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TEXTO PARA DISCUSSÃO
No. 26

THE USE OF S&T INDICATORS FOR GOVERNMENT DECISION-MAKING/PRIORITY SETTING IN HUNGARY

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DPCT/IG/UNICAMP
1998

DPCT
DEPARTAMENTO DE POLÍTICA CIENTÍFICA E TECNOLÓGICA

UNICAMP

The Use of S&T Indicators for Government Decision-making/Priority Setting in Hungary[1]

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[1] A first version of this paper was presented on the Workshop on "The Use of Science and Technology Indicators for Decision-making and Priority Setting" organised by National Science Foundation, US and the Economic Analysis and Statistics Division of OECD, Washington, 8-10 September 1997. This revised version was prepared during my visit at Unicamp, Campinas, Brazil in a very encouraging environment.

INTRODUCTION

Globalisation and the change from a bipolar to a unipolar world system arised many emerging issues, one of them to redesign the national and international science and technology policies. In our changing world science and technology (S&T) have taken on even greater importance in daily life. Recent government efforts for research and development (R&D) are coming under scrutinity or being reduced owing to the serious budgetary restrictions in all industrialized countries which have put considerable pressure on prioritising and controlling financially effective state intervention. More over, in many countries young people show less interest in studies and careers in S&T than in the past. If these trends continue, they will have serious consequences for maintaining R&D activities, with sufficient researchers in the coming decade as large bodies of them will retire. Policy makers, business community and society need more information to understand these changes and to adjust themselves to the challanges of the knowledge-based economy age.

International experience proves that good policies on science, technology, innovation and industry cannot be formulated without acquiring an appropriate pool of information. Decision makers need to know not only the cost of research and development, but also the results of these activities, as well as the environmental factors hindering the practical usage and propagation of these results. *Funding decisions and other science policy issues must be based on evaluation of performance.* This has to take into account not only the cost of their S&T policy but its efficiency too.

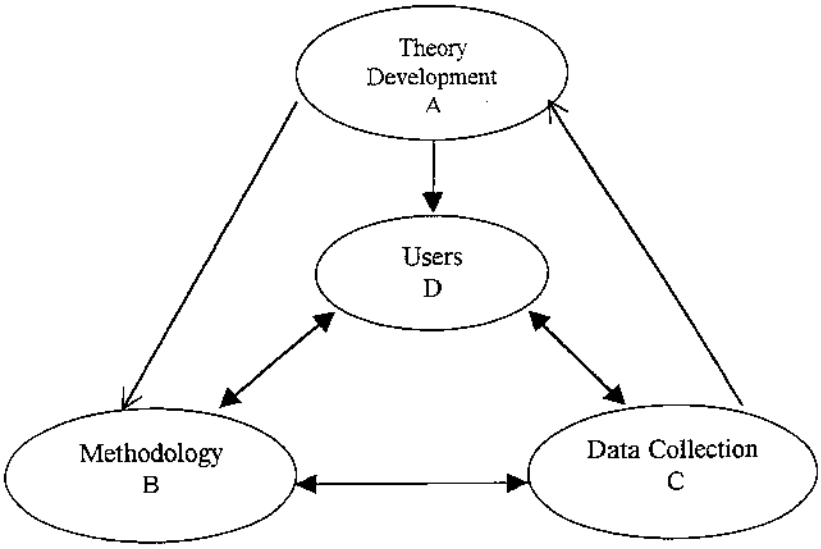
The first section of this paper describes actors and factors of S&T indicator arena. The second section concentrates on the organisation of S&T indicator activities and the process in which they are used during the first decade of transformation in Hungary. It may suppose policy-makers will want to have a complete overview of developments in the S&T sector for use in policy deliberations, encouraging to overcome the lack of proper statistical information. It describes briefly the present relationship between S&T-related government functions and indicator activities performed in Hungary. The relationship between demand and supply is special in this field. It touches on the linkages among the actors and the influence of distinguished groups of users on data collection, the inter-linkage between users and producers of indicators and methodological work. It describes the communication processes on S&T indicator activities. The conclusions take into account hampering factors and also lists the missing indicators.

I S&T INDICATOR ARENA

S&T indicator development has four interlinking phases and actors. The information system for S&T policy making and on S&T efforts is developed by chain-link relationships among these four elements. As figure 1 shows well, to

build new indicators or renew old ones it is also needed to have feedback loops, similar to successful product and process innovations.

Figure 1
S&T Indicators Work



Source: Alison Young, 1993 presentation at OECD training seminar for CEECs.

ad A) *The conceptual framework and definitions for traditional S&T indicators are advanced* thanks to the availability of international knowledge. The theoretical background is evolutionary economics.

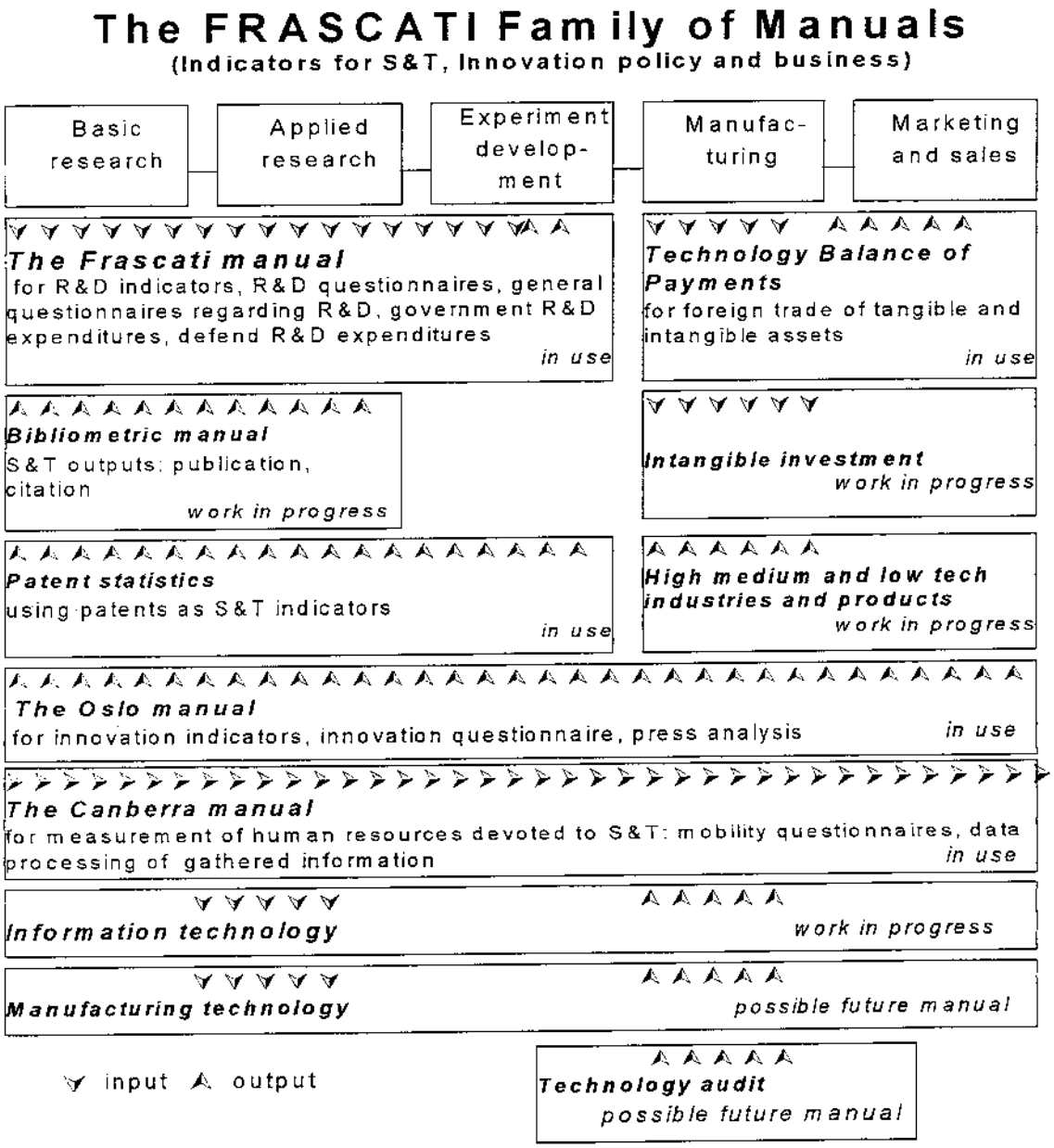
Key actors of this process are scientists, social scientists and conceptual statisticians. They are usually working in a very restricted network of persons who are specialised in the concerned area. Recently many enterprising academic people are designing new indicators to learn knowledge distribution power of societies. They are investigating to identify new use of existing data or ad hoc data collection.

ad B) *Methodology work* is on the one hand academic work and on the other the task of well-qualified statisticians. Usually a large network of specialists are involved in this job. Theoreticians and practitioners may participate in ad hoc data collection, testing various ways of obtaining and analysing the indicators concerned. Methodology work implies setting-up first preliminary statistical framework and testing by experimental surveys. In the matured phase of methodology work first official surveys are launched at national and at international level.

In the last 40-50 years the S&T indicators have developed considerably, thanks to the efforts of the academic community, national statistical agencies, and international organisations like OECD and EUROSTAT for the European Community. International harmonisation of concepts and common

methodologies for data collection have been developed on the international level, especially for the OECD countries, by the preparation of the "Frascati", "Oslo" and "Canberra" manuals that contributed to a considerable improvement in the quality and quantity of indicators, as well as their compatibility. So, creation of a useful source of information for policy planning, decision-making and evaluation processes is methodologically sound.

Table1



However there are still some unsolved methodological problems, to be more precise: theoretically unsolved ones, such as adoption of new methods, international standards, etc. These latter mentioned are burdening factors all over the world. Hungary, as a member of OECD and as a candidate for membership of European Union has to apply methodology sound, so called "classical" S&T indicators and participate in developing new indicators for knowledge-based economy.

ad C) *Data collection* is the demand of official statisticians. Some specialized business organisations are also playing roles. We can speak about established statistics if regular surveys are undertaken and their results are published in established formats. The data collection provides "raw material" for indicators and analytical reports, if the time series are long enough to allow trend analysis.

Since mid-1960s data collection on S&T activities is well organised in many countries and the reports of S&T indicators are published regularly since the 1970s by many countries and by international organisations because of the increasing demand for such indicators.

ad D) *Users* are in the center of figure 1 because they are key players in S&T arena. A variety of actors are involved in S&T indicator activities. Five types of potential users of S&T indicators can be identified: *the policy makers, the business, the scientific community, the general public and the international organisations.* Two of these groups can be the investors in production processes: policy makers (government, its departments, and Parliament) and business. Indicator compilations need to give a strong impulse from the user side, regional actors, and government.

Each group have different demands: *policy makers* want to have a complete overview of development in the S&T for use in policy deliberations. They need up-to-date, key indicators by policy relevant categories. *Business sector* also need general overview and very detailed information on their own sector and relating sectors. *Scientific community* is looking for long time series, detailed statistics, comparable indicators by their research respects. Interest groups of researchers also would like to get very detailed information on their own field. *International organisations* (G7 (8), UN, OECD, EU, European Parliament, APEC, Mercosul, etc.) are interested in the ranking of nations by their competitiveness. Detailed S&T information can help searching co-operation partners, and obtain knowledge of global tendencies.

According to experiences of the most OECD economies, S&T indicators were used by a *relatively close-knit community of specialists* in government science and technology ministries and agencies, science policy research and/or industrial technology institutes, industrial associations and a few very large R&D intensive firms. These specialist users were generally *well informed* about the data available and their strengths and weaknesses. A number of changes have occurred which increased the number of potential users of S&T indicators and which have modified or added to the kind of questions they are asking

about S&T and thus for the type of indicator they seek. (More details in: OECD 1998.)

Besides attempting to respond on old and new S&T related questions there are some specific ones for Central and Eastern European transition economies. They have to re-evaluate the value of their R&D capabilities, and to learn to measure R&D performance during the transition period. They need information on how big is the cost of transformation of R&D institutions, partnership and the impact of brain drain on their countries.

As it is well known, transformation of S&T indicator system is a hot topic for all transition economies. The adoption procedure of OECD/EUROSTAT methodologies on S&T indicators is a great challenge for all of them. In some countries, including Hungary, it may be observed *a huge discrepancy between producers and potential users.* This is a more important hampering factor of transformation than lack of adoption capability of OECD/EUROSTAT indicators.

The main cause of the lack of a proper information system and user-producer discrepancy in transition economies is well known: *the legacy of socialism*, where measurements were developed for solving only macro-economic decisions of the direct (or indirect) planned economy. The former users (and S&T indicator system) of CEECs were different from advanced market economies. Information for business and the general public was also neglected. Measurements which could prove the prestige of scientific-technological progress were very important. It was much less important to prevent the society from investing in projects with negative return. These interests had a strong influence on the collection, production and use of statistical data, indicators, evaluation, etc.[2] Developing user's need is crucial for former socialist countries. Supply side will provide a *continuously updated, standardised, internationally comparable measurement system, and time series on S&T if potential clients of indicators can create demand,* if ex post and ex ante impact studies are required for decision makers.

This paper does not go into the details of all phases of the S&T indicators arena. It discusses the problems of how the potential users of such information can be given an interest in financing and using S&T indicators. However the indicators themselves do not solve the difficulties of shaping and deciding S&T policy. But they have a very important role to play in allowing the policy makers to establish priorities and make their choice on the basis of a better knowledge of the situation and of the way by which scientific and technological policy can impact on the socio-economic objectives they want to reach (Gabolde 1997).

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[2] As a recent OECD study concluded, important changes and improvements have taken place in Hungary's S&T sector, in S&T legislation regarding the main bodies in charge of S&T policy, the growing use of international assessments, and the rise of scientific standards, etc. (OECD, 1995) But the institutional reforms implemented so far do not reveal a comprehensive vision of the role of the S&T sector in the ongoing transformation of society.

II THE ORGANISATION OF S&T INDICATOR ACTIVITIES AND THE PROCESSES IN WHICH THEY ARE USED

As former chapter emphasized users play a very important role in S&T arena. At present business and general public interests are very low so they cannot press the government to create information.[3] Interest on the past of the scientific community is much stronger, but the potential supply side is a much weaker pressure group than the potential demand side. *Policy makers* have a distinctive role in creating solvent demand for indicators because they as stakeholders can dispose financial resources for data collection, processing, etc.

In the following we will investigate only the role of the first user group, the government sphere. This user has a special role in arranging many things for the producer side (legislation, financing, contents of questionnaires). Some actors of the S&T arena try to perform similar (or partially similar) tasks, some others different ones. Table 2 summarises producers, users and indicator products by S&T indicator activities.

[3] Business interest in S&T information is very limited because most firms have to survive the privatisation process, and cope with day-to-day economic difficulties.

Table 2
Actors and indicator products by S&T indicator activities

Table 2 Actors and indicator products by S&T indicator activitiesS&T Indicator Activities*	Actors Producers	Users	Indicator products
1. Ongoing production of basic data**	5, Technical Library, Library of HAS, 12, 13	1, 2, 3, 6, 7, 8, 9, , 11	Yearly R&D reports, factbooks, CD-ROM database
2. The building and maintaining of indicator based databases	5, 2, 7, 12	2, 6, 7, 8, 9, , 11	Summary fact books, methodological reports, analytical reports
3. Analyse of quantitative data	2, 3, individual researchers, ad hoc research teams	2, 3, 6, 7, 8, 9, , 11, 12, 14	Grey papers, (self) analytical reports, (self)evaluation reports, pamphlets, strategy initiatives, academic articles
4. Performing socio-economic research and pilot studies	7, 6, 8, opinion poll research institutes, foreigners	2, 3, 10, , 11, 12	Grey papers, priority area documents, strategy initiatives, academic articles
5. Using S&T indicators in government • Decision making, • Priority setting • Evaluations		1, 2, 12, [14] 2, 9, 12, [14] 2, 7, 8, 9, , 11, 12, [14]	Government reports, reports of foundations
6. Submitting data to international agencies	2, 5, 6,7, 8, National contact organisations by agencies		Publication of Hungarian data and indicators in foreign and international S&T reports, summary factbooks, academic articles
7. Designing new or improved methodology	activity is very rare, if it occurs at all producers are: 6,7,8,10	All producers and users	methodological manuals, academic articles

Notes:
*Hungarian S&T data and reports have not been available yet on the World Wide Web.
** Budget allocates sources for governmental departments and public foundations year by year to finance S&T but there are no S&T budgets in Hungary.

1 = Central government, 2 = Government bodies (not including foundations), 3 = Advisory bodies, 4 = S&T observatory, 5 = Statistical office, 6 = Higher Education, 7 = Other public research institutes, 8= Private research institutes, 9 = Private sector (firms),)= International organisations, 11 = Associations, 12 = Foundations, 13 = Patent Office, 14 = Office of the Hungarian Academy of Sciences

An everlasting problem between policy makers' needs and producers' constraints is the *time gap* between emerging new needs and availability of indicators. Politicians would like to get information right away once they have

recognised their own needs. If they realise they need some information before making a decision, they usually would like to neglect the preparatory phase, for reasons of time. This causes political pressures on statisticians (and experts) to give the information needed on any basis just very urgently. The problem of the quality, reliability, and validity of information are outside the horizon of many users. Another problem is that the time lag in the availability of regular information encourage potential users to organise their own information collection and indicators.

Let's make some brief comments on players in the S&T indicator arena:
As table 2 illustrates well, there is *no specific "indicators agency"* (4) in Hungary. Among the producers there is only one *pure producer* organisation, *the Central Statistical Office* (CSO) (5). This is the key producer of R&D data and indicators. Its activities do not cover all measurable S&T activities. CSO is responsible for collecting basic statistical indicators, revising them and constructing specific indicators with the help of research. CSO publishes the indicators yearly. Revision of the *CSO* managed part of the data collection system started in 1996 and finished in 1997. The revised system of CSO is based on the *Frascati Manual* and up-to-date registers. (Inzelt et al, 1996, Inzelt and Varga 1997)

Beside CSO the list of other producers, which are users too, is impressive. They generally use some CSO data, their own file data, and/or their own data collection results. The main purpose of their data (and indicator) production activities is for internal use. They outsource various research institutes ad hoc or pilot data collection activities and prepare indicators from other file data of agencies. *The Hungarian Patent Office* is the producer of patent data from its own file. *OMFB* (National Committee for Technology Development), *various ministries,* (2) *Hungarian Academy of Sciences* (HAS), *and government funds* (KMÜFA, OTKA, FEFA). *The Ministry of Culture and Education* commissioned a new data collection on research personnel from the CSO in 1997. After evaluation of this pilot survey they may decide to introduce it or not as a regular survey.

Due to the above mentioned reasons *research institutes* (6,7,8) are producers and users of indicators (innovation survey, bibliometric, technology audit, policy evaluation, non regular-surveys). *They have to produce a great deal of data and indicators which in advanced market economies are available as file data and published indicators.* Up to now they have been producing on an ad hoc contract basis (except bibliometric statistics); they do not have long-term contracts to construct specific indicators, and analyse the indicator sets. This situation gives little chance for standardisation and developing time series. *Public opinion poll organisations* are also involved in statistical-type data collection because the borderline between statistics and opinion polls is not clear in Hungary.

Because of the lack of regular information, several *private companies* (9) -- mainly in the field of newly emerging S&T-related activities (e.g. information technology) -- are involved in data collection and indicator activities. They are

the producers, users and sellers of their own indicators. Beside ongoing production of basic data by CSO governmental agencies prefer to make case by case contracts on data collection, methodological research, etc. These research institutes, opinion poll research institutes and consultant firms are financed by different government departments (e.g., Ministry of Culture and Education, Ministry of Industry, Trade and Tourism, OMFB, Hungarian Academy of Sciences) and foreign sources. The government departments directly commission studies and surveys. Recently the Hungarian Academy of Sciences recommended to the Science Policy College to modify some laws and put HAS into the co-ordinator position on S&T information system. This idea means HAS would collect S&T nation-wide data, etc.

Business associations (11) are mainly users but from time to time are also producers. Associations of most competitive branches in Hungary and the Hungarian Innovation Association have started to collect information. But most newly formed (or re-established) associations and chambers have not overcome their own initial difficulties and so have not become the initiators of such investigations. Business can press the government to produce information because the information service has to cover many fields if the tax level is as high as it is in Hungary.[4] Business may produce its own information system if it cannot get relevant data and indicators from public sources. But business never collects those data which fall outside its direct interest.

Authorities which are responsible for science and technology issues and managing one or another subsystem of S&T are the *main governmental users of indicators.* Usually these main user government departments are producers and/or disposes of data collection and production of indicators. The rationale behind data collecting activities by different government departments is *confidentiality of statistics* under the law. If one or another ministry needs individual data to create their own indicators they cannot obtain it from the CSO. Hungary has to revise the organisational structure of data collection and division of labour within government sphere by the Law on Statistics, enacted in 1992. The principle law on data protection is much stronger than the practice was in planned economy. The individual data flow from ministries to CSO (or indicator agency) would be workable by the law. Opposite direction is strictly prohibited. If a ministry organises its data-gathering and collection activities taking into account statistical needs, they can pass individual data on to CSO. Very few *regional authorities* are users of indicators because regions can afford to devote only very limited sources to support R&D activities. The harmonisation of file data systems could result in compatible and comparable data sources and lower the cost of producing regular and new indicators.

International organisations, European authorities, (members of European Parliament and Committees, relevant departments of EU Commissions, EPO)

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[4]Business can be a lobby group for a governmental up-to-date information system as user even if as producer it is not so keen to report to data gathering organisations. (Recently those parts of business which can afford to invest in technology transfer, to introduce new products and processes have had an interest in this type of information.) Business organisations are interested in their own sector and in some general information.

OECD, NATO and UN agencies are important producers and users of indicators. Both types of activities have a significant influence on national indicator producers and users. International trends have a strong impact on decision-making and priority setting. Policy-makers are usually very interested in international comparison as an evaluation tool. When they find that Hungarian data and indicators are still lacking for comparison they try to make some efforts to overcome this problem. So international experiences have a "demonstration effect" on indicator developments. This means that international demand has an important role to play in encouraging Hungarian authorities to develop the production and use of S&T indicators. (Terms of memberships and co-operation have a great influence.) In this period of transition, international impulses have stronger impacts on indicator activities than domestic impulses. In many cases demand of international organisations substitute the poor articulation of government needs.

Indicator activities are not performed for their own sake, but so that the results can be *used in a variety of processes*. Policy makers' needs differ by their relationships to the S&T sphere. *Government and Parliament* have very limited interest in S&T information because of their tremendous other tasks and little knowledge of how and why to use the indicators, audits, evaluations. There is no regular compulsory report to Parliament on S&T matters. Only the Law on the Academy imposes on the HAS the obligation to report to the Parliament bi-annually on basic research.

In transition economies not only the statisticians, evaluators, technology auditors have to learn new techniques, etc. but policy-makers and businessmen also have to acquire knowledge on how to use this type of information. During this long learning process, many government functions are now found in Hungary, but few of them belong among the regular activities of government, of Parliament.

Table 3 shows the present relationship between S&T related government functions and indicator activities performed in Hungary.

Table 3
S&T related government functions and indicator activities performed in Hungary

Government functions	Indicator activities	Users			Government founds
		Gov.	RDG	Parl.	
Monitoring	☺	☹	😐	😐	😐
Accountability	😐	-	😐	-	😐
Evaluation	😐	-	😐	-	😐
Allocation of funds	☺	😐	😐	😐	😐
Allocation of direct budget subsidies	😐	😐	😐	-	-
Technology audit	😐	-	😐	-	😐

Notes: Gov.= government, RDG = related departments of government, Parl. = Parliament

Table 3 clearly shows that the general use of S&T indicators is wide-spread for monitoring and allocation of funds.

Monitoring of R&D activities is a matured system in Hungary The *National Technical Library* collects nation-wide data on projects, institutes, and experts. This system was set up in the mid-1980s, but data collection was interrupted in the early 1990s due to a lack of funds and it was reorganised in 1994, partially financed by OMFB. The *Ministry of Industry, Trade and Tourism* launched a survey to collect data on R&D organisations which devoted their activities to industry oriented research. This register intended to help industry-institute partnership searching[5]. Similar action has been taken by the *Ministry of Agriculture. Other ministries* have some monitoring activities by project and/or by institutional basis. *OMFB* produces yearly a monitoring-type country report. This is based on CSO indicators, file data of OMFB managed financial sources (data on applicants and supported projects), file data from several other sources and publications. *Ministry of Culture and Education* is organising its own data-bank to monitor its distribution scheme. Beside these, there are some pilot surveys carried out by governmental agencies and interest organisations for their own information in pursing their lobby aims. All *state funds* have their own monitoring system which are used by themselves and governmental agencies.

There are some initiatives to revise and complete the Hungarian S&T monitoring system to report to the Scientific Sub-committee and General Assembly, Parliament, and Government.

The main problem of ***accountability*** is not only the gap between founders' and performers' report, but taking the funds into account correctly. Hungarian statistics distinguish four sectors of funding of GERD (Gross Domestic Expenditures on Research and Development), namely government, business, private non-profit sector and foreign. Data on the three first are based on statistical questionnaire (OECD 1997, pp. 18-19). There are limited other sources to control respondents. In a transition economy it is much more difficult to deal with non-respondents because of the unsettled environment. The sum of the government fund is not accurate either. The lack of accuracy arises from

- the transitional structure of the budget system (there is no separate line on R&D budget),
- weak enforcement of the law on openness and secrecy (e.g. defence R&D expenditures are financed by KMÜFA, by the Ministry of Defence, and two other ministries. Data on government subsidies allocated by KMÜFA and the Ministry of Defence are available. Other ministries are not willing to

[5] This is a good example of newly emerging public data collection activities. Their aim is to support attainment of the policy aim: to create a congenial environment for business. Government departments provide free information services to business. They help the partner searching process, and create a better position for research organisations to get closer to potential clients.

publish their data. The secrecy of these data was abolished by a law but the enforcement of the law has not been strong enough yet.)[6]

- some non-R&D oriented government sources are participating in financing these activities (e.g. regional fund, SMEs development fund). These data have not yet been included in government funding.

Evaluation is a newly emerging activity in Hungary.[7] Some molecules of evaluation systems have long tradition in Hungary. Since 1990 different authorities have been conducting (outsourcing) many target group analyses. These are feedback specific programmes supporting further policy formulation. A part of these studies analysed the situation or the behaviour of a potential or actual target group for research and technology policy measures. Other part of the studies concentrated on the financial situation of research organisations (indebtedness, wealth, etc.) Technology foresight concepts (e.g. Delphi approach) were not used in evaluation studies. Hungary has taken some steps towards comprehensive policy evaluation. The *OECD reviews* on Hungarian S&T (1993, 1995) were a good policy evaluation exercises. Budget financed *Hungarian Accreditation Committee* (AC) as quality controlling organisation is the most important evaluator in HE sphere. The Accreditation Committee with the help of the *Ministry of Culture and Education* introduced a new detailed questionnaire in 1996 to monitor and evaluate research activities in the higher education sector. The main purpose of this is to evaluate universities for decision-making on allocation of budget support. For this, the Accreditation Committee needs individual data but the Law on Statistics forbid to provision of individual data of respondents to any organisations. The AC organisation qualify teaching curricula, departments of universities, university staff, results of university researches. Around 2000 the AC will evaluate scientific quality of research in higher education by scientific fields (Patkos, 1997). The Ministry of Culture and Education will evaluate in 1999 the recently introduced grant scheme (bidding system for R&D, scholarships to postgraduates, support publications of textbooks and reading books.) *OMFB* introduced project evaluation system together with the introduction of bidding system in early 1990s. Recently the Council of the OMFB passed "The Evaluation Strategy of the OMFB". Its concept is based on TAFTIE (The Association for Technology Implementation in Europe) Manual. The recent evaluation was based on international co-operation within the framework of TAFTIE. In the evaluations, ex post elements are frequently represented, strategic analysis is rarely conducted. (Török et. al. 1996) A segment of policy -- Hungarian participation in EUREKA -- was also evaluated systematically (Balogh 1997). One measurement, *bibliometric,* has been widely used to evaluate higher education organisation and research institutes since the beginning of the transition period. Public support and project support are linked to this indicator. *Patent indicators* are also used for policy setting. *Technology Balance of Payments* (TBP) are not available in Hungary.

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[6]Despite the large number of funding organisations, defence R&D expenditures are very limited in Hungary. But the picture is not clear because of the non-availability of part of the funding data.

[7] The subject goes beyond this paper. Case studies have long history and they are important in Hungary as tool of evaluation

Allocation of funds is based on indicators and evaluation of S&T results. The indicators contribute to the allocation of funds to academic R&D and the assessment of its result. They are used for allocation to the technology development sub-fund and to FEFA.[8] The indicators are much more widely used by funds in their own allocation procedure than in the decision making to allocate budget for funds.

Priority setting has been done in Hungary only on government department level. There is no nation-wide priority setting. Available and reliable S&T indicators and evaluations were used by policy makers for priority setting. The utilisation of quantitative data and indicators differs by agencies but all of them use these in one way or another. E.g. patent indicators highlighted sharp decline in patenting activities and data analyses made clear the inventors' organisations were not able to cover patent fees abroad. To avoid economic disadvantages of non-patented inventions OMFB offered financial support to potential patent applicants to cover the application fee on time. *Delphi methods, foresight studies, technology assessment have not been used yet in Hungary.* In 1997 OMFB launched the first foresight activity. *Pilot technology audits* back up the policy decision-making process on priorities (OECD Pilot Technology Audit by The Institute of Advanced Studies Vienna; The Technical Research Centre of Finland, Helsinki; FhG Management GmbH, Munich; Bertin & Cie, Paris, 1995; FhG ISI and IKU Biotechnology Audit 1997).

Priority setting is a delicate question in a transition economy. The country would like to avoid slipping back to a socialist-type of mission-oriented S&T policy. Now we are in the middle of the process of learning how to make a distinction between priority setting and the socialist-type of mission oriented policy. The first years of the transition period can be characterised as an adjustment process of S&T policy. Policy priorities were to stimulate business demand for R&D, to encourage technology transfer, to promote new technology devoted SMEs and preserve and strengthen R&D capabilities.

Allocation of direct budget subsidies would be an important indicator of the public role in S&T financing. Reform of the accounting procedures for the state budget has been going on for a long while. Some steps have been taken. There are many reasons why this reform is so slow. One important factor is that government departments are reluctant to improve the transparency of the budget: they are afraid of loosing their positions. Creation and legislation of a multi-channelled funding system was not accompanied by either the definition of a new financial policy or formulation of the necessary strategy for S&T. A part of governmental support does not go through funds. (See table 4) If we take into account that within the state support the proportion of budget increased, while funding support decreased the allocation cannot support the strengthening of strategically thinking. Direct support is not so transparent as

[8]The Ministry of Culture and Education introduced a new bidding system (grants to best professors, research grants, support for the publication of textbook and scientific books). In this sense direct budget support behaves as a fund.

funding support. Changes seem rather to come about as the result of action by individual pressure groups that successfully pursue their goals through the legislative and/or administrative process.

Table 4 shows the state budget allocation by government.

Table 4
Government budget for R&D
(in Billion HUF)

Sources	1991	1992	1993	1994	1995	1996**
State budget*	15.1	19.9	22.9	21.9	20.0	20.6
KMÜFA	4.3	6.7	7.9	7.3	4.6	3.4
Space Office	-	0.04	0.08	0.08	0.08	0.08
Other state funds	1.7	1.6	2.3	2.2	3.3	3.0
OTKA	1.0	1.6	2.3	2.2	1.7	1.7

Notes:
* Final data were recalculated by OMFB to prepare comparable time-set.
** Preliminary data
Sources: Several publications and file data of CSO, OMFB, Hungarian Space Office

These data do not contain all budget items involving R&D. They relate to the Hungarian budget system and data collection. The available data sources allow measurement of only a part of the R&D budget A proportion of KMÜFA's funding was managed and accounted by various ministries until 1995. Since then the ministries have to report to OMFB so accountability of this sub-fund is much better. There is a missing mass in measurable government expenditure. (This sum is probably not very large because government-funded R&D is limited.) The estimation of R&D content of some budget items is too risky. Data on the KMÜFA, OTKA, and Space Office are based on the reports of these organisations, they are quite precise. Other figures are based on performers reports and they are less accurate. Because of the lack of a scientific budget it is not possible to give a more precise picture. A detailed and reliable overview would be important because failures and success of national R&D, and innovation activities are influenced by the system of financing and availability of a critical mass for different aims.

The following state budget outlays on R&D by performers can be identified. (Table 5).

Table 5
Government Expenditure on R&D by recipients

Direct and indirect budget sources	Higher Education	Research Institutes of HAS	Other research institutes	Firms
Budget for Education	☺	-	-	-
Research funded by government departments	😐	😐	☺	☺
HAS	☹	☺	-	-
OTKA*	😐	😐	☹	-
KMÜFA	☺	😐	😐	☺
FEFA	☺	☹	☹	-

Notes: *Because of a budget deficit *OTKA* was financed not only from the budget but also from KMÜFA in recent years. "Overlapping" financing sources results in double counting of a part of state support. This reallocation eased the strain on the budget and was contrary to the interests of basic research and technological development instead of helping interest harmonisation.

Not only the S&T indicators but the complete budget model is under revision.[9] The key player in the allocation of funds is still the Ministry of Finance as treasury organisation: only a subcommittee of Parliament discusses the report on S&T. In the given system, indicators may play a diminished role

III COMMUNICATION PROCESSES ON S&T INDICATOR ACTIVITIES

Communication between the actors involved in S&T indicator activities is important. For a relevant system, the information about current and emerging policy needs for S&T indicators has to flow from users to producers and vice versa from producers to users in the case of information about the feasibility of compiling statistics and calculating indicators to meet these needs.

There are some formal arrangements for organising communication processes between the actors involved.

- *National Statistics Committee:* CSO, all government departments and statisticians are members of this decision making body. It investigates the need and competence of data collection to avoid parallel actions. This body together with CSO propose to government for decision year by year the National Data Collection Programme that is to be included in the regular statistics. R&D statistics is a part of this system. Because the body is responsible for statistics in general, it can devote only limited time to S&T issues; there are no S&T statisticians among its members. (An S&T indicator subcommittee was set up and dissolved without any meetings.)
- *Science Policy College*: might become a forum but it is not one yet.

[9]System of S&T indicators is considered as an important component of the public finance management project presently organised by the Ministry of Finance and supported by the World Bank. It covers substantial revision of planning, execution, control, and reporting of the general government budget.

Ad hoc committees are managed by different ministries and OMFB. These are formal forums for harmonisation on selected nation-wide issues. They discuss S&T indicators that relate to activities of the ministry concerned. These subcommittees have some positive influence on modernisation, and various aspects of the S&T measurement and evaluation system but their activities rise the question of compatibility on a nation-wide level. Except for special sector-related activities, their actions are responses of a non-statistical nature based on producers' constraints and lack co-ordination and co-operation.

The overview of S&T-related government functions and indicator activities highlighted *duplicated data collection by different actors.* Indicator activities are strongly influenced by divided responsibility for S&T and innovation policy among different governmental actors. The division of labour among them is not clear; there are many grey zones because of this weak co-operation and harmonisation among them. Beside parallel information activities, there is a serious lack of information on some other fields. The use of limited financial sources to produce relevant information is not very efficient in such a divided system. The use of file data for indicators is on a lower level than would be possible. It is worth giving thought to the reasons for these losses and possibilities to overcoming them.

It should be mentioned that there are some *informal contacts* too. These are generally based on personal contacts among the professionals. They are usually working co-ordinations. The actors on this stage have been changing frequently during the turbulent years of transition. Informally based co-operation is destroyed by rotation. These changes have both positive and negative impacts. If the old personal contacts disappear it means that the actors are not longer prisoners of their own past and can participate more readily in carrying out their main task of transforming the system. This is the positive impact of newcomers. The negative one originates from the lack of formal experience; it is much more difficult for new actors to replace a formal labour division and contacts with informal ones.

In my opinion the main problem arises from the undefined responsibility of different (potential) players in S&T policy-making. This causes a great deal of articulation and financial difficulties relating to their needs. On the one hand S&T and innovation are increasingly recognised as crucial to competitive advantage, but on the other hand science and technology policy have much less importance during the transition period than general transformation and stabilisation issues. The Central and East European countries have not yet chosen the new value-systems, and they have only partial answers to such issues as the role of the state in S&T and innovation policy, and the role of authority in international economic and S&T affairs. These questions are not in the forefront: S&T and related issues have low priority for government as a whole. Government structure reflects this view. The forum of harmonisation within the governmental sphere is confused. The present phase of transition cannot yet provide revised relating systems. (See OECD 1995)

In the communication process *openness* can also play an important role. *CSO* publishes S&T indicator reports, and some other target group reports yearly. They are available in the catalogues of libraries and booksellers. *OMFB* is one of the main publishers in the S&T indicator and analyses. Its publications are free of charge; they are mailed to OMFB-registered organisations and anybody can obtain them from the OMFB. Scattered publications of OMFB are in the catalogues of libraries. The *Patent Office* publishes data sets regularly in its journal which is available in the catalogues of libraries and booksellers. *OTKA* publishes its own report yearly and distributes it among the scientific community and governmental departments. It is not available at booksellers. *Ministries* also have publications which are available at the ministries and are sent out to those on their mailing lists. The *Library of the HAS* publishes world known bibliometric information. Data-sets of the *National Technical Library* (Hungarian R&D Information Service by CERIF /Common European Research Information Format) are available at the Library in different formats.

Openness has improved significantly since the beginning of the transition process but most government outsourced studies are virtually inaccessible to the public.[10] The final reports and data-sets are frequently available only as "grey literature" or only as internal documents. Few studies have been published as books or articles and appear in the catalogues of libraries and booksellers.
Regular newsletters on S&T indicators and pocket books of indicators are still lacking.

CONCLUDING REMARKS

In the case of Hungary professionally performed statistical data, indicators, pilot evaluation studies and impact analysis of S&T policy are available but their information coverage is narrower than in older OECD member states. Pilot surveys are usually followed slowly or never by surveys, even if they proved their usefulness. The relation between spot-type information and time series is unbalanced.

The combination of indicator users and producers which can be observed in the government sphere is not very healthy. The interwoven function of users and producers is the main cause of short term thinking on such strategic issue as the S&T information system. Policy wishes of pressure groups may prefer the ad hoc character of the system, but Government and Parliament would be responsible for an information system which can serve nation-wide interests. It

[10] A non-democratic society can afford not to inform general public on S&T issues, resource allocation, etc. Democratisation is a very long learning process. It is typical of the public interest in S&T issues, including measurement, that the first subcommittee of Parliament on S&T and innovation was not set up until five years after the first free elections. Except for a very few environmental problems, the general public is not interested in scientific issues.
The social problem of rejecting science is well known all over the world. This attitude is growing in former socialist countries. Non-information opens more ground for this phenomenon.

has to improve information and communication on S&T matters for the general public.

Hungary has taken remarkable steps to redeploy the S&T institutional frameworks, to reorganise its structures and improve the funding of research and innovation. It can be stated that the *centralised system has disappeared*. A part of the system is decentralised, another part is divided, as more precisely *actors* are *separated from each other*. One of the most critical issues of the funding system is that the sum of governmental funds are known only for one year. This allocation practice cannot help to avoid the *short termism* in the funding sphere which would be an important role of public funding. In that sense the *relationship* between government (represented by the Ministry of Finance) and other actors is *too close*. Even total allocation of the budget is not clear enough, allocation of funds by foundations is roughly transparent. This period is a mass learning process; all actors have to find their own roles in the S&T arena and it is very natural that we can observe some attempts to restore the old functions, budget allocations, etc.[11] But the balance of transition is unquestionably positive. However Hungary still has to make a further enormous effort to establish a more R&D- and innovation-friendly S&T financial system to became competitive in the global market. Indicators can play important roles in this process.

Some indicators are still missing in Hungary. First of all, only a pilot innovation survey has yet be conducted so a *nation-wide innovation analysis* still lacks. *Technology balance of payments* which is important for analysing the Hungarian position in the international context is also missing because Hungarian file data at the National Bank and trade statistics are not suitable for this purpose.[12] Trade statistics from third sources offer little chance to create relevant indicators. Detailed *regional data on S&T* are not yet available. (A new survey will contain such information too.) Much additional information is missing on S&T personnel to investigate the *relationship between new technology and job creation*, to evaluate the *brain drain and brain waste*, etc. The transitional character of the related systems (e.g. budgetary system, economic structure, banking system) is also the cause of some missing systematic information. Availability of data on *R&D by foreign affiliates* is scattered. These data would be important to investigate the impact of internationalisation and globalisation on the Hungarian economy over the past 5-7 years and to provide empirical evidence in the heated debate on the role of foreign direct investment (FDI) in the transition economy. In several cases the *link among databases* is missing and this makes it difficult to prepare indicators.

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[11]For example, the declared function of the *Science Policy College* is an advisory body to the government and not a decision-making body. Its shadow function is decision-making. According to the law, *OMFB Council* is responsible for formulating strategy but there are many non strategic issues on its agenda, to make government departments agree with each other.

[12]The classification at HNB is not detailed to such degree to be able to identify transactions related to technology transfer.

Summing up the conclusions of this overview it can be identified some hampering factors explaining why significant groups of policy-makers are quite reluctant in ***using S&T indicators*** and which are the greatest difficulties in communication between producers and potential users of S&T indicators. A typical feature of the socio-economic transformation process is the unequal strength of the conceptual framework for indicators, the definitions, the policy makers' needs and the producers' constraints.

Old routines can survive the changes in the system. Previously S&T used to be a prestige issue. These circumstances allowed authorities to give limited importance to monitoring and evaluation.[13] In a non democratic society it might be possible to neglect the debates on S&T issues not only with the general public but with relevant professional groups too. Some priorities were decided outside the country (CMEA large scale S&T programmes). Parliament did not play any role in S&T priority setting. Because of these reasons accumulated knowledge on a market-type democratic policy-making process is very limited. There are no national patterns which new actors could follow.

The relative quality and reliability of statistics are far from excellent. Without going into the details of these, it has to be emphasised that the application of statistical data and indicators for decision making is less than their non-use is justified by the constraints. If the potential users had a greater interest in application it would provide positive feedback to overcome many methodological and quality problems.

The supply side can grow if the demand side is ready to invest in long term development. Similar to technical invention prototype (the theory and conception of new indicators), there will never be lucrative innovation if nobody invests in the design and development process (data collection and data processing).

The S&T indicators can play important role in CEECs if the demand of their principal customer, who, in the end, financing the corresponding research for proper information, are paying for it.

The relatively poor use of indicators may be explained by a negative consensus. Hungarian people, from politicians to general public, have little trust in the usefulness and reliability of statistical data because of several reasons: methodological shortcomings of available statistics, "lightening

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[13]The *scientific community* (universities, institutes, scientific council, Academy) has a special role as user and producer. In reformed socialism there was weak interest to use indicators because the relations between scientific results and financial support were very soft. Because of political influence, a part of the results were non-measurable (samizdat, administrative and financial difficulties with foreign publication, patenting) Individual scientific reputation, the satisfaction obtained from intellectual solutions, the possibility of participation in international scientific debates and networks are more important than official evaluation of individuals, and institutes. There were very few independent analysers. To become independent in party-state socialism it was a system alien behaviour. The authorities usually preferred to ask advice from opponents of "His Majesty" than others. Availability of information was different for "official" and "non-official" scientists.

surveys" carried out by newly emerging opinion poll agencies. Politicians have not yet learned the differences between statistic and opinion polls.

There is a *lack of proper knowledge* on the value of using such information in the decision-making process. *Skills* to apply them are very limited not only among policy makers, but in state administration too.[14] The *critical mass* of producers and knowledgeable users is still lacking. The bulk of policy drafting is carried out by the staff of ministries, and other government agencies. Even though in many cases, these public servants are quite competent and knowledgeable in their respective fields, they lack specific training in democratic policy formulation for a market economy.[15]

The efficiency of data and indicator producers is weakened by *weak co-operation and co-ordination* among and inside relevant government departments. The budget of reformed socialism allowed the organisations to collect and analyse "prestige" data. (scientific prestige of socialism, professional interests, etc.) The policy usefulness of data collection and indicators were not so important in the decisions on financial sources for information.

These hampering factors have some negative consequences on the possibilities to create more reliable, more up-to-date and new S&T indicators. Because of the above reasons, the time spent on evaluation, monitoring, etc. is usually too short to produce good quality, and expenditures available for each organisation are very limited. These are burdening factors not only for the present but for the future too. The development of an S&T information system is a *long-term process.* If recent government budgets allocated a limited sum to collect and publish R&D indicators, future governments have to face the same problems. For example, the recent budget allocated to CSO does not cover the cost of revising the existing system, register, etc. and the cost of introducing new indicators to meet new needs.[16]

If government were to set up an S&T observatory organisation it could fill the co-ordination gap in the information system. It could support priority setting and

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[14]There are very few researchers who are involved in policy and measurement research. One reason is the above-mentioned legacy, the other one is no real need for policy support research. The indicators are used mainly to defend the interest of the scientific community. Beside these, S&T indicator issues are not part of the education (including post graduate) system.
As a result of the democratisation of society, information has become much more readily available, but information has become a tradable good. Analysers have to find financial sources to obtain it. The independence of policy research strongly depends on its financial background. Because of failures of the information system, scientists usually prefer to use pilot surveys and case studies instead of indicators. The problem is that collection of this information is usually financed by lobby organisations. The scientists are not in a position to investigate the validity of analysing information. The policy advisors and policy scientists are interwoven. The players on the stage and habits have hardly changed yet.

[15]Sometimes social scientists are invited to participate in the policy formulation process. In many cases their presence does not mean scientific work for policy making, their role is to replace the missing training of the administration with their literature-based knowledge and temporarily increase the number of public servants who are involved in policy working groups.

[16] Recent methodological development and revision were supported by OECD and OMFB and IKU Innovation Research Centre as a scientific group was involved in the process.

other decision making on S&T matters with proper information. At present neither public nor private sources are available for this. Not only the financial sources are limited but there is still no support group fight for the allocation of sufficient sources for such a long-term process .

Transition countries face a complex of obstacles in producing and using S&T indicators. These include scarcity of qualified personnel, lack of accessible and reliable data, insufficient co-ordination and implementation mechanisms, and the costs involved. They need to invest more in the education and training of S&T indicator users and producers, including professionally trained public servants, researchers, and politicians in the broad sense. The discussion on strategically issues, and foresight activities should not be neglected any longer. During this process we have to reinvent the government, formulating its new function.

As it builds a market economy, Hungary has to *redeploy the whole information system* including the S&T one. This is a time - and cost - consuming process. Several steps have been taken in this direction but many further steps are ahead of the country. Inherited elements of the Hungarian S&T information system are under revision. During this process Hungary has to solve the revision and introduce new elements into the system in response to new challenges. Both type of players -- new potential users and producers -- have to appear and find their own part in the S&T arena.

ACKNOWLEDGEMENT

The author would like to acknowledge to the participants of the OECD/NSF Workshop, to the professors and students of the Departamento de Politica Cientifica e Tecnologica, (DPCT-IG-UNICAMP), Universidad Estadual de Campinas, Campinas, Brazil, and to Antónia Hüttl, Mihály Laki, András Patkós, András Siegler, Erzsébet Varga, Erzsébet Vízváry for their valuable comments. Thanks to all but as always the errors are my own alone.

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Próximo texto:

Davyt, A.; Velho, L. Los Mecanismos de Evaluación en el Desarrollo Histórico de Agencias Brasileñas de Fomento a la Investigación: CNPq y FAPESP, 1999.