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No. 534

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HUNGARY

POLAND

HUNGARY

ORGANIZATION AND POLICY ON SCIENCE, MAIN TRENDS OF RESEARCH AND DEVELOPMENT OUTLINED

Budapest KULTURALIS INTEZMENYEK ES SZERVEZETEK MAGYARORSZAGON (LEXIKON) (ENCYCLOPEDIA OF CULTURAL INSTITUTIONS AND ORGANIZATIONS IN HUNGARY) Kossuth Publishing House in Hungarian 1976 pp 9-20

[Excerpts] The scientific-technical revolution in general, and science in particular, unfolds itself in Hungary without social restrictions, and produces more and more major results. The scientists in the country — indeed all scientific workers — take an active part in the full building of socialism, basing their work on the needs which arise from the goals of society as a whole and the evolution of science.

The most important social needs imposed on science are formulated in the science-policy guidelines promulgated by the MSZMP [Hungarian Socialist Workers Party]. Our science policy, as part of the overall policy of the Party, expresses the view that a bond between science and socialism is a major element of our revolution, and that following the path outlined in the guidelines is an important factor in the development of scientific life in Hungary.

Since the liberation, and especially since the beginning of the building of socialism, we developed a major research and technical development base in Hungary. Before 1945, we had fewer than ten research institutions, which could be called such by modern definitions. In 1975, we have more than 130 institutions which are engaged in scientific research. The research institutions which form the primary base of scientific research have been created and are being operated by the Hungarian Academy of Sciences, the various ministries with jurisdiction over various branches of the economy, and by social organs. The primary task assigned to the academic institutions is to conduct basic research. The ministerial institutions became the bases of applied research and development, and they serve primarily to establish the scientific basis for our industrialization and agriculture.

In addition to the research institutions, much scientific work is also being carried out in almost 60 universities and more than 1000 departments in them. These are the so-called university research institutes; their research and development work extends to basic and applied studies under the jurisdiction of the three ministries exercising supervision over the universities (the Ministries of Education, Health, and Agriculture and Food), as well as the Hungarian Academy of Sciences. In the past, the research institutions started out from the base of the personnel and facilities of a university research institute. Even today, this basis provides the primary scientific background from which the new disciplines of scientific and technical advancement may unfold.

According to their character, the university research studies may be:

- Disciplinary and interdisciplinary studies, which are activities aimed at training researchers, advancing sciences, and modernize education; they do not necessarily serve the goals of the economy directly. Interdisciplinary research necessitates the cooperation of more than one department (not necessarily within the same university) and perhaps also of outside research institutions;

- Level-maintaining studies, which are not aimed at creating new breakthroughs but are needed to enable us to adapt foreign results, and also to develop and evaluate new methods of testing;

- Studies aimed at the realization of complex plans, which involve the participation of the universities in the realization of a large ministry-level or national-level research programs.

The closest relationship between university research activities and the needs of production is achieved by the fact that the enterprises contract with the university institutions for carrying out certain specific studies.

In addition to the research institutions and the university research institutes, there are approximately 250 additional research facilities, such as development laboratories, design bureaus, museums, libraries, archives, clinics, and the like, where much important research is being carried out, although this is not necessarily the main purpose of the facility. This base is often indispensable for adapting the achievements of scientific and technical achievements, large-scale production operations, healing activities, public education, and so forth.

Parallel to the establishment of the network of research institutions in recent years, we also built up a large cadre of well-trained researchers. Most of the researchers became scientists as a result of substantial support from society. The total number of scientific workers in 1975 was more than 80,000; this represents approximately 1.6 percent of all employees in the economy. Among the scientific workers, almost 34,000 are university graduates, including 4,500 with doctoral degrees or candidate degrees.

The percentage of the national income expended on research and development increases steadily and appears to have a continuing increasing trend. In 1975, we spent approximately 12 billion forints, approximately 3 percent of the national income, on scientific research and technical development; this ratio, in our judgment, compares favorably with the corresponding ratios in other countries whose size and state of development is the same as of Hungary.

The following are the resources from which the financial means of research and development activities are provided: The national budget, the technical development fund built into the price of the products, the value of research and development contracts, and the income from the sale of intellectual property. The national budget finances the basic research; the applied research projects and development studies are financed mainly from the technical davelopment fund. Some research institutions — primarily the industrial research institutions — operate since 1968 almost like enterprises, deriving their income from the proceeds of the contracts with production enterprises. In addition, any research institution — provided that it fulfills its primary function — may contract with any other socialist organ for research projects, so as to obtain additional income. In general, these actions are useful in ensuring the close relationship between science and industry and the interest of research institutions in social needs. This is why the development of social sciences, which was not spectacular in recent times, now advances at a faster rate, so that its participation in the financial and intellectual expenditure for research is today at the six-percent level. But it is also important to maintain the proper ratios in scientific research for best service to the economy as a whole; thus, between 70 and 75 percent of the research capacity is used in industry and agriculture, since these two branches are most closely related to the production of goods. The percentage of the natural sciences is 10-12, and that of medical sciences is 3-4.

The state oversees the entire field of scientific research on the basis of a unified science-political guidance, and establishes the organizational and administrative apparatus required for this purpose.

The system of state control of scientific research changes according to changes in the needs of society, the specific features of the research involved, and shifts in trends. But planning is always an essential feature of this control.

Planning research, in the broadest sense of the term, means the determination of the strategy of scientific research, setting the goals for the various research institutions, designing the conditions which ensure the realization of the thematic plans and concepts, ensuring the financial support for operation and investments, training of personnel, scientific qualification (degrees), publication of books and journals, international relations, and the like, in a systematic manner.

Usually there are three kinds of scientific research plans: a) the national long-range plans, generally covering a period of 10-15 years; b) the medium-range plans, covering a period of 3-5-7 years; and c) the short-term plans, covering usually one year, sometimes including an outline for the subsequent year.

One may regard these three kinds of plan in the following manner: the long-range plan is the strategic document of the government's science policy, dealing with the intended real development and the long-range goals associated with it. The medium-range plan is more activity-oriented, and it also represents the action program of the supervisory bodies aimed at the implementation of the strategic concepts of the long-range national plans. The short-term plan covers the operative work program of an institution, and is a tool for justifying the local decisions.

Insofar as the research institutions financed from the national budget (mainly the Hungarian Academy of Sciences and the research institutions of the Ministries of Health and Education) are concerned, the plans covering the next 3 to 5 years have the greatest orienting force.

Planning of the research institutions financed from the technical development fund differs considerably from the planning of the research institutions financed from the national budget. These institutions have plans dealing with the implementation of tasks assigned by the supervising ministry or tasks arising from contractual obligations.

A new national long-range scientific research plan has been prepared for the 1971-1985 period on the basis of the science-policy guidelines of the Central Committee of the MSZMP. The aim of this plan is, on the one hand, to establish a guideline for science-policy leadership by creating the prerequisites for proper advancement. On the other hand, the plan orients the research planning of the individual supervisory organs and research institutions so that the domestic research activities proceed on a sound basis and in the best interests of society as a whole. Its orienting effect manifests itself by the fact that it specifies the most important research tasks and that it employs indirect economic and scientific incentives for scientific research.

The plan has four sections. The first section specifies the principles of the government's science policy for the 1971-1985 period. The second section contains the themes which utilize about half of the financial and intellectual resources, namely the 17 national-level research tasks (main research directions and target programs) which were promulgated by the government and which are closely monitored by the government.

The following are the national level research directions:

1. Solid-state research.
2. Bioregulation.
3. Complex scientific study of economic development.
4. The socialist enterprise.
5. Study of biologically active compounds.
5. Pedagogic studies in the field of public education.

The following are the national-level target programs for research:

1. The research target program of the central development program of the aluminum industry.
2. The research target program of the central development program of petrochemistry.
3. The research target program for the central development program of computer technology.
4. The research target program for the central development program of complex light construction.
5. Optimum creation of human macroenvironment and microenvironment.
6. Research and development of machine-manufacturing technology.
7. Research and development in the field of electronic components.
8. Research and development in the field of communication systems.
9. Increasing soil productivity by developing novel approaches.
10. Increasing the production of meat.
11. Increasing the assortment of foods on the retail market; their processing and conservation.

The third section deals with financing; it covers the calculations concerning the general development of the research network and the financial means required for the realization of the research tasks included in the plans. The fourth section presents guideline figures and measures on the basis of estimations and calculations for meeting the needs of experts in the various research areas.

In addition to the national-level tasks of the long-range scientific research plan, a considerable percentage of the domestic research capacity is expended toward the accomplishment of more than 100 so-called ministry-level research projects, which in their totality determine the main features of Hungarian scientific research and technical development.

In addition to performing the tasks outlined in the research plans at the various levels, some of the capacity of the research institutions is used to meet new tasks as they come up. Even the most careful planning effort cannot foresee everything in advance, so that means must be provided for enabling the research network to react quickly to new phenomena as they emerge in the course of scientific and technical advancement.

Scientific development is considerably influenced by international relations; these relations represent an organic part of scientific life. For us, participation in the international division of labor is a particularly important matter since we lack adequate resources for working in all fields of science and technology.

The international scientific relations of our country are still inadequate in spite of the fact that that numerically they appear extensive (we have scientific agreement with almost 50 countries, and approximately 17,000 trips to foreign countries are made each year for scientific purposes). Specifically also, there is relatively little actual cooperation in division of labor among research institutions. The establishment of such activities on the basis of the complex CEMA integration program has not yet progressed to the extent which we regard desirable.

Hungarian science management has two typical general features: 1) The highest-level government control is multicentered, meaning that the supervision and scientific control of the research institutions is divided among about 20 ministeries or other organs of national jurisdiction operating under the general management of the government, specifically the Science-Policy Committee operating under government jurisdiction. 2) In addition to the governmental supervisory organs, there are active committees, associations, societies, and the like, which all contribute to the overall oversight of science activities. Based on these two pillars, we synthesize state and society guidance, which is in line with the principle of democratic centralism, so that the creative and guiding influence of society as a whole asserts itself in all important aspects.

The role of government is fundamental in the system of the state organs participating in science supervision. Formulation of science policy and the government decisions ensuring the accomplishment of the goals are promulgated in the form of government decrees.

Government decision is required for establishing a new research institution and for discontinuing an existing one. It is also up to the government to determine the planning and coordinating system of research activities, and to issue general laws dealing with scientific research.

Preparation of these activities and execution of some of them is the job of the Science-Policy Committee, which is chaired by a deputy prime minister. Through this committee, the research-management functions of the ministries, of the Hungarian Academy of Sciences, and the National Technical Development Committee manifest themselves. These latter organs prepare the decisions of the Science-Policy Committee and provide information necessary for major government decisions.

The direction of the execution of the goals of science policy and the direct supervision of the research institutions is the job of the ministries most concerned with scientific research and technical development, and of other relevant organs of national jurisdiction. These various entities have a large degree of independence and jurisdiction; and the financial means for their decisions are made available. Coordination and cooperation among them is realized on the basis of the following principles:

1. All research institutions are subordinated to a ministry of an organ of national jurisdiction, depending on the institution's research profile. This is how the principle of the supervision of the research institutions manifests itself.

2. The system of supervision also covers the work of the research institutions according to their scientific level. Independently of the assignment of a research institution to a governmental body, the Hungarian Academy of Sciences coordinates all theoretical and basic research projects, and the National Technical Development Committee coordinates all applied research projects and development activities. This system is aimed at providing control according to scientific types and levels.

3. According to the provisions of the national long-range scientific research plan, we are also establishing guidance and coordination on the basis of the research tasks. The work of all research institutions participating in the individual main research directions — irrespective of their administrative status — is coordinated by the minister supervising the main direction (through appropriate organs such as coordinating committees) thereby contributing to the ongoing work in the field.

4. In recent times, coordination according to scientific disciplines becomes more and more important; this development is intended to permit consideration to be given to the peculiar features of the individual disciplines and to the specific guidance and administrative needs arising from them. Accordingly, the coordinating role is becoming more and more important of the following organs: The Central Office of the MTA [Hungarian Academy of Sciences] for natural sciences and social sciences, the National Technical Development Committee for the technical sciences, the Ministry of Agriculture and Food for agricultural sciences, and the Ministry of Health for the medical sciences.

The role of two organs is outstanding in this system of the state control of scientific research and technical development. These are: the Hungarian Academy of Sciences and the National Technical Development Committee.

The Hungarian Academy of Sciences is the highest scientific body of the Hungarian People's Republic; it participates in the national supervision of scientific research activities, and is responsible for the research projects carried out in its institutions. Thus, it operates like a scientific society and it also acts as a scientific supervisory organ for research activities carried on in more than 40 institutions.

The National Technical Development Committee is the consultative, coordinating, and — in certain specific areas — supervisory organ of government in matters involving technical development on the national level. Its basic task is to prepare scientifically founded technical-economic studies fit to meet the demands of the most advanced technology and economy, guidelines, reports, and concepts; to coordinate the work of the ministries and organs of national jurisdiction in matters involving general technical development of national importance; and to guide technical research of major importance if they affect several branches of the economy or the economy as a whole.

This system of supervising scientific research (planning, regulating, and organizing) exists under concrete conditions and is operational. In the various stages of development, the individual components or the entirety of the supervisory system may bear with different weights.

In the present system of supervision, the science-policy principles and the main research tasks are determined by governmental organs; otherwise, however, the system is decentralized. Accordingly, the research institutions are quite independent, and their leaders have jurisdiction in the manner how the financial resources granted or earned are utilized for their research plans and programs.

The science-guiding activity of the MSZMP will continue to remain a promoter of domestic scientific research and technical development. This influence, combined with the enthusiastic and devoted efforts of our researchers, will doubtlessly continue to increase the importance of science in our society.

I. The Organs Supervising Scientific Life

The Hungarian Academy of Sciences (MTA)

It is the highest scientific body of the Hungarian People's Republic; it plays a leading role in the national direction of scientific life. Attempts to establish an academy of sciences have been made long ago; the earliest attempt , insofar as we know, was in the era of King Matthias. After many attempts and trials, the "Society of Hungarian Scientists" was established in 1825 on the initiative of Istvan Szechenyi. It started to function actively only in 1830.

The history of the academy over one and a half century led us to the present state through several stages of development.

Decree XXVII. 1949, is the first to cover the new, socialist function of the MTA. The latest regulations governing its function, in accordance with the provisions of the science-policy guidelines of the Central Committee of the MSZMP, are embodied in Decree 14.1969.

The academy participates in the national guidance of the scientific research activities, and through the activities of its members promotes science and advises the research institutions. Accordingly, it functions like a scientific society and at the same time like a scientific supervisory organ.

The academy has honorary, regular, and corresponding members. Honorary members are such scientists of foreign citizenship who are outstanding representatives of their scientific field and whose activities are important for Hungarian science. The corresponding members are chosen from among those doctors of sciences who can demonstrate major scientific achievements and public service accomplishments. The ordinary members are selected from among the corresponding members on the basis of their scientific achievements.

In general, member candidates are nominated by the apporpriate scientific departments. The nominations are submitted to the general meeting by the presidium. Each elected member is affiliated with one of the scientific departments. The ordinary and corresponding members deliver an inaugural lecture at a public department meeting within one year after their election. It is the right and the duty of every ordinary and corresponding academician to participate in the work of the scientific departments of the academy, to contribute to the advancement of science, and to help in the implementation of the achievements of science. The ordinary and corresponding members have voting right; they are paid a special academy honorary. The membership in the academy ceases upon death, resignation, or — if the member becomes unworthy of this honor — upon a resolution to this effect by the general meeting.

The general meeting is the academy's highest organ; the ordinary and corresponding members are obligated to attend it. There must be at least one general meeting every year.

The general meeting elects the presidium, which governs the regular and continuous work of the academy as a scientific society. The following are the members of the presidium: the president, the deputy president, the presidium members without assigned activity, the elected chairmen of the scientific departments, the general secretary, the deputy general secretaries, and the chairman of the Committee of Scientific Qualification.

The president is elected from among the members of the academy for a term of three years; the president is confirmed by the Presidential Council of the People's Republic. The general secretary is also elected from among the members of the academy upon nomination by the general meeting; the actual appointment is coming from the government.

The academy carries out its influential work mainly through its ten scientific departments and its nearly 300 scientific committees. The academy's responsibility is not of an administrative character; as the highest scientific organ of the country, it monitors fundamental research carried out in its own institutions and in the institutions of various ministries. It exerts a scientific and science-political influence, and coordinates research activities insofar as it is able to.

The following are the departments of the academy: I. Department of Linguistic and Literary Sciences; II. Department of Philosophical and Historical Sciences; III. Department of Mathematical and Physical Sciences; IV. Department of Agricultural Sciences; V. Department of Medical Sciences; VI. Department of Technical Sciences; VII. Department of Chemical Sciences; VIII. Department of Biological Sciences; IX. Department of Economic and Legal Sciences; and X. Department of Earth and Mining Sciences.

The scientific body of the academicians affiliated with an individual department is the department meeting, which is convoked once a month in most cases, and which must be convoked at least once every three months.

The presidium and the individual departments establish committees of a permanent character and also of a temporary character for certain specific tasks.

Almost 2,000 outstanding theoretical and practical experts are working in the extensive system of scientific committees. Government organs and enterprises delegate experts to these committees, as do those enterprises who use the results of research. Thus, a forum is provided for everyone concerned to voice his views before the committee renders a final decision, and there are opportunities for practical suggestions, criticisms, and various other considerations. The personnel of a committee changes every three years, synchronously with the academic election cycle. Coordination of individual disciplines through the scientific committees turned out to be a very workable method in Hungarian science management.

The Scientific and Administrative Secretariat performs the organizational and administrative work needed for the functioning of the general meeting, the presidium, the scientific departments and the scientific committees. It is composed of permanent and specialist members.

In order to realize the scientific goals, the academy sponsors congresses, scientific conferences, and lectures; it publishes scientific books and journals; and it support associations with a scientific function to disseminate the achievements of science among all levels of society.

The administrative work related to the work of the academy with its many bodies, to the research supervisory tasks assigned to the academy, and to the various other statutory functions of the academy is carried out by the general secretary of the academy, who is assisted in his task by the Central Office of the Academy.

The general secretary is individually responsible for the work of the Central office, and acts like the leader of an organ of national jurisdiction under government authorization.

The following is the adminstrative organization of the Central Office:

a) Main science-branch departments: 1st Main Department of Natural Sciences; 2d Main Department of Natural (Biological) Sciences; Main Department of Social Sciences.

b) Functional main departments: Central Administrative Secretariat; Main Personnel Department; Main Planning and Financial Department; Main Department of International Relations.

Each main department in the science-branch sector is under the supervision of a deputy general secretary. Among the functional main departments, the Cantral Administrative Secretariat is supervised by the general secretary, and the others are supervised by his assistants.

The branch-supervision activity of the general secretary is assisted by the consultative general-secretary college. Its permanent members serve at the pleasure of the general secretary.

The Science Policy Committee of the Council of Ministers

It is the task of the government (Council of Ministers) to establish the specific science policy on the basis of laws promulgated by parliament, the long-range and annual plans, and the national budget. The science-supervisory function of government is primarily institutional; it also has the Committee of Science Policy (TPB) as its specialized organ.

Government established the TPB to provide unified government supervision for scientific research activities, to coordinate domestic and international science relationships, to implement the science policy of the government, and to realize the goals of the plans. Its chairman is the deputy prime minister responsible for science policy.

The TPB carries out its work on the basis of its own plans, which usually cover a six-month period. In addition to performing work at its own initiative, it also discusses all proposals which reach it beyond the government. Organs of national jurisdiction may ask it to debate important and urgent matters beyond the work plan if they concern scientific life.

All government proposals dealing with some aspect of science policy must first be submitted to the TPB, and the recommendations of the TPB must be included in all position papers.

The resolutions of the TPB are made by the chairman, at a committee meeting, after considering the views of the members of the TPB. In urgent cases, involving a small group of members, the chairman may ask the opinions of these members directly and may render a decision without calling a meeting. Appeals against a decision of the TPB may be made to the government.

National Technical Development Committee (OMFB)

This is the coordinating and — in defined matters — the supervisory organ of the government in matters of technical development involving the national economy. It also advises the government in such matters. Its basic task is to prepare technical-economic studies meeting the highest technical criteria, guidelines, and concepts; to coordinate the work of organs of national jurisdiction and ministries insofar as they concern general technical development of national significance; and to guide major technical studies affecting several branches of the economy or the economy as a whole.

Other tasks of the OMFB are: preparation of the science-policy decisions of the government insofar as they concern technical research; development of a scientific and technical information system; carrying out the domestic tasks resulting from the activities of the Scientific and Technical Cooperation Committee of the CEMA.

Administratively, the OMFB has a chairman, of the rank of minister, deputy chairmen, and 40 to 50 members. The deputy chairmen and the members of the presidium are appointed by the Council of Ministers on the recommendation of the chairman of the OMFB.

The OMFB or its presidium establishes subject committees (working committees, working groups) for the preparation of studies dealing with technical development concepts and other matters related to its scope. Program bureaux under the chairman are established for the coordinated supervision of major research programs, and contracts are issued for other institutions, bureaus, and enterprises if the chairman determines that these activities are warranted.

The chairman of the OMFB appoints the heads of the subject committees and the committee members from among outstanding theoretical and practical experts. The committee features the joint efforts of scientists, outstanding engineers, inventors, technicians and economists in a collective fashion. The chairmen and members of the committees operate in these capacities according to their best judgment and scientific convictions, irrespective of their employers or the views of the organs which they represent.

Since 1970, there is the Technical Research Coordinating Council (MKKT) as a special organ of the OMFB to coordinate scientific research. Its main function is to establish the research programs for the long-range plans and to monitor their execution.

Committee for Scientific Qualification (TMB)

Since 1950, Hungary awards the titles of "candidate of sciences" and "doctor of sciences" on the basis of scientific qualification to recognize systematic and successful scientific activity toward the building of socialist society. The work on the basis of which these titles are awarded may be: a) a dissertation prepared for this purpose; b) a book published in the last five years; c) an achievement which is new, useful for society, and adopted by society, provided it involved scientific activity.

In general, the candidates for these titles study outside the educational network. The candidates for the "candidate of science" title may participate in aspirantures, which are government-sponsored training modes. Candidate of science and doctor of science titles may be awarded in 24 branches of science (physical sciences, chemical sciences, biological sciences, earth sciences, mathematical sciences, technical sciences, transportation sciences, agricultural sciences, medical sciences, veterinary medical sciences, pharmaceutical sciences, linguistic sciences, literary sciences, historical sciences, art-historical sciences, musical sciences, political and legal sciences, military sciences, geographic sciences, educational sciences, psychological sciences, philosophical sciences, sociological sciences).

The Committee for Scientific Qualification TMB) is the organization which administers the work related to the awarding of the candidate of science and doctor of science titles and which guides the organized training activities aimed at qualifying for these titles. The chairman and the secretary of the committee, and the members of the committee, are appointed by the government for three-year terms on the basis of recommendations from the presidium of the academy. The presidium of the academy supervises the committee.

The members of the TMB are individuals with scientific degrees, and representatives of individual ministries. The TMB carries out its work in general meetings, through the work of special committees, and through the efforts of its president and secretary. There is a secretariat within the TMB, operating under the supervision of the secretary of the TMB.

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DATA ON COMPUTER SCIENCE DEVELOPMENT IN POLAND

Warsaw WIADOMOSCI STATYSTYCZNE in Polish Sep 76 pp 34-36

[Article by Magister Barbara Rominska of the Research and Development Center for the GUS [Main Office for Statistics] State Statistical Information System: "The Development of Computer Science in Poland in 1975"]

[Text] Computer science is one of the most rapidly developing areas of technology. A great deal of significance is attached to this development because the utilization of computer science systems has a fundamental effect on accelerating and improving production and management processes. A high rate of development is especially important for our country. During the 1950s and 1960s, when the highly industrialized countries were undergoing rapid computerization, our country was at a standstill in this area. The breakthrough occurred only in the 1970's.

The following statistical investigations, conducted by the Research and Development Center for the State Statistical Information System allow us, in association with data presented last year[1], to characterize the increase in quantity as well as the structural changes that occurred last year. The results of the statistical investigations of the computer science centers[2], supplemented by information obtained from individual ministries, present a picture of dynamic expansion. This dynamic growth is reflected in the data contained in Table 1.

Table 1. Computers, computer science centers, and employment in computer science centers.

(1) Stan na koniec roku

(2) Wyszczególnienie (3)	1973	1974	1975	
	w liczbach bezwzględnych			1974 = = 100
(4) Komputery w jednostkach gospodarki narodowej . . .	528	963	1473	*153*
(5) komputery duże i średnie	379	433	526	*122*
minikomputery	149	530	947	*186*
(6) Komputery w ośrodkach informatyki	.	490	944	*193*
(5) komputery duże i średnie	.	379	514	*136*
minikomputery	.	111	430	*387*
(7) Ośrodki informatyki	677	991	1300	*131*
(8) Zatrudnienie w ośrodkach informatyki w tys.	28,5	35,2	41,3	*117*

Key:

1. Status at the end of the year
2. Specification
3. In absolute numbers
4. Computers in national economic units
5. Large and medium computers
6. Computers in computer science centers
7. Computer science centers
8. Employment in computer science centers, in thousands

In totaling the number of computers, minicomputers were listed separately because of their different areas of application and the different operating conditions for a large number of them. Of course, this division is conventional[3]. In 1975 the number of computers in units of the national economy increased by 53.0 percent, or 29.3 points less than in 1974 when the percentage increase was 82.3 percent. In absolute numbers, however, there were 75 more computers in 1975 than in 1974. In addition, the growth index for the number of large and medium-size computers was 22 percent 14 percent in 1974), and the growth index for minicomputers was 86 percent (256 percent in 1974). Of the total number of large and medium-size computers in the computer science centers, 97.7 percent were computers and only 43.5 percent were minicomputers. In the national economy, the modernity of computers improved markedly; over 81 percent of the total number of computers were third generation computers.

Table 2. Structure of computers according to generation

(1) Generacja	1973	1974	1975
	w odsetkach (2)		
(3) **Ogółem**	**100,0**	**100,0**	**100,0**
(4) I (lampowe	6,3	0,8	0,3
(5) II (tranzystorowe)	48,1	24,8	18,0
(6) III (obwody scalone)	45,6	74,4	81,7

Key:

1. Generation
2. In percent
3. Total
4. First (vacuum tube)
5. Second (transistor)
6. Third (integrated circuit)

On the other hand, changes in the computer-age structure were insignificant. Over 80 percent of all the computers continued to be no more than 3 years old.

Table 3. Structure of computers according to age classification

(1) Wiek	1974	1975
	w odsetkach (2)	
(3) **Ogółem**	**100,0**	**100,0**
(4) Do 3 lat	84,4	83,0
4—5	7,2	8,0
6—8	5,1	5,5
9—10	2,1	2,0
(5) Ponad 10 lat	1,2	1,5

Key:

1. Age
2. In percent
3. Total
4. Up to 3 years
5. Over 10 years

Information concerning computer science centers exclusively will be given later on in this article. Prior to that, however, let us touch upon some additional information concerning production and financial activities related to the 1975 expansion under discussion and compare them with 1974 results.

Table 4. Growth indexes for production and deliveries, and outlays for development of computer science applications

(1) Wyszczególnienie	1974	1975	
	rok poprzedni = 100		(2)
(3) Produkcja komputerów i minikomputerów	180	130	
(4) Produkcja urządzeń transmisji danych . .	344	141	
(5) Produkcja materiałów eksploatacyjnych . .	233	212	
(6) Dostawy komputerów i minikomputerów z produkcji krajowej i importu dla ośrodków informatyki	177	129	
(7) Dostawy urządzeń do przygotowania maszynowych nośników danych	145	132	
(8) Nakłady na rozwój zastosowań informatyki	129	149	
w tym nakłady inwestycyjne	120	152	

Key:

1. Specification
2. Previous year = 100
3. Production of computers and minicomputers
4. Production of data transmission equipment
5. Production of operating supplies
6. Delivery of computers and minicomputers from domestic production and imports for computer science centers
7. Delivery of equipment to prepare machine data carriers
8. Outlays for development of computer science applications including investment outlays

Computers in Computer Science Centers

In 1975 the number of computer science centers increased by 309 (a 31 percent increase). At the end of 1975, there was a total of 1,300 computer science centers in Poland, including 111 organizationally separate ones, that is those having their own bank account and statistical number. The structure of the computer science centers according to equipment was as follows:

Table 5. Structure of computer science centers according to equipment (status at the end of the year)

	Wyszczególnienie (1)	1974	1975
		w odsetkach (2)	
(3)	**Ogółem**	**100,0**	**100,0**
(4)	Ośrodki wyposażone w komputery i maszyny analityczne	4,8	5,2
(5)	Ośrodki wyposażone w komputery	29,2	27,8
(6)	Ośrodki wyposażone w zestawy maszyn analitycznych	9,6	7,5
(7)	Ośrodki wyposażone w urządzenia do przygotowania maszynowych nośników danych	41,5	46,2
(8)	Ośrodki bez sprzętu informatycznego	14,9	13,2

Key:

1. Specification
2. In percent
3. Total
4. Centers equipped with computers and punch card machines
5. Centers equipped with computers
6. Centers equipped with sets of punch card machines
7. Centers provided with equipment to prepare machine data carriers
8. Centers without computer equipment

Of the total number of 1,300 computer science centers, 706, or over 54 percent, were controlled by four ministries: 18 percent by the Ministry of the Machine Building Industry, 15 percent by the Ministry of Finance, 11 percent by the Ministry of the Chemical Industry, and 10 percent by the Ministry of Heavy Industry.

In the computer science centers, the structure of the stock of computers according to generation or age differed somewhat from that of the entire national economy as a whole (shown in tables 2 and 3), and namely:

Second generation computers amounted to 28.0 percent;
Third generation computers amounted to 71.5 percent;
Percentage of computers according to age amounted to:

Up to 3 years	73.5 percent,
4-5 years	12.4 percent,
6-8 years	8.7 percent,
9-10 years	3.2 percent,
Over 10 years	2.2 percent

These differences result from increased deliveries of minicomputers designated to a large extent for facilities that are not computer science centers. The important information about the stock of computers is its structure according to internal storage capacity (in thousands of bits) presented in table 6.

Table 6. Sturcture of computers according to internal storage capacity

(1) Pojemność pamięci operacyjnej	1974	1975
	w odsetkach (2)	
(3) **Ogółem**	**100,0**	**100,0**
(4) Do 256 tys. bitów	58,2	43,7
257—768	34,2	27,4
769—3072	7,2	27,3
(5) Powyżej 3073 tys. bitów	0,4	1,6

Key:

1. Internal storage capacity
2. In percent
3. Total
4. Up to 256 kbits
5. Greater than 3,073 kbits

This comparison indicates a substantial increase in computers having large internal storage capacities. At the end of the year, of the total number of 944 computers in the computer science centers, 807 were operational since not all the newly delivered computers had been installed. The degree of utilization of operational computers was uneven and for large and medium-size computers averaged 8.9 hours daily (without excluding nonworking days). The utilization of minicomputers was markedly less.

Utilization of computer operating time depends on many factors, including user preparation, the amount of software supplied by the manufacturer, structure of applications, equipment quality, and computer operating periods. The lower computer utilization index is casued in part by the fact that computer operating time is based on calendar time and the fact that the time during which a computer is shut down because of technical reasons is only partially deducted from its operating time (computer shutdown times because of technical reasons represents about 13 percent of total computer downtime).

Computer Center Work Themes

The range of computer applications in individual centers depends on the specifics of the particular ministry as well as the user's organizational preparation regarding the utilization of electronic computing technology. Most computer operations in the computer centers are dedicated to objective information systems, especially in the realm of automating management operations.

The themes in which computer science centers are involved in vis-a-vis the automation of management operations are listed in table 7.

Table 7. Computer center themes in the realm of developing and operating objective management systems

(1) Wyszczególnienie	Czas pracy — w odsetkach (2)			
	projektowania (3)	programowania (4)	komputerów (5)	
	1974	1975	1974	1975
(6) **Ogółem**	**100,0**	**100,0**	**100,0**	**100,0**
(7) Systemy wielodziedzinowe	13,0	7,5	5,5	3,7
(8) Techniczne przygotowanie, planowanie i sterowanie produkcji	24,6	23,3	22,0	18,7
(9) Gospodarka materiałowa	19,1	20,6	25,3	23,5
(10) Zatrudnienie i płace	11,6	11,8	10,9	11,2
(11) Środki trwałe	4,5	3,7	3,3	3,2
(12) Wyroby i sprzedaż	7,2	10,9	9,1	11,5
(13) Koszty i analiza działalności	6,8	7,6	5,7	8,8
(14) Inne	13,2	14,6	18,2	19,4

Key:

1. Specification
2. Operating time, in percent
3. Design
4. Programming
5. Computers
6. Total
7. Multiscope systems
8. Technical preparation, planning, and management of production
9. Materials management
10. Employment and payroll
11. Fixed assets
12. Manufactured goods and sales
13. Cost and analysis of activities
14. Other

Compared to the previous year, there are no basic differences in the structure of computer operating times. Materials management continues to dominate. On the other hand, the decreased percentages of multiscope systems and the technical preparation, planning and management of production are negative phenomena. The small increase in "cost and analysis of activities" is favorable. In other areas in which computer centers are involved (in addition to management systems), the control of production processes and engineering work are in first place, which appears to be a positive occurrence. This is presented in table 8.

Table 8. Computer center work themes vis-a-vis other systems

(1) Wyszczególnienie	Czas pracy — w odsetkach (5)		
	(2) projektowania	(3) programowania	komputerów (4)
(6) **Ogółem**	**100,0**	**100,0**	**100,0**
(7) Sterowanie procesami produkcyjnymi	30,8	17,7	32,6
(8) Prace inżynierskie, dokumentacja projektowa i inne	46,4	48,3	40,1
(9) Obliczenia naukowe	12,2	22,7	24,8
(10) Wyszukiwanie informacji	10,6	11,3	2,5

Key:

1. Specification
2. Design
3. Programming
4. Computers
5. Operating time, in percent
6. Total
7. Control of production processes
8. Engineering work, design documentation, and other projects
9. Scientific computers
10. Information retrieval

Perforated Card Machines

The development of electronic computing technology is being accompanied by the gradual decline of punched card system machines. They have not been imported for several years now. Nonetheless, relatively large stores of these machines, still operable, require that they be used in data processing. At the end of 1975, there were 423 tabulating machines, 281 summary punches, 572 sorters, 121 calculators, 232 reproducing machines, 112 collators, and other machines still in operation.

Equipment to Prepare Machine Data Carriers

In computer science, equipment to prepare machine data carriers perform a very important function. However, the high cost of modern equipment, such as recorders of multiposition readers and magnetic disks, is the basic reason why more modern equipment is not used more extensively in data processing procedures. The stock of such equipment is given in table 9.

Table 9. Structure of equipment to prepare machine data carriers

Wyszczególnienie (1)	1974	1975
	w odsetkach (2)	
(3) **Ogółem**	**100,0**	**100,0**
(4) Dziurkarki kart	44,1	42,5
(5) Sprawdzarki kart	29,3	26,6
(6) Dziurkarki i sprawdzarki taśmy dziurkowanej	7,1	7,4
(7) Dalekopisy i flexowritery	8,1	5,8
(8) Perfosumatory	7,1	10,3
(9) Rejestratory danych na taśmach magnetycznych jedno- i wielostanowiskowe	0,3	0,7
(10) Rejestratory danych na dyskach magnetycznych wielostanowiskowe	0,1	0,4
(11) Inne maszyny i urządzenia do przygotowania maszynowych nośników danych	3,9	6,3

Key:

1. Specification
2. In percent
3. Total
4. Card punches
5. Card verifiers
6. Punches tape punches and verifiers
7. Teletypewriters and flexowriters
8. Summary punches
9. Single and multiposition magnetic tape recorders
10. Multiposition magnetic disk recorders
11. Other machines and equipment to prepare machine data carriers

Computer Science Center Employment and Wages

At the end of 1975, the computer science centers employed 41,300 people, an increase of over 17 percent over the previous year. Of the total number of people employed, 29.2 percent had a higher education. Table 10 shows computer science center employment according to professional grouping.

Table 10. Employment structure in computer science centers according to occupation and education (status at the end of the year)

(1) Rodzaje stanowisk	(2) Zatrudnienie — w odsetkach		(3) Udział zatrudnionych z wykształceniem wyższym w %	
	1974	1975	1974	1975
(4) **Ogółem**	**100,0**	**100,0**	**28,3**	**29,2**
(5) w tym:				
(6) Analitycy i projektanci systemów	12,5	12,7	88,3	89,6
(7) Programiści	12,4	12,9	56,0	55,1
(8) Operatorzy	32,0	32,3	1,6	1,5
(9) Konserwatorzy	8,7	9,2	23,9	27,5
(10) Pozostali pracownicy działalności podstawowej	20,4	18,9	20,1	20,1
(11) Pracownicy administracyjno-biurowi	7,2	6,9	11,9	12,3
(12) Obsługa i straż	3,3	3,3	0,0	0,0

Key:

1. Occupation
2. Employment in percent
3. Percentage of employees with higher education
4. Total
5. Including
6. System analysts and designers
7. Programmers
8. Operators
9. Maintenance personnel
10. Remaining employees involved in primary activities
11. Administration employees
12. Guard and other services

The changes in employment structure are observed to be minute. The number of computer science employees did not decrease in the reporting year. From the trend of the indices for employee hirings and resignations, one can conclude that in general employees who resign find employment in other computer science centers and do not change professions. To a large extent, changing of jobs was caused by pay differentials. Some ministries guarantee their computer science employees wages that are much higher than the average for all centers combined.

Table 11. Employment trend in computer science centers

(2) Wyszczególnienie	(1) Współczynnik			
	(2) przyjęć		(4) zwolnień	
	1974	1975	1974	1975
	w procentach			
(6) **Ogółem**	**27,1**	**30,7**	**16,7**	**19,4**
(7) w tym:				
(8) Analitycy i projektanci systemów	26,0	26,9	17,2	17,5
(9) Programiści	28,0	33,0	15,2	18,1
(10) Operatorzy	29,7	35,4	17,8	21,3
(11) Konserwatorzy	27,6	32,8	14,1	16,7
(12) Pozostali pracownicy działalności podstawowej . . .	22,2	24,0	15,7	16,9
(13) Pracownicy administracyjno-biurowi	28,8	28,1	17,3	18,1

Key:

1. Coefficient
2. Specification
3. Hirings
4. Resignations
5. In percent
6. Total
7. Including
8. System analysts and designers
9. Programmers
10. Operators
11. Maintenance personnel
12. Remaining employees involved in primary activities
13. Administration employees

Computer Science Centers, Employment in the Centers, and Number of Computers According to Voivodship

The distribution of computer science centers in Poland was studied for the first time in 1975. Results of this study indicate large differences among the voivodships with regard to number of centers and the number of computers in these centers. Table 12 lists in order the voivodships according to the percentage of computer center employees in the total number of people employed in the socialized economy of these voivodships.

Table 12. Number of centers, employees and computers in computer science centers according to voivodship in 1975 (status at the end of the year)

	(3) Województwa	(1) (4) Ośrodki	Zatrudnienie (5) w liczbach bezwzględnych	Zatrudnienie (6) w ‰ ogółu zatrudnionych w gospodarce uspołecznionej	Komputery (2) (7) duże i średnie	Komputery (2) (8) minikomputery
(9)	Stołeczne warszawskie	284	11181	*11,1*	128	155
(10)	Wrocławskie	68	2736	*6,3*	37	19
(11)	Miejskie krakowskie	58	2511	*5,9*	45	17
(12)	Miejskie łódzkie . . .	92	2875	*5,4*	30	32
(13)	Gdańskie	70	2412	*5,0*	34	20
(14)	Poznańskie	76	2058	*4,6*	23	15
(15)	Katowickie	174	6290	*4,0*	80	45
(16)	Radomskie	17	628	*3,5*	6	1
(17)	Bydgoskie	42	1205	*3,4*	17	10
(18)	Rzeszowskie	11	631	*3,3*	10	9
(19)	Toruńskie	21	567	*3,0*	5	6
(20)	Bielskie	39	760	*2,6*	11	19
(21)	Olsztyńskie	11	601	*2,6*	5	5
(22)	Kieleckie	24	855	*2,5*	5	2
(23)	Lubelskie	21	720	*2,5*	13	10
(24)	Zielonogórskie . . .	22	527	*2,4*	5	6
(25)	Szczecińskie	32	789	*2,3*	8	10
(26)	Białostockie	11	366	*2,0*	4	4
(27)	Częstochowskie . . .	15	450	*1,9*	7	2
(28)	Tarnobrzeskie	5	262	*1,8*	3	5
(29)	Jeleniogórskie	19	348	*1,7*	3	6
(30)	Koszalińskie	11	254	*1,6*	4	—
(31)	Płockie	10	197	*1,4*	5	5
(32)	Tarnowskie	10	196	*1,3*	4	—
(33)	Opolskie	24	445	*1,2*	4	3
(34)	Kaliskie	13	238	*1,2*	2	3
(35)	Skierniewickie	14	80	*0,8*	—	4
(36)	Wałbrzyskie	22	258	*0,8*	1	4
(37)	Elbląskie	4	87	*0,6*	1	1
(38)	Gorzowskie	7	99	*0,6*	2	—
(39)	Konińskie	6	56	*0,6*	1	1
(40)	Legnickie	11	109	*0,6*	4	—
(41)	Włocławskie	5	62	*0,6*	2	—
(42)	Krośnieńskie	4	66	*0,5*	1	—
(43)	Piotrkowskie	9	91	*0,5*	1	2
(44)	Ciechanowskie . . .	2	38	*0,4*	2	—
(45)	Nowosądeckie	8	49	*0,3*	—	—
(46)	Ostrołęckie	3	25	*0,3*	—	—
(47)	Siedleckie	6	40	*0,3*	—	2
(48)	Sieradzkie	6	33	*0,3*	—	4
(49)	Słupskie	5	24	*0,1*	1	—
(50)	Suwalskie	1	18	*0,1*	—	2
(51)	Zamojskie	2	18	*0,1*	—	—
(52)	Bialskopodlaskie . . .	1	4	*0,07*	—	—
(53)	Chełmskie	1	3	*0,05*	—	—
(54)	Przemyskie	1	5	*0,05*	—	1
(55)	Pilskie	1	5	*0,04*	—	—
(56)	Leszczyńskie	1	3	*0,03*	—	—

Key:

1. Employment
2. Computers
3. Voivodship
4. Centers
5. In absolute numbers
6. In percentage of total number of people employed in the socialized economy
7. Large and medium-size
8. Minicomputers
9. Warsaw
10. Wroclaw
11. Krakow
12. Lodz
13. Gdansk
14. Poznan
15. Katowice
16. Radom
17. Bydgoszcz
18. Rzeszow
19. Torun
20. Bielsko Biala
21. Olsztyn
22. Kielce
23. Lublin
24. Zielona Gora
25. Szczecin
26. Bialystok
27. Czestochowa
28. Tarnobrzeg
29. Jelenia Gora
30. Koszalin
31. Plock
32. Tarnow
33. Opole
34. Kalisz
35. Skierniewice
36. Walbrzych
37. Elblag
38. Gorzow Wielkopolski
39. Konin
40. Legnica
41. Wloclawek
42. Krosno
43. Piotrkow Trybunalski
44. Ciechanow
45. Nowy Sacz
46. Ostroleka
47. Siedlce
48. Sieradz
49. Slupsk
50. Suwalki
51. Zamosc
52. Bielsko Biala
53. Chelm
54. Przemysl
55. Pila
56. Leszno

The above data indicates that 67 percent of the computers are located in six voivodships.

FOOTNOTES

1. See: J. Heronimek, "Development of Computer Science in Poland in 1974," WIADOMOSCI STATYSTYCZNE, No 10, 1974.

2. By computer science centers we mean those units in which the primary activity involves at least one of the following types of activities: computer system design and programming; automatic data processing;

preparation of machine data carriers; consultations in the area of computer applications; computer science research and development work; coordination of operations in the area of computer science; schooling of cadres in the area of computer science; and the installation, maintenance and repair of computers and perforated card machines.

3. The following type machines are considered minicomputers: K202, MJK 25, MERA 302, 303, and 305, WANG 2200, NOVA, CELATRON 8205, ADRANCE 6135, FRIEDEN 5800, HP 9830, 9830A, VARIAN, SAAB D5/30.

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