to intellectual property should expand in Hungary; the legal regulations of the field should be corrected, the judicial-procedural system must be developed, etc.[15] The foundation of spin-off companies should also be encouraged.

In developed countries, the governments established strong networks of bridging-liaison institutions that support the knowledge flow between 'research' and 'practice'. Although in the recent years, there were similar networks called to existence in Hungary as well, the general experience reveals[16] that most of the Hungarian institutions could not find the way to operate efficiently. The problem carries on – as the above figure depicted from the GKI Co. researches and the TUB case study experience both have shown. In the GKI Co. cases there was even a special example of wasting time and energy: a foreign innovation had been introduced by a Hungarian institution then a company adopted it again – making use of information from a German partner company. In conclusion, the current practice of institution financing should definitely be altered and changed to project financing in case of the bridging institutions as well.

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Attachment – the 17 Case Studies in the GKI Co. Research

ARATÓ, J.:	Improving Microbiological Hygiene for Cut Poultry processing by KÉKI
	Coated and Deep Frozen Fish Rod by Fish and Food Ltd.
	Solar Battery by Dunasolar Ltd.
	Surgical Laser of Lasram Ltd.
KÁLMÁN, J.:	The Coal Breaking Equipment of 2M Mecsek Ltd.
	Automatic Jaw Chuck of Szimikron Ltd.
	Aspherical Lense of Zeiss Hungary Ltd.
	Plastic Bus by NABI Co.
	Architect Design Software by Graphisoft Co.
LAKATOS, B.:	Recycling Technology for Used Batteries in Perion Co.
LÁNYI, P.:	Waterjet Cutting Adopted by Bay-Logi
	Space Furnace Developed by the Material Science Institute of the University of Miskolc
	Induction Bulb of GE Co.
	Antimast Germ Killer for Udder and the Veszprém Innovation Centre
	Bioenergy Technology and the Innostart Innovation Centre
SZARVAS, I. et al:	D10 Engines by RÁBA Co.
TOKAI, T.:	Measuring Instrument for Fluidum Developed by MOL Co.