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TECHNOLOGY TRANSFER — A SELECTED BIBLIOGRAPHY

by M. Terry Sovel

Prepared by
UNIVERSITY OF DENVER
Denver, Colo.
for

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INTRODUCTION

This bibliography is a product of the Project for the Analysis of Technology Transfer (PATT), a NASA-sponsored project underway at the University of Denver's Research Institute (DRI). PATT, begun in November 1967 has four primary objectives:

> To document and evaluate cases of transfer of space-related technology to other sectors, to explore the circumstances of the transfer, and to identify incentives and barriers to transfer across organizational, sector and disciplinary boundaries.
>
> To establish and maintain a Technology Transfer Data Bank for the use of researchers of the technology transfer process.
>
> To develop criteria for selection of space-related technology which is most appropriate for dissemination to potential secondary users.
>
> To propose programs and mechanisms to help NASA improve the effectiveness of its Technology Utilization Program.

Included also in the scope of work is the establishment and maintenance of a library. This facility acts as a resource of information concerning technology transfer and related areas. It serves three primary functions: first, to support current operations and research; second, to maintain an awareness of the state-of-knowledge of technology transfer, related disciplines, and areas of study; and, third, to act as a source of materials pertinent to the structuring of future research activities. A statement of library policy is included as the appendix of this bibliography.

This bibliography is the initial attempt at compiling a comprehensive listing on the subject of technology transfer. Technology is considered here to be technical information, including scientific knowledge, making possible the conception, development, design, production, and distribution of goods and services. Transfer here means the effective communication of such information from one person or source to a recipient who accepts it for consideration and possible application. The bibliography is further concerned with

information which leads to a greater understanding of the factors affecting the transfer process, namely, the barriers and incentives to the process.

DRI has conducted several major studies since 1961 which have direct relevance to the subject of technology transfer.* A partial information base on technology transfer was gathered in performing those studies. With the establishment of the PATT library, an intensive data collection effort was begun. Material has been assembled relating to the process of technology transfer, the factors affecting the process, substantive content of technology transfer, and related areas of study which are pertinent to an understanding of the process and the factors affecting it. Related areas, for example, include technological and environmental forecasting, research and development management, or patents.

The items presented represent a screening of the available literature. Outdated information with little historical value has been eliminated and, when possible, only primary sources have been included. Only a few bibliographies are listed.

Several interviews were conducted in 1968 to assist in collecting information and to gain broader insights into the subject area. Visits were made to technical information people in the Department of Defense, Atomic Energy Commission, National Aeronautics and Space Administration, Office of State Technical Services, Small Business Administration, and Federal Council for Science and Technology. Interviews were held with people in the Legislative Reference Service and the National Referral Center for Science and Technology (Library of Congress), the National Science Foundation, and the Scientific Information Exchange. In addition, several collections were surveyed including the New York Public Library Economics Division, Dewey Library of the Massachusetts Institute of Technology, Harvard University Program on Technology and Society, Columbia University Bureau of Applied Social Research, and the Dag Hammerjöld Library of the United Nations.

Material was also acquired by reviews of bibliographies on technology transfer, including many of the articles and reports cited

* See items 140, 370, 371, and 419 of the Selected Bibliography.

here, letters to major authors in the field, personal contacts, and monitoring of several abstracting services.

Finally, an intensive review of the bibliography was performed by knowledgeable people in the field. Internally, DRI professional staff members reviewed the literature for quality and applicability. In addition, appreciation is extended to the following reviewers for their thoughtful assistance:

Thomas J. Allen, Massachusetts Institute of Technology, Alfred P. Sloan School of Management

Richard J. H. Barnes, National Aeronautics and Space Administration, Technology Utilization Division

Richard A. Carpenter, Library of Congress, Legislative Reference Service

Howard M. Gadberry, Midwest Research Institute

George J. Howick, IRM (U. S. A.) Inc.

James E. Mahoney, George Washington University, Program of Policy Studies and Science Programs

William J. Paisley, Stanford University, Institute for Communication Research

The bibliography is arranged in three sections: an alphabetical listing, an author index, and a KWIC (key word in context) index. The PB, AD, and NASA numbers, when known, are given in the alphabetical listing. The author index includes primary and secondary as well as corporate authors. The KWIC index is a computer prepared permuted title index. The computer print-out was edited to eliminate words which appeared not to be significant.

Most of the items in the bibliography are in the PATT library collection. As additional items are received, the bibliography will be expanded.

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APPENDIX A

STATEMENT OF LIBRARY POLICY

PROJECT FOR THE ANALYSIS OF TECHNOLOGY TRANSFER

The Project for the Analysis of Technology Transfer (PATT) includes in its scope of work the establishment and maintenance of a library. This library will act as a resource of information concerning technology transfer and related areas. Access to this facility and its materials is open to researchers on the University of Denver campus involved in related work and to others concerned with the study of technology transfer.

Within the PATT operations, the library will serve three functions:

1. Support current operations and research;
2. Maintain awareness of state-of-knowledge of technology transfer, related disciplines, and areas of study;
3. Act as a source of materials pertinent to the structuring of future research activities.

The library will seek to acquire the writings of study groups and researchers who have contributed to the existing body of knowledge concerning technology transfer, such as scientists and engineers, economists, lawyers, sociologists, librarians, data processing specialists, and information specialists.

Technology transfer is a field influenced by many disciplines. Therefore, it is important that the collection not be limited by narrow and precise subject categories. However, some key areas of concentration for library acquisitions are identifiable. The library will direct its efforts to acquiring materials in four main subject categories: the process of technology transfer, factors affecting technology transfer, substantive content of technology transfer, and related areas. Each of these subject categories is discussed in the following paragraphs.

I. Process of Technology Transfer

In general, materials will be acquired relating to the technology transfer process itself--the diffusion of scientific and technical

information, cost effectiveness and evaluation of alternative systems, and the effects of technology transfer. The library will acquire materials relating to the individual steps in the process, described in more detail below.

A. Generation of Information. The transfer process begins with the generation of information from some point. In this subject area materials will be acquired concerning the origination of information to be transferred, such as innovations and inventions, and the originators of information, such as innovators.

B. Storage of Information. Included in this subject area is material concerning information storage, abstracting, documentation, identification, retrieval, and indexing. The library will not acquire detailed information involving computer programs or library automation systems.

C. Communication of Information. For information to be utilized, it must be communicated to the user. Thus this subject area is concerned with the acquisition of information by the user. For example, it will include the channels and media used to communicate the information (both formal and informal), sources of information, the dissemination process, linkages (such as information centers or transfer agents), communication systems, and the communication network in general.

D. Application of Information. This field includes areas relating to the application of technology and scientific and technical information once the information has been acquired by the user, and the results of the application. It will include such areas as the evaluation of the information by the user, motivation to apply information, requirements for information, the level within a firm where information is applied, users and user needs, and utilization of information. The materials in this subject area and in the general area of technology transfer should yield information on cost-effectiveness and cost-benefit.

II. Factors Affecting Technology Transfer

Materials will be acquired relating to both the internal and external factors affecting technology transfer. These are the barriers and incentives to the process as dealt with in "I" above.

A. Internal Factors. This area concerns factors within an institution or individual which might influence the transfer of information. Among the identifiable factors are barriers and incentives to technology transfer such as patents and licensing procedures, education and educational opportunities, the environment, information requirements, the nature of the information, user needs, proprietary data, security regulations and restrictions, time pressures, cost-effectiveness, and the management of research and development.

B. External Factors. External factors are defined as the barriers and incentives outside the institution or individual which might affect the transfer of technology. These include such factors as expenditures for missile/space programs or technology transfer, policies and programs for technology transfer, institutions (including, for example, universities, government, and industry), the volume of technology, legislative, judicial, and executive concerns, and user needs.

III. Substantive Content of Technology Transfer

Included in this subject area will be the substantive knowledge about a field whose technology is being transferred. It will deal with the technical information needed to understand what led to the application of an innovation or invention. For example, included here would be materials dealing with electronics technology, materials technology, or urban affairs, and other areas for potential transfer. This subject area will be restricted to materials necessary to the background information of the PATT study team.

IV. Related Areas

This category will include materials that might or might not contain information on the transfer process but which are areas of study pertinent to an understanding of technology transfer and the factors affecting it. These areas include: technological and environmental forecasting, R&D management, new product development, diversification, patents (this subject will also be considered as an internal or external factor affecting technology transfer, but because of its broad scope, is also included as a related area), history of technology, international technology transfer, the technology gap, economics, library science, and the information sciences. Material in these and other areas will be acquired as needed for study efforts.

The library will cooperate with the American Library Association policy for interlibrary loan. The library reserves the right to restrict circulation of certain materials, including those which are unsuitable for mailing or which are needed to support the current PATT work.

The materials collected in the library will not be restricted by form, but will include: journals and serials, books, symposia proceedings, reports, papers and speeches, industrial publications, directories, indexes, clippings, encyclopedias, bibliographies, catalogs, congressional hearings and reports, and other government documents.

A critical evaluation of material will be made, when possible, before it is acquired. This will be accomplished through book reviews, abstracts, newsletters, recommendations by knowledgeable people, library accession lists, book publishers catalogs, subject bibliographies, and other reliable sources.

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The aeronautical and space activities of the United States shall be conducted so as to contribute . . . to the expansion of human knowledge of phenomena in the atmosphere and space. The Administration shall provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

—NATIONAL AERONAUTICS AND SPACE ACT OF 1958

NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS

TECHNICAL REPORTS: Scientific and technical information considered important, complete, and a lasting contribution to existing knowledge.

TECHNICAL NOTES: Information less broad in scope but nevertheless of importance as a contribution to existing knowledge.

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CONTRACTOR REPORTS: Scientific and technical information generated under a NASA contract or grant and considered an important contribution to existing knowledge.

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SPECIAL PUBLICATIONS: Information derived from or of value to NASA activities. Publications include conference proceedings, monographs, data compilations, handbooks, sourcebooks, and special bibliographies.

TECHNOLOGY UTILIZATION PUBLICATIONS: Information on technology used by NASA that may be of particular interest in commercial and other non-aerospace applications. Publications include Tech Briefs, Technology Utilization Reports and Notes, and Technology Surveys.

Details on the availability of these publications may be obtained from:

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