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ABSTRACT

This document represents the first of five components of a project conducted to design a comprehensive information system (termed SYSTEM) for identifying, selecting, and disseminating relevant military curriculum materials to civilian vocational and technical education programs. This particular report identifies, reviews, and analyzes existing information and retrieval systems with the idea that aspects of several of the existing systems could be incorporated into the proposed SYSTEM. The first section presents brief descriptions of 13 information systems, covering funding sources, scope of information coverage, information input sources, products and services, and user groups for each system. The second section consists of nine tables designed to facilitate compilation, review, and comparison of the different information systems. Each table gives the name of the system and the following information: Geographic acquisition and distribution coverage and type of information acquired, primary users, media classification, information acquisition, information selection, information processing, information storage, products and services, and management structure. Conclusions, implications, and recommendations appear in the third section. A summary states that a new information system need not be developed but rather a centralized system which would pull together activities, people, facilities, and products and services from existing information systems and which would add its own products and services when necessary. A bibliography is included. (LMS)

REVIEW OF EXISTING INFORMATION SYSTEMS AND NETWORKS: APPLICABILITY TO THE DESIGN OF THE SYSTEM
(A Staff Working Paper)

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PREFACE

This document is an interim report of the "Department of Defense Curriculum Materials Utilization in Vocational Education" project (Contract No. 300-750-276) being conducted by The Center for Vocational Education at The Ohio State University. The purpose of the report is to assist the project staff in identifying, reviewing, and analyzing existing information and retrieval systems which may provide the basis for, or support to, a system for delivering relevant military training materials to civilian vocational and technical schools. The specific operating procedures and intricacies of each information system are not analyzed, but rather, general system capabilities are identified which can be explored and evaluated in greater depth when the requirements of the SYSTEM have been fully explicated.

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INTRODUCTION

Information - that is, facts or data which can be read, communicated, transferred, or used to add to, change, or repeat a representation of what is believed to be known or is known - has existed since the beginning of time. Similarly, systems or combinations of parts working together to accomplish some function as a whole have existed in varying degrees of complexity.

Systems for information, or information systems, with varying degrees of organization and effect, can be defined as: a combination of different or similar parts, procedures, facilities, personnel, and technologies concerned with getting facts or data, organized and related or unorganized and unrelated, through printed, audio, and visual means of transfer from one place or person to the beneficiaries or users of that complex or unitary-whole. The general purpose of information systems, then, is to effect a transfer of information from one place to another in an orderly and efficient manner.

With the rapid growth of the "technological world-society" of the twentieth century, an ever increasing amount of information is created each day as men explore their world and the world of others in more and more detail. The amount of information produced in the past fifty years is greater than all the information produced in the preceding history of man. Little wonder, then, that we continually seek organized and efficient means of transferring that information from its producers to its users.

During the past decade, a flurry of activity has occurred to design, operate, and maintain information systems for various fields of knowledge and organizations. In 1975, in the United States alone, over 100 computer-based (machine-readable) information systems exist. Internationally about 75 additional machine-readable data bases are either operating or in final planning stages.

The rapid increase in the number of operating and developing information systems in the United States and the world during the past decade and a half has led to many problems. Problems caused by "... moving from an industrial society to an information society will need to be solved, in the end, not just by new laws, regulations, and policies, but by new technical concepts and their embodiment in future systems and networks." (Caudra)

The rapidly changing nature of the science and technology of information systems, services, and centers, and the volume of various kinds and forms of information have created a deluge of literature on the subject area as well as a keenly competitive and innovative market place for an "industry of information." The entire area of information systems is therefore one of excitement; investigation; change; and most importantly, awareness of the need to create systems which provide needed, useful, relevant, and timely information services, and products to their users. It can be concluded then that in order for one to establish "... a national information system, taking stock of existing facilities is of paramount importance, since sound planning can be based on proven facts and figures only." (Vilentchuk, ii)

REVIEW PROCEDURES

The purpose of this report is to "identify and analyze existing information and retrieval systems ...to ... reveal possible support to and linkage with the proposed SYSTEM* and provide insights for potential responsiveness by the vocational and technical education community" (USOE RFP 75-83, p. 4), thereby providing the "proven facts and figures" for "sound planning." The review is conducted to provide a list of information systems with components which could be of potential value to the design of the SYSTEM.

To identify linkages and the support existing information systems might have with the proposed SYSTEM, to reveal their weak links, and to determine user exploitation of existing facilities requires an outline of the SYSTEM, something which is not yet available. Therefore, the review shows what exists now, and thus provides, without value judgment, a guide to information system components which might be utilized in the design of the SYSTEM. In other words, the "analysis" provides the designers of the SYSTEM with a list of processes, procedures, and information which could help them (1) determine how the SYSTEM would link directly with extant systems, (2) gain support for the proposed SYSTEM, and/or (3) copy processes/procedures from existing systems for use in the SYSTEM.

The first step in this analysis was to review a variety of directories (e.g., Encyclopedia of Information Systems, Encyclopedia of Associations) to

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*SYSTEM in capitals, refers to the physical facilities, financial assets, personnel, and procedures which when designed, tested, operated, evaluated, and revised will identify, acquire, and evaluate curriculum materials developed by the Department of Defense and the Coast Guard and disseminate those materials to civilian education programs.

obtain a list of information systems potentially related to the design of the proposed SYSTEM. Each information system reviewed and selected for study meets at least one of the following criteria:

1. Processes Department of Defense information.
2. Processes instructional/curriculum materials.
3. Provides services/products on a national, regional or state level.
4. Acquires information from sources nationwide.
5. Provides varied information-media reproduction services and catalog/index products.

These criteria broadly define the information field or area, the geographic coverage for the system's acquisition of information and dissemination of products and services, and the types of products and services available through each system. Using these criteria, the following thirteen (13) information "systems" were selected:

Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM)

Aerospace Education Foundation (AEF)

American Council on Education (ACE)

Curriculum Coordination Centers (CCCs)

Defense Documentation Center (DDC)

Educational Resources Information Center (ERIC)

National Audiovisual Center (NAC)

National Information Center for Educational Media (NICEM)

National Technical Information Service (NTIS)

Naval Institute, U.S. (NI)

Research Coordinating Units (RCUs)

Westinghouse Learning Corporation (WLC)

Xerox University Microfilms, Curriculum Materials Clearinghouse (CMC)

Generalized literature about these information "systems," their design, operation, users, and problems, was identified, acquired, and reviewed. The accumulated information was synthesized and reported herein.

The Aerospace Education Foundation and the American Council on Education were not well represented in the literature; therefore, visitations were made to these organizations to discuss and examine the operation of these systems with their directors. Additional trips to the documented systems (ERIC, Xerox, etc.) may be required as the SYSTEM is designed to learn more of the very specific procedural and technological aspects of each system.

The first section of the review presents brief descriptions of the 13 information systems studied. The descriptions give the reader an overview of the nature of the systems in terms of funding sources, scope of information coverage, information input sources, products and services, and user groups.

The actual review of the 13 information systems is presented in a series of nine tables in the second section. Each table shows the name of the system along with information about the following types of attributes, operational factors, or components:

1. Geographic Acquisition and Distribution Coverage and Type of Information Acquired
2. Primary Users
3. Media Classification
4. Information Acquisition
5. Information Selection
6. Information Processing
7. Information Storage
8. Products and Services
   Retrieval/Search
   Reproduction/Dissemination

9. Management Structure
   Management
   Funding Sources

The presentation of information in table form facilitates the compilation and review of that information and allows for easy comparison of systems. Statements clarifying or defining system components dealt with in the particular table, as well as a comparison and summary of the information precede each table. These statements are based on an objective review of the data and are not made on the basis of comparison of the system's components with some established criteria. The tables and summary statements should provide the necessary informational detail to allow the designers of the proposed SYSTEM to decide which systems and which components of those systems will serve as exact or slightly modified blueprints for use in the SYSTEM design, testing, and eventual operation.

OVERVIEW OF SELECTED SYSTEMS

Of the 13 systems reviewed, all but two, Research Coordinating Units and Curriculum Coordination Centers, are systems which (1) acquire original copies of information (materials), (2) review and select the information on the basis of some selection/assessment/evaluation standards, (3) process or handle and manipulate the information in some manner, (4) store the original information, and (5) provide some kind of products and services (e.g., indexes, abstracts, searches, reproductions) to users.

The RCUs and CCCs serve primarily as would a retail car dealer, selling and servicing a finished product, but not taking the raw materials and fashioning them into an automobile as does the manufacturer. The other 11 systems are analogous to the car manufacturer, and like the manufacturer, provide some types of products and services directly to users on a limited basis. However, the manufacturers and 11 systems depend heavily on the retail sales/service organization to keep the users satisfied.

To expand the concept further, the 11 systems depend very heavily on regional, state, and local libraries, referral services, and information specialists to make users aware of the products and services available from each system and to help users actually use such products and services. In other words, the producer of information sends a "raw product" to the information systems, which in turn process and handle the information to produce user-needed products and services. Without the producers of information, information systems, retail product/service representatives of the systems, and the users themselves, there is no network or linked system for transferring information from one point to another in an organized, efficient, and effective manner. Each part of the network serves its role, and because RCUs and CCCs

have a direct relationship with the scope of the proposed SYSTEM, they are included in some tables where they really do not function in terms of application of the tables' components to the design of a SYSTEM.

Abstracts of Instruction and Research Materials in Vocational and Technical Education

In an effort to make information regarding relevant instructional and research materials (in-use and under development) in vocational and technical education accessible to those who can use these materials to improve education, The Center for Vocational Education, The Ohio State University, 1960 Kenny Road, Columbus, Ohio, produces a publication entitled Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM). This publication covers a wide range of areas in vocational and technical education: agricultural education, business and office education, distributive education, health occupations education, home economics education, consumer education, industrial arts education, trade and industrial education, and related fields, such as manpower economics, occupational guidance, and occupational rehabilitation. Basically, the users of AIM/ARM are associated with one of the above mentioned areas and include researchers, teachers, curriculum specialists, administrators, planners, students and counselors, as well as business and industry managers.

Each bi-monthly issue of AIM/ARM contains the following sections: Abstracts, Subject Index, Author Index, and Projects in Progress. The "Abstracts" section presents information about authors, titles, availability, and the content of documents. Information of this nature can help the reader determine if he or she wants to read the full text of the document. If more in-depth information is desired, copies of full texts of most documents are available through the AIM/ARM Microfiche Sets.

The "Subject Index" lists subject descriptors which conform to those listed in the Thesaurus of ERIC Descriptors. The purpose of the index is

to help the user locate abstracts of documents relevant to his or her information needs. The subjects in this index are listed alphabetically, with VT accession numbers listed in numerical order under each subject heading.

The "Author Index" lists documents under the name(s) of their author(s). It is arranged in alphabetical order by the person's last name and/or the institution's full name. Document abstracts appear in numerical order under the name of each author and/or institution.

A section in AIM/ARM entitled "Projects in Progress" announces in-progress research and curriculum development projects funded by the Vocational Education Amendments of 1968 (Public Law 90-576), Parts C, D, and I. Two subsections are included in "Projects in Progress." The first subsection includes a directory of Curriculum Coordination Centers (CCCs); the second subsection provides a directory of state Research Coordinating Units (RCUs). Abstracts in this section (with VTP accession numbers) help to keep the reader aware of on-going research and curriculum development projects and activities in vocational education. Contributors of materials for announcement in AIM/ARM include local school districts, state departments of education, curriculum materials laboratories, professional associations, industrial organizations, U.S. Office of Education, private foundations, and other organizations.

Aerospace Education Foundation

The Aerospace Education Foundation (AEF) is a non-profit organization located at 1750 Pennsylvania Avenue, N. W., Washington, D.C. The primary purpose of the organization is to apply aerospace technology to the advancement of education. In doing so, AEF has as one of its tasks the determination and dissemination of those U.S. Air Force vocational-technical training

materials applicable for civilian school use.

Under a grant from the U.S. Office of Education, AEF screened Air Force training materials to identify those adaptable for immediate civilian use. The product of this effort was a publication entitled Inventory of U.S. Air Force Vocational Course Materials for Possible Adaptation to the Civilian School Systems. This publication is a 228-page catalog which documents 82 Air Force instructional systems, covers 24 occupational career areas, and represents more than 26,000 hours of instruction. An index listing the occupational areas and the occupations within each is also available.

In 1972, seven Air Force courses were selected for pilot testing in selected civilian schools. The seven courses selected were "Auto/Truck Mechanic," "Nurse's Aide," "Medical Service Fundamental," "Food Inspector," "Structural Engineering Assistant," "Aircraft Maintenance Fundamental," and "Apprentice Carpenter." Each course package contains the following: (1) all printed materials on microfiche or in printed form (the total number of hours and cost for microfiche and hard copy versions of materials are made available for each course); (2) a "Plan of Instruction;" (3) a complete set of lesson plans for each instructional system - microfiche or print format; (4) a summary of key elements in each system, including a list of essential equipment; and (5) audio/visual "Materials Availability Summary," which lists titles, prices, and sources for the visuals used in each system.

In late 1973, an eighth instructional course/system, "Electronic Principles," was added. The content of the electronics course ranges from basic electrical concepts through microwave principles. The course is comprised of 10 modules (blocks) and the modules are available on an individual basis

for the cost of assembling, reproducing, and disseminating the course materials.

The National Laboratory for the Advancement of Education (NLAE), a division in the Aerospace Education Foundation, makes all course or system packages available at a cost-plus-handling fee to interested secondary and post-secondary schools, education departments, other institutions, corporations, and private individuals. Subject to availability, NLAE provides a preview package of any one block of instruction of the requester's choice. The preview package consists of the Plan of Instruction, all printed materials, and one sample of the TV programs in the block. No slides are available for preview. Additional information and inquiries should be addressed to NLAE in care of the Aerospace Education Foundation.

American Council On Education

The American Council on Education (ACE), located at One Dupont Circle, Washington, D.C., is considered the nation's major coordinating body for post-secondary education. It is composed of institutions of higher education and regional and national associations. Its primary function is to provide leadership for improvement of educational standards, policies, and procedures.

The Office of Educational Credit (OEC), the Council's division concerned with educational credit policies and practices in post-secondary institutions, has as its purposes (1) evaluation of military educational programs, (2) assisting educators in making credit decisions on such program experiences, and (3) administration of the General Educational Development (GED) Testing Service. Beneficiaries of the Council's services usually include admissions officials of secondary and post-secondary institutions, colleges, universities, state departments, civil service commissions, business and industry

employers, and others who assess the applicability of a veterans' or service persons' military training to a selected program of study at the institution or agency.

As a part of its services, the Council has periodically provided (since 1946) a publication entitled Guide to the Evaluation of Educational Experiences in the Armed Services. The "Guide" includes a listing of formal courses offered by the Department of Defense and the branches of the Armed Services, with recommendations for equivalent credit in post-secondary education categories. More specifically, the 1974 edition of the "Guide" has included courses for possible credit in the vocational, technical, baccalaureate, and graduate categories. Future editions of the "Guide" are to be published annually as a new edition or as a supplement, with the intent of better serving the needs of students, the military, and educational institutions or agencies. As an additional advisory service, after the publication of each edition of the "Guide" OEC will continue to receive and review new and revised programs of instruction. Recommendations for these programs are provided upon request.

As for format, the 1974 edition includes the following sections: Course Exhibits, Appendix, Keyword Index, and Course Number Index. An Office of Educational Credit identification number (OEC I.D. number) is listed for each course in the "Guide." Prefix initials precede each OEC I.D. number to indicate the branch of the Armed Services offering the course. For example, AF-1234-5678 indicates the following: (1) the initial "AF" indicates the Air Force as the branch offering the course, (2) the first four numbers codify the subject matter covered in the course - USOE definitions for all subject-matter codes are listed in the appendix, and (3) the last four numbers assign

a unique number to each course within a given subject-matter code and within a given branch of the service. The format for each course listed in the Course Exhibits section (excluding the OEC I.D. number) is as follows: training program title, military course number, location, length, dates offered, course objectives, instructional description, and a credit recommendation.

Curriculum Coordination Centers

Presently, Curriculum Coordination Centers (CCCs) are located in California, Illinois, New Jersey, Oklahoma, Mississippi, and Washington, representing the western, east central, northeast, midwest, southeast and northwestern regional centers, respectively. Curriculum Coordination Centers are federally funded and designed to serve the entire field of vocational and technical education, especially those educators directly involved in curriculum endeavors. The primary purpose of the CCCs is to coordinate curriculum development, dissemination, utilization, and evaluation activities within their regions. Liaison and coordination efforts are maintained with groups such as teacher education programs, local education agencies, state research coordinating units, professional organizations, the two national centers on vocational and technical education, and other agencies. The number of states included in each regional center varies, and a liaison person is available from each state.

Each center makes a list of curriculum materials available to each of the other five centers for distribution to affiliated states. The list contains those materials that are in the planning and development stages within projects as well as those already published. As a external service, the centers also make abstracts of curricula that are underway in its respective region available to The Center for Vocational Education in Columbus, Ohio,

for inclusion in a special section of the AIM/ARM publication entitled "Projects in Progress."

Defense Documentation Center

The Defense Documentation Center (DDC), a major field activity of the Defense Supply Agency, is located at Cameron Station, Alexandria, Virginia. The Center serves as the centralized scientific and technical report documentation center for the Department of Defense (DOD).

The Defense Documentation Center collects, catalogs, classifies and codes, indexes, abstracts, announces, retrieves, and stores formally recorded technical information in all scientific disciplines and engineering fields of interest to the Department of Defense. Most of the information collected by DDC relates to either (1) ongoing research and development work conducted by or for DOD as collected and stored in the Research and Technology Work Unit Data Bank, or (2) records of completed work as collected and stored in the Technical Report Data Bank. Most documents are in microfiche and hard copies, and work unit summaries are on magnetic tapes or punched cards. Data elements used to describe documents include originating activity (corporate author), security classification and group, title, descriptive note, author(s), date, pagination, number of references, contract/grant/project number(s), report number(s), distribution statement, supplementary notes, sponsoring military activity, abstract, and keywords. Date of current and previous summary, kind and level of summary, security classification, distribution statement, contractor access, title, scientific and technological area(s) of concern, starting and estimated completion dates, funding agency, performance method, contract/grant number, resources estimate, responsible DOD organization and individual, performing organization, principal and

associate investigators, approach, progress, and keywords - all these are elements used to describe work unit summaries. Unclassified or unlimited technical reports and announcement data describing them are made available from DDC to the public through the National Technical Information Service.

Generally, DDC services are available only to DOD and other federal agencies and their contractors, subcontrators, and grantees; however, each of the military branches may permit research and development organizations to qualify for DDC services if their work is of potential benefit to the military.

Other services available to the user include the DDC reference service which consists of work unit and bibliographic searching; processing of requests for information and documents; several publications, among which are Technical Abstracts Bulletin (TAB), TAB Indexes, DDC Digest, and Scheduled Bibliographies. The DOD Information Analysis Centers also provide current awareness bibliographies according to user-established subject-interest profiles.

Educational Resources Information Center

The Educational Resources Information Center (ERIC), with central headquarters located in Washington, D.C., is a nationwide information system designed to quickly provide significant information (technical and research reports, speeches, conference papers, curriculum and teacher guides, and the like) to the education community. The central headquarters coordinates the efforts of 16 ERIC Clearinghouses with locations in universities and professional organizations throughout the United States. The purpose of each clearinghouse is to search for, acquire, select, abstract, index, store, retrieve, and disseminate significant information as related to its particular

area (e.g., the ERIC Clearinghouse on Career Education acquires and processes that information related to Career Education and related fields). In addition, each clearinghouse publishes and disseminates special reports, literature reviews, summaries, state-of-the-art papers, and the like. Some clearinghouses provide Current Awareness Services to their immediate users. Teachers, students, administrators, researchers, librarians, and others interested in educational literature reap the benefits of ERIC products and services.

As a service to those interested in research endeavors, ERIC provides a monthly publication entitled Resources in Education (RIE). Every issue of RIE contains indexes (subject, author, institution) and resumes of every document processed in one of the clearinghouses. Included as a part of each resume is standard information, such as accession number (ED number), author, title, publication date, descriptors and identifiers, price, availability, descriptive note, abstract, and other information useful to the reader.

In order to service more practitioners in education and not limit its services to the research-oriented users, ERIC also provides a publication entitled Current Index to Journals in Education (CIJE). This is a monthly, annotated index of articles in over 750 education-related journals. CIJE is organized similarly to RIE (but with an EJ accession number) and includes a Main Entry Section, Subject Index, Author Index, and Journal Contents Index.

The Thesarus of ERIC Descriptors controls the terminology of ERIC. Documents available through ERIC are obtainable on microfiche or reproduced paper copy form. Documents announced in RIE are obtainable, upon demand or subscription, from the ERIC Document Reproduction Service (EDRS).

National Audiovisual Center

The National Audiovisual Center (NAC) was established in 1969 in the National Archives and Records Services, General Services Administration, Washington, D.C. The Center provides reference and distribution services to anyone interested in audiovisual materials for instructional or promotional purposes -- students, educators, government agencies, private organizations, and business and industry. The reference service helps the public become aware of the federal audiovisual materials (16 mm films, motion cartridge, audiodisc, audiotape, slide set and filmstrip) available for distribution through NAC, other federal agencies, and non-government services. The loan, rent and/or sale of audiovisual materials placed with NAC is the function of the distribution service.

A catalog of all the audiovisual materials available for sale and/or rent can be obtained from the Center. The format of the catalog includes a guide to subject section, title section, media format codes, title and agency numbers, series, new entries, and a supplement. Any requests for materials must contain a title, title number, agency number, date, complete shipping and billing address, telephone number, and remittance for all necessary pre-paid charges. The user can contact the appropriate branch within NAC for sales, rental, or general information regarding these materials.

National Information Center For Education Media

The National Information Center for Education Media (NICEM), University Park, Los Angeles, California, was established by the University of Southern California in 1966. The purpose of NICEM is to collect, catalog, and make available to the educational-library community, descriptive bibliographic information concerning all of the audiovisual materials distributed through-

out the United States. NICEM basically receives the information from those who create or own the medium of interest (producers), from those who handle sale, lease, or rental of the particular production (distributors), and the Library of Congress.

Currently, seven non-book media (16 mm films, 35 mm filmstrips, 8 mm motion cartridges, over-head transparencies, educational records, audiotapes, and videotapes) are covered in the NICEM master data bank. Entries in the data bank are filed under 2,087 key words or subject headings oriented to (but not limited to) users at the elementary, secondary, and post-secondary levels of education.

NICEM provides several publications and catalogs covering the seven non-book media mentioned above. One of the publications is the Index to Vocational and Technical Education-Multimedia. The Index is divided into three principal sections: (1) the "Subject Guide to Vocational and Technical Education-Multimedia;" (2) the "Alphabetical Guide to Vocational and Technical Education-Multimedia;" and (3) the "Directory of Producers and Distributors" including separate alphabetical listings by code and by name. More detailed procedures for using the index are available.

In addition to the services previously mentioned, NICEM also provides abstracting, indexing, custom cataloging and computer literature searching services. All NICEM data are stored on machine-readable tape, generated from punched cards. NICEM information and system are copyrighted by the University of Southern California.

National Technical Information Service

In 1970, the National Technical Information Service (NITS), 5285 Port Royal Road, Springfield, Virginia, was established as the primary operating

unit within the U.S. Department of Commerce with the dual responsibility of (1) coordinating the business and technical information activities of the Department of Commerce, and (2) serving as the primary focal point within the federal government for accessing government publications and data files. More specifically, NTIS searches for, collects, catalogs, abstracts, indexes, announces, and disseminates unclassified or unlimited government-supported technical reports, translations, and data. Those who benefit from efforts by NTIS include students, researchers, business managers, and the like.

The subject areas covered in the NTIS document collection include science, technology, engineering, business, economics, and library and information science. The full range of subjects are characterized by the COSATI Subject Category List, and each document is cataloged according to the following COSATI standards: author, title, report number, contract number, accession/order number, date of report, pagination, assigned descriptors, abstract, and price. The Thesaurus of Scientific and Engineering Terms (with subject, personal author, corporate author, contact number, and accession/report number categories) is used to index each document. Documents and magnetic tapes containing business, management, transportation, state and local information are also included in the collection.

NTIS services are available, without restrictions, to government, industry, and the general public. Documents/reports can be obtained in paper copy, microfilm for pre-1964 reports, microfiche, magnetic tapes, or punched cards. Microreproduction services include (1) selected categories in microfiche (SCIM), a bi-weekly dissemination service of microfiche subscriptions of reports in several hundred highly selective fields of interest; and (2) U.S. Patent on 16mm microfilm.

NTIS also provides selected reference and referrral services to its users. The Information Services Branch of NTIS serves as the reference center. It compiles general subject bibliographies and performs, for a fee, in-depth NTIS document searches via NTISearch, an on-line, interactive retrieval system. The bibliographic data base of NTIS is available on tape and contains current abstracts of research and analysis efforts sponsored by the government. In addition, other government agencies use NTIS facilities to announce and distribute their documents and data files.

Another service component of NTIS is the Joint Publications Research Service (JPRS). It selects and translates research and development literature from all over the world. The JPRS Standing Order Service provides automatic mailing of translations as they become available. Translations are available in three categories: ad hoc scientific and technical, ad hoc social sciences, and serial reports.

NTIS makes a number of publications available to interested readers, some of which are: Weekly Government Abstracts, Government Reports Announcements, and Government Reports Index. These periodicals are prepared from government-sponsored research and analysis information.

United States Naval Institute

The United States Naval Institute (NI) located in Annapolis, Maryland. With the cooperation of the Naval Commands, the Institute identifies and reviews those courses developed by the U.S. Navy which may be useful to civilian institutions or agencies in training students in the basic technological skills. As a result, the efforts of NI have potential use by vocational and technical students, educators, business, industry or individuals having training responsibilities in technological skills.

To date, the Naval Institute has produced a packaged version of the Navy Basic Electricity and Electronics Individualized Learning System. This package is available to the civilian education community. A course summary, price sheet, and preview kits are available upon request.

In addition, through further study and investigation of Naval courses, NI has published a report entitled An Inventory of U.S. Navy Courses Suitable for Use in Training Civilian Personnel in Basic Technical Skills. This report contains those courses identified as useful in civilian training and are indexed by career fields. The format of the courses listed consists of the following headings: Career Field, Course, Catalog Number, Course Description, Comments, Course Content, Blocks, Note, Support Materials, and Equipment.

Anyone interested in acquiring this report or more detailed purchasing information should contact the Navy Institute. A complete file of Curriculum Outlines of the courses in the report can be made available for the minimal cost of copying, handling, and postage.

Research Coordinating Units

Research Coordinating Units (RCUs) are established throughout the United States and trust territories with locations in universities and state departments of education. The RCUs are mainly concerned with (1) research in vocational education, (2) research training programs, (3) projects designed to test the effectiveness of research findings, (4) demonstration and dissemination projects, (5) development of new vocational curricula, and (6) projects in the development of new careers and occupations. In other words, RCUs focus on research, development, technical assistance, and dissemination activities. Results of efforts by the RCUs are of potential benefit to

vocational and technical educators, researchers, students, administrators, and state department of education personnel at the secondary and post-secondary levels.

The Research Coordinating Units provide leadership for states' vocational education research and development programs; they also play a major role in long-range planning and development of vocational research priorities. In addition to their research and dissemination efforts amoung units, the RCUs occasionally provide to AIM/ARM information concerning ongoing projects or proposals. Also listed in the "Projects in Progress" section of AIM/ARM is a directory of state Research Coordinating Units, and titles of ongoing projects indexed by state.

Westinghouse Learning Corporation

With central facilities at 100 Park Avenue, New York, New York, the Westinghouse Learning Corporation (WLC) provides instructional materials in all media, for any given topic, and for audience levels ranging from pre-school through post-secondary institutions.

For those interested in instructional media, the Corporation provides a publication which lists all media in 47 different media classifications. This publication as well as its supplements comprises a catalog entitled Learning Directory. The "Directory" is designed to help the users obtain full information on all learning materials that meet their needs without having to restate or categorize the area of interest, thus eliminating cross-referencing. No judgment of educational quality or effectiveness is passed on entries in the Learning Directory; users are expected to form their own evaluation.

Information in the Learning Directory is divided into two sections:

the "Instructional Materials Index" and the "Source Index." Each entry appears under one or more topic entries in the "Instructional Materials Index" and contains the following column headings: Topic, Level, Medium, Title, Color, Sound, Size, Price, Source, Reference, and Notes. The "Source Index" section provides names, addresses, and telephone numbers for each publisher, producer, or distributor whose offerings are included in the "Instructional Materials Index." A section called "Users Guide" (with information on the scope, special uses, and indexing rules and abbreviations of materials indexed in the catalog) assists the user in effectively using the Learning Directory.

Xerox University Microfilms, Curriculum Materials Clearinghouse

The Curriculum Materials Clearinghouse (CMC), a subsidiary of Xerox University Microfilms, 300 North Zeeb Road, Ann Arbor, Michigan, is an educational information and publishing service designed to acquire, compile, and disseminate instructional materials in all subject areas and at all grade levels. The CMC audience includes students, teachers, administrators, and anyone interested in commercial instructional materials.

The functions of the Clearinghouse are to (1) provide the education community with practical and innovative materials and ideas that would otherwise not receive wide dissemination, and (2) provide publishing services to curriculum developers who have not found suitable means for disseminating their materials or who have not been inclined to disseminate their materials. Materials announced through CMC are listed, indexed, abstracted, and critiqued for dissemination. A cooperative network of information and publishing services makes dissemination of these materials possible: Curriculum Briefs and Index, Curriculum Materials Microfile, Curriculum Publishing Service,

and Curriculum Materials Copy Service.

Curriculum Briefs and Index is an information service which describes each instructional unit included in the Curriculum Materials Microfile; the Microfile contains microfiche copies of all materials submitted by curriculum developers and accepted by the Clearinghouse.

The Curriculum Publishing Service publishes new instructional materials in all content areas produced by developers. The Curriculum Materials Copy Service provides zerographic, lithographic, and microfiche copies of CMC printed materials on a demand basis. In addition, the copy service, upon request, obtains copy-right registration for eligible materials produced by its contributors.

REVIEW OF SYSTEM COMPONENTS

This section of the paper will review the components of information systems in terms of (1) geographic acquisition and distribution coverage and type of information acquired, (2) primary users, (3) media classification, (4) information acquisition, (5) information selection, (6) information processing, (7) information storage, (8) products and services, and (9) management structure.

Geographic Acquisition and Distribution Coverage and Type of Information Acquired

Table 1 shows the geographic coverage and the types of information acquired by the 13 systems. The "geographic" section of the table is divided into two dimensions: one showing the primary sources from which a system acquires information, and the other, the primary distribution of products/services by the system to its users. The "types of information" section refers to the types of materials, reports, speeches, and non-print information acquired by the systems.

The data point out that an overwhelming number of systems (11 out of 13) have a nationwide source for distribution of materials even though all the systems have a fairly specific group of producer institutions or organizations. The Research Coordinating Units (RCUs) provide the only state and local service while the Curriculum Coordination Centers' (CCCs) primary focus is at the state and regional levels.

As for the types of information sought by these systems, seven (54%) of the systems seek mainly instructional and curriculum materials. Although no system excludes instructional and curriculum materials, the Defense Documentation Center (DDC), the National Technical Information Service (NTIS), and

TABLE 1

GEOGRAPHIC ACQUISITION AND DISTRIBUTION COVERAGE AND TYPE OF INFORMATION ACQUIRED

SYSTEM	..eographic Coverage					TYPE OF INFORMATION ACQUIRED
	Information Acquisition Sources	Distribution of Products/ Services to Users				
		National	Regional	State	Local	
Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM)	Nationwide. USOE funded projects.	X				Education-related instructional/curriculum/demonstration/ research reports for vocational and technical education.
Aerospace Education Foundation (AEF)	Nationwide. U.S. Air Force training schools.	X				Air Force developed curriculum/instructional materials, mainly those applicable to civilian uses.
American Council on Education (ACE)	Nationwide. U.S. Military services training commands (Army, Air Force, Coast Guard, Marines, Navy).	X				Plans of instruction of all military services instructional programs.
Curriculum Coordination Centers, National Network of (CCCs)	Assigned regional areas of states for each of the 6 CCC's. Sharing of information between CCC's.		X	X		Vocational and technical education curriculum/instructional materials, both those in use & under development.
Defense Documentation Center (DDC)	Nationwide. All Department of Defense agencies.	X				Scientific and technical research reports and some instructional materials. Classified ones remain in DDC. Unclassified ones go to NTIS.
Educational Resources Information Center (ERIC)	Nationwide. Any source of education-related information.	X				Education-related (mainly printed) materials/reports of all types for all levels of education.
National Audiovisual Center (NAC)	Nationwide. All Federal Government agencies and departments (executive agencies) producing audiovisual materials.	X				Audiovisual materials of any type.
National Information Center for Educational Media (NICEM)	Nationwide. All sources of non-book, education/ training materials (multimedia).	X				Non-print, multimedia curriculum/instructional materials for all levels of education.
National Technical Information Service (NTIS)	Nationwide. Federal Government agencies and departments.	X				Scientific and technical reports and DDC unclassified materials.
Naval Institute, U.S. (NI)	Nationwide. U.S. Navy training schools.	X				Navy developed curriculum/ instructional materials, mainly those applicable to civilian uses.
Research Coordinating Units (RCUs)	Nationwide. From specific and general in sources depending on the information needed by RCU for internal work and/or external services to users.			X	X	Vocational and technical education materials/reports/research of all types and media.
Westinghouse Learning Corporation (WLC)	Nationwide. All instructional media suppliers/producers.	X				Curriculum/instructional materials of all media types for all levels of education.
Xerox University Microfilms, Curriculum Materials Clearinghouse (CMC)	Nationwide. All producers of instructional materials submitting materials to Clearinghouse.	X				Curriculum/instructional materials (mainly printed media) for all levels of education.

the National Audiovisual Center (NAC) can be classified as systems which deal more with scientific and technical research information.

It is evident that diverse sources of acquiring information exist, with a marked overlap in the "type" of information collected, especially, instructional and curriculum material. The particular type of organization or institution (e.g., school, research center, laboratory) at which the users of the systems reside can be seen to be very diverse if one extrapolated from the data on the types of information collected by the systems.

Primary Users

Users in this report refers to an individual, group of individuals, organizations, government agencies, or associations that use the systems' services. The users may be representative of a local, state, regional, national, or international geographic region.

Table 2 indicates that the users of the 13 information systems literally include anyone and everyone in the world who seek specific types of information. Five of the systems are clearly geared to the vocational and technical education trainers, educators, or personnel in the world of education and business and industry. One system, NTIS, probably has the most scientific and technically research/scientist-oriented users. ACE users are specifically college/university admissions officers. In only one instance, DDC, is the user group limited. In this case all unclassified, unlimited distribution information is sent to NTIS for public access.

In all systems there are very precise definitions of who the users may be (e.g., vocational educators, scientists), but the difficulty comes in making sure that what one person or system defines (e.g., a scientist) actually fits the role of a person using the system. Thus, although each system defines who its users are, the open access to products/services provided by all but one system, (DDC), makes it safe to say that the users of any system can be any person who wants the information, in the media format available, provided by a particular system.

TABLE 2

PRIMARY USERS

SYSTEM	USERS
Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM)	Vocational and technical educators, administrators and researchers, primarily in grade levels 9-14.
Aerospace Education Foundation (AEF)	Vocational and technical educators and trainers primarily at the post-secondary/junior college levels. Also, trainers in business and industry.
American Council on Education (ACE)	Admissions officers in junior/community colleges, colleges, and universities.
Curriculum Coordination Centers, National Network of (CCCs)	Vocational and technical educators involved with any of the aspects of curriculum and instructional materials development and utilization.
Defense Documentation Center (DDC)	Defense Department personnel, and contractors and subcontractors. Limited public access to unclassified materials only.
Educational Resources Information Center (ERIC)	All educational administrators, teachers, researchers, and other users interested in educational literature.
National Audiovisual Center (NAC)	Any users interested in audiovisual materials developed by the bureaus and agencies of the Federal Government.
National Information Center for Educational Media (NICEM)	Any users interested in non-print instructional media produced by commercial firms.
National Technical Information Service (NTIS)	Scientific and technical personnel, researchers, administrators. Some users interested in training.
Naval Institute, U.S. (NI)	Vocational and technical educators and trainers primarily at the post-secondary/junior college levels. Also, trainers in business and industry.
Research Coordinating Units (RCUs)	Vocational and technical education researchers, administrators, teachers, mainly at the secondary and post-secondary levels.
Westinghouse Learning Corporation (WLC)	Any users interested in commercially produced instructional materials in all media formats for all grade levels.
Xerox University Microfilms, Curriculum Materials Clearinghouse (CMC)	Any users interested in instructional materials mainly produced non-commercially.

Media Classification

Review of the literature indicates that the documented systems are interested in and provide for the users a variety of media formats. Four media categories are listed: printed, visuals, audio, and audiovisual. Printed media refers to books, reports, pamphlets, speeches, and other types of on-paper information.

Visual media refers to that information contained on slides, transparencies, photographs, silent films, filmstrips, charts, and the like. The visual information can be viewed by various projection methods, viewed in actual size (e.g., large wall charts and photographs) or be reduced to normal-range (e.g., 8 ½" X 11", or 11" X 14") printed-matter size. In the latter case, each system may apply a very specific selection standard to determine if the materials are relevant to their scope of coverage.

Audio media information consists of that found on phono-discs, audio tape cassettes, and audio tapes; while audiovisual media refers to video tape recordings, motion picture films, and slide/tapes, slide/records, or slide/cassettes.

Table 3 shows that nine of the 13 systems seek printed matter; eight seek visuals; five seek audio materials; and five seek audiovisuals. Only three systems (AEF, NI, and WLC) seek all four forms of media.

AIM/ARM, ACE, and ERIC deal exclusively with printed matter. Visuals (e.g., transparency masters, pictures, diagrams) contained as part of the printed materials are kept with those materials in the AIM/ARM and ERIC systems. While DDC, NTIS, and CMC seek mainly printed materials, they also accept visuals in so far as they are necessary adjuncts to the printed matter.

Whereas NAC and NICEM are limited, by their mandated scope of coverage to audio and visuals media, the RCUs and CCCs seek any media format depending on the particular information need at the time.

TABLE 3

MEDIA CLASSIFICATION

SYSTEM	Type of Media Materials			
	Printed	Visual	Audio	Audiovisual
Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM)	X			
Aerospace Education Foundation (AEF)	X	X	X	X
American Council on Education (ACE)	X			
Curriculum Coordination Centers, National Network of (CCCs)	As required, based on need.	Same	Same	Same
Defense Documentation Center (DDC)	X	X		
Educational Resources Information Center (ERIC)	X			
National Audiovisual Center (NAC)		X	X	X
National Information Center for Educational Media (NICEM)		X	X	X
National Technical Information Service (NTIS)	X	X		
Naval Institute, U.S. (NI)	X	X	X	X
Research Coordinating Units (RCUs)	As required, based on need.	Same	Same	Same
Westinghouse Learning Corporation (WLC)	X	X	X	X
Xerox University Microfilms, Curriculum Materials Clearinghouse (CMC)		X		

Information Acquisition

This component basically shows how the systems acquire their information, that is, what is done to get the information. Several terms used within Table 4 are defined below to assist the SYSTEM developers in effectively analyzing this component.

Standing agreements refer to a contracted or routinely agreed to procedure by which particular information producers or suppliers automatically provide a system with copies of the newest or most up-to-date information. An agreement most often refers to a free-of-charge provision of information to a system.

Solicited acquisitions refer to acquisitions which are received as a result of a system's requesting specific or general information from specified or unspecified sources via a newsletter, brochure, letter, speech, or the like.

Unsolicited acquisitions refer to those pieces of information sent to a system(s) by a producer or supplier because they believe the system(s) will most likely accept and utilize the information.

Standing orders refer to a contracted provision of information to a system by a supplier at cost to the system.

In some instances only specified sources provide the information, while in other cases any one of many publishers, authors, or others can supply information.

Table 4 shows that eight systems maintain routine standing agreements to continuously receive information within their scope from producers or suppliers. In some cases, most notably in DDC, NTIS, and NAC, it is mandated that the specified producers of information supply such information to a system when available.

TABLE 4

INFORMATION ACQUISITION

SYSTEM	ACQUISITION PROCEDURES AND SOURCES
Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM)	Routine routing of all Bureau of Occupational and Adult Education, U.S. Office of Education funded projects through Washington and regional USOE offices. Unsolicited reports.
Aerospace Education Foundation (AEF)	Continuous, direct contact with Air Force training schools and internal review of acquired training materials.
American Council on Education (ACE)	Continuous standing agreements with all military services training schools to provide plans of instructions to ACE. Some Air Force training material will be excluded.
Curriculum Coordination Centers, National Network of (CCCs)	General and specific requests for needed information and standing orders with suppliers.
Defense Documentation Center (DDC)	Continuous receipt of all information produced by DOD services (by mandate to services).
Educational Resources Information Center (ERIC)	Standing agreements. Reviews of literature for relevant information and ordering. General solicitations. Unsolicited information.
National Audiovisual Center (NAC)	Standing agreements with all federal agencies plus a general solicitation to those agencies.
National Information Center for Educational Media (NICEM)	Survey of commercial producers of non-print information to locate materials. Unsolicited information sent to them.
National Technical Information Service (NTIS)	Standing agreements with bureaus and agencies of the Federal Government.
Naval Institute, U.S. (NI)	Continuous, direct contact with U.S. Navy training schools and internal review of acquired training materials.
Research Coordinating Units (RCUs)	General and specific requests for needed information and standing orders with suppliers.
Westinghouse Learning Corporation (WLC)	Survey of commercial producers of instructional and curriculum materials. Unsolicited materials from commercial producers.
Xerox University Microfilms, Curriculum Materials Clearinghouse (CMC)	Solicited and unsolicited curriculum materials, mainly non-copyrighted, from non-commercial producers.

As can be expected from the defined coverage of each of the systems, sources of materials vary considerably. It is known, however, that there may be an overlap of systems' coverages and sources (e.g., ERIC covers information received and processed originally by NTIS, AIM/ARM, and DDC, while Xerox may cover information announced by AIM/ARM, ERIC, NTIS, or NICEM). Overlap of coverage is to be expected given the varying nature of information produced by any one type of producer or supplier (e.g., educational institutions do curriculum research and development, produce instructional materials, and conduct basic educational research).

Information Selection

This information system component consists of the standards or criteria applied by the systems to determine (if such a determination or selection process is really allowed within the constraints of system(s)' defined scope of work) what information, of all information received, will be utilized by the particular system.

Selection, assessment, and evaluation are all terms which imply a comparison of various qualities of information (e.g., content, media form, date of publication) with listed and hopefully validated standards or criteria of acceptability.

As presented in Table 5, AEF and NI have a very limited scope of coverage and utilize professional judgment as the means of selecting information. The CCCs and RCUs again, have a unique situation in that they acquire and select material as needed to satisfy their immediate information requirements.

AIM/ARM and ERIC are the two systems which show the most detailed selection criteria while other systems (e.g., DDC, NTIS, NAC, NICEM, WLC, CMC) tend to let their defined scope of coverage be the criteria for selecting information.

The entire issue of selection criteria is a difficult subject. Basically the selection process and so-called standards can be determined by defining for each system: (1) what information producers can supply the systems, (2) in what media format can the material be provided, (3) what user groups will be serviced by the system, and (4) specifically, what the content of the information must be.

System-wide standards of reproducibility, size, copyright, availability, and currentness can probably be easily defined and utilized by all systems.

TABLE 5

INFORMATION SELECTION

SYSTEM	SELECTION CRITERIA
Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM)	All reports from projects funded by USOE/BOAE are accepted. Unsolicited information must be for vocational education programs, grades 9-14. Content, reproducibility, and availability also determine acceptance.
Aerospace Education Foundation (AEF)	Relation of information to civilian application determines acceptability. Professional judgment used, no written standards evident.
American Council on Education (ACE)	All military plans of instruction are evaluated. Professional judgment used in evaluation process; no written standards evident.
Curriculum Coordination Centers, National Network of (CCCs)	All curriculum materials accepted from within the CCC region. Other materials accepted based on need for particular information.
Defense Documentation Center (DDC)	All Department of Defense generated technical information is accepted.
Educational Resources Information Center (ERIC)	All educationally related information accepted in terms of content, scope of coverage, reproducibility, availability, and media of presentation. Standards defined in Manual.
National Audiovisual Center (NAC)	All audiovisual materials produced by Federal agencies accepted. Audiovisual materials produced by other sources accepted if used by Federal agencies.
National Information Center for Educational Media (NICEM)	All non-book media produced by commercial firms is accepted.
National Technical Information Service (NTIS)	All Federal agency reports are accepted. Unsolicited reports accepted based on relevance to scope of NTIS coverage.
Naval Institute, U.S. (NI)	Relation of information to civilian application determines acceptability. Professional judgment used, no written standards evident.
Research Coordinating Units (RCUs)	Based on general and specific in-house and external, on-demand, as needed, requests for information as well as standard reference information.
Westinghouse Learning Corporation (WLC)	All instructional materials accepted from commercial publishers and producers.
Xerox University Microfilms, Curriculum Materials Clearinghouse (CMC)	All solicited and unsolicited instructional materials accepted from non-commercial publishers and producers.

Information Processing

Clarification or definitions of terms are needed to assist the reader in analyzing procedures utilized by the systems for processing or handling of received information as described in this component. Bibliographic data refers to the reviewing and recording of the information's title, author(s), corporate author(s), funding sources, length in pages, size in dimension measurements, year of publication, publisher, and copyright information.

Indexing means the classification categorization of the information's content, use, users, effect, and the like, using standardized (e.g., Thesaurus) or unstandardized terms which may or may not be hierarchically related and arrayed.

Abstracting refers to the process of writing a brief description of the information, be it an informative or indicative abstract, annotation, resume, or synopsis.

Cross-referencing means the process of relating numbers, titles, abstracts, authors, indexing terms, and related information to one another.

Reproducing refers to the procedures whereby the system(s) reproduces or copies the original information onto some media (e.g., paper copy copied on paper copy, microfilms, microfiche, film, etc.) for the purposes of storage, future retrieval or reference, and possible reproduction services to system(s) users.

Table 6 indicates that all 13 systems utilize bibliographic processing, a fact which could easily be assumed as mandatory processing for any information system.

Nine of the systems provide some kind of indexing process. AIM/ARM and ERIC utilized the structured ERIC Thesaurus for their indexing terminology (although they also have a non-structured "Identifiers" indexing option as

TABLE 6

INFORMATION PROCESSING

SYSTEM	Processing Procedures				
	Bibliographic Data	Indexing	Abstracting	Cross-referencing	Reproducing
Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM)	X	X	X	X	X (EDRS)
Aerospace Education Foundation (AEF)	X				X
American Council on Education (ACE)	X	X	X Evaluation Statement	X	
Curriculum Coordination Centers, National Network of (CCCs)	X		X		
Defense Documentation Center (DDC)	X	X	X	X	X (DDC & NTIS)
Educational Resources Information Center (ERIC)	X	X	X	X	X
National Audiovisual Center (NAC)	X	X		X	X
National Information Center for Educational Media (NICEM)	X	X		X	X
National Technical Information Service (NTIS)	X	X	X	X	X
Naval Institute, U.S. (NI)	X		X		X
Research Coordinating Units (RCUs)	As required of those pieces of information not already listed in some other system (e.g., ERIC).			X	
Westinghouse Learning Corporation (WLC)	X	X		X	
Xerox University Microfilms, Curriculum Materials Clearinghouse (CMC)	X	X	X	X	X

needed). DDC and NTIS utilize a variety of thesauri including the Thesaurus of Engineering and Scientific Terms, Thesaurus of DDC Description, COSATI Subject Category List, and DDC Authorized Identifiers. All other systems performing indexing use an unstructured or free-language approach.

Abstracting is performed by eight of the 13 systems; cross-referencing is performed by ten systems; and nine systems perform some form of reproduction of original copies of the information received.

Information Storage

Information may be stored in the format in which it is received or the system(s) may transpose the received information into a different format for storage. In the latter case the original media format may or may not be retained.

Table 7 displays data concerning the means by which the systems store the information they receive. The categories indicating the media of storage are self explanatory. The only exception is "Tapes/Cassettes-Audio" which includes the little used phonographic media of audio storage.

Four systems - AEF, CCCs, RCUs, and WLC - store information in all media formats. The CCCs and RCUs store information in the format received. Two systems, NICEM and WLC, do not necessarily store all the information they receive and process.

Excluding CCCs and RCUs, five systems (AEF, NAC, NICEM, NI, and WLC) select and process audiovisuals, and only three of them (AEF, NAC, and NI) maintain a complete collection of all information acquired. Again, as shown in other tables, the systems limit themselves in various component functions based on their defined scope of coverage (e.g., information content, media format).

TABLE 7

INFORMATION STORAGE

SYSTEM	Storage Methods								
	Papercopy	Microform		Tapes/Cassettes		Film			Transparencies
		Fiche	Film	TV	Audio	Filmstrip	Slides	Motion Picture	
Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM)	X	X							
Aerospace Education Foundation (AEF)	X	X		X	X	X	X	X	X
American Council on Education (ACE)	X								
Curriculum Coordination Centers, National Network of (CCCs)	X	X	X	X	X	X	X	X	X
					As required, based on information needed.				
Defense Documentation Center (DDC)	X	X	X						
Educational Resources Information Center (ERIC)	X	X							
National Audiovisual Center (NAC)				X	X	X	X	X	X
National Information Center for Educational Media (NICEM)				X	X	X	X	X	X
					Not all materials retained for storage.				
National Technical Information Service (NTIS)	X	X							
Naval Institute, U.S. (NI)	X			X	X	X	X	X	X
Research Coordinating Units (RCUs)	X	X	X	X	X	X	X	X	X
					As required, based on information needed.				
Westinghouse Learning Corporation (WLC)	X	X	X	X	X	X	X	X	X
					Not all materials retained for storage.				
Xerox University Microfilms, Curriculum Materials Clearinghouse (CMC)	X	X							

Products and Services

This component indicates the products and services which each system may provide. It is divided into three dimensions: printed products, searches services, and reproduction services. Printed products and indexes with or without abstracts, serves as reference tools the seeker of information can read (at specific locations or by some "subscription/mail" arrangement) and determine what information, products, and services are available from the system(s).

Searches, both computer and manual, are self-explanatory means of determining what the system(s) has in the way of relevant information to satisfy the needs of system(s) users. Such searches may be done through in-house facilities only or through external services (e.g., on-line search services) and products.

The reproduction services dimension indicates the media format(s) the systems use to provide copies of their acquired materials to interested users. Paper copy and microfiche are self-explanatory, while "other forms" refers to reproduction in microfilm, film, filmstrip, tape cassettes (audio and video), slides, transparency, and phonograph record formats.

The products and services as listed in Table 8 are provided to varying degrees by the systems, sometimes through the systems' headquarters (e.g., AEF, NI), sometimes through subcontractors (e.g., ERIC's ERIC Document Reproduction Service-EDRS), or through private firms and public agencies (e.g., AIM/ARM, and ERIC and NTIS data base are available for computer searching through Lockheed's DIALOG and System Development Corporation's search services, and through some RCUs and state departments of education). Each system has made a decision on what types of products and services it will offer and through whom they will be offered. The decision is usually based on cost

TABLE 8

PRODUCTS AND SERVICES

SYSTEM	Products and Services							
	Printed Products			Searches Services		Reproduction Services		
	Indexes Only	Indexes with Abstracts	Other	Manual	Computer	Papercopy	Microfiche	Other
Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM)	X	X		X	X		X EDRS	
Aerospace Education Foundation (AEF)			Catalog of materials			X	X	X
American Council on Education (ACE)			Guide					
Curriculum Coordination Centers, National Network of (CCCs)	Some	Some				Some		Some
Defense Documentation Center (DDC)		X	Rapid response bibliography		X			
Educational Resources Information Center (ERIC)	X GPO printed	X GPO printed		X	X EDRS	X EDRS	X	
National Audiovisual Center (NAC)	X							All forms and combinations of audio and visual media.
National Information Center for Educational Media (NICEM)	X							X
National Technical Information Service (NTIS)		X		X	X	X	X	
Naval Institute, U.S. (NI)		X				X		X
Research Coordinating Units (RCUs)	Some produce indexes for internal use.		Newsletters, Bibliographies	Some	Some	Some	Some	
Westinghouse Learning Corporation (WLC)	X							
Xerox University Microfilms, Curriculum Materials Clearinghouse (CMC)		X				X	X	

and technological factors as well as user groups and their assumed needs for various products and services.

Management Structure

A brief description of the management structure of each system in terms of top administration and location of facilities is presented in Table 9. Ten of the 13 systems utilize federal funds to varying degrees from full federal funding to heavy sharing of costs by users. Three of the systems are completely private, commercial endeavors for profit (NICEM, WLC, and CMC).

The CCCs and RCUs, networks of six and 57, respectively, are separate but similar-in-function locations. Each of the RCUs and CCCs has its own director or co-directors and facility. RCUs' functions are similar, as are the CCCs'. Each "networked" system interacts within that system and between systems. These particular systems have been specifically built for the servicing of the nation's vocational and technical educators' educational research and curriculum/instructional materials information needs.

The remaining 11 systems all function with one director and maintain a central facility or headquarters. DDC branches out to include several information analysis centers located throughout the country, while ERIC branches out from an administrative headquarters to a nationwide, subject-oriented system of 16 clearinghouses, a central publication/processing coordinating facility, and a document reproduction facility. AIM/ARM maintains a central processing/management facility but utilizes the ERIC system for its document reproduction services. All other systems maintain one central facility for management, processing, and user services.

TABLE 9

MANAGEMENT STRUCTURE

SYSTEM	Operating Characteristics	
	Management	Funding
Abstracts of Instructional and Research Materials in Vocational and Technical Education (AIM/ARM)	Project Director. Central facilities (except for duplication services through EDRS).	Federal. Paid subscribers. Complimentary subscribers paid by Federal funds. EDRS handles microfiche (see ERIC below).
Aerospace Education Foundation (AEF)	Managing Director. Central facilities.	Federal for some studies. A subsidiary of the Air Force Association. Cost-recovery through sales. Not-for-profit organization.
American Council on Education (ACE)	Project Director. Central facilities.	Federal for some studies. A subsidiary part of the National Council for Higher Education.
Curriculum Coordination Centers, National Network of (CCCs)	Single director for each CCC. Each CCC coordinates regions of varying numbers of states, each state having a curriculum liaison person.	Federal. Also, some cost-recovery.
Defense Documentation Center (DDC)	Single director. Central facilities except for information analysis centers. Reproduction service for unclassified, unlimited distribution items through NTIS.	Federal.
Educational Resources Information Center (ERIC)	System wide director. Central headquarters in NIE. Central processing headquarters through contract with commercial firm. Diffused 16 clearinghouses contracted at remote sites. Commercial contracted document reproduction services.	Federal. Paid subscriptions through GPO. Document reproduction service [illegible] cost-plus-profit through commercial firm.
National Audiovisual Center (NAC)	Director. Central facility.	Federal. Also, cost-recovery through sales and rentals.
National Information Center for Educational Media (NICEM)	One director. Central facilities.	Private subscription/sale of catalog.
National Technical Information Service (NTIS)	One director. Central facilities.	Federal.
Naval Institute, U. S. (NI)	One director. Central facilities.	Federal funds for some studies. Non-profit organization.
Research Coordinating Units (RCUs)	Located within state department or university administration. Single or co-directors.	Federal funds given to states to administer. Some cost-recovery services (searches, duplication).
Westinghouse Learning Corporation (WLC)	One director. Central facilities.	Private. Subscription/sale of catalog (directory).
Xerox University Microfilm, Curriculum Materials Clearinghouse (CMC)	One director. Central facilities.	Private. Subscription/sale of microfiche, catalog, services.

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This final section of the review draws conclusions based upon the findings, examines several implications for the development of the SYSTEM, and offers up recommendations for SYSTEM design.

Conclusions

It must be strongly emphasized that the U-S-E-R is the most important factor in any information system (other than those which can be considered archival, and even these systems are for the benefit of a distant-future user). Without knowledge of user characteristics and information needs, there is little or no value in any system. Therefore, with the SYSTEM user in mind, the following conclusions are reached:

1. The context in which most of the information dealt with and collected by each of the 13 systems is unique in most cases, with some overlap of "producer/supplier" types (e.g., military, education, scientific, technical).
2. The nature or types of information collected by the systems vary, with all systems covering educational/training (curriculum/instructional) types of information to varying degrees.
3. Considerable differences exist in the types of products and services provided users by the systems, depending on the type of information collected and the types of coverage, products, services, and users each system is intended to deal with.
4. The users of the systems vary considerably depending upon the nature of the information-producers "covered" by each system, the nature of the information collected by each system, and the defined/limited

user groups to whi[illegible]tems are open.

5. Each system has some capacity to satisfy the information needs of users interested in utilizing military-produced educational/training information.

The foregoing five conclusions describe a situation in which a seeker or user of information (in this case, instructional/curriculum materials) must be cognizant of his or her exact information needs; the types of producers who create the information he or she seeks; the particular information system(s), among many, which would have the information; and the availability of the information from an information system in a particular, usable media format.

Implications

The implications of this review in terms of the design and operation of a SYSTEM to provide military-developed instructional materials to civilian users are described below.

1. The designers of the SYSTEM need to "study" the potential users of such a SYSTEM to determine what types of instructional/curriculum materials they need. Such a "needs investigation" is being conducted by project staff through a school survey.
2. The designers must study the producers of information to determine specifically what types of information are produced; for whom; for use under what circumstances, and in what time period; with whom; and in what media format.
3. The designers need to study the technology and science of information transfer, not merely in terms of existing systems and how they satisfy user needs for information, but rather in terms of how users would,

given that they know needed information exists, like to receive that which is now available and be kept up-to-date on what becomes available in the future. This study is closely allied with the "user study" mentioned in item number one.

A SYSTEM designed with the user in mind will provide to vocational and technical education users timely, accessible, relevant, comprehendible, and useful information about military-developed instructional materials.

Recommendations

Based upon the review, the conclusions, and the implications the following recommendations are made:

1. In designing the operating and facilitating components of the SYSTEM, it will be necessary to identify specific procedures related to acquisition and selection; processing; reproduction and dissemination; evaluation and feedback; and requirements for staffing, equipping, and financing. Therefore, it is recommended that more in-depth information be secured about the operation of the information systems reported in this review and that representatives of the "key" systems be consulted in designing the SYSTEM for making military curriculum materials available to civilian vocational and technical schools.
2. With the diversity of existing information systems (as described in the tables) to serve the user information needs, and with the systems' lack of comprehensive and centralized services and products to meet the users needs, it is recommended that the SYSTEM be national and centralized. The SYSTEM should be designed to have one point from which users request and receive products and services.

3. Although the SYSTEM should be centralized it is recommended that it be one linked with existing systems to create an effective and efficient "network" which (a) provides information to the users on request; (b) collects the information requested by users; (c) provides the users with information in the media format most easily used by them and cost-effectively produced by the SYSTEM, and (d) interacts with the users to obtain their comments about the SYSTEM. Thus, it must be a SYSTEM which uses existing system products and services to the fullest advantage (cost and benefit-to-the-user factors being considered), yet a SYSTEM which acts as the focal point for those products and services. In other words, the SYSTEM must be the place where users would go to get the "information products and services" they need. Such products and services can be produced and provided directly by the SYSTEM or produced by another information system, but distributed to the user by the SYSTEM. However, there are some practical problems involved which need to be pointed out regarding a SYSTEM distributing products or services produced in other information systems. For example:

a) Potentially long turn-around time in response to requests.

b) Inhibiting procedures and practices of other information systems.

c) Handling of user payment for other services.

d) General lack of "control" over outside information systems.

Such a SYSTEM, like a supermarket with many kinds and brands of food products in one store, provides the user easy access, through a central and convenient place to shop, to information produced by the SYSTEM itself or by many other existing information systems.

SUMMARY

As noted earlier in the review, the USER is the focal point of any information system. The facts known about civilian applicable military-developed curriculum materials and information systems serving the needs of users for any curriculum materials show that:

1. the materials and information do exist;
2. the materials and information are, to a limited extent, available through a variety of systems;
3. within users' timeliness, relevance, and usability (media format) factors, the information is difficult to obtain - given the complexity and diversity of existing information systems;
4. there is a need for some centralized, coordinating SYSTEM to be developed and operated to provide military-developed curriculum materials to civilian educators and trainers;
5. the proposed SYSTEM need not be totally new, but should utilize existing information system products and services, adding its own unique products and services only when necessary; and
6. there should be centralized access to the SYSTEM in order to make it as attractive, efficient, and effective as possible for users to learn about the SYSTEM and its products and services, and to actually use that SYSTEM for their benefit (also, to feel free to interact with the SYSTEM to comment on its efficiency, effectiveness, and value.)

To serve the information and curriculum materials needs of vocational and technical educators and trainers (in this case a need for military-developed materials), a new information system need not be developed. Instead, a centralized SYSTEM needs to designed, pulling together current activities, people, facilities, and products and services from existing information systems, and adding its own products and services when necessary. Such a SYSTEM does not now exist, but is necessary in order that vocational educators and trainers can have ready access, in a timely and uncomplicated manner, to curriculum materials developed by the military.

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