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THIRD ALL-UNION CONFERENCE ON INFORMATION SEARCH SYSTEMS AND AUTOMATED PROCESSING OF SCIENTIFIC AND TECHNICAL INFORMATION
(Author Unknown)

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THIRD ALL-UNION CONFERENCE ON INFORMATION SEARCH SYSTEMS AND AUTOMATED PROCESSING OF SCIENTIFIC AND TECHNICAL INFORMATION

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ABSTRACT

A summary is given of the proceedings at the Third All-Union Conference on Information-Search Systems held in Moscow during 19-22 December 1966. Progress is reported on the development of a nationwide S and T information system called for in a special decree of the USSR Council of Ministers of November 1966. The achievements of various institutes engaged in the development of complete computer-based information-search systems are listed and system elements and components are described. Particular reference is made to the development of automata for reading a limited number of fonts from certain types of documents which will shortly permit the automated input of large masses of S and T, statistical, and economic data into digital computers. Reference is also made to a printer which operates at the rate of 288 lines per second; to electrographic and thermographic reproduction equipment, to systems for the logical processing of information, to systems with large associative type memories, and to microfilm search systems which are now being developed. Shortcomings in present research on information-search systems and the factors responsible therefor, including inadequate training facilities for specialists in information processing, are discussed. Recommendations of the conference are given for improving and accelerating the development of information-search systems, for research in semiotics, and for the industrial production of system components and elements which have already been developed, as well as for stepping up the training of specialists in institutions of higher learning.

THIRD ALL-UNION CONFERENCE ON INFORMATION SEARCH SYSTEMS AND AUTOMATED PROCESSING OF SCIENTIFIC AND TECHNICAL INFORMATION

Conclusions of the Conference

A highly important condition for accelerating the pace of technical progress in all branches of the national economy and increasing the efficiency of social production and of the creative labor of scientists and engineering and technical workers of enterprises, scientific research organizations, and planning and development organizations is efficient organizations of information activity in the country.

On the basis of modern technical facilities for the gathering, processing, searching, and distribution of informational data and automation of information processes, the national scientific information system has been assigned the task of insuring provision of timely and complete information on the achievements of domestic and foreign science and technology. The Party and government are constantly devoting attention to the development and improvement of the information service system. The special resolution adopted by the Council of Ministers of the USSR in November 1966 is aimed at execution of the tasks assigned by the Twenty-Third Congress of the CPSU concerning the creation of a highly efficient national system of scientific and technical information.

Current State of Automation of Information Processes

The Third All-Union Conference on information search systems and automated processing of scientific and technical information held from 19 to 22 December 1966 in Moscow summed up the results of the scientific and technical information activity of scientists and specialists and mapped out a course for the most complete and rapid accomplishment of the tasks assigned by the Party and Government in the field of scientific and technical information.

The work of the conference was participated in by 1150 persons, representatives of the ministries, departments, information organs, scientific research and planning organizations, enterprises, and institutions of the country. A total of 220 reports were presented at the conference.

The conference notes that during the period which has elapsed since the holding of the First All-Union (1961) and Second All-Union (1963) Conferences, no worthy progress has been made in development of the information service in the country as a result of the efforts of the workers of the information organs, scientific workers, and specialists.

The principles of centralization of information activity developed and applied in our country have proved themselves in practice and are now being borrowed from us by the largest capitalist countries. The outfitting of a number of scientific research organizations and enterprises with electronic computers and other modern equipment has increased their capability to improve the information service and to construct experimental documentographic and factographic information search systems.

During the period which has elapsed since the Second All-Union Conference on information search systems the front of scientific research work has been broadened somewhat in the field of information and the scientific level of treatment has been elevated. A certain amount of experience has been gained in the elaboration both of search systems as a whole and various component elements of systems, in particular, information languages, descriptor dictionaries, and thesauruses. A certain amount of positive experience has also been gained in the operation of experimental information search systems utilizing computers, in particular, in the field of electrical engineering (VINITI [All-Union Institute of Scientific and Technical Information] and Special Department of the VNIEM), computer technology (Institute of Cybernetics of the Academy of Sciences of the Ukrainian SSR), radio electronics (NIIEIR), chemistry (VINITI and NIITEKHIM), patent information, and in a number of other branches.

During the period which has elapsed original special devices have been developed for automation of information processes. Considerable progress has been made in the elaboration of devices for direct input of alphameric information into digital computers (automatic reading devices). Automatic reading devices have been built at the VINITI (1965) and at the special design office of the Vilnius calculating machine plant (1965) and are being built at the Institute of Cybernetics of the Academy of Sciences of the Ukrainian SSR and in a number of other organizations. These automatic devices are designed for the reading of a limited set of type from certain kinds of documents and even in the immediate future will permit accomplishment of automation of input into digital

computers of large blocks of scientific and technical, statistical, and economic information.

Devices have been developed for rapid (up to 288 lines per second) output of information from digital computers, electrographic and thermo reproduction machines, a mockup of a photographic assembly machine, and a test model of the NP-2 typesetter-typewriter. The technology of preparing offset forms by electrographic method has been developed. In recent years much work has been done in this direction by the VINITI, at which a series of new reproduction equipment has been developed in collaboration with industry: the "Elektrofot," "EK-2," "Termokopir," "REM-400," "Elektrofil'm," etc. These devices make it possible to accomplish rapid output of information from a digital computer for subsequent reproduction in a large number of copies or direct dispatch to the consumer, as well as copying and reproduction of documents in documentographic information search systems and other information search systems. Systems are being developed for logical processing of information, storage devices with a high storage capacity which apply new search principles (of the associative type), a system for search of microfilmed information and other models of equipment for automation of information processes.

The conference notes that the theory of scientific information is moving in an independent scientific direction, that of informatics, the basis of which is represented by semiotics as the general theory of symbol systems, the theory of information search, the theory of image identification, the theory of large systems, and other divisions of contemporary science.

Research on semiotics is being successfully conducted in the VINITI and other organizations. In the field of the mathematical logical foundations of semiotics the work done at the VINITI on analysis of semantic paradoxes of the theory of sets is yielding certain methods of approach to the problems of auto-abstracting. A certain amount of progress has been made in the field of algorithmic comparison of natural and formalized languages, this being of particular importance in automatic indexing problems, automation of index compilation, and information search where it is necessary to establish correspondence between natural and formalized languages. Formal information languages are being created to describe the fact of various sciences, ones with a grammar of varying complexity and varying semantic force. Mathematical models are being developed for natural languages, ones which include formal description both of syntax and of semantics.

Work has begun on investigation of the complex of processes of collection, processing, storage, search, and read-out of information from positions of the theory of large systems. These questions are assuming especially great importance in connection with the necessity of constructing a highly efficient national system of scientific and technical information.

On the whole the theoretical research being conducted in the country is progressing successfully; it measures up to world standards and is laying the foundations for further more complete automation of the processing of scientific and technical information.

The conference notes that certain progress has been made also in the training of scientific and engineering personnel for the information services. In 1965 the Ministry of Higher and Intermediate Special Education of the USSR decided to establish specialty No. 0640, "automation and mechanization of information processing and read-out processes." The training of specialists in this field is being conducted at four institutes of higher education in the country, Kubyshev Polytechnic Institute, the Tomsk Radio Electronics Institute the Sevastopol' Instrument Engineering Institute, and the Tallin Polytechnic Institute.

A postgraduate course in the specialty "scientific and technical information" was instituted at the VINITI in 1959.

Deficiencies of the Existing Information Service System and Factors Impeding Automation

The conference considered it necessary to note that, despite the progress made, the existing system of scientific and technical information in the country, the level of mechanization and automation of information work, the level and scope of scientific research and experimental design work, and the state of training of scientific and engineering personnel failed to satisfy the increased needs for information of all the branches of the national economy. There is unjustified duplication of effort in the work of the information organs, the periods of publication of information materials are still too long, and such progressive forms of publications as signal information have not been sufficiently widely developed. Not enough study is being devoted to the needs and demands of consumers of information, and not enough attention is being devoted to search for new forms of information publications and information service. Little

attention is being devoted to the issuance of publications in small printings. The information organs are poorly outfitted with modern equipment for mechanization and automation of the processes of preparation, search, and read-out of information data.

The scientific research and experimental design organizations and groups conducting work in the field of automation of information processes have not been provided with a sufficient number of computers and other equipment and often do not have material resources of suitable quality, and in a number of cases work is being done with insufficient personnel. Consequently, the adoption of the models of systems and equipment for automation of information processes is sometimes being inadmissibly delayed.

The industry is not producing dependable high-speed devices for input and read-out of alphameric information, and the reproduction and industrial engineering equipment produced is wholly inadequate. The information services are extremely poorly outfitted with equipment for regular output of information.

The experience gained in the use of existing technical resources in the information services is not being sufficiently generalized and disseminated. Coordination and planning of work in the field of reproduction equipment and in a number of other fields is imperfect.

In the USSR the production of a number of machines, apparatuses, instruments, and devices for the automation of information work and scheduled publication of scientific and technical information still has not been mastered, while abroad equipment for mechanization and automation of this nature is widely employed in information practice.

The existing imported and domestic reproduction equipment is not providing materials in the necessary quantities and of the necessary quality.

Serious deficiencies exist in the training of engineering and technical personnel for scientific information, as well as in the curriculum for specialty number 0640 "automation and mechanization of information processing and read-out processes," approved by the Ministry of Higher and Intermediate Special Education of the USSR.

The extent of training of specialists in scientific information and in mechanization and automation of information work is entirely inadequate and

cannot satisfy the need for specialists of this type.

Measures to Overcome Deficiencies and Ways of Solving Problems of Mechanization and Automation of Information Work

The conference believes that all efforts of scientists, specialists, and workers of the organs of scientific information should be concentrated on implementation of the Directives of the Twenty-Third Congress of the CPSU and the decree of the government concerning the establishment of a highly efficient national system of scientific and technical information in the country.

In the Field of Information Search

The conference believes that it has now become urgently necessary to establish and adopt large-scale automated information search systems of different types and purposes which carry out the processing of large volumes of scientific and technical information.

In order to accomplish this task successfully within fairly short periods of time it is necessary to broaden the front of scientific research work in this field and engage a much large number of qualified specialists in accomplishing it.

Owing to the fact that at the present time the broad class of information search systems are based on descriptor dictionaries of the thesaurus type, it is necessary to apply all measures to develop work devoted to improvement in procedures of compiling thesauruses and for this purpose to make a more thorough analysis and generalize from the position of information the large body of experience acquired in the practice of library systems of classification and subject division. Research must be expanded on ways of automating the compilation of thesauruses, particularly by use of statistical methods.

For further development and strengthening of the theoretical foundations of the establishment of information search systems it is necessary to continue and expand research aimed at development of generalized requirements for information search systems and objective criteria for evaluating the quality of operation of systems. The experience gained in the operation of existing information search systems can be of assistance in elaboration of these criteria and methods of optimization of information search systems. It is advisable to continue work on comparative testing of various information search systems on the basis of the same body of documents, in order to arrive at definite conclusions as to the merits and defects of existing information search system

structures. At the same time, the work aimed at comparative study of various systems as a whole, should be accompanied by the development and intensification of research of the role of the individual components of systems, especially information search languages of various types, the criteria of semantic correspondence applied, methods of organizing bodies of information, etc.

It is necessary to intensify theoretical research on interpretation, evaluation, and further improvement in the resources of expression of information languages. This research is to serve as a scientific basis for selection of information languages of a fairly highly developed structure which are suitable for the creation of future large-scale systems which may be oriented toward complex solution of information search and information logic problems.

The results of research in structural linguistics and logical semantics must be utilized and developed for further advancement of work in automatic indexing and abstracting. It is necessary to speed up the development and application of information search systems on the basis of use of a natural language in the input system.

The practical operation of automated search systems functioning as a part of various information retrieval systems can yield an appreciable effect in a relatively short period of time for the development of research and acceleration of technical progress in the corresponding fields of science and technology.

In the designing of information service and provision systems it is necessary to give maximum consideration to the interdependence of the information search system and the consumers of the system. For this purpose it is necessary to intensify research on the information needs of various categories of consumers. The information service systems must achieve a comprehensive solution of the problems both of purposeful selective dissemination of current information and of retrospective documental and factographic information search.

In order to carry out the project now being developed for creation of large-scale information service systems it is necessary to allocate sufficient resources for outfitting these systems with complete sets of equipment and for staffing them with the necessary personnel. The ministries of the leading branches of the national economy must play a prominent part in the creation of such information services.

In order to establish a national scientific information system it is necessary to create interdepartmental information search centers on the basis of information search systems for individual groups of technical and natural sciences.

To improve coordination and prevent duplication of effort in the field of development of information search systems, it is necessary to intensify the work of the Methodological Council on Information Search Systems of the Administration of Information and Propaganda of the State Committee of the Council of Ministers of the USSR on Science and Technology.

In the Field of Semiotic Research

The conference believes that in order to develop automated methods of scientific information processing it is necessary to develop semiotics as the general theory of symbol systems.

Further intensification of work is needed in the field of creating mathematical models of natural languages in order to create in the immediate future the necessary conditions for solving the problems of automatic indexing, automatic abstracting, machine translation, automatic thesaurus compilation, and other similar tasks. It is especially important to intensify work in the field of methods of formal description of the semantics of natural languages, without which solution of such problems as machine translation is impossible.

At the same time, more rapid adoption in information practice of the important results already obtained in semiotics should be insured.

In the Field of Technical Information Service Resources

The conference believes that for the most part technical resources have not yet been created for the processing of scientific and technical information and that such resources cannot fully meet the needs of mechanization and automation of information processes.

The conference deems it necessary to intensify the research on and the development and adoption of technical resources and complexes in the following directions:

(a) High-speed storage devices of great capacity;

(b) Special operational storage devices, especially those of the associative type, and devices for logical processing of information in digital computers;

(c) High-speed read-out devices for textual information;

(d) Devices and complexes for searching microfilmed information for systems of different purposes and size;

(e) Special collators and printing machines for machine punch cards;

(f) Technical facilities for punching, multicopy reproduction, and reading of information from superposition cards;

(g) Technical facilities for preparation and input of alphmeric information into digital computers.

In the field of automatic reading devices, considering the urgency of the problem and the need for more rapid introduction of automatic reading devices into mass production, the Third All-Union Conference considered it necessary to take the following measures:

1. To request the Ministry of Radio Industry of the USSR in the immediate future to assemble a Soviet project group on the international group ISO-TK 97-PKZ-RGI to elaborate a unified technical policy in the matter of creating standard characters convenient for automation of reading processes.

2. To request the State Committee of the Council of Ministers of the USSR on Science and Technology and the Ministry of the Radio Industry of the USSR to organize a discussion of the question of elaboration of requirements for automatic reading devices by consumer organizations and design and development personnel.

3. To request the Ministry of the Radio Industry of the USSR and the Ministry of the Electronic Industry of the USSR to organize the industrial production of standard components and units for automatic reading devices, after coordination with design and development personnel.

4. The conference considers it useful to call the attention of design and development personnel to the necessity of proper information of the public about achievements in the field of automatic reading devices and of technical information service resources and systems, without permitting exaggeration of the results achieved. Descriptions of achievements should be made not only on the basis of theoretical prerequisites, but also and chiefly on the basis of results verified in practice.

In the Field of Training of Engineering and Technical Personnel in Mechanization and Automation of Information Work

1. In order to provide engineering and technical personnel for the large network of information organs of the country, the Conference considers it necessary to request the Ministry of Higher and Intermediate Special Education of the USSR additionally to institute speciality No. 0640 "automation and mechanization of information processing and output processes" in the immediate future at several of the leading colleges and universities of the country where there are highly qualified teachers in allied specialities, computer technology, automation and telemechanics, cybernetics, and where suitable laboratory resources are also available.

In addition, it is advisable to introduce at the basic leading branch colleges and universities a course the content of which should be represented by an introduction to scientific information, in order to render specialists sophisticated in the use of modern information service resources.

2. In view of the fact that the curriculum for speciality No. 0640 in effect at the present time contains many serious deficiencies and does not assure high-quality training of specialists in automation of information processes, the Conference considers it necessary to request the Ministry of Higher and Intermediate Special Education of the USSR to revise this curriculum. The Conference considers it advisable to recommend revision of the curriculum of the VINITI of the Academy of Sciences of the USSR, with the appropriate departments of the colleges and universities where speciality No. 0640 has been instituted participating in the revision.

At the same time, the Conference requests the Ministry of Higher and Intermediate Special Education of the USSR to discuss the possibility of training engineers in speciality No. 0640 without taking them away from production (in the evening and correspondence school system).

3. The specific features of speciality No. 0640, the fundamental disciplines of which are based on computer technology, automation, electronics, communications equipment, etc., necessitate costly equipment for the organization of laboratories for this speciality. Hence the Conference considers it necessary to request the State Committee of the Council of Ministers of the USSR on Science and Technology and the Ministry of Higher and Intermediate Special Education of the USSR to provide the colleges and universities with the necessary materials when instituting

this speciality at these colleges and universities, allocating sufficient resources and funds for this purpose, including resources and funds for the procurement of imported equipment.

4. Because of the great need of the information services and printing enterprises of the country for specialists in reproduction engineering, the State Planning Commission of the USSR and the Ministry of Higher and Intermediate Special Education of the USSR should be requested to organize the training of engineers of this type at the Moscow Polygraphic Institute, the Ukrainian Polygraphic Institute, and the Leningrad Polytechnic Institute, and also the training of specialists with intermediate qualifications in the same speciality at a number of technical schools in the country.

5. On the basis of the need for systematic improvement in the scientific and engineering qualifications of personnel employed in the field of the development, adoption, and operation of information search systems and of mechanization and automation of scientific and technical information processing processes, the Conference recommends:

--that the directors of the information organs expand the practice of organizing permanent and short-term courses, scientific seminars, and other forms of training and preliminary training of scientific and engineering personnel and the management personnel of the information institutes, utilizing the experience of the VINITI for this purpose;

--that at the colleges and universities of the country where speciality No. 0640 has been instituted, special courses be introduced in order to improve the qualifications of specialists working in the field of scientific information;

--that there be more extensive engagement of specialists and associates and doctors of science working of having training in the field of scientific information in the delivery of lectures and conduct of teaching activity in the field of scientific information.

* * *

The Conference considers it necessary to organize at the VINITI a section for the assembly of documentation on a national scale concerning scientific research work in the field of automation of the processing, search, and output

of scientific and technical information. The filing of reports on scientific research work and the publication of abstract and other reference materials on this work in this section should be envisaged. All organizations developing descriptor dictionaries should submit such dictionaries to the VINITI for filing, along with other materials on information search systems in operation, so that the VINITI may send copies of these documents to interested organizations when so requested.

The Conference also considers it necessary to publish the proceedings of the Conference on the occasion of the Fiftieth anniversary of the Great October Socialist Revolution and provide all the information services of the country with these proceedings.