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Knowledge-based society in Hungary in 2015¹

T*wentieth century strategic thinking in Hungary was characterized by policies assigning special importance to knowledge, the level of experts, to science, education and the role of culture in societal development. Especially since the new start following the Trianon Treaty (Editor! the peace treaty concluded at the end of World War I that established the new borders of Hungary), the cult of first-class intellectual products made in, or related to Hungary has been a central part of the Hungarian national self-image. Intellectuals, at least, have believed to find the value, the excellence of the nation for Europe and the whole world somewhere in the special importance assigned to knowledge production. This was most obvious in the science policy of education minister Klebelsberg as early as in the late 1920's. It was also apparent in the scientific-technical revolution concept of the modernization wave of the 1960's, in the utopias of the 1960-70's on the opportunities of automation and computerization, in the economic reform ideas of the late 1960's on innovation and later, from the early 1990's onwards, in the development of IT networks and in the import of information society concepts urging state involvement. Despite these concepts, the internationally comparable performance of the sectors concerned did not reach an outstanding level, radically ahead of the general development of the country, however. It did*

not lag behind the average development, either; it rather reflected a general, transitional position of the Hungarian society in Central-Europe and in a wider economic-social scale.

KNOWLEDGE SOCIETY ON THE SEMI-PERIPHERY

For over 30 years, Central European economies have tried to adapt to the effects of globalization and the appreciation of knowledge production in various ways. Before 1989-1990, this adaptation had a given geopolitical framework; state socialism inevitably concealed certain forms of the adaptation, while some others could not be tested. After the political change, however, economic and social policy in Hungary tried all the means applied by national governments in other peripheries of the world system. Deregulation and privatization policies were launched, the labor and financial markets were liberalized, major state companies (except if they had gone bankrupt right away) and, later on, the majority of services were sold by the state and local governments and various trade regimes were liberalized. Following from the economic philosophy of the Washington Consensus, the specialization of the industry and the mobilization of the

workforce were shifted to areas offering greater competitive advantage. Adapting countries, in Latin America, for example, had been disappointed in several aspects by then. The economy and society had become fragmented, cohesive links had loosened, several long-term educational and human capital investments had been indefinitely postponed and the reforms had involved a more unequal distribution of burden on various groups of society than previously expected. It was the refined versions of clear market approaches that reached Central and Eastern Europe and the supply and educational systems established during state socialism, even though in ruins, were obstacles to the unchanged adoption of the Latin American versions. The goal of the reforms was unchanged, nevertheless: by eliminating the measures and restrictions hindering various market forces, it was the establishment of the automatism of an accelerating development model that remained the primary task. The system thus developed in the region may be understood as an example of asymmetrical globalization. Thus, the fluctuation of growth, the ruptures of the innovation chain, the imbalance in the distribution of resources and the growing inequality of incomes can all be arranged into models.

After 1989–1990, Hungary clearly chose export-oriented industrialization to be the central element of its development policy and, although the period of state socialism had not simply been an example for import-substituting industrialization, either, it had been similar to the Latin American period of import substitution in certain ways. In any case, it similarly ended in indebtedness, it similarly forced out a period of reforms in the 1980's and it similarly led to the introduction of a new, open model in the 1990's. Considering the Central-East European region as a whole, export performances improved but, in the majority of countries, imports grew faster than exports.

Although the rates of growth were higher than in Western Europe, they did not come close to the growth rates in the East Asian rivals, and the problem of poverty grew worse instead of showing any improvement. In the 1990's, after a sharp initial fall, there was a rise in GDP, but, at the same time, the groups under the poverty threshold had grown, instead of getting smaller in size. Unemployment and the operation of the informal economy got increasingly intertwined and, in certain regions, probably the majority of new employment or rather money earning opportunities were available in the informal sector. Liberalization presupposed that there would be a growing demand for unqualified workforce and thus the employment rate and the income level could both rise, but the internal structural deficiencies of the educational system that became apparent very soon, as well as the general appreciation of information technologies primarily increased the demand for qualified workforce. Income differences grew accordingly and many of the new places of employment were of a low quality (in that they involved short-term assignments with low salaries, deteriorating work conditions and loosening social protection and solidarity). This in turn affected the innovation potential of Central Europe, too, since due to the swell in temporary and informal jobs, companies were not encouraged to invest in training, or increase productivity.

From the mid 1990's, the notion of knowledge-based society has become the key concept of major EU policies, including both short-term competitiveness and long-term strategic policies. Various EU mandates have differed on the composition of knowledge-based society, however, and regulatory work in Brussels has been carried out in various official frameworks. There has been a team specialized in research development, another in skills and a third one in media regulation, while a fourth office has specialized in studying the social environment of

the info-communication sector. The terms of knowledge economy and knowledge-based society have been used in all areas but the underlying concepts have not always been the same. The largest apparatuses and the most comprehensive EU policies were developed in research policy and related to the information society policies at the earliest. These policies in fact started to intensively focus on candidate countries, too, very soon. Thus in the modernization of the Central European policy in the 1990's, in the above-mentioned two fields, national policies were formed or influenced by the will of Brussels to a great extent, often at the level of actual projects, from the beginning of the reforms. Education primarily remained a national competence but towards the end of the nineties, the Bologna Process put the reform of higher education on the agenda in all Member States. Under the Lisbon goals, in the various EU documents with various focuses, knowledge economy – especially its clusters directly related to innovation and research development – has been assigned special importance.

BASIC ISSUES

Three basic issues must be made clear in the beginning.

① To what extent should we deal with the sectors of knowledge industry and to what extent with knowledge-based society as a social order?

② To what extent should the various sectors of the knowledge industry be dealt with separately, i.e. traditionally as educational policy, research policy, innovation and the media, or should knowledge production and dissemination as a whole be treated as a system, beyond the description of the individual policies and their effects?

③ Should we and can we apply a bottom-up and a top-down approach at the same time?

Which is to say that, clearly, the sectoral problems of the knowledge industry should be the starting point, but would it not be useful at the same time, as an experiment, to formulate, along synthetic indicators, possible and desirable states in the knowledge economy of the society by 2015–2020 and examine what the various sectors of the knowledge industry are able, or unable to do to attain these?

In the nineties, major international organizations started producing comprehensive reports on the knowledge economy or knowledge-based society. It was basically the problems raised by these reports that governments and national administrative systems started to react to by their own policies. This is what should be referred to as the first generation knowledge policy. In these texts, the emphasis was on the novelty of the phenomenon – as a system – because of which nobody really cared what interfering effects the various knowledge industrial sectoral policies had on one another. In what aspects they undermined one another and in what ways they unintentionally shifted the emphases of one or another policy. Understandably so, because in this phase the primary intention was to mobilize governments, implying that it was governments that should take definite and determinative action. Since in the nineties there was no turn in any of the sectoral knowledge industrial policies in Hungary despite the rhetoric, it would be quite obvious to force out the change now, 10 years after Western Europe, as is usually the way. But should we not make an advantage of the backlog at least in this respect and try some second generation knowledge policy? That is, to shift towards the integrated policies of the state, the corporate sector, the academy and the civil sphere? After all, this would be a kind of knowledge capitalism that could be interpreted as the subtype of some formation. For this it should be specified, however, what knowledge markets in Hungary may be like in the next

decade, what advantages certain persons, organizations and institutions could draw from controlling some part of the knowledge and finally, in what ways knowledge could actually become capital (as human capital, research results or some other ways). In the current literature, there are two models for knowledge production. The first one is Mode 2 scientific knowledge production concept. The second one is the Triple Helix of research-industry-government relations. Mode 2 knowledge production is application centered, constantly moving in the demand-supply field and, from the very beginning, it seems useful (or offers benefits) for some key societal players. The Triple Helix model emphasizes inter-institutional cooperation and indicates that knowledge production in its new concept leads to the creation of new, hybrid structures between the academy, the industry and the government which, instead of the chain-like institutional cooperation in innovation and knowledge application, force out the prominence of network structures.

In the concepts of common use, knowledge is seldom defined separately and the interrelation of training, R&D and the IT infrastructure has not been clarified, either (i.e. we do not know if the backlog in one area can be counterbalanced, along an indicator package, by relative development or advance in another area). The digital divide between households, regions and countries primarily highlights the availability or unavailability, or sometimes the quality of technological elements. The question is to what extent narrowing the knowledge gap is a prerequisite for accelerating development. At first glance, it certainly is, but a comprehensive analysis is required to get a detailed picture.

There is an antithesis that can probably be defended against the above: the growth of knowledge-based economy involves the widening of the knowledge gap, both between countries and between various societal groups. This

gap thus probably becomes a prerequisite for growth, too, in a peculiar way. In the 1970's–1980's, New Economy indeed contributed to the narrowing of the income gap and to the reduction of some other forms of related inequality. In the 1990's, however, the gap grew in industrial countries, despite the partial equalization of the informatics supply level.

In 2015, the consequences of the educational reforms launched in the 1990's will already be reflected in the composition (and probably also in the qualifications structure) of the new groups in the labor market. For the interpretation of the latter – in higher education, for example, and probably also in adult education – educational political-historical analogies related to the growth and inflation of educational systems can be used.

Here, an attempt is made to clear the following, among other things.

■ What is the development of supply and demand like in the educational markets, especially regarding knowledge-intensive sectors or corporate groups? How will elite secondary schools founded in the nineties react to the demographic fall in pooling opportunities? What do supply and demand mean for this type of schools? What will be the real source of growth here in the next decade: demand or supply?

■ What role does the private sector have in the various fields of training? What share should the economy employing the workforce have in the direct financing of the training that it requires (e.g. in technical higher education) and what could it get in return? How much weight should this corporate sector have in financing the development of the system (i.e. its projects reaching beyond its daily operation) in 2015?

■ How bad can the replacement effect be, i.e. when private funds serve the operation of system elements earlier established through public funds, instead of serving new demands?

Could it be possible in Hungary for private funds not to simply replace public financing but to precede these in some fields and actually generate growth thereby? And the state would then actually approve those courses of development and become a secondary player in the courses of development identified as important by the private sector.

■ What forms can institutional or sub-sectoral competition have in the educational system of a thus widened capacity? Where can it contribute to quality increase or anticipate the demand for degree production in the next ten years? Do we have a picture of what institutional constructions or forms of training may be the winners and losers in this process?

■ Who will be able to formulate training ideals for the system in the next ten years: the state, the educational elite or the buyers' market? How will their power relations develop in influencing the contents development of the educational system?

■ There are three motives or major subtypes in the 20th century history of the expansion of the educational system.

- External transaction (when external interest groups negotiate with some part of the educational system in order to achieve that the latter establish particular services in return for some funds put at their disposal).
- Internal initiatives (when the growth policy emerges within the system itself and looks for new markets for the special expertise produced by the system). Finally,
- political intervention, when, for some general social political consideration outside the knowledge economy, it is the state that determines expansion.

■ Could it happen that important interest groups – companies employing graduates or some of the families interested in attaining higher education diplomas – withdrew their confidence from the state as the education service provider (as has already happened in the

case of denominational schools offering good opportunities in further studies)? And, primarily, with reference to what they saw as an unsatisfactory state of public education, they would try to establish their own elite training institutions (and where this was not possible, they would start using European higher education institutions abroad in great numbers). In what ways could a potential withdrawal from the state educational system begin and which are the highly sensitive fields where the latter could become a mass-scale phenomenon?

■ What will happen to technical training? There are ongoing debates everywhere in Europe on the desirable forms of technical training, on the organizational responsibility necessary for the operation thereof as well as on the raising of funds. The former system of technical training in Hungary has more or less collapsed and there have not even been serious debates launched in the field, let alone a government decision for a desirable new model to be followed. To what extent should companies be involved in solving the problem? What is the desirable skill structure like that is able to attract the highest number of foreign investors to Hungary, who could in turn create the highest number of new jobs in the next decade? And how could the same skill structure be interpreted from other viewpoints like the quality of life or social cohesion?

THE STATE OF THE RESEARCH SYSTEM

■ In 1989–90 and the years to follow, ideas regarding the scientific and technological development capacity and opportunities of Hungary had a prominent role in the plans, dreams and hopes of the intellectuals forcing out the political change, related to the new Hungary. It was obvious that, considering the then economic development level and geopolitical position of the country, its research institu-

tional network and R&D workforce could seem overdeveloped or excessively numerous in the short run. But both the professional elite and politicians opined that the two weaknesses of the system, the insufficiently organic international relations and the low input compared to the size of the R&D workforce could be easily dealt with. The end of the Cold War offered an exceptional opportunity for internationalizing relations and, because at the global level there was a shortage of high technology workforce, it seemed that the Hungarian capacity could be sustained by the orders of major international development centers (i.e. could be outsourced, so to speak) until the necessary sources within the country were available once again.

■ Not quite contrary to the above, there was a negative scenario as well. On the one hand, the acceleration of brain drain, a phenomenon unfolding already in the 1980's, was feared. There were worries that, as the opportunities of traveling and working abroad widened, Hungarian R&D workforce that were, or could become of an international rank might gradually leave the country and, in search of better living and working conditions, might be permanently or even irrevocably lost for the Hungarian science and technology policy. And, at the same time, as the Western export restrictions, which had determined the international trade of high technologies in several fields for Hungary before, loosened, these products appeared in Central and Eastern Europe, too, and the development capacity, or even the institutional networks that had been constructed as a replacement, simply became superfluous, and the systems developed in original but autarch systems became unmarketable. These two factors, although in different ways, could undermine the whole system of research and development in Hungary.

■ At the same time, public opinion in Hungary and the foreign experts invited to

examine the then R&D system agreed that a prerequisite for survival was to adjust the structure of the system as well as the policy instruments used therein to the Western examples. And since in the systems presented as analogies, organizations similar to the academic research network and industrial sectoral development institutes either did not exist or, compared to their weight in Hungary, were smaller and were less complex than those in Hungary, major reforms, downsizing and restructuring were recommended in these sectors. In the desirable new structure, research was to be assigned to universities, while development to production companies, basically.

■ Economic policy makers in the 1990's were deeply convinced that, in the institutional restructuring of the economy, market logic would in itself decide what kind of innovation was necessary for whom and it would also turn out as a consequence, the existence of which technology capacities was justified and which was not. State intervention was regarded unnecessary in this aspect, too. Therefore, there was no need for an explicit technology policy, either, it was concluded, since corporate logic would inevitably overrule everything. The only role of the state technology policy could be the application and essential local adaptation of the policy instruments tested elsewhere, the application of which, with the aim of increasing the efficiency of market effects, had become a routine elsewhere (development parks, innovation incubators, scholarships of further education and mediatory networks). The new industrial system in formation, during the economic crisis and on the semi-periphery of the international system, certainly did not look for breakthrough points in research-intensive fields. The few examples in the pharmaceutical industry, in electronics and agriculture did not change the general trend. Thus it was not the permanently low GDP rate spent on R&D (GERD) that was the biggest problem in the R&D system

but probably the fact that, within the former, the rate of subsidies coming from the competition sphere was just half or one third of what was usual in Western Europe.

■ The 1990's inevitably corrected these scenarios. The academic research network was stabilized, albeit its size had shrunk by one third. Following from the edge conditions of the unfolding higher education reform, university research opportunities became most unequal. In the first phase of the reforms, basically following the Western European examples of two decades before, the focus was on radically widening the admission framework. While in the West this had initially been carried out in the wake of what seemed to be a permanent general economic upswing and, as a part of the reforms, comprehensive investments were put in the system, in Hungary it was the other way around. The economic collapse in the early 1990's rendered a significant increase in state funds an illusion, the majority of citizens were unable to pay for higher education services and potentially unemployed young age groups were also to be dealt with somehow. Accordingly, the radical increase in the number of admitted students had to be managed more or less without any increase in the teaching staff and in the rooms and laboratories already available. Thus, the conditions of university research radically deteriorated, although not at the same extent at various places. And since higher education policy, quite understandably, focused on the radically new education organizational tasks, there was a dramatic fall in the weight, the evaluation, as well as the performance indicators of university research. In the late 1990's, debates were launched on the above and, although the deteriorating trend probably stopped in some places and respects, for the time being, no turn can be spoken of.

■ By the restructuring of the economy, the appearance of multinational companies and their gaining determinative weight in the corporate sector, the R&D abilities and interests

of the industry have radically changed. As regards the economic structure, the weight of technology-intensive sectors is too high compared to the level of economic development in Hungary, while companies primarily rely on the results available in international technological networks rather than their own developments here in Hungary. The rate of technology-intensive sectors in the Hungarian and Swedish economies, for instance, is approximately the same. At the same time, there is an eight times difference in the corporate sectors in this respect. As consequence of this, the sectoral structure of the Hungarian economy already meets the structural requirements of modern economies according to its technological features, while its research intensity and intellectual content still fall short of the requirements. Thus, the potentially required restructuring is to be implemented within the sectors rather than intersectorally.

■ Considering the new Member States of the EU, Hungarian innovation and technological development capacities are in the top third of the group, but in most cross sections, they are not among the best three (in most cross sections, the Czech Republic, Estonia and Slovenia are all better than Hungary). Regarding the overall performance of the system, the general belief according to which the innovation performances of Hungary are better than its general economic performance and are outstanding at the regional level, is thus simply not confirmed by data. Performances do not change along a simple East-Western axis, however, but the catching up potential differs according to the research abilities, technology absorbing capacity, diffusion capacity and vigor in demand of the innovation system. As regards the absorbing capacity, Hungary is just in the middle of the list of the new Member States, while in research capacity it is relatively better and comes the third in the list. It is also among the top three as regards diffusion.

■ In the 1990's, there was no improvement considering the regional inequalities of the R&D system; in fact inequality probably became more marked. Internationally registered basic research (not as individual products but as institutional achievements) was conducted only in Budapest and a few major university centers in the country (primarily in Szeged and Debrecen). In the case of a significant part of new universities or colleges of higher education, higher education performance was not yet accompanied by proportionate scientific achievements. A high percentage of lecturers were guest lecturers from Budapest or other major universities, who spent the least necessary amount of time at the headquarters of the institution concerned. This undoubtedly restricted local research spirit and ability. Significant corporate development divisions, especially ones with international relations, were, once again, almost restricted to Budapest, with only a few exceptions. As regards local research-intensive innovation clusters with an internationally effective range, there were in fact no examples for these at all. The new technological districts of Western and Central Transdanubia were essentially independent from local developments and new technological knowledge production abilities; the new higher education clusters of the region had no significant presence in this respect yet. As regards the traditional scientific centers in Eastern Hungary, on the other hand, no significant corporate network using the local adaptation and diffusion capacity had developed around them as yet.

■ By the second half of the 1990's, a range of companies nevertheless developed which, irrespective of whether they were of Hungarian or foreign ownership, were willing and able to operate significant Hungarian technological capacities. This range was relatively narrow, however, but what is more important is that in the stabilized economy of the final years, it did not widen, either.

■ In the network examined, the state is determinative as the maintainer of institutions but is hardly ever present as a project financier or innovation organizer. The will, guarantee and responsibility of the state are primarily reflected in the state's role in maintaining the infrastructure. The state provides the salaries, maintains the buildings and, from time to time, purchases some instruments and it also guarantees access to some major international databases. But it does not really ask for anything in return, except that it wants the system to operate smoothly if project moneys are made available. Beyond this, the state certainly also appears as the financier of projects like OKTA (National Scientific Research Base Policies), NKFP (National Research and Development Policies) and other major projects as well but, from the point of view of the researchers' budget, these are not considered subsidies following from state policies but rather some funds existing as a consequence of the laws of nature, which can be divided up by the research elite. A real evaluation of research units outside the academic network is basically non-existent. The state does not appear as an unavoidable and determinative primary financier (even though it is the state that maintains the examined research workshops, almost exclusively at the level of their basic operation), because state subsidies are guaranteed and not target-dependent. And the research elite have got accustomed to the fact that efficiency can only be spoken of if subsidies are not guaranteed but are dependent on some targets or solutions, at least in the rhetoric.

■ In the system, there are no genuinely functioning research political priorities or, if there are some, these only exist as paper reference when research project plans are submitted. It is by no chance after all that no Hungarian priorities are known of, since no priorities have existed for years. Interestingly, even the European priorities appear only in the

forewords of research project plans, related to the key concepts mentioned therein. Many of the researchers interviewed cannot identify clear subsidization goals or tough selection principles even there. And since today's research elite are able to recall real priorities primarily from the time of state socialism (although these were not real, either), if priorities are mentioned, it is first of all these once priorities that they can think of. The way of operation and the policy environment of the once priorities have certainly sunk into oblivion by today, and they cannot be adjusted to today's research environment in any case. The research elite have actually seen no mission-oriented research in Hungary yet and, accordingly, they are unable to think of that as a scene of role-taking by the state.

■ At the international level, there are two basic types of major technology political projects. The first type arranges capacities around major technological assignments, or aims at the construction of complex technological systems, while the other serves horizontal diffusion, the testing of results. In Hungary, the first type is basically unknown, but there would be no need for it, either, because there are no such Hungarian technology-intensive corporations whose international position could or should be improved in this way. And, since in industrial policy there are no national champions, a technology policy supporting these does not exist, either.

■ There are no policies subsidizing revolutionary new ideas by abundant funds which, if successful, will bring disproportionately high financial and moral return compared to the investments but which also risk a spectacular failure. The overwhelming majority of projects in Hungary (whether they are financed by Hungary or the EU) almost lack any risk factors. They do not involve any risk of intellectual failure (as far as one can see?). Accordingly, those interviewed expect increasingly less from

the state strategically, as regards the innovation system and even the rearrangement of their own research conditions. And as there are no serious mission-oriented projects and, at the same time, no large-scale adaptation policies or networks have been established, either, the system that has not expanded in either direction attempts to meet the momentary needs of the elite of a dozen major research institutions related to slow pace development projects, within its own limited framework.

■ Due to the inflexible research financing practices of the EU and the growing distrust between researchers and policy players therein makes it increasingly less attractive for many researchers to cooperate in joint projects financed in this way. This attitude cannot perfectly be counterbalanced even by the attempts of the Hungarian research management to highlight and laud EU projects, using them as general institutional and personal success indicators in the long run, either. If simpler alternatives for financing can be found (from Hungarian sources, for example), many researchers would prefer to choose these. A considerable part of successful researchers choose a kind of hybrid strategy in the end: they carry out a few EU projects so as to avoid criticism regarding their international unmarketability but nevertheless attain easily absorbable research moneys from Hungarian sources.

■ In the European projects, at the level of EU coordinators, there have been increasing oligopolistic tendencies in the past few years. A range of institutions and research enterprises that have learned the language of the Eurobureaucracy has developed, with which they have coexisted in various cooperative relations anyway. These research enterprises are able to construct and operate projects in the widest range of fields and even if they do not monopolize a certain limited field, they are constantly in and around the operating projects. They almost exclusively use EU sources

and prefer integration practices following the momentary competition fashions but they also integrate secondary players if serious professional competitors can thus be kept away from the field. In a great many project fields, EU projects are covered by such connected enterprises and, despite all the slogans, it is not free competition that determines their assignment to one or another consortium. Thus, the real question for Hungarian project players is how they can attain the trust capital through which they are able to enter these oligopoly networks (as subcontractors for the time being).

■ The research system as a labor market has become divided and this division is especially harsh in the public employment system. The current system protects public employees to an extent that makes them insensitive to evaluation and research management is also unable to really react to underperformance or even the lack of performance. At the same time, it makes career planning difficult for others. While the burden of the actual work related to the projects is put on them to a growing extent, an increasing part of team members (PhD students, staff recruited for projects, etc.) remain exposed to the system.

THE NATIONAL INNOVATION SYSTEM

An important concept of evolutionary economics is the national innovation system (NIS), which underlines that the innovation performance of an economy, and its international competitiveness thereby, does not depend on the performances of its separate individual units but on the ways these units connect, interact and are able to cooperate and whether they promote the socially and economically beneficial application of knowledge produced anywhere.

The concept of NIS and its economic political conclusions offer a useful framework for

Hungarian decision-makers in working out the catch-up strategy.

Innovation is basically a corporate responsibility; the role of the state may be in the strengthening of the national innovation system and establishing a favorable environment for innovation. In the catch-up strategy, Hungarian conditions should certainly be considered when setting the targets, i.e. it would be a mistake (and, as is already clear today, it would be simply impossible) to mechanically follow either the Barcelona targets (3% of GDP spending on R&D by 2010), or those of the EU R&D Framework Programs.

It is (or would be) also a serious mistake to copy the technology political trends that have become fashionable in the past few years but are in fact totally ungrounded, which consider the new economy, i.e. high technology sectors, to be the engine of economic growth. Hungarian examples especially clearly show that decision-makers must differentiate between what is referred to as high technology sectors and knowledge-intensive – and therefore high value-added producing – activities.

Putting the issue in a broad context, it should also be considered what public money is spent on and at what rate. Should we enter the competition of forcing up subsidies higher and higher – which, in the past few years, has become significantly stronger in Central European countries, for example – or should the sources available rather be spent on strengthening NIS and developing a more comprehensive economic environment (physical infrastructure, suppliers, etc.), or possibly on reducing public burden?

The situation of the Hungarian NIS, due to the size and level of development of the economy and the open economic policy fostering foreign investments, can be reasonably analyzed only by considering international relations, too. The R&D sector had an extraordinarily fast and positive reaction to the interna-

tional political changes following the series of Central and East European ones. In the first part of the decade, Hungary acquired membership in a series of international R&D programs (e.g. COST and EUREKA) and organizations (e.g. CERN and EMBO) and its research cooperation with the EU got more intensive, too, which finally led to the formal integration of Hungary to the R&D Framework Programs of the EU.

An explicit innovation strategy is indispensable for a successful catchup for several reasons: it makes it possible to

- clearly and convincingly declare the long-term goals and commitment of the government;
- strengthen the national innovation system – and thereby anchor foreign investors fostering the development of the Hungarian economy, with activities producing high added value (i.e. not those in the pursuit of short-term benefits only);
- harmonize the currently dissipated resources of the various ministries on the one hand – so as to more efficiently serve the innovation process, complex by nature and therefore in need of support by several means at the same time –, as well as state and public resources on the other hand (on the basis of mutually intensifying intentions and development directions, but not mixing the responsibilities for the decisions).

The NIS approach focuses on the correlations between specialized policies because of which it offers a suitable analytical, decision preparatory framework for working out the catch-up strategy.

By strengthening NIS, conditions must be established under which knowledge can be most quickly and easily used for the solution of social-economic problems. All players must be made aware that innovation has many sources: in addition to formalized R&D activities car-

ried out within an organized framework, there is the widest range of engineering activities, among others, like experiments and trials related to prototypes and to working out the production method, an activity referred to as harnessing, the modification and perfection of already existing products and methods on the basis of the accumulated experience, etc. Accordingly, the development, acquisition and application of unformalizable (uncodeable) knowledge and skills attainable through practice only, i.e. of what is referred to as tacit knowledge, must also be supported.

Hungarian R&D policy thus must not be restricted to subsidizing technical R&D activities in Hungary; the acquisition, development, dissemination and application of knowledge and skills produced elsewhere, by other ways and forms, must also be fostered. Thus, the development of learning abilities and the application of knowledge must be put in the focus, irrespective of its source (Hungarian or foreign, formalized R&D or other activity, etc.), form and content.

The further university reforms reformulated the policies referring to education, leaving the regulations and the institutional system of research essentially untouched. Accordingly, the whole decade was characterized by tension between the reform universities increasingly devoted to mass education and university research, which tension grew towards the end of the decade. Moreover, the conditions of research were generally financed from outside sources; universities were usually able to add only very little from their own budgets. Educational responsibility and the sources accumulated especially for this purpose did give birth to some internal projects on the education side, on the other hand. This structural disproportionateness in the policy was further reflected in the project making ambitions. While, on the education side, university managements and ministerial bureaucrats spent the

decade working out projects almost continuously, all that could be just thought of on the research side in the very same years was improving the competition abilities of the education-research staff of the universities. Understandably, no comprehensive projects or efficient institutional construction programs could be based on such petty work. Education and research are, however, evidently much closer related than reflected by today's management practices.

Considering international examples, there is certainly a need for a more obvious acknowledgement of the scientific performance of universities as an output indicator. This could be done by comparing universities or departments, maybe majors. Two basic indicators can be thought of here: the research subsidies attained per researcher/lecturer (both Hungarian and international) and the number of PhD graduates. It is these that are also used in systems abroad, in various combinations.

We are aware that it may cause outrage in the world of universities and yet, in the mid run, it is unavoidable to publicly classify the scientific performance of universities into some kind of clusters. One option is to adopt the American research university clusters, certainly adjusting the actual clusters to Hungarian conditions. Even if we fail to take this step, with reference to sensitivity, the EU will do it in the years to come, without really asking for Hungary's approval. In a clustering scheme of 1994, for example, Carnegie Foundation classified institutions entitled to award PhD degrees into four clusters: Research I, Research II, Doctoral I, Doctoral II. The classification depended much on the differences given in research funds. There, the clustering successfully mobilized institutions in the end: since the first classification, there has been a second one where institutions attempted to advance from their earlier positions. Other popular classifications, like a clustering by Carnegie in the year 2000, are

based on the number of PhD degrees awarded in the year concerned. In Hungary, these figures, considering universities and departments annually, are still too low for fine classification but the numbers will have to grow anyway if the country makes the smallest attempt to keep pace with international trends.

It seems very important to integrate research and education parameters once again. Considering the American universities taken as an example, research income rose the fastest at universities where the student/lecturer rate also grew at the greatest pace, and this held especially for private universities. The growing number of PhD students could be involved in education to a greater extent and regular lecturers had thus more time for research. Thus, considering tuition fees, it was not only PhD students but even undergraduate students who, indirectly, took part in research financing. It seems that the elite university-mass university opposition so determinative for Hungarian lecturer-researcher circles may be resolved or at least co-managed in dynamic situations. We know from American data, by the way, that research success is also reflected in educational acknowledgement.

The future of research institutes depends partly on whether they find for themselves research assignments that can be based on old research fields but which meet new demands to a greater extent. Much depends also on whether they are able to take part in European integration as national institutions and, if they are, in what ways. In the longer run, it can be an advantage if the service activities of research institutes are of a cross-border type and a reasonable division of labor is made between national players. At the same time, there is no mention of expanded (service) research institutes yet. For the time being, the task is to try to meet the demands of local small and medium companies. One way to do so is to develop research services which prove to be an increas-

ingly successful business branch and, as an intermediate organization, connect universities and the industry².

For institutes strong in basic research, the industrial application of their own achievements may be one of the best sources of income also in future, since it is them that reserve the patent rights. The involvement of external capital and the foundation of spin-off companies seem to be the most obvious ways for this. Their participation in postgraduate training may be another important profile for these institutes.

As public institutions, however, they cannot afford to miss out on research projects through which they can contribute to improving the welfare, security, health conditions and quality of life of society. They must also develop their capacity in fields through which they are able to help the government's work as advisors (experts), be it subsidization or regulation.

As apposed to the original triple model of research institutes (basic, applied research and development), a more diversified activity model seems to be taking shape today. The findings of a comprehensive European study related to this are the following.

■ The profile of institutes primarily involved in basic research should be preserved. The maintainer may decide through regular evaluations whether they should continue their earlier activities or change direction.

■ Major technical infrastructures (usually) require a research institute framework. In principle, they could also operate within a university framework, but the expertise required for their operation is more easily provided by a specialized institute. The research institute framework is also an advantage when the only way to make operation economical is by involving external users.

■ Usually, it is worth maintaining a research institute for applied research if there is a group of special users behind the institute and, in

addition, there is a need for special expertise and infrastructure for the research, or in the case of some social-economic needs (like standardization). It is important that these demands should be permanent so that it was worth constructing and developing the capacity of these institutions for the long run.

■ There is a high demand for research centers which help the diffusion of technologies. Although this is a task of universities, too, it cannot be made their primary task. Research centers operating in a non-profit form, as part of the innovation system, can move around in this field more easily in principle if they are able to acquire the required intellectual capacity.

As regards research, a major question is if today's organizational system within the public sphere can be kept, or whether gradual restructuring should be started to make sure that budget + industrial + foreign sources are sufficient for the inevitable quality development. A most important task of the public sphere is to vigorously join training, even by establishing academic doctoral schools. A shift towards government laboratories should also be considered so that the research network based significantly on budget sources could (and should want to) react to governmental demands.

In some European countries in the past few years, development programs requiring concentrated sources, able to mobilize state and private capital (as well as structural funds) have been designed, which can also help regional development. It would be most important to strengthen co-evolution so that development could become possible in many places at the same time and those lagging behind could be helped.

POLICY ALTERNATIVES

Considering international examples, in countries and national economies of a similar size as Hungary, knowledge-based society models

have been established in three, easily distinguishable ways. The first could be referred to as the directly dependent, the second as the research intensive and the third as the network model.

① The best example for the first, i.e. the dependent model is Israel and another one is probably Ireland. Countries establishing this model are the branches or, in a certain sense, the subsidiaries of an especially important major international player (which may be the American economy, research sector and probably even American politics). It is primarily and directly related to this major international player in its professional terminology, professional ethos, relation networks and capital movement and, through specialization, takes part in the solution of the special tasks of the big system, i.e. sometimes even of the patron economy and society. Its operational methods and tasks are to a great extent formed on the basis of the impulses coming directly from this center. It does not develop large corporations itself but the corporations of the patron economy establish divisions there. The research system of the country takes part in the operation of the base networks of the patron country not as an international cooperation partner but as an internal contributor. In the environment of the early turn of the 19–20th centuries, this is how the Hungarian research and economy must have operated in relation with the German economy and science.

② The second model is research intensive in the sense that, by a significant concentration of the country's resources, a serious, internationally marked scientific potential is established, which potential later ensures that the economy of the country concerned is able to operate somewhere at the level of the most outstanding international innovation performances and, irrespective of the small size of the country, can be in the frontline of international technological changes. This is the Dutch, Swedish or

Finnish model. All the three national systems are determined by the fact that there are multinational companies in the countries that developed from former national companies, operating in high technological sectors. Following from this structure, local development, certainly connected to the base of Nokia, Philips or Ericsson, is at the same time part of the global corporate strategies.

③ The third model is that of small and medium network enterprise innovation zones. Saxony and Thuringia were such zones at the turn of the 19–20th centuries. Central Italy after 1945 and Denmark all through the last decades of the 20th century can also be considered such zones. In these zones, a unique trust network of small enterprises, development centers and universities develops, which is kept alive by the human experience, social capital and local knowledge characteristic for the zones and which is nevertheless internationally marketable. According to the descriptions, it is not primarily research but a certain pressure forcing out flexible compliance that moves these networks towards users' demands.

In the current geopolitical environment, the first model is basically no alternative for Hungary. Although Hungary is now inside the gates of the EU, the country will not generate sufficient cultural or communication skills in the next ten years, either, to start thinking in terms of solutions similar to the Irish or Israeli model. In the 1980–1990's, Hungarian researcher intellectuals considered the Dutch-Finnish model to be the example to follow (and they partly do so even today). The references so far have been undoubtedly successful in that they persuaded the state, when corporate interest in research temporarily [?] fell, to continue subsidizing research from at least the state budget. The pathos of this model can necessarily be used in future, too, but exactly due to the lack of knowledge-intensive corporate parent centers, the construction of a Hungarian ver-

sion of the Dutch-Finnish model cannot be seriously considered in the next decade. Accordingly, the only alternative left is combining the Central-Italian and Danish network model with an experiment that tries to complement the intellectually poor plants of multinational corporations with technological developments. At the same time, development policy in the past two decades, captured by illusions and always engaged in some emergency work, has failed to choose from these or other potential models. Thus, the targets announced have been incidental and it is not clear, either, what learning skills and knowledge stocks should be established, since we do not know what strategies they should be related to.

■ In the 1990's, although there were calls for the development of major innovation projects and the design of ambitious strategies for big jumps, there was no real concentration of efforts in this respect almost anywhere in post-socialist reform countries. The only exception from this point of view may be Estonia which, in the past fifteen years, has made uniquely serious efforts to establish the technical environment of the information society and to introduce and foster the widespread use of related informatics skills. At the level of technical systems, these programs have been undoubtedly successful and their existence in itself was enough for Estonia to be presented as a model state among new Member States in Brussels. In the last few years of the decade, Baltic states produced higher growth rates than Central European countries but, beyond that, no Munchausen effect of any kind could be detected. It seems that, at that stage of development, informatics did not pull forward the entire economy and society as directly and fast as the ideologists of the information society had believed before. Accordingly, we, too, should answer the following question: should we, in relation with the information society, try to develop a policy, wide-scale and consistently

comprehensive like the Estonian way? Estonia treated the formation of the information society as the single, central top priority and, in this field, they had achievements by leaps and bounds ahead of all other post-socialist successor states. According to certain parameters, in a little more than a decade the country surpassed the Western European average and almost caught up with Scandinavia, a top performer in the field. The Estonian example proves on the one hand that, by the sufficient concentration of efforts, much can be achieved in this field in just 10–15 years. But should we, too, do it, is it worth doing, and if we did it, what would we do it as a replacement for? Finally, if we succeeded, what could such a program bring about for the whole national economy and the majority of society?

■ In our education-related plans, there should be more focus than before on the fall in the number of children expected in the decades to come and the necessary action following from that. Here, only two aspects will be highlighted.

① The existing educational institutional system and the given number of teachers will meet a much lower number of children and youth to teach, as a consequence of which the physical and intellectual infrastructure for a more intensive education of the next cohorts is available and education could be made more intensive at a relatively low cost. It should be considered what follows from this. Could some higher-education like training be extended to whole age groups that join the education system? Or, similar to international examples, will the fall in the number of children be followed by a fall in the number of institutions and teachers, too? To what extent will this branch be exportable (in the sense that will it attract a high enough number of solvent foreigners to be taught in Hungary)?

② In the next decade, too, a growing number of children to be born, maybe their majority, will be born into relatively unmodern families

with low qualifications and income. If these people are not to be kept at a third-world level of knowledge and motivation, the role of schools or other social institutions in the socialization of children, even as opposed to that of families, should be made stronger. It may sound harsh but a family-related education political concept, relying increasingly on families, will probably be counter-advised because it would only reproduce families like those that the majority of children are born into. Thus, instead of a European workforce, it would produce some kind of an *underclass*, of which those concerned are currently, apparently, unable to break free, without maximum community subsidies.

■ As a consequence of the above, center-periphery relations need to be reconsidered. Periphery means one thing in the world of the mass production of material, and another thing in the new order of information production. It has become obvious in any case that, although new information networks have eliminated some former periphery positions in some respect, other peripheral boundary-marking roles have remained and even strengthened.

■ What will be the extent of meritocracy (i.e. the correlation of knowledge-based acknowledgement and social status) in the Hungary of the next 15 years? Among the related problems, it is especially important whether it is the attitude of the higher reward related to knowledge, the better that will be put in the foreground, or there also exist other versions in the knowledge society hierarchy that are softer than the above but are still acceptable for us.

■ What abilities and skills should those lagging behind attain if it is sure that they will otherwise have nothing to do with the up-to-date knowledge sectors? What will happen to them if they then really remain captured by family traditions and experience to be gained in practice?

■ It is likely that, in the Hungary of the coming period, the dependent versions of eco-

nomic and social development will be put in the foreground on the whole: shortening adjustment cycles, the co-effects of various outside patrons, etc., will become determinative. What consequences will all this have on the knowledge structure of schools? In the current reform ideas, the above seems not to be considered at all...

■ Several key elements of what you can see on the European maps of attainable knowledge will probably be missing in Hungary. Those wishing to acquire these will inevitably have to go abroad for some time. The question is in what numbers people will thus leave the country and integrate into the operation of the most important European knowledge centers, certainly operating outside Hungary, whom Hungary will thus have to miss, at least in principle.

■ In the Central Europe of national societies, the knowledge package of schools has so far been comprised of information concerning the nation and information on the outside world. Due to the effects of globalization, the rate of these two is likely to change, with a shift to global knowledge and skills, to the detriment of knowledge and skills related to the nation. How will this transition take place? How long will it take? Are there any minimum requirements to follow in this respect? The command of languages is certainly an important element of this but is by no means the only one.

■ After all what industries, regions and social groups will be permanently excluded from the informatics networks (of primary importance)? The practicing of what alternative lifestyles does this allow, apart from the cash economy, personal relations, barter, and modernity?

■ What effects will Europe have on Hungarian education in the next 15 years (i.e. the effects assigned to the European Union and, to a lesser extent, really generated by the European Union)? We have not even estimated the Bologna effects yet but these are just one slice of the cake anyway.

■ What consequences will the fact that Hungary, as the only country in the region, has significant informatics instruments industry and exports, have on the self-renewing ability of the Hungarian economy? The thing is that there are people who advertise this fact abroad as a key indicator of the relative maturity of the Hungarian economy.

■ What will be the levels of penetration of informatics instruments and systems (i.e. beyond which application cannot really be increased, which is called the penetration ceiling) in the Hungarian society and economy in the next decade? Some maintain that there are not any penetration levels at all here because every day there are new application opportunities on the frontline of technology. Others believe that even in industrial societies more developed than Hungary it can be observed that due to their ways of living, survival strategies or probably exactly due to their attitude towards literacy, a most significant part of society will get excluded from the technological world even in years to come. Computer literacy is restricted by real reading comprehension and writing skills.

■ The international trends highlight very well upon the high growth sensitivity and easily vulnerable inner dynamics of the knowledge-based economy. The question is how far we should lag behind so that the hectic movement that can be observed in the first frontline (like the fate of the “new economy” bubble) could affect us as little as possible but so that we could still be close enough to the front to get part of the extra profit generated there.

Basic questions

In this summary, actual problems of education, science or cultural policy are not to be treated. Some basic questions should be discussed nevertheless.

① We believe that it is primarily the medium enterprise network model based on cooperation that seems probably the most easily feasible for Central Europeans. This, however, requires exceptionally good social capital, very high trust within professional circles and fast adaptation skills. Such characteristics of the workforce here may be more important than its discipline or the quality of the available research and development staff. If this model is preferred, however, it is not elite programs of an international level but rather a good quality mass education developing and mediating the above skills that will be crucial (which certainly does not mean that the elite of an international level will be unable to find work in patches in this country). Such a program does not primarily focus on the edges of social hierarchy but establishes a wider middle class characterized by trust and cultural understanding between its members. It is not political categories that are meant here but primarily a cultural environment in which two thirds of the population move around freely, understand one another and feel secure. Without the creation of such an environment, it is impossible to establish the above described innovation networks.

② The above makes it necessary to deal with the problems of the withdrawn and fallen behind. The issue of social justice is not to be touched upon here; nor shall we discuss social cohesion programs or minority policy, which all affect the problem. We simply wish to underline that, as pointed out above, if a growing number of children are born into such families (unless they are helped by society), in two-three decades' time, 30–40 per cent of the workforce will be reproduced in such an environment and this, together with the general ageing of the population, will make the country increasingly less attractive for international capital and technology. There certainly exists a conservative vision, too, of what needs to be

done. According to this, the child rearing of families who are able to socialize their children in a suitable way without or with just little assistance, should be supported. And the child rearing of those who are unable to do so should be restricted to the extent possible. If it is not this path that is followed, however, and the environment lagging behind has changed only a little in itself, the children will have to be provided with catch-up opportunities relatively independent from the families (through student hostels, all-day schools, regular school meals, etc.). Children's institutions (presumably nursery schools) may have a key role in preparing these children coming from an underprivileged environment for school. The ways of organizational development are thus quite easy to see here. In this field, it may be a major social political goal to eliminate the current forms of child poverty by 2015. This in itself may be as important a knowledge society element as is pedagogical modernization in a restricted sense. If we do not want a growing proportion of Hungarian workforce to be characterized by (today's) Bangladeshi parameters (which may frighten off even some of the capital already present), large-scale state intervention is required in the field. This should, on the one hand, maximize the number of children to the extent possible and guarantee that they, as adults, will be technologically recruitable. Multiculturalism here cannot really be opposed to integration but, as far as we know today, the lack of the former may endanger economic growth. The aspects of integration have increasingly come into prominence also in the latest Western European immigration debates.

③ If we admit – and in fact all knowledge political literature agrees on this – that continuous training and further training are the key elements of keeping up the workforce at all levels of education, these levels in themselves clearly become relative in two ways. On the one hand, the differences between primary, sec-

ondary and higher education certainly become relative. Originally, these were institutions established with different objectives in different historical periods, inevitably marked by the circumstances of their birth (not only in their names, but also in their work ethos, world concept and disciplinary order). Through the integration of the educational system, these differences are likely to diminish. On the other hand, this may also mean that these various tasks are performed by the same institutions. And they do not necessarily have to be constructed bottom-up, either. Talent care by universities, for example, should presumably involve increasingly younger age groups. The 'practicing school type' model will become one of the practical forms of integration that may attain widespread use. Obviously, universities may finally take over further training functions, too. There is no reason why an abundance of small private enterprises specialized in further training should get rich, while public education remains underfinanced.

④ Furthermore, the issue obviously requires the reconsideration of international migration movements, many of which are related to the acquisition and efficient application of knowledge. Inevitably, Hungarian policies will become more active in this respect in the next 10-15 years. At the moment, it is almost exclusively some parts of Hungarian minorities that are regarded as potential immigrants but the issue is at least partly tabooed. In the next ten years, the single labor market in formation within the EU and the situations in the Ukraine and Serbia will both raise the issue most seriously, although from different angles, even if these groups are not really significant from the point of view of technological-natural scientific knowledge. But exactly because they are not significant and because migration movements in Europe may become more intensive, recruiting active players from outside (like Hungarians working in the West, looking for fresh career

opportunities, and probably also from the Balkans and other ethnic groups in Eastern Europe) may become very important.

STRATEGIC VISIONS

In the Hungarian scenarios of the 1990's, three alternatives were usually considered. There was a *business as usual* alternative, i.e.: this will happen unless we change former routines. There was a small Finland ideal alternative. And there was something in between the two, which was still regarded as progressive. As apposed to these alternatives, we would like to offer a less linear but rather a spatial arrangement of Hungarian knowledge society models. The three axes of these are European effects, technological effects and the structure of professional training. In fact, all these three effects can be formulated by three models each. The combinations of these effects offer various alternatives for action, in individual sectors or regions or at the national level.

European strategies establish a kind of environment for Hungarian scenarios. In expert debates in the European Parliament or in the apparatuses in Brussels, we do probably have the chance to influence these to a little extent. Yet, considering the weight and number of votes of Hungary, the Hungarian stance will hardly bring about a major rearrangement of the European situation in these respects. It is essentially the European strategies that establish the environment. Considering the Hungarian room for action, the three most marked alternatives may be the following.

① Within the EU-29, a hard core is formed by countries more deeply integrated than the rest of the Member States, even if only in some specific areas. Within this core, solidarity and understanding between the elite, irrespective of any formal regulations, will be stronger than with countries outside this core. Countries

outside the core may occasionally join the core in specific areas, regions or along specific problems. If it is this scenario that gains preference, there is a great danger that Hungary is left outside the hard core in most areas and respects.

② Relations within the EU-29 remain balanced; multi-speed European concepts do not get a central role but the enlargement of the European Union does not continue, either. The Western Balkans, Turkey and the Ukraine do not really get closer to the EU. Within the EU-29, however, some homogenization process has taken place or has at least started.

③ The preparation and admission of new Member States continue. Accordingly, the Eastern and Southern borders of the Union are in a certain state of anxiety. As a consequence, in the wider border regions, there is continuous uncertainty regarding movement opportunities and the projectability of development roles.

Certainly, various technological or economic structural decisions also provide a framework for the Hungarian strategy. The key technological players of the Hungarian economy are international corporations. It is under the influence of their sectoral traditions, management styles, the long-term demand for their products, as well as the efforts of the Hungarian government that they choose the special technological regimes (technological cultures that will best characterize the companies concerned) implemented at their Hungarian plants. And it is on the basis of these corporate regimes that the dominant regional as well as the national technological styles are formed. Here, too, three options will be presented.

① The first is the skilled workers' country option. International corporations do not bring an abundance of important R&D projects to Hungary but the technological styles will be determined by the well-trained, well-disciplined and relatively cheap skilled workforce on the intermediate level. This basically

means assembly industry, with relatively homogeneous skilled worker ranks and a practical technical staff supervising them. The R&D sector of the country will have no determinative relation with these corporations. In the knowledge demand of this model, it is cooperative skills and disciplined executive functions at the industrial works that are of special importance on the one hand and good quality skilled worker training on the other hand. Skilled workers do not only participate in material production. In this sense, the skilled workers' country also includes the mass of applied informatics developers or of clinics staff involved in routine experiments. Considering international examples, this structure is probably closest to the society of the most highly developed Latin American urban zones after World War II. Regarding the structure of its economy, it is this model that Hungary is the closest to, irrespective of its ambitions. The question is whether we want this and, if we do, what action we should take (e.g. obviously implement a major reform in skilled worker training and better prepare college as well as BA graduates for practical work).

② The second is the regional technological center model. The basis for this model is that Eastern and Southeast Europe will become an increasingly important international market in the next 15 years. For the operation of this market, however, it is Hungary and primarily Budapest that may come into question as a kind of logistic, user-friendly system constructor and operator center. In the new technological cultures, the reliable operation of service centers requires a lot of experts and may also involve the establishment of systems meeting local demands. These may serve as the basis for a growing number of serious developments and it is these local technology construction clusters that finally determine the technological style of the country. Certainly, the countries, groups of intellectu-

als and professional cultures concerned in the regions also participate in the operation of a wider regional center. Budapest and probably some other centers, too, will become increasingly international.

③ The third is the model of transfer technology cultures. The major European infrastructure channels (transport channels, information highways, environment protection cleaning systems) will lead through Hungary. The operation of these, also as technological systems, will have to be guaranteed in the joint systems, at the best European levels. Apart from these major channels, a technological culture of quite a different nature will remain unchanged and the relations between the two spheres may actually even loosen in future.

Finally, the level of technical training will also attract or keep away knowledge-applying enterprises or centers. Compared to the previous two categories, the state and the local society will have a greater role in formulating supply here. It is easy to see that, in addition to technical training in its restricted sense, cooperation skills, language proficiency and the ability of self-orientation within large corporations will become increasingly valuable competences. The acquisition of these, compared to actual technological knowledge, will determine the value of the workforce to a growing extent. It is the following three models that a choice is likely to be made from.

① The Hungarian professional structure and preparedness more or less correspond with those of the European core, with probably a few years' delay. By 2015, we shall reach the European average or be just a little behind it, still offering lower costs. The technological, productional roles reflecting the division of labor originally established in Western Europe also operate in Hungary. Technology does not have to be transformed so as to make labor cheaper (the way it had to be in Southeast Asia in the 1980–1990's, for example).

② The structure of technical training is getting polarized. Networks of creative enterprises marketable also at the international level are established, while a significant part of the workforce fall behind and maybe one fifth of them will only have skills mostly typical of developing countries.

③ Some 15–20 per cent of the workforce makes up a unique, trained but nomadic stratum, consisting of individuals who are not devoted to any organizations, traditional bonds or application schemes functioning throughout a whole life. They may have liked to belong to big organizations for considerable periods of time but the structure of the Hungarian economy did not make this as easily possible as the Western European structures did. But as the European economy does need these nomads – be this role freely chosen or superimposed – this mobile Hungarian workforce gets especially valuable after all. On the one hand, it becomes the basis for the flexible adjustability of the Hungarian economy and, on the other hand, it is able to get good positions when working abroad (and, by their salaries transferred to Hungary and through their savings, they support Hungary just the same).

In the three cross-sections, Hungarian knowledge application scenarios of various probability can be determined. Further research is required to make these more precise and, from the point of view of later subsidization, it is probably politicians and the professional elite together that will have to choose from the most likely versions.

Here, two versions are to be presented as samples for discussions.

In the *Considerate progress version*, alternative 2 of the European effects (stable EU-29), alternative 1 of the technological scenarios (skilled workers' country) and alternative 1 of the professional training category (the delayed but cheap copy of the European core) in fact go hand in hand.

In the *Jump start progress*, the uncertainty due to the changes in the Eastern integration borders is favorably used (alternative 3 of the European effects). The former is beneficially affected by the establishment of the regional development and service centers of the technological version 2. Finally, the nomads of the professional structure (version 3) may make the operation of the above even more dynamic.

Let us finally draw up some of the possible scenarios. We can make a taxonomy of broader social scenarios and choose from the existing models. From the two axes used here, one is the person-community cross section, while the other would mean the autonomy of the system versus the acknowledgement of the various outside dependencies affecting the system. Thus, there are four basic roles. (*See Chart 1*)

Our knowledge-political models are not value but action centered, however. One of their cross-sections will be an elitist mass axis. This reflects the dilemma of catching-up economies that, in the catch-up progress, there is energy only for a few points or smaller areas and the rest inevitably fall behind, which means

Chart 1

	Individual players	Community actors
Acknowledges outside dependencies	world market actors	actors with global responsibility
Basically thinks in terms of autonomous development	national enterprises	local movement actors

Chart 2

	Market automatism	Activist
Elitist	neo-liberal	basic science, high culture-sponsor
Supporter of equal chances	plebeian libertarian	social policy-centered

that the cohesion between social groups and economic actors loosens. Or, on the contrary, an attempt is made to widen chances, which means that there is no guarantee that catch-up in the key areas will succeed.

The other cross-section will be an activist-market automatism-oriented axis. This would basically reflect the state will, the determina-

tion of the government in knowledge policy or the various cross sections thereof.

Here, too, a 2x2 matrix is attained, drawing up various alternatives of the state-government role taking by 2015 as alternatives (*see Chart 2*).

The most important and likely contact points of the value and the activist matrices can be drawn up here.

NOTES

¹ It was compiled by highlighting (some parts of), editing and updating the author's work entitled "An Outline of Knowledge-Based Society – 2005", the source of the document referred to is: Hungary 2015, Visions, White Paper, MTA (Hungarian Academy of Sciences)-MEH (Prime Minister's Office) Project, MTA Institute of Sociology, Budapest, 2006

² These tasks were earlier performed by contractual research institutes operating in the private sector. Public research institutes are now in competition with these, or try to cooperate with them, too.