知識就是力量

Scientific and Technical Information Needs and Resources in the Republic of China (TAIWAN)

Report of a Sino-U.S. Workshop
Washington, D.C.
24-26 April, 1973

Academia Sinica
Republic of China and
National Academy of Sciences
United States of America

NATIONAL ACADEMY OF SCIENCES
Washington, D.C. 1974

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"Knowledge is Power". Message found in a Fortune Cookie at Workshop's farewell luncheon.

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Additional copies of this report, and the full text of individual conference working papers, are available from the National Academy of Sciences - National Research Council, 2101 Constitution Avenue, Washington, D.C. 20418, U.S.A.

Copies of the Chinese-language version of the workshop report are available from the Science and Technology Information Center, National Science Council, P.O. Box 4, Nankang, Taipei, Taiwan, Republic of China

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NOTICE: The project which is the subject of this report was approved by the Governing Board of the National Research Council, acting in behalf of the National Academy of Sciences. Such approval reflects the Board's judgement that the project is of international importance and appropriate with respect to both the purposes and resources of the National Research Council.

The Members of the committee selected to undertake this project and prepare this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. Responsibility for the detailed aspects of this report rests with that committee.

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PREFACE

The National Academy of Sciences - National Research Council of the United States, and the Academia Sinica of the Republic of China jointly sponsored a workshop on the Scientific and Technical Information Needs and Resources of the Republic of China (Taiwan) during the period 16 April to 14 May 1973. The workshop consisted of a 3-day conference in Washington, D.C., 25 - 27 April 1973 and a series of technical visits to 33 U.S. information organizations before and after the conference.

The purposes of the workshop were threefold:

1. To identify the needs for scientific and technical information in Taiwan and the resources required to meet them

2. To examine and make recommendations on actions that Taiwan might take to strengthen its national scientific and technical information infrastructure, and to establish linkages with information systems, centers, and services in other countries

3. To identify areas for future cooperative efforts between counterpart U.S. and Chinese institutions.

The background and events that led to the workshop and the details of the workshop conference and related technical visits are summarized in chapter I.

Workshop recommendations were formulated on areas relevant to the development of a national scientific and technical information system for the Republic of China:

- National objectives, policies, and support
- The role of a national science and technology information center
- Manpower development
- Identification, acquisition, and dissemination of information
- Information services for industry
- National library network plan
- Application of information technology
- International cooperation

The conclusions and recommendations of the workshop are presented in chapter II.

Under the auspices of the National Science Council of the Republic of China (ROC) the findings of the workshop were presented to and reviewed by representatives of government agencies and the scientific, technical, industrial, library, and academic communities in the Republic of China. In the months following the workshop, several actions have been taken that are in keeping with the workshop recommendations. Some of these are summarized in Appendix E of this report.

This report presents only those concerns and recommended actions that could be considered in 3 days. Although the workshop has been an important first step, its conclusions and recommendations by no means reflect all the issues and actions that must be considered if the Republic of China is to develop a national scientific and technological

information system adequate to its needs. This requires a continuing commitment of financial and human resources, and continued study and consideration by both policy and technical people in Taiwan. The growing body of experience and literature may prove helpful in this endeavor. Most notable are the series of country studies and information policy studies of the Organization for Economic Cooperation and Development (OECD), and the various publications and guidelines on national information policy objectives and programs issued by the UNISIST Program* of the United Nations Educational, Scientific and Cultural Organization (UNESCO). Several of these documents are listed in Appendix G.

Implicit also in the workshop's deliberations and recommendations is a desire for continued cooperation between the United States and the Republic of China. At the workshop future bilateral cooperative programs were explicitly discussed and are now being actively explored in manpower development, information services to industry, and improvement of the means for distribution of information. Three such programs are outlined in Appendix F. Continued cooperation suggests an obvious requirement that was not a direct result of the workshop itself: If cooperation between the United States and the Republic of China in scientific and technical information is to be furthered, an appropriate focus in the United States must be maintained. It is hoped that the National Academy of Sciences, under the auspices of the Joint Committee for Sino-American Science Cooperation, can obtain the necessary staff and funding to continue to serve in this capacity.

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* The UNISIST Program is a UNESCO Science Sector Program of international cooperation in scientific and technical information.

Recognition and thanks are due to the many individuals who contributed many hours and dedicated efforts to make the workshop a success. Credit must go to all panel members, participants, and observers whose written presentations and active discussions were the essence of the workshop, and to the staff of the National Academy of Sciences, the Science and Technology Information Center, and the National Science Council of the Republic of China for their efforts in organizing and implementing workshop activities. Sponsors and participants of the workshop are particularly indebted to the staff members of the 33 U.S. information organizations listed in Appendix B for their kind considerations during the technical visits. Special thanks are extended to Dr. and Mrs. Bruce Billings and the staff of Aerospace Corporation, Dr. and Mrs. Joseph Becker, Dr. and Mrs. Robert Hayes, and staff members of Battelle Memorial Institute for their tireless efforts and kind hospitality on behalf of the workshop participants.

Facilities and local staff support for the workshop were provided by the National Academy of Sciences - National Research Council (NAS-NRC). Participation of the NAS-NRC, its U.S. panel members and staff, and the publication of this report were made possible through the financial assistance of the International Foundation. The National Science Council of the Republic of China and the several organizations represented by the Chinese panelists provided funds to support the participation of the Chinese panelists. The China Committee of Sino-American Science Cooperation provided funds for the printing of a Chinese-language version of the workshop report.

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I

BACKGROUND AND ORGANIZATION OF WORKSHOP

Background

The Workshop on Scientific and Technical Information Needs and Resources of the Republic of China (Taiwan) is one of a series held since 1964 under the auspices of the Joint Committee on Sino-American Science Cooperation, a committee of representatives of the National Academy of Sciences - National Research Council (U.S.A.) and the Republic of China's Academia Sinica. The purpose of this program is to foster cooperative efforts relevant to socioeconomic development between scientists in the United States and in Taiwan. The workshops have the purpose of identifying areas of mutually productive interest.

The choice of scientific and technical information as the topic of this most recent workshop is logical for several reasons. In the United States, there is interest in improving international cooperation in the aquisition and distribution of scientific information. The information resources and systems of the United States, especially in their use of mechanization, are exceptional, but to be most effective, they require the continuing flow of information and data from the world at large; there is much to be gained if U.S. resources can be made readily available to users in other countries.

To the Republic of China, this topic was of even more direct and immediate interest. Until a few years ago, Taiwan had fairly easy access to a wide range of information resources through its participation in the specialized agencies of the United Nations and other multinational activities. After its expulsion from the U.N. in October 1971, it suddenly found most of these avenues of communication closed. How to replace these sources of scientific and technical information has become a pressing problem.

More basically and more importantly, however, the spectacular pace of industrial development in Taiwan has brought it to the point where adequate information resources may well be the critical requirement. Information is essential to day-to-day technical decisions in science, engineering, and industrial planning and to policy decisions on national priorities.

To lay the groundwork for the workshop, to define the issues that should concern it, and to identify the individuals who could contribute to and gain most from the discussions, Dr. Robert Hayes traveled to Taiwan in August 1972 as a consultant to the Academia Sinica and the National Science Council. His mission included a general fact-finding survey on the practices, needs, and problems in the collection, retrieval, and dissemination of scientific and technical information in Taiwan. In addition, he was requested to examine and make specific recommendations on the future development and responsibilities of the Scientific Documentation Centre* in Taipei. The report resulting from that trip served as a basic background document and working paper for the workshop; its findings and recommendations were substantiated and reinforced by the workshop.

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* The name of the Scientific Documentation Centre was officially changed in February 1974 to Science and Technology Information Center (STIC). This latter version will be used in this report.

The workshop was held in the United States in the spring of 1973 so that the Chinese participants could observe a variety of U.S. information systems and services and see at first hand the importance of such systems and services in the conduct of U.S. scientific and technical research and development.

Organization and Objectives

The workshop consisted of two parts--a series of technical visits to U.S. information organizations during the period 16 April - 14 May 1973 and a 3-day workshop conference in Washington, D.C., 25 - 27 April 1973. Through this combination of visits and a more formal conference, which provided problem-identification, state-of-the-art, and problem-solving sessions, the workshop hoped to achieve the following objectives:

1. To review the elements necessary for the development of an effective national system for scientific and technical communication in Taiwan

2. To identify the policy and technical problems involved in the development of such a system in Taiwan

3. To suggest possible solutions to these problems and make recommendations addressed to their implementation

4. To identify and/or initiate appropriate bilateral and regional relationships that will help Taiwan in the solution of these problems

5. To consider possible future activities to follow up the workshop, including: pilot projects in scientific and technical communication carried out jointly between Taiwan and the United States; and additional workshops on more specialized aspects of scientific and technical communication.

Workshop Participants

The 15 Chinese participants included representatives of high-level government policymaking bodies, technical information centers and libraries, academic institutes, scientific and industrial research organizations, selected industries, and the scientific and industrial user communities. U.S. participants represented a similar mix of experience and expertise. A list of participants is included as Appendix A.

In addition to the formal workshop sessions, several social events were scheduled in conjunction with the technical visits and the conference to introduce the Chinese participants to a broad spectrum of U.S. professionals concerned with scientific and technological information programs.

Technical Visits

During 16 April - 14 May 1973, the Chinese participants, collectively or individually, visited 33 private, academic, and governmental organizations in 12 U.S. cities. These visits were structured to provide exposure to a cross-section of U.S. scientific, technical, and industrial information activities from organizational, technological, financial, and policy perspectives. They were designed to illustrate, reinforce, or elaborate on issues, programs, and operations to be discussed at the 3-day workshop conference. The visits included tours of technical operations, state-of-the-art reports, and demonstrations of new information technologies, as well as traditional systems and services. In addition, the host organizations were asked to identify potential areas for future cooperative programs with the Republic of China. Appendix B summarizes these visits.

Workshop Conference

The 3-day conference consisted of a series of fairly short presentations by U.S. and Chinese participants, structured around major topics, such as (1) national policies for scientific and technical information; (2) manpower and educational needs; (3) information technologies; (4) scientific and technical information systems and services, including publications, libraries, documentation and information centers, information analysis and data centers, and industrial information services; (5) management information systems for research and development; (6) design and use of information systems; (7) opportunities for future bilateral and international cooperation in information programs. A detailed agenda is included as Appendix C. A list of the conference presentations and working papers is included as Appendix D.

Each presentation was followed by an unstructured discussion of its implications for the development of an adequate national information system for science, technology, and industrial development in Taiwan.

The recommendations resulting from these discussions were formulated by working groups on the final day of the conference. Conclusions and 38 recommendations of the workshop are reported in chapter II.

II

MAJOR OBSERVATIONS, CONCLUSIONS, AND RECOMMENDATIONS

National Objectives, Policies, and Support

Scientific and technical information is an essential ingredient of economic growth and industrial development. It helps assure that capital investment is effectively utilized, that unwanted duplication is avoided, and that development plans can be based on firm data, rather than mere wishes.

The development of information resources and services is an integral part of national economic planning policy. Governments should allocate funds specifically for this purpose, and there should be a national focus to exert professional leadership in the use of those funds.

It is difficult to assess the appropriate level of investment for information, but in private companies in the United States it ranges from perhaps 1 percent (in static industries) to 4 percent or more (in highly dynamic industries) of their industrial research and development (R & D) budgets. In recent years the U.S. federal government has allocated an average of 3.8 percent of its annual R & D budgets for the management, processing, and transfer of scientific and technical information.

It appears that the human and financial investments now made in information activities in Taiwan are, as a percentage of its total investment in the development of science and technology, significantly less than are needed to use that total investment efficiently and effectively.

This workshop therefore recommends and strongly urges the following actions:

Recommendation 1

The Republic of China should establish a budgetary level for the acquisition, distribution, and utilization of scientific and technical information at a level appropriate to its economic development.

Recommendation 2

To assist in defining that level, a policy panel with the highest possible quality of membership should be established within the Republic of China to assess the requirements and establish the goals and objectives for the necessary national and scientific and technical information system and to develop the policies required to guide its overall development.

Recommendation 3

These goals and objectives and the extent to which they are being met should be continually monitored. To do so, a set of measures of the performance of the system should be established, and data should be acquired by which the policy panel can periodically evaluate the effectiveness of the system.

Recommendation 4

It should be the responsibility of the National Science Council of the Republic of China to acquire and to provide whatever data may be required for this evaluation of performance.

The proposed policy panel should be established as a permanent government body, preferably at the subcabinet level, and entrusted with the duty and authority for general policy matters relating to the development of a national scientific and technical information system. To assure that it clearly considers all elements in the development of such a system, the panel should include among its members high-level representatives of the following organizations:

The National Science Council (the vice-chairman or his appointed representative)

The Ministry of Education (a vice-minister)

One or two national universities (the presidents)

One or two major research libraries, including the National Central Library (the directors)

The Industrial and Technological Research Organization of the Ministry of Economic Affairs (the director or his appointed representative)

The Chung Shan Institute of Science and Technology (the director or his appointed representative)

One or two major scientific and technical professional societies, such as the Chinese Engineering Society and the Society of Natural Sciences

Administrative and technical support required by the panel should be provided by the National Science Council and its Science and Technology Information Center.

Among the panel's chief responsibilities will be to persuade appropriate organizations and individuals in the Republic of China of the need for new policies and additional revenues in shaping a national information system, and, simultaneously, to make sure that revenues are used effectively. This will require the panel to interact not only with national policymaking and funding agencies for science and technology, such as the National Science Council, the Ministry of Economic Affairs, and the Ministry of Defense, but also with other national bodies responsible for activities that are relevant to the development of a national information system, i.e., the Ministry of Education (library and university development), the Ministry of Communication (communication technologies), the Ministry of Examinations (manpower development and utilization), and the Ministries of Justice and Finance (legislative and fiscal matters affecting the development and utilization of information resources). Along with these national organizations, private industry should be induced to increase its support of information activities, as it increases its investment in R & D.

The formulation of scientific and technical information policies in the Republic of China should be based on an agreed-upon set of quantitatively oriented objectives that are time-phased to match the priorities and available resources of the government, public enterprises, and private industries in Taiwan.

Recommendation 5

Seven such general objectives are recommended for the panel's consideration:

Timely and uniform accessibility to scientific and technical information

An efficient information-distribution system that uses various communication and transportation media

Sharing of information resources to avoid unnecessary redundancy and costs

Equitable capability of information utilization throughout the country

Continuing assessment of information needs and resources

Coordinated research and development efforts phased to meet these needs

Development of the necessary manpower, and the formalization of a national information infrastructure to meet the above objectives

The panel should develop time-phased plans to achieve each of these objectives, preferably within the next decade. Such plans should provide for identification of a set of products, services, or other results to be produced; a proposed set of annual or biannual programs, and projects within such programs, to carry out the plan; assignment of responsibilities to operating agencies for implementing these programs; and appointment of advisory structures. The development of these detailed plans should be a high priority task of the proposed policy panel.

Recommendation 6

The workshop identified the following as priority areas for action programs and recommends their early consideration by the proposed panel:

Development of a national science and technology information center

Manpower development

Identification, acquisition, and dissemination of information resources within the Republic of China, as well as international resources

Development of information services for industry

Development of national library resources and services

Development of a phased program for the application of information technology

Establishment of mechanisms for relating to programs of international cooperation in the acquisition and sharing of information

Conclusions and recommendations of the workshop relating to these specific areas form the remainder of this chapter.

Role of the Science and Technology Information Center

The current activities and potential programs of the Science and Technology Information Center are, in the workshop's view, a major national resource in developing a national scientific and technical information system in the Republic of China. Reconstituted in March 1973 as an independent organization operating under the executive control of the National Science Council, the center has begun to develop the tools and organizational structure needed to coordinate and support a national information effort.

Recommendation 7

The functions, responsibilities, and activities of the Science and Technology Information Center should form an integral part of a national policy on scientific and technical information. The center should be organized, staffed, and funded at a level commensurate with this national role.

Throughout this report specific responsibilities and tasks have been suggested for the center. In some instances, strengthening and broadening existing activities is recommended; in others, new responsibilities are proposed. Taken together, they characterize a set of roles and functions for the center.

The center should serve as the technical secretariat and primary operational arm of the proposed policy panel. It should provide technical and management information services to the National Science Council in support of national science policy formulation and the development, funding, and evaluation of scientific and technical research and education programs. In information resource development, the center should continue its present publishing, technical support, and reference service programs. At the same time, it should place significantly greater emphasis on the development and distribution of specialized products and services to meet mission-oriented and industrial needs, while continuing to serve the academic research community. It should play a major role in identifying indigenous information resources and capabilities, and in encouraging communication, coordination, and cooperation among them. The center should stimulate and help implement necessary education and training programs and the introduction and use of appropriate information technologies within Taiwan. It should

serve as a national referral and switching center for information and other resources relating to science, technology, and economic development; it should provide a focus for international cooperation with other organizations and programs.

Manpower Development

A prime resource of the Republic of China is its people. At present this resource is underdeveloped and underutilized with respect to information activities in support of science and technology in Taiwan. The current situation regarding professional manpower development in the library and information fields may be summarized as follows:

- Librarianship in Taiwan has traditionally tended toward conservation; training in reference skills, attitudes of service, and newer information technologies have been neglected.

- University and college undergraduate programs in library education are limited in number and suffer from inadequate budgets, limited teaching materials, and a shortage of qualified teachers.

- There are few graduate library-education programs, no graduate information-science programs, and only a few courses offered infrequently that are geared to the particular needs of scientific and technical information. As a result, the professional staffing of information activities in Taiwan consists of (1) a very few graduate librarians, primarily from library schools in the United States; (2) a small number of graduates of Taiwan university and college programs, essentially at the level of library technicians; and (3) almost no information specialists with the combination of subject competence and library professional education.

On the demand side, positions for professional librarians and information specialists are limited, and carry low job classifications, salary levels, and status.

Recommendation 8

High priority should be given to the development of education and training programs for the preparation of information specialists for industry and industrial research.

The need for specialized short courses and training programs to meet the information requirements of industry is particularly acute. A series of short courses and seminars should be developed to

- Provide technical people in industry with a basic knowledge of the techniques of information transfer
- To supplement the education and experience of in-service professional librarians
- To prepare a cadre of professionals in the library and industrial fields who can teach such courses in the future.

The Science and Technology Information Center should spearhead the development of these programs in cooperation with appropriate universities, research institutes, and other agencies. Visiting faculty from other countries should be utilized until there are enough trained teachers in Taiwan. Representative topics to be covered in such courses include: availability and use of specialized scientific and technical information resources; information center services and management; abstracting and indexing; technical processes and services, patents and standards documentation; and selection and use of appropriate information technologies.

Recommendation 9

Diversification in curricula and types of degree programs offered by existing undergraduate library schools in Taiwan should be encouraged. Greater emphasis should be placed on preparing special librarians with subject competence in science and technology.

At present, undergraduate degree programs in librarianship are basically similar in scope and content. Diversification and specialization might be encouraged along lines that reflect the general orientation of the colleges and universities offering these programs, e.g.: National Taiwan Normal University--school librarianship; Fujin University and Tamkang College of Arts and Sciences--special librarianship, with particular emphasis on audiovisual techniques and information technologies; World Junior College of Journalism--specialties in technical processing, and publishing and related fields; National Taiwan University--a diversified program, in public, university, and special librarianship.

Recommendation 10

The development of graduate programs in specialized librarianship and information science in the Republic of China should be encouraged and supported.

There are more than seventy-five accredited graduate degree programs in librarianship and information science in the United States; there are none at present in the Republic of China. Beyond their obvious academic

necessity, the development of graduate programs has other merits. Such programs provide a nucleus around which related academic research and development programs can assemble. They serve as a focus for formalizing sister relationships and exchange programs with academic institutions abroad, and they give visibility and status to the field. These appear to be minimum conditions which must be met if the Republic of China is to develop and sustain an effective national scientific and technical information system.

Recommendation 11

Cooperative arrangements for internships, specialized training programs, and visiting faculty programs should be explored with relevant institutions in the United States and other countries.

Taiwan already has a network of such relationships in other areas of science and technology; similar relationships should be pursued in the scientific and technological information field. Opportunities for establishing such relationships via the scholarship and visiting professor programs of the National Science Council and the U.S. - R.O.C. Cooperative Science Program should be explored.

Recommendation 12

A series of professional-position classification standards in the library, information science, and related fields should be developed in the Republic of China. Detailed job descriptions and educational requirements for each position should be delineated; salary levels commensurate with the responsibilities and education requirements for each position should be assigned.

The Science and Technology Information Center and the National Science Council, in cooperation with the Ministry of Examinations and appropriate professional associations in Taiwan, such as the Chinese Library Association and the Cooperative Organization of Technical Libraries, should encourage the development of such standards and their use by private and public enterprises. Materials developed by U.S. professional library and information science organizations, and the U.S. Civil Service Commission might serve as reference materials in this regard.

Recommendation 13

An employment clearinghouse for library and information positions in science and technology in the Republic of China should be established.

The Science and Technology Information Center or an appropriate professional organization might best undertake this task. For the longer term, requirements for scientific and technical information personnel should be included in manpower projections carried out by the National Science Council.

Recommendation 14

A roster of expertise of Chinese-born librarians and information scientists now residing outside Taiwan should be developed for the purpose of identifying short-term consultants and exchange teachers.

A probable location for such a roster is the Science and Technology Information Center. The assistance of professional library and information-science associations in the United States and other countries should be solicited in this effort.

Recommendation 15

Diversified educational programs for users of information should be developed.

It is not enough to develop improved information products and services. Resources must also be spent to assure that they are effectively utilized. Potential users must be informed of such products and services, and instructed in their use. A variety of mechanisms may be employed:

- Establishing scientific and technical information course(s) as prerequisites in degree programs in science and engineering
- Special in-house courses, such as those referred to in Recommendation 8
- Inclusion of an information component in the specialized science, technology, and industrial workshops and seminars sponsored by the National Science Council, the various industrial research institutions, and the U.S. - R.O.C. Science Cooperation Program
- Special information programs and exhibits at meetings of professional scientific, technological, and industrial organizations such as those of the Chinese Engineering Society and the Society of Natural Sciences
- By encouraging on-site visits and meetings of scientists, engineers,

and industrialists at specialized libraries and information centers in Taiwan.

Identification, Acquisition, and Dissemination of Information

The sources of scientific and technical information required by the Republic of China are manifold, and the mechanisms for identifying and acquiring such information are equally diverse. To use its resources wisely in acquiring needed information, Taiwan must (1) know what is already available within its own boundaries; (2) establish worldwide channels for identifying appropriate information products and services; (3) develop appropriate mechanisms for arriving at "make-or-buy" decisions on products and services; and (4) facilitate by legal, fiscal, or other means their transfer to Taiwan.

Recommendation 16

High priority should be given to the continuous development of national inventories of scientific and technical resources and capabilities, including facilities, instruments, manpower, on-going research, and information resources and services.

The present efforts of the Science and Technology Information Center and the National Science Council in preparing such inventories should be supported and expanded.

Recommendation 17

A national referral center for scientific and technical information resources should be established at the Science and Technology Information Center.

As a basis for such referral services, the center should use the national inventories of indigenous scientific and technical resources referred to earlier, and increase its holdings of "meta" information sources (information about information) from other countries, including such items as (1) newsletters issued by major national and international information services (i.e., the Newsletter of the U.S. National Library of Medicine, the Newsletter of International Council of Scientific Union's Committee on Data (CODATA); (2) directories of information resources, services, and personnel, and library and information equipment suppliers; (3) directories of publishers; and (4) national union catalogs and lists of books, serials, technical report series, and research in progress.

The center should become a focus for information on new developments in information technology worldwide; it should establish and cultivate relationships with key information organizations and personnel in other countries. These activities would be expected to stimulate and support a network of key individuals in the Republic of China--the decisionmakers in the development of an effective national scientific and technical information system.

Recommendation 18

The possible placement of information attaches in scientifically and technologically advanced countries should be explored.

Several countries have found it expedient to have a scientific and technical information specialist or office in selected industrialized nations. Those established in the United States are generally attached to an embassy's Office of the Scientific Counsellor (e.g., the United Kingdom); established as an adjunct of a national organization (e.g., the

Washington Office of the Institut für Dokumentationswesen, West Germany); or associated with a regional office serving the needs of several countries (e.g., the Scandinavian Documentation Center). Their responsibilities include providing scientific and technical information services to their diplomatic missions; identifying, acquiring, and dispatching specific information products and services requested by organizations and individuals in their own country; and facilitating contacts between these organizations and individuals and their U.S. counterparts. They attend professional meetings of scientific, technical, library, and information science organizations in the host country, and often take short courses or degree programs during their tour of duty. The contacts and experiences they acquire in such positions are often invaluable when they return to positions in their own country.

Recommendation 19

Various options and alternatives for acquiring and providing information products and services should be exploited.

As a general principle, the Republic of China should discourage the expenditure of scarce human resources in the preparation of basic information products and services that are otherwise available from external sources, such as abstracting and indexing services or current-contents publications; nor should they develop computerized data bases and related search services available elsewhere. Instead, indigenous resources should be directed initially toward (1) improving access to information generated in Taiwan and (2) developing the capabilities for processing and repackaging available information products and services to meet specific national needs.

Acquisition and distribution of information products in various forms (e.g., journals in microfilm, technical reports on microfiche) and in various formats (e.g., customized journals such as those now offered by the American Institute of Physics) should be explored.

Recommendation 20

A communication and distribution system that uses modern communication and transportation media should be developed to facilitate the acquisition and sharing of resources.

Services used effectively by other countries that could be developed by the Republic of China include the following:

- Bulk airfreight and charter air services for delivery of publications, magnetic tapes, and other information products from the United States and other countries
- A telex network among libraries and information centers in Taiwan, to facilitate domestic interlibrary cooperation, and communication with libraries and documentation centers in other nations. The recently developed Argentine Telex Network for Scientific and Technical Information might serve as a model in this regard.

For the longer term, the use of satellite and UHF systems (such as the ALOHA System) should be assessed and implemented when cost-effectiveness is apparent. It is expected that UHF interlinking will take place in the near future.

Recommendation 21

Policies and mechanisms governing the importation of scientific and technical information products to the Republic of China should be examined, with the purpose of promoting greater economies and efficiency in the cost and delivery of such products.

Diversification and healthy competition in the delivery of information products and services may often result in overall economies to the nation. The intent and terms of the UNESCO Agreement on the Importation of Educational, Scientific, and Cultural Materials (the Florence Agreement)--to which the Republic of China is signatory--should also be brought to the attention of appropriate government authorities. They should be encouraged to explore all practicable means of simplifying importation procedures for scientific and technical information.

Information Services for Industry

Industrial information services are created to provide better information, efficiently and economically, in support of the industrial process. Their products and services are characterized by great flexibility, and are geared to two major functions: (1) to keep management and technical people up to date on a continuing basis, and (2) to provide information to solve specific problems. Industrial information services typically use some or all of the following resources to provide such products and services:

- Their own internal technical reports and "intelligence"
- In-house specialized libraries and search services

- External information services such as specialized information and data centers, bibliographic data base tapes and services, and data compilations

- Advisors and consultants

Professional staff of such services are generally scientists and engineers with additional education and training (often on-the-job) in information-related fields. Increasingly, such services are line operations, reporting to technical rather than administrative management. The kinds of industrial information services required and the funds made available to provide them are generally a function of the nature and degree of change of the technologies in the industry for which the services are being developed. In the United States, high-technology industries (aerospace, pharmaceuticals) generally budget about 5 percent of their R & D budgets for information purposes, although some pharmaceutical industries have invested as much as 12 percent for information activities. Expenditures of medium-technology industries (chemicals, petroleum) average around 4 percent; low-technology industries may spend as little as 1 percent on information services.

A major characteristic of successful industrial information systems is their interaction with their users. Close contact is maintained with users, to know, and ultimately to satisfy, their information needs. Information services are "marketed" internally, much as industry markets its technological products: through informed advertising and promotion, orientation programs and seminars, and feedback mechanisms for evaluating and adapting such services.

In the clear consensus of the workshop, the most tangible and immediate values of improved information services in the Republic of China would be found in services directed to the needs of industry.

In the past, industrial development in Taiwan depended heavily on importation of foreign technology. The requisite technological information and know-how was acquired as a part of this exchange. Of the industrial enterprises in Taiwan 97 percent are small (less than 1,000 employees) or medium-size (1,000 - 5,000 employees) businesses. Few enterprises, even the largest ones, have R & D programs, and there has been little need for local industrial information services.

Transformations in industry are now occuring. Family businesses are evolving into larger, integrated enterprises. One-third of industrial output is now generated by 39 government-controlled industries. More indigenous research and product development is taking place, as is higher production for export purposes, and increased cooperation between the government and the private industrial sector. This suggests requirements for new types of information and new organization forms for meeting them.

The kinds of information increasingly required by industries and industrial development planners in Taiwan include the following:

- Planning information--including the processes of industrialization, mix of inputs (economic, technical, and manpower) needed, industrial planning methodologies, and government policies

- Determination of technical and economic feasibility of industrial processes--including possibilities for using indigenous resources, new applications of existing products, new industrial uses for by-products, effects of competitive products, adaptation of technologies to local requirements, and the impact of worldwide trends such as environmental concerns

- Basic scientific and technological information and data in support of industrial research and development

- New production processes and manufacturing methods--including equipment, maintenance and power requirements, quality control, labor requirements and costs

- Suppliers of equipment, materials, and services--including names and addresses of suppliers, types of products and services available, costs, conditions for purchase, and delivery procedures and schedules

- Standards and specifications--including standardizations systems, standards adopted by other nations, industrial regulations, testing facilities and specific product standards and materials specifications for indigenous use and export purposes

- Markets and marketing--including data on present and future markets, international prices and economic trends, and competitive positions

- Administration and management--including methods of organizing industrial enterprises, investment opportunities, enterprise planning and management, project planning, accounting and personnel management

At present, the means for providing these kinds of information efficiently in Taiwan are fragmentary at best.

Recommendation 22

The development of relevant information services should be considered an integral part of industrial sectoral development in the Republic of China.

As industry areas become priority interests in Taiwan's overall economic development strategy, present information services should be oriented, or new information services should be developed to meet the needs of these industrial sectors. Industry studies, such as those

already completed for the electronics, metal, machinery and food industries, and those being considered or undertaken in other priority areas such as textiles, plastics, building materials, and pharmaceuticals, should include an examination of the information needs of the sector and the requirements for meeting them.

Recommendation 23

The information capabilities of organizations with close working relationships with industry should be strengthened and expanded.

Such organizations should serve as "interface" institutions, coupling information needs of industry with existing information resources in Taiwan. Appropriate institutions for this role would be industrial research institutes such as the Union Industrial Research Institute (UIRI) and its new parent organization the Industrial Technology Research Institute, industrial associations, or productivity centers. Whatever organization(s) is selected for this role, it should have the following features: its primary function is service to the industrial community; it knows the needs and problems of industry and the information required to meet them; it is a potent organization, national in scope and closely coupled to industry. Its role would be to promote the demand for and use of information, help elucidate industry's needs, direct inquiries to appropriate sources, and ensure that such sources and the information they provide are responsive to these needs. Such organizations would be expected to work closely with the Science and Technology Information Center, the National Bureau of Standards (ROC), and other governmental and private organizations to ensure the maximum use of existing information resources, and the development of new ones where required.

Recommendation 24

The capabilities of the Science and Technology Information Center for providing specialized industrial information products and services should be strengthened.

The center's program for future development provides for increased service to industries and industrial research institutes, including the preparation of specialized publications, inventories of industrial research projects, and promoting technology transfer. The program also calls upon the center to identify, inventory, and encourage the sharing of industrial and technological information resources throughout the country. Support should be provided to implement these activities.

Recommendation 25

Specific industrial user groups in the Republic of China should be identified, and information services designed to meet their needs.

Such groups may consist of companies in the same industry grouping or industrial research teams working on similar or related problems. Experience in the United States has shown that it is more economical, and often as effective to service the information requirements of groups rather than individual scientists or technologists, particularly with respect to computer-based selective dissemination of information. Profiles of particular industrial user communities should be developed, and experimental information products, including computer-based current awareness services and retrospective searches that match these profiles should be developed and tested.

Recommendation 26

Every industrial organization in the Republic of China, regardless of size, should be urged to designate a portion of their budget for information support, and to educate and encourage their staff to use scientific and technical information services.

It is recognized that small, medium, and large organizations will have differing needs and organizational capabilities in this regard. The following approach is offered to address these requirements:

- Small companies should rely primarily on industrial research institutes for requisite information and training. The institutes will interpret their requirements, and obtain information from available sources, such as the Science and Technology Information Center, for repackaging to meet the needs of the small company.

- Medium companies should designate a scientifically or technically trained person to serve as the company's information specialist/information officer and to act as a liaison between the company and external information services. This person should be aware of available information resources, encourage the use of information within his own organization, and obtain information services for the company, as needed, from the industrial research institutes, the Science and Technology Information Center, and other national information resources.

- Large companies should develop integrated information services, staffed by scientific, technical, and information professionals, to (1) manage the company's internal technical reports; (2) provide information services as needed, from either in-house sources or external national and international sources; and (3) establish sustaining contacts with international information sources.

Where proprietary considerations allow, industrial organizations should be encouraged to make their information resources and services accessible to the industrial research institutes and the Science and Technology Information Center, and through them to the nation. In this way, they can contribute to the development of a necessary national resource.

Recommendation 27

Industrial enterprises in Taiwan should recognize the value of, and encourage the formation of, technological "information gatekeepers" within their organizations.

Several recent studies within the United States and other countries have shown that a few scientists and engineers within an organization are responsible for keeping the members of that organization informed of pertinent scientific and technical information generated externally. These information gatekeepers must be well integrated into the external networks of foreign information sources, as well as the network of domestic users. This integration is best produced through on-the-job experience. When staff members from industrial firms in Taiwan are sent abroad for study, technical training, or extended technical visits, an information-oriented component should be built into the overall program in which they are participating, to put them in touch with appropriate information sources in the host country, instruct them in the means of access, and provide channels for maintaining contacts with these sources when they return to Taiwan.

Recommendation 28

Symbiotic relationships between industry, industrial research institutes, and scientific information services should be established to encourage the development, support, and use of industrial information services.

Because few information services have been devised to meet the particular information needs of industry, the possible benefits of such services go unrecognized. Appreciation of these services must be cultivated; demand for their information must be stimulated. Means must be found to integrate information concerns within the broader context of industrial activities. The seminars and workshops on industrial developments in particular fields, organized by UIRI, provide one avenue of approach; the programs of the Bureau of Industrial Development provide another. The Science and Technology Information Center should encourage industrial and technical associations to hold their professional and trade meetings in the center's new headquarters. Industrial information products and developments should be given more exposure in the journals of the trade associations and industrial research institutes.

Library Resources and Services

The effectiveness of any information system depends ultimately on its ability to deliver information to the individuals who need it. Information exists in many forms: printed books, periodicals and technical reports, microforms and other audiovisual materials, and computer tapes.

Libraries are the traditional custodians of such information; they acquire it, make it accessible (through cataloging, bibliographic, and reference services) and assure its delivery (through individual and interlibrary loans and photographic and micrographic services).

Efficient use of library resources depends increasingly on interlibrary cooperation--sharing of materials, services, expertise, and planning--to accomplish more than any one library can do alone, and to offer users the collective resources of all.

There are numerous libraries in the Republic of China, but no extensive interlibrary cooperation. Library services in support of science and technology are further hindered by (1) the limited financial support of libraries (less than 2 percent of overall institutional budgets for academic libraries, and less than 3 percent for industrial and research center libraries); (2) lack of scientific and technical subject specialists on library staffs; (3) noncurrent collections; (4) the relative expense of reference and secondary information services in science and technology; and (5) acquisition policies that do not respond to the real needs of indigenous R & D programs.

Recommendation 29

A cooperatively designed national plan for the acquisition and sharing of scientific and technical information resources should be developed for the Republic of China.

The National Science Council and its Science and Technology Information Center, the Ministry of Education, the National Central Library, and the Cooperative Organization of Technical Libraries should participate in the development of such a plan.

The plan should clearly assign responsibilities for subject area specializations among the libraries with major holdings in science and technology. Such assignments would modify the acquisition, exchange, and service policies of these libraries, and ultimately, reduce unnecessary and costly duplication in the acquisition and processing of information. These libraries might also serve as major nodes in a more formalized library network which may be developed in the future.

The institutions in TABLE 1 should be included among the participants in such a plan.

The plan should establish formalized procedures for sharing resources, including interlibrary-loan protocols, and, where economically justifiable, the provision of microfilm, microfiche, or photocopies in lieu of such loans. It should provide for the development of cooperative programs in library technical processes such as cataloging, serials control, and the preparation of related bibliographic tools. It should encourage experiments and pilot projects in the computerization of library operations, as are now being undertaken at the Library of the Chung Shan Institute of Science and Technology.

The plan should also strive to eliminate unnecessary duplication now taking place among some libraries in the preparation of bibliographic tools, abstracting and indexing services, directories, and other reference works. Instead of duplicating efforts, libraries should work toward improving timeliness and frequency of existing publications and services, and providing new bibliographic and reference services that are much needed.

TABLE 1 ROC Institutions with Major Information Holdings in Science and Technology

Institution	Subject Speciality
National Central Library	general science and technology
National Cheng Kung University	engineering science
National Chiao Tung University	electronics, electrical engineering, control engineering, and computer science
National Taiwan University	science and technology
National Tsing Hua University	science and technology, nuclear engineering
National Bureau of Standards, Ministry of Economic Affairs (MOEA)	patents, industrial and other standards, evaluated data
Chinese Petroleum Corporation	petroleum research, technology and practice
Chung Shan Institute of Science and Technology	chemistry, physics, electronics, and computer science
Food Industry Research and Development Institute	food research, technology and practice
Joint Commission on Rural Reconstruction	agricultural research, technology and practice
Library, National Taiwan University Medical School	medical and biological sciences
Library, Industrial Technology Research Institute (formerly: The Union Industrial Research Institute, Metal Industries Research Institute, and the Mining Research & Service Organization, MOEA)	industrial, metal and mining research and technology and practice
Agricultural Research Center, National Science Council (NSC)	agricultural research
Biology Research Center, NSC	biological research
Chemistry Research Center, NSC	chemistry research
Engineering Research Center, NSC	engineering research
Mathematics Research Center, NSC	mathematics research
Physics Research Center, NSC	physics research
Precision Instrument Development Center, NSC	scientific instruments
Science and Technology Information Center, NSC	science and technology

Recommendation 30

Access to collections of scientific and technical information materials purchased with national funds should be accorded to everyone in the Republic of China.

National policies should treat such materials as a national resource. Government agencies that fund the purchase of scientific and technical information products and services directly, or as adjuncts to R & D projects, should require as a condition of funding that these products and services be made available to other libraries through interlibrary loan.

Recommendation 31

Special attention should be given to developing in the Republic of China specialized collections of scientific and technical publications and data including the following:

- Indigenous scientific and technical reports
- Resumes of scientific, technical, and industrial research in progress in Taiwan
- Evaluated scientific data, and the related literature

At present, there is little control of the country's scientific and technical report literature. The Science and Technology Information Center has made an effective start in collecting, storing, and providing access to the reports of the National Science Council and its grantees; these services might in the future be extended to the reports of other government agencies. The center would also be an appropriate focus for

the development of information services on research in progress. Two U.S. agencies, the National Scientific and Technical Information Service and the Smithsonian Science Information Exchange might serve as organizational models. Assembling a collection of the world's literature on evaluated scientific data, a relatively small, but vitally important information resource, might be carried out by either the center or the National Bureau of Standards (ROC). The Office of Standard Reference Data of the U.S. National Bureau of Standards is suggested as a model for this project.

Recommendation 32

Appropriate actions should be taken to stimulate the development and use in the Republic of China of depository sets of scientific and technical publications that are acquired through exchange agreements with government and private agencies in the United States and other countries.

Publications acquired through such exchange agreements are important information resources that may be unattainable (for economic or other reasons) in any other way. A survey of existing information-exchange agreements should be made to characterize the kinds of information now being received, to identify the present repositories for such information in Taiwan, and to identify subjects on which additional exchange agreements might be established. The assistance of the scientific and technical counselors in ROC embassies should be sought in carrying out such a survey and in establishing new exchange agreements. Organizations in Taiwan that serve as depositories for such publications should be required to maintain their collections adequately, and to assure their accessibility to other libraries and information centers.

Application of Information Technologies

Some technologies that support the handling and sharing of scientific and technical information resources include:

- Computer technology - Computers, peripheral equipment and related software governing their use
- Audio technology - Audio tapes and equipment for their production and use; voice-input devices
- Optical technology - Microforms and equipment for their production and use; optical readers and other input devices; video and other output devices
- Communications technology - Telecommunications equipment, networks and protocols relating thereto
- Printing technology - Traditional and computer-based printing processes
- Packaging and distribution technologies - Product design, materials, handling, etc.

These technologies are characterized by high rates of change and increased interfacing with one another in the creation of products and services. As with other high technologies, their effective development and use depend on the creation and utilization of appropriate standards, and on adequate maintenance and instructional support systems. Legal and societal concerns, copyright issues, proprietary rights, rights of entry and access (to information systems), rights of privacy, and freedom of information increasingly affect how these technologies are used.

Their possible applications to scientific and technical information purposes are broad and varied:

- Generation and packaging of information in various forms and formats, i.e., indexes, abstracts, synopses, data tables, documents (articles, reports, books)--in printed, microform, audio, video, or digital form
- Acquisition, technical processing and dissemination of information
- Information storage, analysis, and retrieval
- Administrative and recordkeeping processes related to information handling

Choices in information-handling technology are available today that did not exist a decade ago; the potential developments of the next few decades are staggering.

Recommendation 33

Mechanisms should be established in the Republic of China to continuously monitor worldwide developments in information technologies.

Choices regarding the use of such technologies in the development of a national scientific and technical information system in Taiwan must be made judiciously, in full knowledge of their current costs and capabilities, and probable future developments.

Recommendation 34

The utilization of various information technologies in the development of a national scientific and technical information system in the Republic of China should be carefully planned and phased, in keeping with the overall priorities of the system.

Computers should be used at first to provide technical-processing and bibliographic services (e.g., production of catalog cards and book catalogs; serials control and preparation of union lists; production of data bases that describe indigenous information resources, such as the technical reports of the National Science Council, and inventories of personnel). The experimental efforts and potential capabilities of the Chung Shan Institute of Science and Technology and Tsing Hua University in these areas should be recognized and encouraged; the capabilities of the Central Data Processing Unit of the Executive Yuan in providing such services should also be explored.

Microfiche and microfilm should be introduced selectively as alternatives to hard copy; at the same time, use of these technologies, however, will create requirements for new types of microform production, copying, and viewing equipment which must be satisfied.

Experiments with low-cost audiovisual technologies for the storage and transfer of information should be undertaken, particularly in situations where the intent is to rapidly transmit current, ephemeral information rather than to store, retain, and provide accessibility to that information for a long time.

Recommendation 35

Local industries should be encouraged to investigate possibilities for indigenous development and production of information products and services, for both internal consumption and export.

Several such products that seem particularly appropriate to Taiwan's present or potential industrial capabilities come to mind: minicomputers; calculators; portable, hand-held tape recorders and slide/film projectors; and inexpensive portable microfiche readers. Cooperative projects or joint ventures might be explored with member companies of the U.S. Information Industry Association, or similar organizations or companies in other countries.

Recommendation 36

For the longer term, a coordinated information systems R & D effort should be planned to support the development of national information systems.

Certain R & D activities, no matter how elementary, should accompany the design, development, and use of information systems. These include systematic data collection and analyses (on facilities, manpower, resource allocation, etc.) and user studies, as well as more technologically oriented R & D projects. Coordination of these activities is important; disparate R & D efforts not tied to specific national policies or programs generally do not receive adequate funding, nor do they adhere as well to development timetables. High priority should be given to developments such as the Chinese input/output keyboards. Such devices should help to reduce the costs of local information products and services, thereby insuring their wider use by user communities not now properly served.

Recommendation 37

A focus should be established within the Republic of China to monitor the development of international standards, specifications, and regulations relevant to national and international scientific and technical information systems, and to develop and promulgate complementary national standards.

Organizations and activities that should be monitored include the following:

- Technical Committees (TC) of the International Organization for Standardization (ISO) such as; ISO/TC 37 on Terminology; ISO/TC 46 on Documentation; ISO/TC 97 on Computers and Information Processing; and ISO/TC 154 on Documents and Data Elements
- Committees of the American National Standards Institute, including: Committee Z39 on Library Work, Documentation and Related Publishing Practices; and Committee X3 on Computers and Information Processing
- The UNISIST Program at UNESCO, particularly its efforts at promoting systems interconnection
- The International Serials Data System, Paris
- The Abstracting Board of the International Council of Scientific Unions, Paris
- The Cataloging Secretariat of the International Federation for Library Associations, London
- The MARC Project of the U.S. Library of Congress, Washington, D.C.

- The developments of major international, mission-oriented information systems such as the International Nuclear Information System (INIS) of the International Atomic Energy Agency; the Agricultural Information System (AGRIS) of the Food and Agriculture Organization; and the MEDLARS/MEDLINE System of the U.S. National Library of Medicine.

The National Bureau of Standards (ROC), working in close cooperation with the Science and Technology Information Center, would appear to be an appropriate location for such activities within the Republic of China.

International Cooperation

Development of modern information systems and services should not take place in isolation from other national and international information activities. Increased economic pressures are requiring planners of information systems and services to consider ways of sharing the costs of input, access to information resources, and exploitation of new information media across national boundaries. Networking and other cooperative activities between systems and nations are developing, bringing with them economic, administrative, political, and legal issues not easily resolved. Designers of national systems must be aware of the opportunities and economic benefits of such cooperation, and should develop channels through which it can be furthered.

Recommendation 38

The Republic of China should selectively cultivate bilateral, regional, and international relationships that will facilitate national awareness of information developments abroad and provide opportunities for cooperative activities with other national and international information systems and services.

Several specific relationships, involving a variety of institutions, have already been suggested in earlier recommendations, for example: bilateral, intergovernmental agreements for science cooperation and exchange of information; sister relationships with academic institutions; cooperation with national and international professional organizations in scientific, technical, and library- and information-science organizations; interaction with developing international information programs such as INIS, AGRIS, and UNISIST; and joint ventures with information industries.

Other developments might include reciprocal information cooperation-and-exchange programs with trading partners (e.g., Mexico, Korea, Japan, Thailand, Australia) and programs sponsored by regional organizations such as the Asian and Pacific Council. Cooperative programs in other areas should also be examined and evaluated from an information perspective.

Sino-U.S. Workshop on Scientific and Technical Information Needs and Resources in the Republic of China (Taiwan)

April 25 - 27, 1973
Washington, D.C.

WORKSHOP PARTICIPANTS

Republic of China

Workshop Participants

TA-YOU WU, Chairman, National Science Council, 214 Roosevelt Road, Section III, Taipei, Taiwan, Republic of China. CHAIRMAN, ROC PANEL.

PING-CHAO CHEN, Librarian, Chung-Shan Institute of Science and Technology, Shihmen-Tooyaun, Taiwan, Republic of China.

PAUL HAO, Director, Union Industrial Research Institute, P.O. Box 100, Hsinchu, Taiwan, Republic of China.

FRANK F. HSIEH, Chemist, Kaohsiung Oil Refinery, Chinese Petroleum Corp., Tzoying, Kaohsiung, Taiwan, Republic of China.

LUCY TE-CHU LEE, Head, Scientific Documentation Division, Science and Technology Information Center, National Science Council, P.O. Box 4, Nankang, Taipei, Taiwan, Republic of China. COORDINATOR, ROC PANEL.

CHAO-YANG LIN, Supervisor, Tatung Co., and Dean of Studies, Tatung Institute of Technology, 12-3 Alley 1, Lane 870 Ming-hsin E. Road, Taipei, Taiwan, Republic of China.

CHING-HSIEN MA, Librarian, Joint Commission on Rural Reconstruction Technical Library, 37 Nan Hai Road, Taipei, Taiwan, Republic of China.

WERNER NING, Director, National Bureau of Standards, Ministry of Economic Affairs, 5-7 Floors, 61-1, Sung Chiang Road, Taipei, Taiwan, Republic of China.

TSENG-CHEE SHEN, Director, Science and Technology Information Center, National Science Council, P.O. Box 4, Nankang, Taipei, Taiwan, Republic of China.

Affiliations listed are those held at time of workshop.

YU SUNG, Director, Planning Division, Chung-Shan Institute of Science and Technology, Shihmen-Tooyaun, Taiwan, Republic of China.

CHI-WU WANG, Director, International Programs, National Science Council, 214 Roosevelt Road, Section III, Taipei, Taiwan, Republic of China.

Invited Speakers and Discussants

YUNG-HSIANG LAI, Library, Harvard Yenching Institute, Harvard University, 2 Divinity Avenue, Cambridge, Massachusetts 02138.

TZE-CHUNG LI, Graduate School of Library Science, Rosary College, 7900 West Division Street, River Forest, Illinois 60305.

HSEUH-CHANG PAN, Counsellor for Science and Technology, Embassy of the Republic of China, Suite 453, Van Ness Center, 4301 Connecticut Avenue, Washington, D.C. 20008.

ANTHONY WU, Scientific Attache, Embassy of the Republic of China, Suite 453, Van Ness Center, 4301 Connecticut Avenue, Washington, D.C. 20008.

United States

Workshop Participants

ROBERT M. HAYES, Professor, School of Library Science, University of California at Los Angeles, Los Angeles, California 90024. CHAIRMAN, U.S. PANEL.

SCOTT ADAMS, Senior Staff Scientist, Biological Sciences Communication Project of the George Washington University, 2001 S Street, N.W., Washington, D.C. 20009.

ANDREW A. AINES, Senior Staff Associate, Office of Science Information Service, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550.

EDWARD L. BRADY, Associate Director for Information Programs, National Bureau of Standards, Washington, D.C. 20234.

RUTH M. DAVIS, Director, Institute for Computer Sciences and Technology, National Bureau of Standards, Washington, D.C. 20234.

BART HOLM, Manager, Systems Development Section, Information Services Division, Secretary's Department, E.I. duPont de Nemours and Co., Wilmington, Delaware 19898.

H. WILLIAM KOCH, Director, American Institute of Physics, 335 East 45th Street, New York City, New York 10017.

JOHN W. MURDOCK, Chief, Information Systems Section, Battelle Columbus Laboratory, Battelle Memorial Institute, 505 King Avenue, Columbus, Ohio 43201.

RUSSELL SHANK, Director of Libraries, Smithsonian Institute, Washington, D.C. 20560.

Invited Speakers and Discussants

HENRIETTE AVRAM, Chief, MARC Development Office, Library of Congress, Washington, D.C. 20540.

BRUCE BILLINGS, Assistant to the President, Aerospace Corporation, 2350 El Segundo Blvd., El Segundo, California.

CHESTER CLARK, Science Advisor-Elect, U.S. Embassy, Taipei, Taiwan, Republic of China.

JOHN FARMAKIDES, U.S. Atomic Energy Commission, 1717 H Street, N.W., Washington, D.C.

DAVID LISTON, Chief, Planning and Technical Development, Information Systems Section, Battelle Columbus Laboratory, Battelle Memorial Institute, 505 King Avenue, Columbus, Ohio 43201.

JOSEPH B. PLATT, President, Harvey Mudd College, Claremont, California 91716.

Observers

JOHN BANNIGAN, Asia Foundation, 2301 E Street, N.W., Washington, D.C. 20037.

MARY MCDONNELL, Office for Republic of China Affairs, Bureau of East Asian and Pacific Affairs, U.S. Department of State, Washington, D.C. 20521.

J. E. O'CONNELL, Program Manager, U.S.-China Program, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550.

ROBERT YODER, Office of General Scientific Affairs, Bureau of International Scientific and Technological Affairs, U.S. Department of State, Washington, D.C. 20521.

Staff, National Academy of Sciences

VICTOR RABINOWITCH, Staff Director, Board on Science and Technology for International Development, National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418.

M.B.C. MCDONALD DOW, Deputy Director for Bilateral Programs, Board on Science and Technology for International Development, National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418.

JUDITH A. WERDEL, Professional Assistant, Board on Science and Technology for International Development, National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418. U.S. PANEL AND WORKSHOP COORDINATOR.

TECHNICAL VISITS

ORGANIZATION & ADDRESS	PRINCIPAL CONTACT(s)	SPECIAL TOPICS/ACTIVITIES COVERED DURING VISIT
April 13, 1973 Stanford, California		
1. Stanford University Stanford, CA 94305	Dr. Edwin B. Parker Associate Professor Institute for Communications Research (415) 321-2755	Science and engineering library system and services; BALLOTS System (Bibliographic Automation of Large Library Operations on Time Sharing System); educational programs in information Science.
April 16-17, 1973 Los Angeles, California		
2. Aerospace Corporation 2350 El Segundo Blvd. El Segundo, CA 90245	Dr. Bruce Billings Assistant to the President (213) 648-6638	Aerospace Library services and corporate information exchange; on-line library system.
3. System Development Corp. 2500 Colorado Avenue Santa Monica, CA 90406	Dr. Carlos Cuadra, Manager Education and Library Systems Department (213) 393-9411	Overview of corporate R and D in information systems in commercial, industrial, and public sectors; activities of the Education and Library Systems Department: demonstrations of new information technologies (e.g. voice and graphic input/output systems); ORBIT II On-Line Search Service System.
4. University of California at Los Angeles 405 Hilgard Avenue Los Angeles, CA 90024	Dr. Robert Hayes Professor, School of Library Service (213) 825-4351	Overview of research library system; activities of the Center for Information Services and the Campus Computing Network; Engineering and Mathematical Sciences Library; Health sciences and bio-medical information services including the operations of the Regional Medical Library and the Brain Information Service.
April 19, 1973 Chicago, Illinois		
5. Center for Research Libraries 5721 Cottage Grove Avenue Chicago, IL 60637	Mr. Gordon R. Williams Director (312) 955-4545	Organization and services of the Center, with particular emphasis on its role as a national resource, and cooperative programs with non-U.S. organizations.
6. ITT Research Institute 10 West 35th Street Chicago, IL 60616	Dr. Allen J. Gaynor, Manager Industrial Development Chemistry Research Division (312) 225-9630	Industrial research and information programs; educational programs, R and D program, and services of the Computer Search Center, with particular emphasis on its interactions with user communities; activities of the Technology Utilization Program.
7. John Crerar Library 35 West 33rd Street Chicago, IL 60616	Mr. William S. Budington Director (312) 225-2526	Overview of organization, operations and services, with particular emphasis on relationship to user communities and its participation in library networks; Photoduplication Service; National Trans lations Center; cooperative programs with the Argentine Telex Network for Scientific and Technical Information.

ORGANIZATION & ADDRESS	PRINCIPAL CONTACT(s)	SPECIAL TOPICS/ACTIVITIES COVERED DURING VISIT
April 20, 1973 Columbus, Ohio		
8. Battelle Columbus Laboratory of Battelle Memorial Institute 505 King Avenue Columbus, OH 43201	Mr. John W. Murdock Chief, Information Systems Section (614) 299-3151	Overview of information science and technology activities - basic and applied R & D, engineering and technical services (user studies, systems design, and education) and operational systems (BASIS-70); technology transfer information programs; new information technology; information analysis center operations.
9. Chemical Abstracts Service 2540 Olentangy River Rd. Columbus, OH 43210	Mr. Dale Baker, Director (614) 421-6940	Overview of organization, operations, services and products of CAS, including new technologies for input and production; bilateral and international cooperative programs of CAS.
10. Ohio College Library Center 1314 Kinnear Road Columbus, OH 43212	Mr. Frederick G. Kilgour Director (614) 422-8509	Organizational and technological aspects of the OCLC on-line cooperative network; use of MARC data bases in system.
April 23-24, 1973 Washington, D.C. Area		
11. American Petroleum Institute 7th Floor 1801 K Street, N.W. Washington, D.C.	Ms. Judy James Office of the Vice President for Administration (202) 833-5660	Information publications and services.
12. American Society for Information Science 1155 16th St., N.W. Room 210 Washington, D.C. 20036	Mr. Skip McAfee Director of Member and Education Services (202) 659-3644	Overview of information products, services; opportunities for bilateral professional cooperation.
13. Defense Documentation Center Cameron Station, Bldg. 5 Duke Street Alexandria, VA 22314	Mr. Herbert Rehboch (202) 274-6817	Overview of operations and services.
14. Library of Congress Room 110, Main Bldg. 1st Street & Independence Avenue, S.E. Washington, D.C. 20540	Mrs. Jean Allaway International Relations Officer (202) 426-5220	Activities of the Science and Technology Division and National Referral Center; MARC Program, and library automation programs; National Serials Data Program, and international activities thereof.
15. National Aeronautics and Space Administration Scientific and Technical Information Facility 5001 Calvert Road College Park, MD 20740	Col. E. E. Baker (301) 779-0492	Overview of operations and services.
16. National Agricultural Library Beltsville, MD 20705	Ms. Lila Moran Information Officer (301) 344-3725	Overview of operations and services; demonstration of CAIN On-Line system.

ORGANIZATION & ADDRESS	PRINCIPAL CONTACT(s)	SPECIAL TOPICS/ACTIVITIES COVERED DURING VISIT
17. National Bureau of Standards Washington, D.C. 20234	Dr. Edward L. Brady Associate Director for Information Programs (301) 921-3641	General overview; information sciences technology R & D programs; the National Standard Reference Data System.
18. National Library of Medicine 8600 Wisconsin Avenue Bethesda, MD 20014	Miss Mary Corning Assistant Director for International Programs (301) 496-6481	Overview of library organization, programs, and services, including regional medical library network, MEDLARS and MEDLINE.
19. National Oceanographic and Atmospheric Administration Environmental Science Information Center Page Building #2 Wisconsin Avenue and Whitehaven Street, N.W. Washington, D.C. 20235	Mr. Malcolm Rigby Technical Information Specialist (202) 343-7636	Activities of Environmental Science Information Center; cooperative activities with the Food and Agricultural Organization in fisheries information; activities of Extension Division of the National Marine Fisheries Service.
20. National Technical Information Service Springfield, VA 22151	Mr. Marvin Wilson Director of Springfield Facility (703) 321-8574	Overview of operations, including cataloging, abstracting, indexing and machine-processing of bibliographic data on 60,000 reports per year; production of announcement publications; on-line retrieval system; and storage, reproduction and sales operations.
21. Organization of American States Pilot Project on Technology Transfer Division of Planning and Studies Department of Scientific Affairs 1735 I Street, N.W. Washington, D.C. 20006	Mr. James Beverly Principal Specialist (202) 381-8167	Overview of Pilot Project on Technology Transfer and information activities related thereto.
22. Smithsonian Science Information Exchange 1730 M Street, N.W. Washington, D.C. 20036	Dr. Willis Foster Vice President and Director Professional Services Division (202) 381-5511	Overview of operations and services; bilateral and international cooperative programs.
23. U.S. Book Exchange, Inc. 3335 V Street, N.E. Washington, D.C. 20018	Miss Alice Ball, Director (202) LA9-2555	Overview of organization and services.
April 30, 1973 Wilmington, Delaware		
24. E. I. du Pont de Nemours & Co. Wilmington, DE 19898	Mr. Bart Holm, Manager Systems Development Section Information Services Division (302) 774-7501	Overview of corporate industrial information services; in-house operations and use of commercially available services.

ORGANIZATION & ADDRESS	PRINCIPAL CONTACT(s)	SPECIAL TOPICS/ACTIVITIES COVERED DURING VISIT
April 30-May 1, 1973 Philadelphia, Pennsylvania		
25. BIOSIS of Biological Sciences Abstracts, Inc. 2100 Arch Street Philadelphia, PA 19103	Mr. Edward Kennedy Director for Scientific Affairs (215) 568-4016	Overview of organization, operations, services and products of BIOSIS; bilateral and international cooperative programs.
26. Institute for Scientific Information 325 Chestnut Street Philadelphia, PA	Dr. Morton Malin Vice President for Corporate Development (215) 923-3300	Overview of products and services; perspectives on the role of the commercial information industry in the development of national and international scientific and technical information systems; review of programs with other countries for the provision of products and services.
27. National Federation of Abstracting & Indexing Services 3401 Market Street Philadelphia, PA 19104	Ms. Stella Keenan Executive Director (215) 349-8572	Products, services and educational programs of nfais; perspectives on role of A and I services in development of national information systems.
May 2, 1973 New York City		
28. Engineering Index, Inc. and Engineering Societies Library 345 East 47th Street New York, NY 10017	Mr. John Creps, Jr. Director Engineering Index, Inc. (212) 752-6800	Overview of organization operations and services; cooperative programs between EI, Inc. and Engineering Societies Library.
May 7, 1973 Oak Ridge, Tennessee		
29. Oak Ridge National Laboratory P. O. Box x Oak Ridge, TN 37830	Mr. Fritz McDuffy Head, Information Division (615) 483-8611, ext 36777	Research Materials Information Center and related specialized information centers.
May 14, 1973 Honolulu, Hawaii		
30. East-West Communication Intsitute East-West Center Honolulu, HI 96822	Dr. Robert Worrall Assistant Director	Education and training programs; opportunities for bilateral and regional cooperative information activities.
31. East-West Technology and Development Institute East-West Center Honolulu, HI 96822	Dr. Louis J. Goodman Acting Director	Opportunities for bilateral and regional cooperative activities in the development of information programs supportive of technological development.
32. University of Hawaii Honolulu, HI 96822	Dr. Robert Stevens Dean, Graduate School of Library Studies Dr. Norman Abramson Technical Director, ALOHA System, Department of Information and Computer Sciences	Education and training programs in library, information and computer sciences; the ALOHA System (a Pacific educational computer network) and its implications for library applications.

NATIONAL ACADEMY OF SCIENCES
2101 CONSTITUTION AVENUE
WASHINGTON, D.C. 20418

OFFICE OF THE FOREIGN SECRETARY

SINO-U.S. WORKSHOP ON SCIENTIFIC AND TECHNICAL INFORMATION NEEDS AND RESOURCES IN THE REPUBLIC OF CHINA (TAIWAN)

April 25 - 27, 1973

Room 200 A, Joseph Henry Building
National Academy of Sciences
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20036

AGENDA

Wednesday, April 25, 1973

9:00 a.m.	1. Welcome on behalf of the National Academy of Sciences and the Sino-American Science Cooperation Committee	Dr. Joseph Platt
9:05 a.m.	2. Objectives of the Workshop on Scientific and Technical Information Needs and Resources in the Republic of China (Taiwan)	Dr. Robert M. Hayes and Dr. Ta-you Wu, Co-Chairmen of the Workshop
9:20 a.m.	3. Review of Pre-Workshop Technical Visits and Related Activities	Mr. Tseng-chee Shen
9:30 a.m.	4. National Policies for Scientific and Technical Information	
	A. General Overview and International Perspectives	Mr. Scott Adams
	B. U.S. Policies	Mr. Andrew Aines
	C. National Policy on Science Information in the Republic of China	Dr. Ta-you Wu
	D. Identification of Problems of Policy and Suggestions for Solutions	Participants
12-1:30 p.m.	LUNCH	

1:30 p.m.	5. Manpower and Education Needs	
	A. Manpower and Library Education in the Republic of China	Mr. Tsung-chee Shen
	Discussants	Mr. Yung-hsiang Lai Dr. Tze-chung Li
	B. Educational and Training Alternatives	Dr. Robert M. Hayes
	C. Identification of Problems and Suggestions for Solutions	Participants
3:15 p.m.	6. Technologies - Traditional and Innovative	
	A. Current Status and Future Potential of Communication Technologies in the Republic of China	
	1. General Overview	Dr. Bruce Billings
	2. Potential Programs and Activities at Specific Organizations in the Republic of China	Mr. Yu Sung
	a. Institute of Physics, National Tsing Hua University	
	b. The Executive Yuan	
	c. Chung Shan Institute of Science and Technology	
	B. Possible Applications of This Technology	Dr. Ruth Davis
	C. Identification of Problems and Suggestions for their Solutions	Participants
5:15 p.m.	ADJOURNMENT	

Thursday, April 26, 1973

9:00 a.m. 7. Scientific and Technical Information Systems and Services, Current Status, Republic of China; U.S. Perspectives

(Note: Discussion on Identification of Problems and Suggestions for Solutions will follow each major subject below.)

A. <u>Primary and Secondary Scientific and Technical Literature - Publications and Distribution</u>	
1. Survey of Publishing and Reference Services in the Republic of China	Dr. Tze-chung Li
2. U.S. Perspectives	Dr. William Koch
B. <u>University and Research Libraries</u>	
1. Review of the Present Situation in the Republic of China	Mr. Yung-hsiang Lai
2. A Brief Report on Chung Shan Institute of Science and Technology Library	Mr. Ping-chao Chen
3. U.S. Perspectives	Dr. Russell Shank
C. <u>Documentation, Information and Information Dissemination Centers</u>	
1. The Present Status and Future Plans of the Scientific Documentation Centre	Mr. Tseng-chee Shen
Discussant	Ms. Lucy Te-chu Lee
2. Current Status of Agricultural Libraries and the Proposed Agricultural Documentation Centre in the Republic of China	Mr. Ching-hsien Ma
3. U.S. Perspectives	Mr. John Murdock
D. <u>Information Analysis and Data Centers</u>	
1. The Status of the National Bureau of Standards, Ministry of Economic Affairs, Republic of China, and Technological Documentation Development in the Bureau	Dr. Werner Ning
2. The Role of the Information Analysis Center in National and International Information Systems	Dr. Edward Brady
E. <u>Industrial Information Services</u>	
1. Current Needs and Services in the Republic of China	Dr. Paul Hao
Discussants	Mr. Frank Hsieh Mr. Chao-yang Lin
2. U.S. Perspective	Mr. Bart Holm

12:45-2p.m. LUNCH

2:00 p.m.	F. Management Information Systems for Research and Development	
	1. Current Needs and Services in the Republic of China	Dr. Paul Hao Dr. Chi-wu Wang
	2. U.S. Perspective	Mr. John Murdock Mr. David Liston
2:45 p.m.	8. Aspects of Scientific and Technical Information Systems Designs and Use	
	(Note: Discussions on Identification of Problems and Suggestions for Solutions in the Republic of China will follow each subject area below.)	
	A. User Interfaces	Mr. Bart Holm
	B. The Role of Standardization in National and International Information Systems	Mrs. Henriette Avram
	C. Legal Aspects in the Design and Use of National and International Information Systems	Mr. John Farmakides
	D. Information Systems Research and Development	Dr. Robert M. Hayes
	E. Pricing, Marketing and Distribution of Information	Mr. John Murdock Mr. David Liston
5:30 p.m.	ADJOURNMENT	

Friday, April 27, 1973

9:00 a.m.	9. Current Status and New Possibilities for National, Bilateral, Regional and International Cooperation	
	A. Within the Republic of China	
	1. Technical Libraries Cooperation Committee	Mr. Yu Sung
	2. Programs of the National Central Library	Dr. Tze-chung Li
	3. New Possibilities	All Participants
	B. With the United States	
	1. Present Areas of Cooperation (governmental, academic, professional, other) in:	All Participants
	a. Document Exchange	
	b. Information Exchange	
	c. Manpower Exchange	
	d. Other	

	2. The Role of the Embassy of the Republic of China and Other U.S. - ROC Formal Relationships in Promoting Scientific and Technical Cooperation and Exchange of Information	Mr. Hseuh-chang Pan Mr. J. E. O'Connell
	3. Possibilities for New Co-operative Ventures with U.S. Organizations	
	a. Organizations Visited in Pre- and Post-Workshop Visits	Mr. Yu Sung
	b. Other	All Participants
	C. <u>With Other Countries</u> (trading partners, regional neighbors, etc.)	All Participants
	D. <u>Regionally</u> (through Asian Regional organizations)	All Participants
	E. <u>Internationally</u> (through non-governmental organizations, indirect linkages with UNISIST, etc.)	All Participants
12:30-2 p.m.	LUNCH	
2:00 p.m.	10. <u>Possibilities for Future Activities</u>	All Participants
	A. Pilot Projects B. Future Workshops, Study Groups, Regional Meetings, etc.	
	11. <u>General Summary and Conclusions</u>	Dr. Robert M. Hayes and Dr. Ta-you Wu Joint Chairmen
5:00 p.m.	ADJOURNMENT	

SINO - U. S. Workshop on Scientific and Technical Information Needs and Resources in the Republic of China (Taiwan)

April 25 - 27, 1973
Washington, D. C.

WORKING PAPERS

CONTRIBUTIONS FROM THE REPUBLIC OF CHINA

1. Chen, P. C. "A Brief Report on Chung Shan Institute of Science and Technology Library." 4 pp.

2. Hao, P. "Industrial Information in the Republic of China - Current Needs and Services." 4 pp. (outline)

3. Lai, Y. H. "Proposed Courses for Graduate Library Institute, National Taiwan University." 2 pp.

4. Li, T. C. "Comments on the Publication of Reference Works in the Republic of China." 4 pp.

5. Li, T. C. "Library Science and Education in the Republic of China: An Appraisal." 25 pp.

6. Ma, C. H. "Agricultural Libraries in Taiwan." 5 pp.

7. Ning, W. "The Status of the National Bureau of Standards, Ministry of Economic Affairs, Republic of China." 13 pp.

8. Ning, W. "Technological Documentation Development in the National Bureau of Standards, Republic of China." 6 pp.

9. Shen, T. C. "Manpower and Library Education in the Republic of China." 6 pp.

10. Shen, T. C. "The Present Status & Future Plans of the Scientific Documentation Centre." 13 pp.

11. Sung, Y. "Computerization of Library Operations in the Chung Shan Institute of Science and Technology (CSIST) - a Tentative Program." 1 p. (outline)

12. Wu, T. Y. "National Policy on Science Information (in the Republic of China)." 7 pp.

CONTRIBUTIONS FROM THE UNITED STATES

13. Summaries of U. S. Panelists' Presentations. 8 pp.

14. Adams, S. "National Policies for Scientific and Technical Information - General Overview." 1 p. (outline)

15. Aines, A. A. "National Policies for Scientific and Technical Information from a U. S. Perspective." 10 pp.

16. Brady, E. L. "The Role of the Information Analysis Center in National and International Information Systems." 1 p. (outline)

17. Davis, R. M. "The Technologies in Support of Scientific and Technical Information Needs and Resources." 26 pp.

18. Hayes, Robert M. "Science Information in Taiwan." August, 1972, 58 pp.

19. Holm, B. E. "Industrial Information Services." 1 p. (outline)

20. Holm, B. E. "User Interfaces." 1 p. (outline)

21. Koch, H. W. "Primary and Secondary Scientific and Technical Literature - Publication and Distribution." 1 p. (outline)

Summary of Workshop Follow-up Activities in the Republic of China

(May, 1973 - May, 1974)

Planning and Policy Development

4 July 1973:	Meeting on Scientific Information, Taipei, sponsored by National Science Council (ROC).
September 1973:	Visit of Mr. Wang and Dr. Shu to U.S. to meet with Dr. Hayes, BOSTID staff and other U.S. institutions to discuss follow-up activities in scientific and technical information.
September 1973:	Meeting, Library Cooperative Organization, Taipei; one day meeting attended by 40 participants.
December 1973 - January 1974:	Mrs. Ching-chih Chen, Assistant Professor, Graduate School of Library Science, Simmons College, Boston, Massachusetts, invited by Dr. Shu, National Science Council, as a consultant to the Science and Technology Information Center.
18 March 1974:	Meeting, Library Cooperative Organization, Taipei, one day meeting.
April, 1974:	Preliminary planning for visit of Dr. Robert Hayes to Taipei in August, 1974 for consultations on development of national scientific and technical information system.

Education and Training

September 1973:	Initiation of a course on Information Centers and Services, Tam Kang College of Arts and Sciences (taught by Ms. Lucy Lee).
October 1973:	Preliminary discussions on the development of specialized education and training programs in library and information science, at the University of California, Los Angeles, to meet needs of the Republic of China.

December 1973:	Lectures on library automation and recent library developments in the United States, given by Mrs. Chen at Chung-Shan Institute of Science and Technology, National Taiwan University, and the Science and Technology Information Center.
February 1974:	Lectures on computers and computer applications, given by Mr. Yu Sung, Director, Planning Division of the Chung-Shan Institute of Science and Technology.

Activities of the Chung-Shan Institute of Science & Technology

1973-4:	Planning and initiation of library automation program using CDC computer Cyber 70.
May 1974	Visit of Mr. Yu Sung, Chung Shan Institute of Science and Technology, to various U.S. institutions to discuss various aspects of library automation, including serials control, cataloging, and use of computer-readable bibliographic data bases.

Activities of the National Bureau of Standards, Ministry of Economic Affairs, R.O.C.

November 1973:	Meeting on Scientific & Technical Information (Emphasis on Patents & Standards), Taipei, sponsored by the National Bureau of Standards, Ministry of Economic Affairs. 1/2 day meeting attended by 20 participants.
4 December 1973:	Establishment of The Chinese National Standards Association by the National Bureau of Standards, Ministry of Economic Affairs.

Activities of the Science and Technology Information Center (STIC)

A. General

July 1973:	Publication of the National Union Catalog of Scientific and Technical Books in Libraries of the Republic of China - 10 volumes.

October 1973:	Initiation of monthly publication On-going Research Projects in Taiwan. (In three categories.)
October 1973:	Compilation of a Bibliography of Scientific and Technical Research Projects Funded by the National Science Council (1959-1973) - in process.
November 1973:	Initiation of publication Current Contents of Selected Scientific & Technical Periodicals. (In nine categories.)
November 1973:	Dissemination of monthly specialized information searches provided by the Computerized Information Service, University of California, in the following industrial areas: 1. Ceramics industry. 2. Silicon wafer processing. 3. Processing magnetic materials. 4. Integrated circuits. 5. Ceramic dielectric materials.
May 1973 - May 1974:	Distribution of various materials concerning scientific information received from National Academy of Sciences to related organizations and individuals in Taiwan.

B. Information for Industry

July 1973:	Initiation of industrial information newsletter (title: Science & Technology Briefs) on industrial development, primarily in the fields of electronics, electrical engineering, petrochemistry, metallurgy and machinery, plastics, and textiles. Newsletter also includes information about information resources in these fields. This is a joint project under the cooperative activities with Chao-tung University, Instrument Corporation of Taiwan, Taiwan Metal & Machinery Research Center, Chinese Petroleum Corporation, and the Textile Research Center.

C. Automation Programs

January 1974:	Initiation of computer application to various STIC functions, as recommended by workshop and consultants.

Bilateral and Regional Cooperation

Korea

May 1973:	Discussions with KIST (Korea Institute of Science & Technology) and KORSTIC (Korea Scientific & Technological Information Center) on cooperative activities with the Nation Science Council's Science and Technology Information Center (STIC).
October 1973:	Two staff persons from STIC to visit KORSTIC, KIST, and other Korean organizations for 2 weeks. Discussions with KORSTIC on cooperative activities with STIC.
January 1974:	Negotiation of the KORSTIC & STIC Cooperations Agreement: A three year cooperative program (1974-76).

Japan

May 1973:	Visiting & Informal Discussions with JICST (Japan Information Center for Science and Technology) on cooperative activities with STIC.

Thailand

August 1973:	Informal Discussions with Dr. Hwa-wei Lee, Asian Institute of Technology, Bangkok, on possible cooperative programs between AIT and STIC.

A PROPOSAL FOR SINO-US COOPERATION IN THE DEVELOPMENT OF INFORMATION SERVICES IN SCIENCE AND TECHNOLOGY IN THE REPUBLIC OF CHINA

R. M. Hayes

Chairman, U.S. Panel

Sino-U.S. Workshop on Scientific and Technical Information Needs and Resources in the Republic of China (Taiwan)

May 30, 1973

INTRODUCTION

On 25-27 April 1973, a workshop was held at the US National Academy of Sciences, under the sponsorship of the joint Sino-US Committee on Science Cooperation, to discuss the needs and resources for scientific and technical information in the Republic of China (Taiwan). The principal product of that meeting was a set of recommendations, the most important of them being that a high level committee be established in the Republic of China to guide future program policy in the development of information services. Among the subsidiary areas recommended as being of highest priority, three appear to be especially important:

(1) Manpower development
(2) Development of services to industry
(3) Acquisition of material

For each of these areas, it seems evident that much would be gained from a continuing effort of Sino-US cooperation, so that the maximum advantage can be taken of US experience and resources. To do so requires that there be a continuing dialogue and that there be an active effort to transfer US knowledge to Taiwan. The purpose of this proposal is to define the nature of such a cooperative program and to request funding for the first steps in it.

PROPOSED PROGRAM

The program for Sino-US cooperation in the development of scientific and technical information services in Taiwan will be described in terms of specific activities in each of the three priority areas outlined above, although it is evident that they are not the only areas to be considered and that others may become more important as time goes on.

Manpower Development. The workshop generally confirmed the picture that the development of proper manpower for providing information services to scientific and technological work was a priority need. The present manpower at a professional level in Taiwan is very limited, the bulk of the librarians being trained at the level of a library technician and few if any having any technical subject expertise. The following paragraphs outline steps which could be taken both within Taiwan and in cooperation between the US and Taiwan.

First, the Scientific Documentation Center, in cooperation with the National Taiwan University, could establish a series of two to three week "short courses" especially designed to provide people having technical backgrounds and working in business and industry with a knowledge of techniques for information transfer. Some of these courses might appropriately be presented by visiting faculty from the US and other countries. Each should be a highly concentrated, pragmatic rather than

theoretical presentation; each should be well supported by workbooks and practical examples designed to give the participants as much realistic experience as can be concentrated into a two to three week period. The identification of the courses which could most appropriately be presented in this manner, of the organization and content of them, of the requirements for supporting material, and of the persons who would be capable of presenting them should be a first item for discussion between people who would be responsible for this program in Taiwan and knowledgeable people from the US.

Second, the National Taiwan University is establishing a graduate level program in librarianship which could be designed to include specialization in information work for science and technology. Knowledge of US experience in development of appropriate curricula, courses, and faculty would be invaluable in defining such a program. This therefore should also be an item for discussion.

Third, one of the most effective means of developing faculty would be a "sister university" relationship with one or more institutions in the US. Likely alternatives and the means of bringing them to a formal or even informal arrangement should be a third topic of discussion.

Development of Services to Industry. This has been identified as a priority area for obvious reasons, but accomplishing the aim is extremely difficult. It represents both a technical problem--what does each specific industry need in the way of information--and a marketing problem--how can they be convinced that information will indeed improve their productivity

and profitability. The following paragraphs outline steps which could be taken.

First, one or two industries regarded as especially important should be identified. Assuming that there are public sector enterprises represented among these industries, visits could be arranged, under National Science Council auspices, to these enterprises for discussion, at a technical level, of their development programs and of the information resources needed to support them. These discussions should involve people knowledgeable in the technology and in the provision of information services. There are people in United States organizations with this combination of expertise, usually in the special libraries or information centers of the most successful companies. A first item of discussion should therefore be the identification of such individuals who would be willing and able to spend the time in Taiwan necessary to determine the needs.

Second, information "packages" could be developed for each industry in a form which combined SDI services with translations of the resulting abstracts and of the most significant of the referenced articles (for a discussion of the possibilities of cooperative programs between the US and the Republic of China in this area, please see the next section, on such cooperation). Eventually, the package should include summaries of the state of the art, reviews of activities within Taiwan, and similar forms of more immediate and direct value in communication.

Third, these packages should then be marketable more broadly in the private sector. To develop a marketing program, a deliberate effort should be made for communication with the private sector. The program packages developed to meet the needs of the public sector enterprises could serve as a starting point. If they have met the needs of the public sector enterprises, their value should be evident, and the private corporations ought to be more than ready to take advantage of them and to provide input to the total communication program.

Acquisition of Material. The problems in timely acquisition of material are many--costs and time for shipment, conversion of funds, procedural barriers, failures in delivery, etc. Of all the areas for immediate action, this one would seem to be the most valuable for cooperative effort. The following paragraphs outline steps which could be taken.

First, in association with the effort to develop information packages for particular industries, arrangements can be made with one or more centers in the United States already providing information alerting services (called SDI, for "Selective Dissemination of Information") to academic and industrial institutions. There is every reason to expect that profiles can be developed representing the interests of industry in Taiwan and processed in exactly the same manner as those for industry in the US. This would provide a monthly (or in some cases bi-weekly) delivery of listings. The cost of airmail for this limited amount of material would not be prohibitive,

so the delivery could be rapid. The resulting lists could then be screened by the staff of the Scientific Documentation Center for identification of those of special value, for translation where appropriate, and for production of the associated information package. Part of that package might be full articles, also sent by airmail, of the most valuable data.

Second, if the results of this experiement prove it to be a success, the programs and procedures used for providing such a dissemination service could be replicated in Taiwan, presumably at the Chung-Shan Research Institute. Again, cooperation with dissemination centers in the United States would make the transfer of this technology easy and rapid and would take maximum advantage of the experience already gained in the US.

Third, there are experiments under way in the United States for distribution of publications in microform and, in the case of those publishers in the commercial and professional society sector, for licensing libraries and others for "on-demand" publication from them. The values in the use of microform in this way are many, but one in particular is relevant in the case of Taiwan--it will permit low cost, high speed air mail delivery of the microforms, with on demand publication in Taiwan using Taiwanese facilities and labor.

Fourth, There are possibilities for establishing working relations between the Scientific Documentation Center and one

or more book agents in the United States to the aim of improving the speed with which other kinds of material can be acquired and delivered.

NEXT STEP

The program outlined above is an ambitious one. It is possible that it may be too ambitious; there are certainly other things which can and should be done as well. In order to identify what can be done, especially as it relates to cooperation between the Republic of China and the United States, it is proposed that there be a series of technical consultancy visits by appropriate people from the U.S. to Taiwan during the coming year. The purposes of these visits would be as follows:

1. a visit for planning and organizing the total effort, with emphasis on what would be the most effective contribution by subsequent visitors from the U.S.;
2. a visit by an educator, for discussions on the total education program, design of specialized short courses, identification of opportunities for future cooperation with U.S. educators and institutions, and the presentation of a representative short course and special lectures;
3. a visit by a person with experience in the management of industrial information services and the training of staff for them, to provide a concentrated "short course" in that kind of work, and to help develop the requirements for a prototype "information package" to meet the needs of a specified industry of prime importance in the Republic of China

The initial planning visit should focus on the discussion of the value, feasibility, and importance of various alternatives. Among them might be the ones outlined in the earlier section of this proposal, but others should be considered as well. During this visit, if it turns out to be feasible and appropriate, discussions could also be held with people from the educational institutions concerned with manpower development. Similar discussions could be held with people from industry.

The visit by an educator should be under the joint auspices of the National Taiwan University and the Scientific Documentation Center, and should include the tasks enumerated above.

The visits by the industrial specialist should be very carefully scheduled so that he will have the opportunity of meeting with as many people in the public sector enterprises in that industry as possible. His discussions should be at the highest possible technical level, so that he can clearly identify the resources which will be required to meet the requirements in future development.

TIME SCHEDULE AND BUDGET

It is proposed that these three visits be held within the coming year, the first sometime in September and the others in winter and spring. Each visit should be scheduled for two to three weeks. A proposed budget per visit (based on a three week stay) would be as follows:

Travel (these costs depend upon place in the US and the availability of 14-21 day excursion)	$1000
Honorarium (at $125 per day)	1875
Per diem in Taiwan (at $25 per day)	500
Total per visit	$3375

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