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ABSTRACT

An information system analysis, development, and implementation program was conducted at Hamline University to create a dynamic, responsive targeted information system that would support curriculum-based requirements. Existing information system inadequacies were diagnosed; a new concept was proposed and empirically tested. The concept was put into effect on a small scale and used to project the requirements of an expanded operation, and a full-scale system was implemented. The system focused upon the information specialists who linked information requirements generated by the curriculum to information resources; task models of courses were constructed and used to derive information needs and to evaluate products and services. The system proved to be effective, for interactions with librarians rose by a factor of three for students and 14 for faculty. Material provided from off-site sources increased tenfold and the judged effectiveness of disseminated materials was around 85 percent. Professors expanded the range of material in their courses and modified the format of some courses due to the availability of the information specialists, who became the partners of the professors in enriching the educational experiences of the students. (Author/PB)

DEVELOPMENT AND IMPLEMENTATION OF A CURRICULUM-BASED INFORMATION SUPPORT SYSTEM FOR HAMLINE UNIVERSITY

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Dr. Jerry S. Kidd, who has been a friend and a consultant of the project from the beginning, has worked with the authors in developing many of the guiding concepts of the system. Dr. Kidd is a professor of Information Science at the University of Maryland.

At Hamline University the job of day-to-day supervision and coordination of on-site system personnel was ably accomplished first by Mr. H. F. Johnson (current Head Librarian, Oberlin College) and later by Mr. Jack B. King. Additionally, they both worked closely with University administrators to insure the success of the system implementation and the eventual integration of system costs into the operating budget of the University.

This project could not have been accomplished without the enthusiasm, dedication and creativeness of the entire system staff. The four information specialists, Lois Byrum, Tinna Wu, Carolyn Sorensen and Dorothy (Pat) Tehters, contributed many important insights throughout the development effort. The two clerical supervisors, Carol Steele and Karen Kolb, were extremely useful in identifying procedural inefficiencies in the clerical operation and in proposing and implementing needed solutions.

Finally, we wish to thank those professors and students who worked closely with us in both the pilot and experimental phases of development. These individuals put in many hard hours helping us to perfect the task analysis methodology as a means to identify needs and to develop responsive information services.

ABSTRACT

During the period April 1967 to June 1973 the National Science Foundation, Office of Science Information supported an information system analysis, development, and implementation program at Hamline University. The impetus for the program was the concern of Hamline librarians that their information services were becoming progressively less relevant to student and faculty requirements, and that new directions and alternatives needed to be explored, tried out and evaluated. The goal was to develop a dynamic, responsive, targeted information system that would directly support curriculum-based requirements.

The program progressed through a series of five phases in which the existing information system inadequacies were diagnosed, a new concept proposed and empirically tested for feasibility, the concept put into effect on a small scale and used to project requirements and costs of expanded operations, and finally, a large-scale system implemented which serviced every member of the Hamline faculty and student body.

The central features of the system are contained in the role of the information specialist who serves as a link between the information requirements generated by the curriculum and available information resources. The specialists work with professors to construct a task model of each supported course. These task models are used both as the basis for deriving information needs and as a reference for the evaluation of products and services provided.

Data collected during the experimental and implementation phases of system development attest to its effectiveness. Librarian-user interactions were three times greater for students and fourteen times greater for faculty than occurred in the traditional library operation. The amount of material provided by the new system from off-site resources represented a tenfold

increase over the traditional system and the judged effectiveness of disseminated materials to course related tasks was on the order of 85-88%. At a qualitative but equally important level of evaluation, information specialists contribution to the educational process was in substantial evidence: professors expanded the range of material included in their courses, and in some instances modified the format of the course due to the availability of the information specialist. To some extent the information specialist became a teaching partner of the professor in enriching the educational experience of the students.

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DEVELOPMENT AND IMPLEMENTATION OF A CURRICULUM-BASED INFORMATION SUPPORT SYSTEM FOR HAMLINE UNIVERSITY

I. OVERVIEW

A. Background

Hamline University is a small liberal arts college located in St. Paul, Minnesota. It is composed of approximately 80 teaching faculty, 1200 students, and a library collection of 130,000 volumes. Since 1967, members of the Hamline Library staff have been working in conjunction with Whittenburg, Vaughan Associates personnel to develop, as part of the library operation, a system of information services which would directly support curriculum-oriented requirements. This effort has been conducted under the sponsorship of the National Science Foundation, Office of Science Information Service.

1. Problem Statement. The Project grew out of a recognition on the part of Hamline librarians that the traditional library operation was making less and less input to the educational program at Hamline University. There were several major factors contributing to this decline: large increases in the amount of printed material being generated; a limited and relatively constant budget for informational materials; emphasis on technical service operations such as acquisitions, cataloging, storing rather than on the provision of information services to faculty and students; and lack of effective marketing for available information services. In order to obtain a more systematic picture of the existing information problem, Phase I of the project was initiated. In this phase a descriptive analysis was

developed of the information environment of Hamline University, with particular emphasis on identifying the deficiencies of the library as a provider of useful services and materials to faculty and students. This analysis focused in three areas: (1) the information needs and information-gathering habits of faculty and students, (2) the operating procedures and collection characteristics of the Hamline library and (3) the services and collections available at off-site resources used by Hamline faculty and students. Information on faculty and student needs for materials and services was gathered through a series of open-ended interviews with a large percentage of the faculty and a representative sample of students. These interviews were designed to obtain descriptions of the activities of faculty and students which required information support, and the procedures used for identifying and obtaining materials to meet these requirements. The description of the library was developed through interviews with key library personnel in acquisitions, serials, cataloging, circulation and reference, and through analysis of data collected on library operations. This information was used to create flow diagrams of all library operations and to characterize the collection by the academic areas represented on the Hamline campus. Descriptions of local off-site resources were obtained by interviewing head librarians and by reviewing documentation on the collections and the services offered by these resources.

The major finding of this first project phase was that many information requirements of Hamline faculty and students were being satisfied outside the Hamline library. Both faculty and students relied heavily on off-site local resources for identifying and obtaining materials useful in performing their academic tasks. In some cases, needed materials were not obtained because of the time and energy necessary for search and retrieval. This extensive use of external resources was attributed to three factors: (1) the limited collection of materials on-site, (2) the time delay associated with

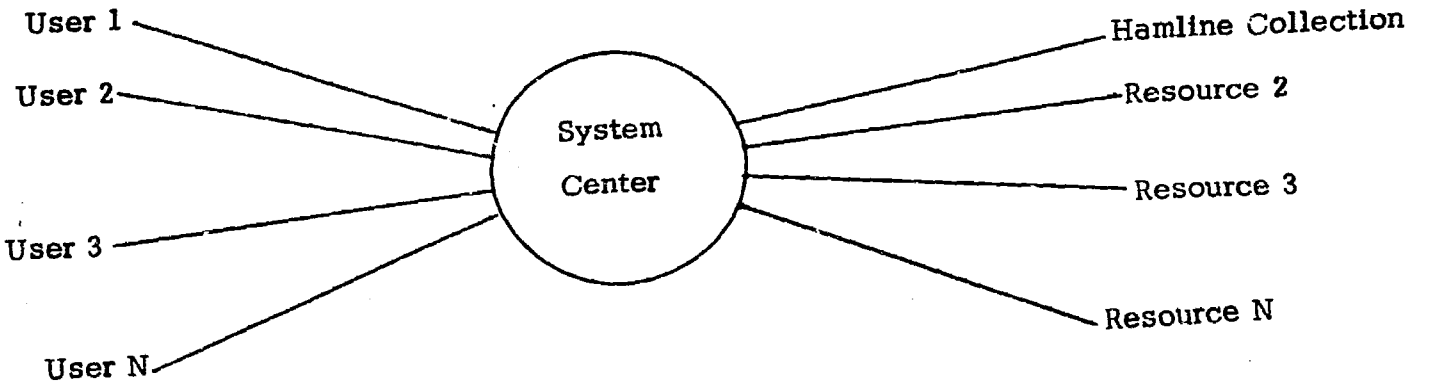
acquiring and processing new materials, and (3) the lack of awareness on the part of the users as to what materials were held by the Hamline library and what services were available. It was clear from the accumulated data that if the library did not alter its current mode of operations, it would become progressively less useful to the educational program. Over time it would acquire a successively smaller proportion of the materials being published and unless more direct and positive links were formed between the faculty and the students in the form of service, these potential users would depend to an increasing degree on off-site resources. A detailed description of the work effort in Phase I is reported in Schumacher, 1968.[1]

2. Proposed System Concept. The findings of Phase I led to the development of a new concept of library service for Hamline University. The concept involved the library acting as a dynamic link between faculty and student needs for information on the one hand, and the information materials and services that would satisfy these needs on the other. Librarians operating as information specialists would work actively with faculty and students to identify information requirements and provide individually-tailored services to match requirements with relevant sets of materials. Materials not available through the Hamline collection would be obtained by tapping collections available at other information centers (see Figure 1). The types of services offered would be derived from the information needs identified on the campus. The materials selected for dissemination would undergo minimal processing in order to facilitate quick delivery.

a. Description of User Needs. The first step in the proposed approach to need-diagnosis was to develop a systematic description of the context in which the needs occur. Since, at Hamline, the major activities

[1]Schumacher, A. W., A Small College Information System: An Analysis and Recommendations (Alexandria, Va.: Whittenburg, Vaughan Associates, 1968).

Figure 1. System Concept



-IDENTIFY Information Requirements

-EVALUATE Usefulness of Materials Provided

-TRANSLATE Information Requirements Into Sets of Material

- LINK Material Requirements to Resources

-OBTAIN Selected Materials

-DISSEMINATE Selected Materials

-DEVELOP Procedures For Obtaining Materials

of both faculty and students relate to course preparation, course conduct and course assignments, the academic course was selected as the basic unit of analysis. The planned procedure was to describe the faculty and student tasks associated with each course and then to determine the information needed to facilitate the performance of these tasks. The task descriptions would be obtained through a series of work sessions between the information specialist and the faculty member. Once a structured set of tasks was identified, the detailed need diagnosis procedure would begin, using the tasks as the basis of support requirements. Need diagnosis work sessions would be conducted throughout the period of the course. Each need identified in these sessions would be related back to a course task. Further need diagnosis would be carried out through attendance of class sessions and through structured work sessions with students.

b. Provision of Services. As stated earlier, the services provided by the system would be derived from analysis of faculty and student information requirements. These services might include searching through popular and professional literature, creating specialized information packages (e.g., data compilations, tables of extracted materials, etc.), identifying relevant audio-visual aids, and locating and disseminating selected materials. If needed materials were not available through the Hamline collection, cooperative arrangements would be established with other libraries and information centers. Once selected materials were obtained, procedures would be needed for quick processing and dissemination. It was expected that the bulk of material provided through the system would be in the form of reprints, photocopies, pamphlets, and other non-durable forms.

3. Feasibility Test of Proposed System Concept. Phase II of the project was devoted to testing the feasibility of implementing the proposed system at Hamline University. The purposes of this phase were threefold:

(1) To determine if the task analysis approach could provide a sufficiently detailed description of information requirements to serve as a basis for designing information services

(2) To determine if cooperative arrangements could be set up with off-site resources having materials relevant to the needs of system users

(3) To determine if efficient procedures could be established for providing faculty and students with services and materials to match their requirements.

The first step in establishing feasibility was to select and describe a small sample of courses. The criteria for selecting courses for analysis included: a perceived need for information on the part of the responsible faculty member, a course content area that was dynamic, and a faculty member who had extensive experience in teaching undergraduate students. Using these criteria, four courses, representing the disciplines of biology, history, sociology and economics were chosen for description and eventual information support.

The development of course descriptions and the initial identification of information requirements involved three two-hour work sessions with each faculty member. In the first session, the faculty member was asked to describe what he did in preparing for and conducting the selected course. This description included the purposes of the course and the steps taken to achieve these purposes. The results of this session were then organized into a model picturing tasks performed and guidelines used in performing each task. (See Section II, Figure 3 Task Model.) The second and third work sessions were devoted to elaborating the task descriptions and identifying the types of information needed to facilitate the performance of each task. This modeling effort resulted in a framework for further need definition discussions. Basically, the model development process provided both the

professor and the information specialist with a common understanding of course tasks and the information related to those tasks.

The second step in the feasibility test focused on developing characterizations of potentially relevant off-site information resources and examining the potential for cooperative arrangements with them. A one-page questionnaire was sent to 195 libraries and information centers identified as possessing materials which matched the subject areas in the four participating courses. This questionnaire was designed to obtain information about the content characteristics of the collection, the services offered, the procedures required to make use of each service, and the cost and turn-around time associated with each service. One hundred and nineteen of the facilities indicated their willingness to cooperate through the provision of at least one service. The major areas of cooperation included photo duplication, preparation of bibliographies, circulation of acquisition lists, inter-library loan, selective dissemination and referrals.

At the local level, the Hamline library was participating in a cooperative network with six other college libraries. These colleges were planning to make all materials in each collection available to faculty and students at each member institution. Additionally, a daily pick-up and delivery service was operating between these libraries.

The third step in establishing feasibility was to set up a pilot operation of the proposed system to provide information support services to the faculty and students in the four participating courses. The services provided by this pilot operation were derived directly from the need statements associated with the course tasks. Throughout the period of support, information specialists conducted periodic need definition work sessions with faculty and students. Internal operating procedures were set up to provide quick and maximally useful services. The pilot system was staffed by two information specialists. These specialists kept daily records of services provided,

functions performed, efficiency of external resources tapped, and material costs. The specialists provided five major services: topic searches for background and current material, location of specific citations, answers to factual questions, compilation of extracted material on a given topic, and guidance to students in selection and use of appropriate bibliographic resources.

Basically, the results of the pilot system operation demonstrated the workability of the proposed concept. During the period of support, 527 articles and pamphlets were provided to faculty and students in the four participating courses. Approximately 20% of these materials were located in the Hamline library; 80% were obtained from 25 off-site resources. The average turn-around time for external resources ranged from one to two days for local resources to four weeks for government agencies and civic organizations. Although no quantitative data were collected on service value, subjective evaluations by faculty indicated that most of the material had been useful to both themselves and their students. Based on these findings it was recommended that the Hamline Library undertake a three-year project to develop and implement a curriculum-based information support system. (A detailed description of Phase II can be found in Johnson, et. al., 1970).[2]

B. System Development and Implementation

System development and implementation was accomplished in Phases III, IV and V. Phase III was an experimental operation of the proposed system concept; Phase IV involved the generalization of experimental system findings to expanded system requirements and costs; Phase V was the implementation of an expanded system.

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[2]Johnson, H. F., King, J. B., Mavor, A. S. A Feasibility Study for Establishing and Information Switching Center at Hamline University. Annual Report under NSF Grant GN-786, Hamline University, St. Paul, Minnesota, April 1970.

1. Phase III: Experimental System Operation. The experimental system was operated for one academic year in support of 30 courses. One of the purposes of this operation was to further delineate system services, functions and procedures,and to develop an organization of professional and clerical personnel to perform system functions. Of particular emphasis was the development of a detailed specification of the information specialist role in terms of interaction with faculty and students, performance of internal system functions, and coordination with clerical operations. Project work in this area focused on refining the methodology for task analysis and need diagnosis, developing forms and files for efficiently recording, processing, disseminating and evaluating materials provided in response to requests for service, and constructing job aids for both information specialists and clerical personnel.

A second purpose of the experimental operation was to develop a means for collecting data which could be used to examine the cost and effectiveness of offering selected information services, and to project future costs associated with providing system services to an expanded set of courses. Throughout the experimental system operation, records were kept on the amount and category (professional/clerical) of personnel time spent on each system function, the cost of materials provided to each user and each course, the turn-around time required to satisfy each information request, the efficiency of external resources tapped, and the usefulness, as judged by faculty and students, of each document provided by the system.

The third purpose of the experimental system operation was to provide students in the 30 supported courses with a fuller and more meaningful educational experience. Several of the participating faculty members restructured their courses to take advantage of the services offered by the system and in general, students were provided with more information from a larger variety of sources than they had experienced in the past. Library-user contacts in the form of focused reference were three times more frequent for students in

supported courses than for students receiving traditional library services; faculty contacts increased from an average of one per term to 14 per term. Overall, 1,902 documents were processed through the system in support of the 30 courses. Of the 1,542 documents evaluated by faculty and students, 83% were judged as being useful in supporting some course-related task.

2. Phase IV: Generalization of Experimental System Results. This phase involved two tasks: describing the information service requirements associated with all academic courses, and projecting the system costs for providing these services on a campus-wide basis. The description of service requirements was accomplished through the administration of a two-part questionnaire to all faculty members. The first part of this questionnaire was designed to obtain characterizations of each course taught by the faculty member (see Appendix B for sample questionnaire). The response categories were developed directly from results of previous task analysis interviews. Some of these categories included: specification of course objectives, course format, topic characteristics, reading characteristics and student assignments. The second part of the questionnaire dealt with the categories of information services that might be useful in supporting each course. This part of the questionnaire had several forms which corresponded to the various course descriptions (see Appendix B for example). Ninety percent of the faculty responded to both questionnaire sections. The results provided a picture of both the kinds of services desired and the level of demand for each of these services.

System cost projections for a campus-wide system were developed by combining the generalization questionnaire results with the service costs obtained from operating the experimental system. These projections were used to prepare three alternative system implementation plans: support to all campus courses, support at a level of one course per term to each faculty member and their students, and support to all courses in one of the three

academic divisions (science, social science, fine arts and humanities). The personnel projections for full campus support required six information specialists with clerical support; four information specialists were projected for a system of limited support to all faculty and students; one or two information specialists were required to provide support to a single academic division. These plans were reviewed by the University administration and the plan for limited support to all faculty and students was selected for implementation.

3. Phase V: System Implementation. The system implementation plan involved the scheduled phasing-in of new faculty members, courses and students to be supported by the system, the development of an information specialist training program and the integration of the system with the traditional library operation.

The phasing-in of new courses to receive information support services was carried out over an 18-month period. At the end of this time, all faculty members had been supported for at least one course offering. Throughout the implementation, data were collected on all cost and effectiveness areas of system operations.

A second focus in this phase was the development of training materials for new information specialists. As part of this effort, a training manual was designed and a task analysis exercise was devised. The contents of the training manual were based on the role definition work conducted during the operation of the experimental system.

A third area of concentration was the creation of a plan to integrate the system functions with the operations of the traditional library. The primary areas of overlap between the system and the library were reference and circulation. A number of alternative schemes were devised to combine common functional areas as a basis for personnel assignments. A common aspect of the proposed plans was that all faculty and student services were effected through the information specialists. Thus, the information specialists would

require procedures for coordinating with all library departments as well as with the faculty and students.

II. OPERATION OF AN EXPERIMENTAL SYSTEM

The experimental system operated for one academic year and provided full information support to faculty and students in 30 courses. The courses participating in the first term of operation were selected on the basis that they would generate a large demand for a variety of information services. It was felt that the faculty and student requirements associated with these high demand courses would provide the system with a specification of the range of information services needed on the campus. Courses selected to participate in the second term of operation were chosen to broaden the subject area coverage of the system.

The purposes of the experimental operation were fourfold: (1) to delineate and describe system services and functions, (2) to characterize the role of the information specialist within the system, (3) to develop procedures and forms for efficiently processing and satisfying faculty and student requests and (4) to assess the cost and the usefulness of services provided by the system. The remainder of this section discusses the information collected during the operation of the experimental system in terms of the four purposes.

A. Delineation of System Functions

Throughout the experimental system operation detailed records were kept by both professional and clerical personnel concerning the procedures used in providing required information services. Analysis of this documentation led to the categorization of specific functions and procedures into five major work areas: interaction with the user, translation of user needs into relevant sets of materials or information products, coordination with off-site resources, internal processing and record keeping, and system monitoring and evaluation. Table 1 provides a breakdown of the specific system functions included in each of these areas and indicates the categories of personnel responsible for performing these functions. In the first two

TABLE 1
SUMMARY OF SYSTEM FUNCTIONS AND RESPONSIBILITIES

Functions	Information Specialists	Clerks
Interaction with the User		
• Describe the context in which the need occurs	x	
• Identify and delineate specific information requirements	x	
• Guide students in use of bibliographic tools and search strategies	x	
• Obtain evaluative feedback from faculty and students	x	
Translation of User Needs into Sets of Materials or Information Products		
• Develop understanding of terminology in subject area of request	x	
• Develop current and retrospective search strategies	x	
• Identify and select material relevant to the need	x	x
• Evaluate retrieved material for relevance	x	
• Prepare information products which match needs	x	
Coordination with Off-Site Resources		
• Order materials from local network (CLIC)		x
• Select other useful local, regional and national resources		x
• Record cost and turn-around time for all resources used .		x

TABLE 1. SUMMARY OF SYSTEM FUNCTIONS AND RESPONSIBILITIES (Cont.)

Functions	Information Specialists	Clerks
Internal Processing and Record Keeping		
• Verify references for requested materials		x
• Search Hamline Library for requested materials		x
• Process received materials - record cost, resource, turn-around time, etc.; make photocopies if required.		x
• Disseminate processed material to information specialist, faculty, student, reserve		x
• Maintain files		x
• Fill-out data collection forms for system evaluation	x	x
System Monitoring and Evaluation		
• Collect data on all system functions	x	x
• Summarize data		x
• Analyze data	x	x

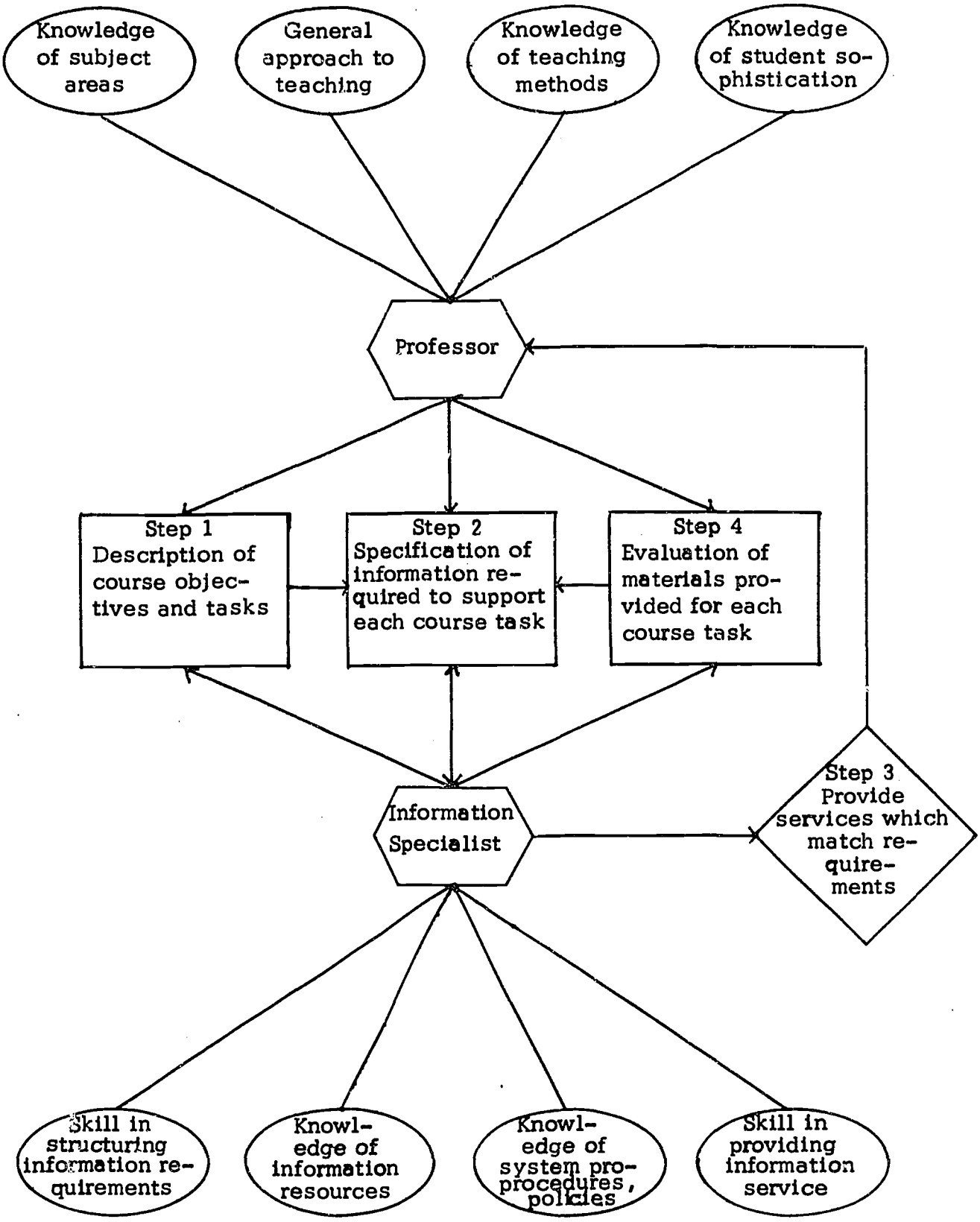
categories, interaction with the users and translation of user needs into relevant sets of material, the information specialist has primary responsibility. Work in these areas focuses on describing the context of the need, developing a detailed need characterization, matching the need with appropriate services and obtaining evaluative feedback from faculty and students on the usefulness of services provided. Responsibilities for coordinating with external resources and for internal record keeping lies principally with the system's clerical staff. Functions in these two work

areas include locating and ordering requested materials, evaluating the efficiency of off-site resources in filling orders, processing and disseminating received materials, and maintaining system files and data collection forms. The final system work area includes the administrative functions of monitoring system performance. This area involves the collection of data by professional and clerical staff on all system functions. Periodic summary and analysis of these data provide corrective feedback to the system operation. For example, the results of the analysis can be used to identify functions that are being performed inefficiently. This information provides the system manager with a basis for making timely procedural alterations.

B. The Information Specialist Role

Effective performance on the part of the information specialists is critical to the successful operation of the system. Basically, these individuals are responsible for insuring that the system receives a complete and accurate statement of faculty and student information needs as they relate to course activities, for translating these needs into sets of materials, for coordinating requests for materials with the clerical support section, and for adjusting services to reflect evaluative feedback received from faculty and students. Figure 2 shows the interactive relationship which occurs between the faculty member and the information specialist as these responsibilities are being carried out. The information specialist and the faculty member bring to this interaction diverse sets of skills and knowledge which, when combined, work to provide a richer educational experience for the student. The first step in establishing the faculty-information specialist relationship is to develop a description of the course objectives, the course-preparation tasks, the course-conduct tasks and the student assignments. In the performance of this step, the information specialist introduces a series of potential course tasks for discussion; in describing course tasks the faculty member draws on knowledge of subject areas, general approach to teaching, knowledge

Figure 2. Information Specialist Role



of teaching methods and knowledge of student sophistication. The resulting description represents a shared understanding of the context in which information is used. The second step involves the specification of information requirements associated with the performance of each course task. In this step the information specialist draws on his skills in structuring information requirements and on knowledge of information resources. The faculty member responds in terms of subject knowledge deficiencies, level of sophistication of needed material and potential use of the material. The third step is for the information specialist to translate the needs, perform necessary services and provide selected material to the faculty member. In this step, the information specialist uses the course description, the specific need definition and prior evaluative feedback from the faculty member as well as drawing on knowledge of information resources, knowledge of system policies and skill in providing information service. The fourth step is an evaluation by the faculty member of the material provided. In this evaluation, the faculty member uses the course description, the specification of information requirements and subject knowledge background to assess the usefulness of each document or information package in terms of the course task it supports. The evaluation provides both the faculty member and the information specialist with a basis for further refining the statement of information requirements. The following sections will provide a detailed discussion of the procedures associated with accomplishing the four steps represented in Figure 2.

1. Development of Course Description. The primary purpose of developing the course task description is to provide the information specialist and the faculty member with a common understanding of the course, and to create a structured framework for identifying information needs, for providing services and for assessing the usefulness of those services. The more the information specialist can understand about the course and the perspective

of the faculty member teaching the course, the more focused the information support services will be.

The course description procedure requires two or three interview work sessions between the information specialist and the faculty member. The first work session is devoted to determining how the faculty member views his course, identifying the tasks performed in preparing and conducting the course and determining how course tasks relate to course objectives. This is accomplished by the information specialist's introducing task categories for discussion. Based on the course descriptions developed during the feasibility test and the experimental system operation, nine task categories have been identified. Appendix A provides a complete list of these tasks and the guidelines associated with their performance. Briefly they are:

- Specifying objectives. The ways in which the students' attitudes, knowledges and skills should be influenced or modified by the course.

- Selecting methods for conducting the course. The primary methods used (e.g., lecture, reading and discussion, etc.) and the ways in which these methods help implement course objectives.

- Selecting topics to be covered in lecture/discussion sessions. Characteristics of topics included in the course.

- Selecting reading for the lecture/discussion. Characteristics of reading selected for the course and the purposes to be accomplished by the reading.

- Selecting audio-visual aids. The ways in which these aids supplement other course tasks.

- Preparing lectures or discussion sessions. The procedures associated with the preparation process and the course objectives satisfied.

- Selecting student assignments. The nature of the assignment, the degree of student independence in performing the assignment and the purpose of the assignment.

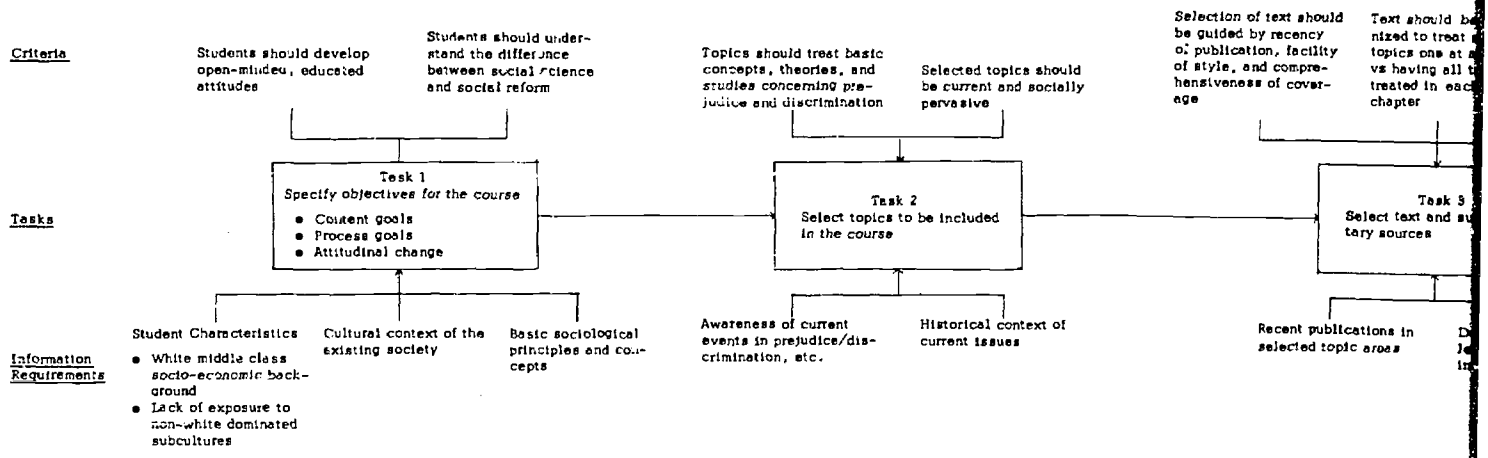
- Selecting problem areas and/or exercises for the laboratory. The ways in which the laboratory relates to lecture/discussion, the scope and purpose of the exercises, the degree of student independence.

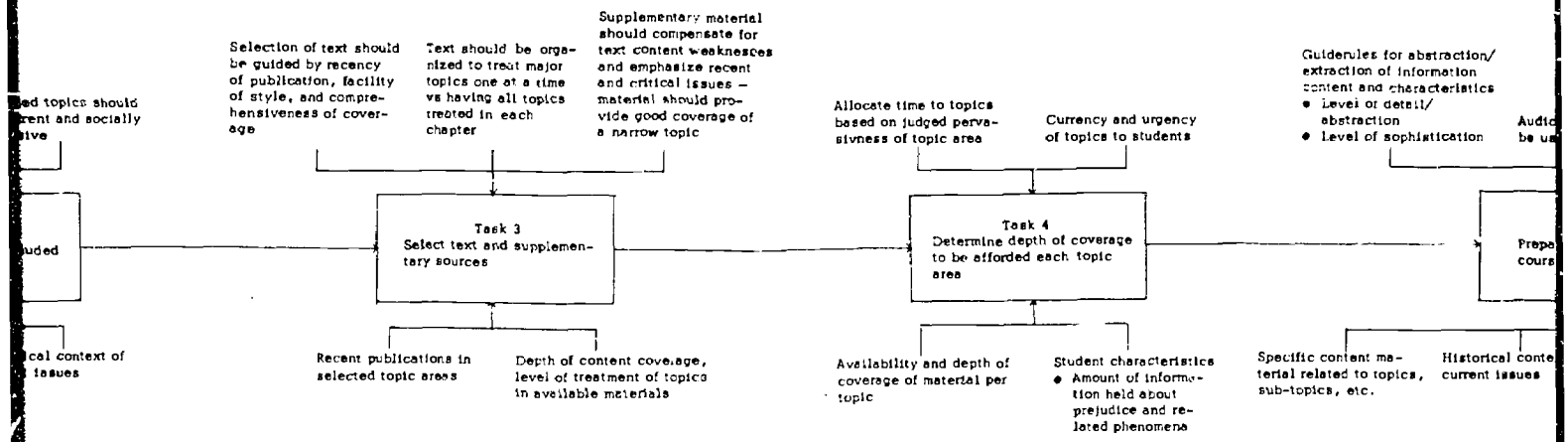
- Selecting reading for the laboratory. Characteristics of reading and how it relates to laboratory projects.

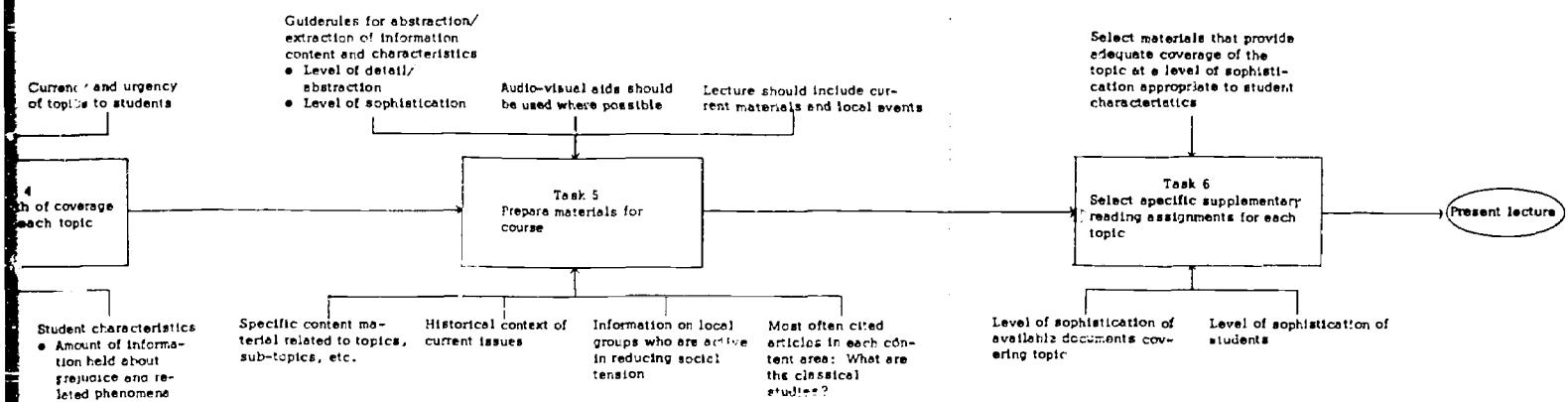
"Selection of Course Objectives" is the first discussion topic introduced by the information specialist, since the objectives influence how all other course tasks are performed. That is, each course task can be discussed in terms of the objectives it is accomplishing. As the work session progresses, the information specialist introduces each task category for discussion. The order in which the tasks are discussed will depend on the faculty members' responses. In many cases the faculty member will not respond directly to the category introduced but will provide information relevant to another task. This is due to the tendency for faculty to think of course preparation as the integration of several information sources rather than the performance of a series of discrete tasks (see Appendix A for work session guidelines). Information gathered during the first session will be of three types: course tasks, characteristics of or guidelines for performing each task, and types of information needed to support selected tasks. The results of this work session are organized into a rough task model flow chart. An example task model is presented in Figure 3. In this model each task is represented by a box; the guidelines for performing each task are listed above the box; the categories of information required to support each task are entered below the task box.

In second and third work sessions, the information specialist and the faculty member review this model. The faculty member is asked to

Figure 3. Task Model




ed topics should
rent and socially
tive
uded
cal context of
issues
Selection of text should be guided by recency of publication, facility of style, and comprehensiveness of coverage
Text should be organized to treat major topics one at a time vs having all topics treated in each chapter
Supplementary material should compensate for text content weaknesses and emphasize recent and critical issues – material should provide good coverage of a narrow topic
Task 3
Select text and supplementary sources
Recent publications in selected topic areas
Depth of content coverage, level of treatment of topics in available materials
Allocate time to topics based on judged pervasivness of topic area
Currency and urgency of topics to students
Task 4
Determine depth of coverage to be afforded each topic area
Availability and depth of coverage of material per topic
Student characteristics
• Amount of information held about prejudice and related phenomena
Guidelines for abstraction/ extraction of information content and characteristics
• Level of detail/ abstraction
• Level of sophistication
Audic
be us
Prepe
cours
Specific content material related to topics, sub-topics, etc.
Historical conte
current issues


Guidelines for abstraction/ extraction of information content and characteristics
• Level of detail/ abstraction
• Level of sophistication
Audio-visual aids should be used where possible
Lecture should include current materials and local events
Select materials that provide adequate coverage of the topic at a level of sophistication appropriate to student characteristics
Currenc and urgency of topics to students
4
th of coverage each topic
Task 5
Prepare materials for course
Task 6
Select specific supplementary reading assignments for each topic
Present lecture
Student characteristics
• Amount of information held about prejudice and related phenomena
Specific content material related to topics, sub-topics, etc.
Historical context of current issues
Information on local groups who are active in reducing social tension
Most often cited articles in each content area: What are the classical studies?
Level of sophistication of available documents covering topic
Level of sophistication of students

examine the guidelines and the information requirements associated with each task and make additions and modifications. The result is a fully developed model of the course.

The course task description work sessions have resulted in two positive side benefits for participating faculty. First, they provided a means for the faculty member to think through the course in a structured, systematic fashion. Second, the discussions, in many cases, led to a restructuring of a course by adding tasks, modifying the way in which a task was performed or changing the emphasis of the course.

2. Diagnosis of Specific Information Requirements. The information specialist conducts periodic need diagnosis work sessions with each faculty member throughout the period of support. In order to provide responsive information service, the information specialist must develop a characterization of the information request in terms of the faculty member's perspective and goals. This characterization includes a discussion of the purpose of the request in terms of the course task being supported and the intended use of the material, a description of the level of sophistication of the user (i.e., faculty, student), a specification of time frame and the type of material best suited to the purpose, and a description of the topic, including the depth and breadth of treatment desired. Additionally, it is important for the information specialist to determine what the faculty member already knows about the topic, what material he reads regularly and whether the interest in the topic was a continuing or a one-time requirement.

After a number of need diagnosis work sessions have occurred, the information specialist begins to develop a more complete understanding of what information is important within the structure of the course. As this understanding develops, the services provided by the system become more focused and relevant. In a sense, the information specialist assumes the

perspective of the faculty member when searching for information materials or creating information products to support the course.

The need diagnosis work with the students follows a similar procedure. Most student tasks are in the form of class assignments imposed by the faculty member; these include term papers, oral reports, laboratory projects, and class exercises. Through discussion with the student, the information specialist determines project goals, topic characteristics and limitations, existing background in subject area, the time frame in which the material is required, and the type and level of material best suited to the need. In general, the information specialist works with the student in an instructional role, suggesting bibliographic tools, providing guidance in the use of these tools, and aiding in the final screening and selection of material to be ordered.

3. The Translation of Information Needs and Provision of Services. The information specialist performs a number of steps in moving from a statement of need through a literature search to the provision of relevant materials. The first step requires the acquisition of sufficient content knowledge to insure a complete understanding of the request. If the information specialist is not familiar with the topic area, some background reading may be necessary. The second step is the identification of relevant bibliographic sources and the development of a meaningful search strategy. The choice of sources to be searched and the selection of titles resulting from the search are guided by the intended use of the material by the faculty member or student, the topic description, the level of sophistication of the user, the type of material required (professional, popular, etc.), the depth of coverage needed and an understanding of what the user already knows about the topic. The third step involves the screening of selected titles for relevance by comparing titles with the request description. The final selection of titles to be retrieved and disseminated may be made by the faculty

member, the student or the information specialist. Step four is to notify the clerical section to order and process the selected titles within a specified time frame. The final step involves the dissemination of materials to faculty and students for their use and evaluation.

The bulk of the services provided by the experimental system required some form of searching for both print and non-print materials. The range of services during this operation included: current and retrospective searches through professional and popular sources; searches for films and slides; document location and dissemination; preparation of bibliographies, summaries, data tables and syllabi; selection of materials for the permanent collection; instructional assistance to students; and providing answers to brief reference questions. Most of the disseminated material was in the form of photocopies of articles or sections of books; however, journal reprints, books, pamphlets, newspapers, slides, recordings, films and maps were also provided.

4. Evaluation of Disseminated Material. Faculty and students are asked to judge the usefulness of each document or information package provided through the system in terms of the course task supported. This is accomplished through the use of document evaluation forms. Basically, the evaluation process involves a determination by faculty and students as to whether the material is exactly what was needed to meet the intended purpose, nice to know about, or not useful. If a judgment of "not useful", is made, reasons for this judgment are solicited.

Faculty and student evaluations serve two important functions for the system. First, they provide the information specialist with feedback on the adequacy of service. If a faculty member judges material as "nice to know about" or "not useful" for a specific request, the information specialist can modify or refocus the service in response to that feedback. The faculty member may also gain insight into the nature of the information requirement

by subjecting material to an evaluative process; he develops greater precision in specifying needs by identifying deficiencies in the material provided. Student evaluations are also useful to both the student and the information specialist in further delineating and understanding information needs.

The second major function of collecting evaluative data is to examine the overall effectiveness of the system. Comparisons of the percentage of usefulness of materials from one academic term to the next provides a description of how consistently the system is performing over time. For example, should the percentage of useful material decrease from 85% one term to 75% the next term, then adjustments in the service are indicated.

C. Procedures and Forms

A set of forms and files were developed as part of the experimental operation to provide a means for organizing the flow of information through the system and for collecting data on the efficiency, effectiveness and cost of the operation. The four basic categories of system forms include: request forms for recording faculty and student requirements for information; master file cards for keeping track of all materials ordered by the system and the resources used to obtain these materials; citation cards for recording cost and specific ordering, processing and dissemination data associated with each item processed by the system; and evaluation forms for obtaining feedback from faculty and students on the usefulness of disseminated materials.

All system forms are organized within a coding structure which provides the capability of tying together processing and evaluation information on all documents selected, ordered and disseminated for each request. This system includes course codes, request numbers and document numbers. Request forms carry a course code (e.g., B-15 for Biology 15) and request number (e.g., A-1, A-2, etc.). Master file cards, citation cards and evaluation

forms carry a request number, a course code and a document accession number.

In addition to system processing forms, personnel time sheets were developed to collect daily information on the amount of professional and clerical time devoted to each system function. Analysis of these data provide a means for determining per document and per course processing time and cost.

1. Request Forms. Each time a faculty or student need for information on a new topic is identified, a request form is filled out by the information specialist. Form A is used for faculty requests; form F for students. The numbering for these forms is sequential starting with A-1, F-1 for each course. Figure 4 provides an example of a faculty request form. Information to be recorded on this form includes request number, course code, request and desired delivery dates, principal user of the material (faculty member or student), course task supported by the request, topic description, information specialist search notes, type of search conducted (retrospective or current), and the type of material desired by the requester. If information is requested on the same topic for more than one term, the matrix at the top of the form is used to indicate that the topic request area is carrying into the next period of support. For each new term that a topic request continues, information is recorded on request and delivery dates, task supported and principal user. If necessary, topic descriptions and search notes are modified and/or elaborated. This carry-over feature is built into the request form to allow all materials gathered on the same topic to be classified together in the system.

2. Citation Card. A citation card is filled out for each document ordered by the system in response to a faculty or student request

Figure 4. Request Form

FORM A
TOPIC INPUT: Professor

Request No. _ _ _ _ _ _
(1-6)

Professor's Name _____

Course _ _ _ _ _ _
(7-9) (10-12)

Term

Dates:	Requested											
	Needed											
Task(s)	Specification of Objectives											
	Topic Selection (lect, disc, lab)											
	Reading Selection (lect, disc, lab)											
	Lecture Supplement											
	Material Preparation (lect, disc, lab)											
	Other											
Principal User:	Professor											
	Student											
	Information Specialist											

Topic Description _____

Search Notes _____

(13) Type of Search: Current ____ Retrospective ____

(14) Type of Material: Popular ____ Professional ____ Card No. 1
(80)

(Figure 5). Prior to the actual ordering of the selected material, the following information is recorded on this card:

- The number of the course (B-15) for which the document is being ordered.
- The number of the request (A-1) within that course which guided the selection of the document. (There may be several documents associated with one request number.)
- The name of the faculty member or student to be provided with the material.
- The full citation.
- The dates indicating when the request was received, when the request was sent to the clerical section and when the document was desired by the faculty member/student/information specialist.

When the selected document is ordered, the date ordered and the resource used (Hamline Library, CLIC, etc.) is recorded by a member of the clerical staff. Upon receipt of the document, the date received is entered and the document is processed for dissemination to the user. This processing involves assigning and recording a document number (consecutive within each course), and recording the dissemination dates and the cost on the citation card. If the same document is ordered more than once for the same course, the identical document number will be assigned; if the same document is ordered for a different course, a document number will be assigned within that course code. The cost, time and resource information recorded on each citation card is summarized at the end of each academic term and used as an input to the cost effectiveness evaluation of the experimental system operation.

The citation cards are organized into a number of files reflecting the processing stage of the document within the system. All of these files are organized by course, request number within course, and document number within request (see Figure 6).

Figure 5. Citation Card

Document No. _____
Request No. _____

TERM _____ Send to:
USER _____ User: _____

CITATION _____
Title

Author Edition Publisher Place Year

(If Periodical) Name of Periodical Vol. No. pp. Date

Source of Citation

DATES:

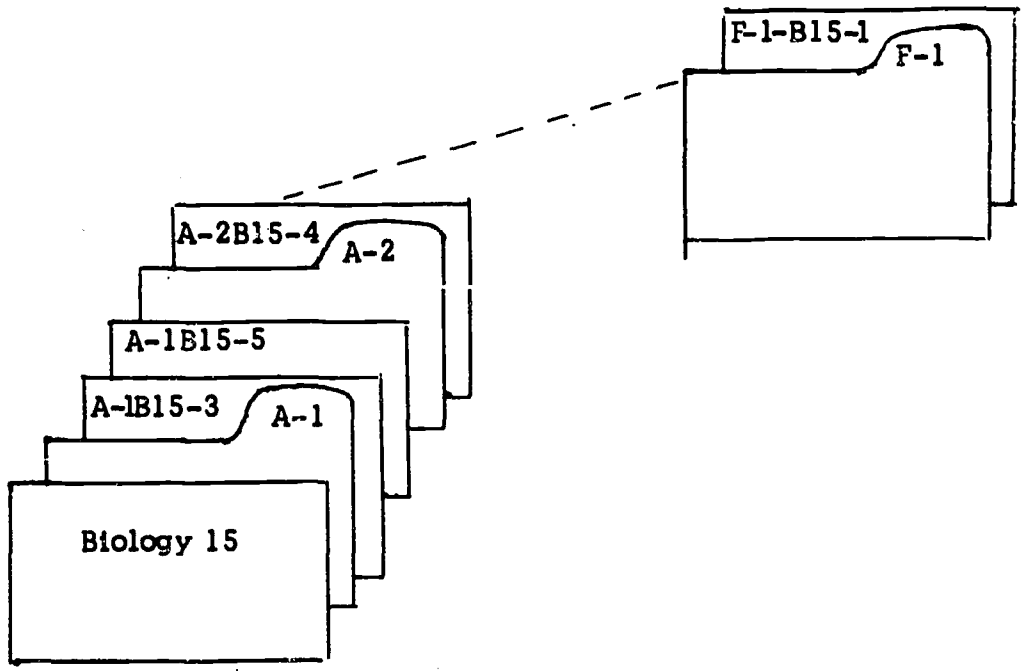
Request Received	Sent to Clerical	Desired Completion	Ordered	Received	Sent to Info. Sp.	Sent to User

ILLRQ or Purchase Order Number _____ Resource Used _____

Cost _____ Fund Charged _____

Action: _____

Figure 6. Organization of Citation Card Files



An "On Order" file is used to indicate that a document has been ordered but not received. When the document has been received, processed and disseminated, the citation card is placed in a file labeled "Document Disseminated: Evaluation not Received." The card is moved to the "Document Disseminated: Evaluated" file when the faculty or student evaluation form has been returned to the information specialist. Additionally, a suspense file was developed for documents on loan from another library. Citation cards are organized in this file by requested return date. When the material is returned, the citation card is moved to the appropriate "Disseminated" file.

These system files are used extensively by the information specialists to determine the amount of support that has been provided in response to a request as well as to identify the ordering-processing stage of selected documents. The clerical staff relies on the files to provide reminders of additional steps to be performed.

3. Master File Card. The master file, which is organized alphabetically by title, contains cards on all documents ordered and processed by the system. As each document is ordered, the full citation and the resource used is

recorded on a master card (Figure 7a). When the document is received, the term number, request number and course document number are recorded on the reverse side of this card (Figure 7b).

Figure 7A. Master File Card

Citation _____

Resource _____

Figure 7B. Master File Card

Term	Request No.	Document No.
1	A-1	B15-8
1	A-4	B27-3

If a document is ordered more than once, the master card will not be duplicated. However, for each new request, request and course document numbers will be recorded on the back of the card.

The master file is used primarily by the clerical staff for matching new requests against the citations already processed by the system. If the material can be obtained easily from the first requester, a reorder may not be necessary. If a reorder is required, the master card provides information on the resource used previously.

4. Evaluation Forms. A document evaluation form accompanies each document disseminated to a faculty member or student. The faculty form (Figure 8) provides the following alternatives:

- Exactly what is needed for a selected task
- Nice to know about in performing a selected task
- Not Useful.

If the material is judged not useful, several possible explanations are provided, for example:

- The material is too general
- The level is too elementary
- The information is redundant.

Additionally, this form allows the faculty member to indicate any desired actions such as putting copies of the material on reserve or providing a copy for his or her personal use. The student evaluation form, shown in Figure 9, includes (1) a general list of student tasks, such as, selecting a topic, refining a topic, writing a paper, preparing an oral report, and (2) three evaluation categories — very useful, useful, not useful. Students are asked to check the box which indicates the task supported and the degree to which the material was useful. The form also provides a space for students to comment on the adequacy of service. Summaries of both faculty and student evaluations provide a basis for assessing the overall effectiveness of the system as well as indicating the per course and per request value of the service.

5. Personnel Time Sheets. Throughout the experimental operation, both information specialists and clerical personnel filled out a time sheet each day. This time sheet (see Figure 10) was designed to obtain information on the allocation of personnel time to system functions. At the end of each academic term of operation, time allocation data were summarized and an analysis was conducted to determine the per course and per document personnel time associated with each function. One result of this analysis was a further

Figure 8. Document Evaluation Form

To: _____

Date: _____

Topic _____

Author _____

Title _____

_____

	Useful	
	Exactly What I Need	Nice to Know About
Topic Selection		
Text Selection		
Prep. for Lect/Lab		
Required Reading Selection: Lect/Lab		
Optional Reading Selection: Lect/Lab		
Other		

___ Too general

___ Too specific

___ Too sophisticated

___ Too elementary

___ Redundant

___ Too old

___ Irrelevant

___ Other

___ I would like to have a copy

___ Put ___ copies on reserve

___ Other _____

___ Useful for another course _____

___ Useful for another topic _____

Comments:

Request No. _____

Information Specialist _____ Document No. _____

Figure 9. Student Evaluation Form

Request No. _____ (1-6)

Document No. _____ (7-12) - _____ (13-17)

The Library is concerned with evaluating its services to students. We would appreciate it if, as you use each document, you would evaluate its usefulness. Please return each completed form to the Library. Our goal is to have 100% of the forms returned and we need your cooperation. Thank you.

CITATION _____

Title

_____

Author Publisher or Periodical

Name of User _____

How Useful Was This Item? For What Was It Used?

	Very Useful	Useful	Not Useful (25)
(18) Selecting the topic			
(19) Refining the topic			
(20) Writing the paper			
(21) Oral report			
(22) Class discussion			
(23) Laboratory project			
(24) Other (specify) _____			

Comments (if any) _____

_____

Card No. 4 (80)

Figure 10. Time Record

Name _____

Date _____ (If part time) Hours Worked _____

Function	a.m.	p.m.	Total
Talking to Professor - General			
Talking to Professor - Reference			
Talking to Professor - Evaluation			
Talking to Students - General			
Talking to Students - Reference			
Talking to Students - Evaluation			
Attending Class & Summarizing Lecture			
Filling Out Request Forms			
Understanding Request			
Searching to Identify Title (CA)			
Searching to Identify Title (Retrospective)			
Searching to Identify Bibliographic Sources			
Filling Out Instruction Forms			
Brief Reference Questions			
Evaluation of Documents for Dissemination			
Coordination with Admin. Asst.			
Coordination with Clerk			
Coordination with Information Specialist			
Coordination with			
Verifying References			
Filling Out Citation Cards			
Searching for Documents in Hamline Library			
Locating & Ordering Documents from Other Facilities			
Xeroxing Documents			
Processing Received Documents			
Abstracting Documents			
Extracting Documents			
Summarizing Documents			
Compiling Data Tables			
Indexing Documents			
General Typing			
General Filing			
Administrative			
Account Books			
Supervising			
Non-NSF Work			
Quarterly Report			

clarification of the level of personnel performing each function. Based on this clarification a new form was designed to account for information specialist time (see Figure 11). In this form, new functions were added and old functions were combined. It should be noted that the various types of professor and student contact were combined and that the several categories of search were combined. These changes were effected for two reasons: first the analysis of the time data showed no differences between the subcategories and, second, the information specialists found the broader categories easier to work with.

D. Experimental System Performance

The operation of the experimental system covered one calendar year and provided full information support services to 30 academic course: 10 spring term courses and 20 fall term courses. These courses were drawn from 11 of the 18 departments and represented a wide range of topics from art and religion to chemistry and physics. A complete listing of supported courses is contained in Appendix C. In the spring term the system was staffed by two information specialists with clerical support; the fall term staff was augmented to three information specialists.

A summary of the data collected during this period is presented in Table 2. The amount of support in terms of the average number of documents per course did not differ significantly for the two terms: spring term average was 68 unique* documents per course; fall term average was 62. In the spring, support ranged from 27 documents for one course to 150 documents for another, while the fall results ranged from 8 to 172. A comparison of the distribution of documents per course for each term shows a greater proportion of courses receiving less than 60 documents during the fall term. The median number of documents per course was 59 in the spring and 37 in the fall. This shift was attributed to two factors. First, the courses supported in the spring were

*Multiple copies are not included in this count.

Figure 11. Information Specialist - Time Sheet

Name _____

Date _____

Function	a.m.	p.m.	Total
1. Professor Contact			
2. Student Contact			
3. Class Attendance			
4. Literature Search			
5. Document Location			
6. Document Evaluation			
7. Document Abstracting			
8. Compilation of Bibliographic Sources			
9. Syllabus Development			
10. Reviewing & Planning			
11. Background Reading			
12. General Clerical			
13. Coordination			
14. Non - NSF			

TABLE 2
SUMMARY RESULTS

	Spring 1971	Fall 1971
Number of Courses	10	20
Number of Documents	678	1224
Average Documents per Course	68	62
Total Cost for Materials	$098.00	$1088.66
Books	134.52	184.35
Films	101.00	162.59
Loans, Copies, etc.	463.10	741.72
Average Cost per Course	69.86	54.43
Evaluation of Useful	409 Docs.	878 Docs.
Evaluation of Not Useful	100 Docs.	155 Docs.
Not Evaluated	141 Docs.	169 Docs.
Not Disseminated	28 Docs.	22 Docs.
Evaluated/Disseminated	80.3%	85%
Total Turn-Around Time	5.49	4.13
Request-Clerical	3.53	.50
Clerical-Ordered		.89
Ordered-Received	.23	1.65
Received-Disseminated	1.73	1.18
Percent of Materials from Hamline	51%	43%

selected on the basis that they would generate a large number of both faculty and student requirements for information, while many of the fall term courses were chosen to broaden the subject area coverage of the system regardless of anticipated demand. Secondly, several of the courses supported in the fall had received support services previously. In general the first period of information support involved the provision of more materials than subsequent support periods.

The cost of materials provided by the system was broken down into three major categories: books, films, and copies or loans. In both the spring and fall terms, the largest expenditures were for copies, loans, and reprints (66% spring, 61% fall). Books purchased for the collection represented 19% of the spring budget and 17% of the fall budget, while films and other audio-visual materials used approximately 14% in each term. The average cost per course decreased from $69.86 in the spring to $54.43 in the fall. This decrease is in part a function of the decrease in the average number of documents provided per course. Additionally, in the fall, many materials were provided to students from course files established during a previous support period.

The summary of faculty and student evaluations shown in Table 2 indicates an increase in system performance effectiveness from the spring to the fall. In the spring, 80% of the disseminated documents were evaluated and 80% of these were judged as having some use in performing a course-related task. The fall term summary shows that 86% of the disseminated documents were evaluated and 85% of these documents were judged useful. When these data are considered separately for faculty and students, the results show 89% and 92% usefulness judgments by faculty and 75% usefulness evaluations by students. The lower percentage of effectiveness obtained with students is based on the fact that students were guided in the use of bibiliographic tools and in the development of search strategies but they made their own

selection of titles. In many cases students did not apply adequate criteria in the selection process.

The total turn-around time from request for a topic search to the delivery of selected materials was broken down into four time periods (see Table 2): (1) Request received from the user to citation requests sent to the clerical section, (2) citation request received by the clerical section to material ordered, (3) material ordered to material received and (4) material received to material disseminated. The primary purpose of this breakdown was to identify areas of inefficiency in the processing of requests. The total time from request to dissemination for the average document was 5.49 days in the spring and 4.13 days in the fall. The principal time lag in the spring was between the request from the user and the ordering of the material. During the fall operation this time lag was decreased by 2.14 days. The other major difference between the two terms was the time required between ordering and receiving material. The increase of 1.42 days in the fall can be attributed to two factors: 8% more material was being obtained outside Hamline University in the fall (i.e., Hamline materials dropped from 51% to 43%) and, CLIC (the local network) began operating a centralized ordering and delivery system in the fall which provided greater convenience but resulted in a longer delivery delay.

E. Personnel Time

Information specialist time during the operation of the experimental system was focused on five functions. The largest percentage of this time, 35%–40% was devoted to contacting faculty and students, developing course task models, diagnosing needs and holding evaluative discussions. The second largest time allocation was to literature search activities. This function required approximately 20% of the information specialists' time and included such activities as searching for audiovisual material, identifying

current and retrospective titles and searching to answer brief reference questions. The remaining three areas included coordination with the clerical staff and other library divisions, 12%; scanning and evaluation of retrieved documents before dissemination to the faculty member or student, 9%; and general clerical work such as typing, filing, and filling-out request forms and citation cards, 7%. Other functions engaged in by the information specialists, each accounting for about 2% of their time, were syllabus development for supported courses, abstracting, compilation of bibliographic sources, document location, and background reading in selected subject areas.

The majority of system clerical time was allocated to seven functional areas.

- Processing received documents for dissemination, 20%
- Locating and ordering selected documents, 17%
- Performing simple literature searches, 9%
- General typing, 7%
- Xeroxing Documents, 7%
- General filing, 5%
- Coordination with information specialists and other library divisions, 5%.

Other clerical functions included putting material on reserve for supported courses, filling-out citation cards and other system forms, and maintaining account books.

III. PROJECTIONS OF REQUIREMENTS FOR AN EXPANDED SYSTEM

The data collected during the experimental system operation provided a basis for generalizing system services to all courses, faculty and students, and for projecting the system costs associated with providing these services. The course descriptions developed by the information specialists and participating faculty members resulted in a general list of course-related tasks, a series of alternative guidelines or considerations associated with the performance of each task, and a set of potentially useful information services. This information was used to structure a two-part questionnaire for describing all Hamline courses and the information requirements related to the preparation and conduct of these courses. The results obtained from this questionnaire served as one input to the system expansion plans. A second input to these plans was comprised of experimental system data describing the allocation of professional and clerical personnel time to system functions, the amount and type of material provided on a per course basis, and the costs of borrowing, copying or purchasing selected materials.

The material presented in this section will focus on the design and administration of a questionnaire to project system service requirements for an expanded system, and the use of experimental system data in combination with questionnaire results to estimate expanded system costs.

A. Survey of Support Requirements

Campus-wide requirements for information support were estimated by the administration of a two-part questionnaire to all Hamline faculty. Part I of this questionnaire was designed to obtain a description of all academic courses; Part II was designed to identify the desired services associated with each of these courses.

1. Part I: Course Descriptions. Three forms of Part I were developed: Science, Social Science, and Fine Arts and Humanities (see Appendix B).

The course task categories and the task characteristics listed in each questionnaire were derived empirically from the course task model descriptions developed during the experimental system operation. The three forms were similar in terms of task categories, but varied in terms of the alternatives for describing the tasks. The format of the questionnaire was a matrix with the courses of each faculty member forming the columns and the categories of course description forming the rows. The first three questions concerned the number of times the faculty member had taught each course, the average number of students generally enrolled in each course and the grade class of the majority of students. Question four dealt with specifying the objectives for the course. For this question a number of alternative objectives were listed and the faculty member was asked to rank these alternatives from most to least important for each course. Space was provided for listing additional objectives. Alternative objectives listed on the form were as follows:

- Students should acquire knowledge of concepts and principles
- Students should acquire factual information.
- Students should acquire skill in using methods and techniques of the field.
- Students should develop open-minded, educated attitudes.
- Students should develop the ability to analyze problems critically.

The fifth question concerned the principal methods selected for conducting the course. In responding to this question, faculty members checked those methods used for each course and circled the method most emphasized. Alternative formats offered for teaching students included lecture, laboratory, discussion groups, readings, preparation of oral and written reports, and field work. Again space was provided for specifying additional instructional methods. Question six involved the characterization of topics included in the course. Here again a series of alternative topic dimensions were

provided and the faculty respondent was asked to check the appropriate dimensions and/or add to the presented list. Some of the alternative dimensions offered were: topics should be broad/narrow in scope, topics should emphasize current/historical issues, topics should treat facts/concepts, and topics should relate methods, facts and principles. The seventh question dealt with the selection of supplementary reading and a characterization of the content or purpose of the selected material. Some example characteristics were reading should provide in-depth coverage of selected topics, reading should relate course topics to one another, reading should provide an historical framework for interpreting current events, and reading should acquaint students with primary source materials. Question eight dealt with a specification of student assignments such as term papers, oral reports, class exercises, and required or optional reading. In the science form of the questionnaire an additional question was asked concerning the selection of topics for laboratory or field exercises. This question included a description of the topic characteristics as well as a specification of whether the general or specific exercise topics were chosen by the faculty member or the student.

Part I of the questionnaire was completed and returned by 70 (90%) faculty members and provided characterizations for 350 academic courses. These characterizations were used for two primary purposes: first, to tailor the service part of the questionnaire to specific course descriptions and, second, to provide the information specialists with an aid for interviewing faculty members about described courses and for developing preliminary course task models.

2. Part II: Information Services. Part II of the questionnaire was designed to obtain a description of the information services perceived by faculty as being useful in the support of the courses described in Part I. The general list of services used for developing questions was based on the

services that had been offered by the experimental system. In order to make the questions responsive to the course task descriptions, several alternative forms were developed. That is, the service-task relationships indicated in each form of the questionnaire were selected on the basis of specific course characterizations. If a course had no lecture or did not offer a laboratory, questions in these areas were eliminated (see Appendix B for example questionnaires). The first page of the questionnaire presented questions about how frequently new topics were introduced in lecture/discussion, how often lecture/discussion topics were modified and updated, how frequently student reading was changed, and what courses required information support to accomplish these tasks. For each of these questions, the appropriate courses were listed and the faculty member was asked to respond by a check mark or a circle (see Figure 12 for example). The second and third pages of the questionnaire provided a list of service/task combinations. Again, the appropriate courses were listed and the faculty member was asked to circle those courses where the specified service would be useful. An example question from this section is provided below:

A. Would a service which locates current materials from the professional literature be useful for							
1) Introducing new lecture topics	Phy 15	Phy 16					
2) Updating lecture	Phy 15	Phy 16					
3) Preparing for discussion sessions			Phy 20	Phy 34		Phy 102	
4) Selecting student reading	Phy 15			Phy 34	Phy 60	Phy 102	

Figure 12. Information Services

NAME _____ DATE _____

Lecture/Discussion-(Please check the appropriate frequency for each course listed following questions 1, 2 and 3.)

1. How frequently do you introduce new major topics into your lectures/discussions?

	Phy 15	Phy 16	Phy 20	Phy 34	Phy 102			
Every yr.								
2 yrs.								
3 yrs.								
More than 3 yrs.								

2. How frequently do you modify or update the detailed material covered in your lectures/discussions?

	Phy 15	Phy 16	Phy 20	Phy 34	Phy 102			
Every yr.								
2 yrs.								
3 yrs.								
More than 3 yrs.								

3. How frequently do you change your student reading lists?

	Phy 15	Phy 20	Phy 34	Phy 60	Phy 102			
Every yr.								
2 yrs.								
3 yrs.								
More than 3 yrs.								

4. When preparing for your lecture/discussion sessions, do you find it necessary to go beyond the materials you have at hand? (For each task listed below please circle those courses where additional resources are required.)

   a. Introducing new lecture topics.

Phy 15	Phy 16						

   b. Updating lectures.

Phy 15	Phy 16						

   c. Preparing for discussion sessions.

		Phy 20	Phy 34		Phy 102		

   d. Selecting student reading.

Phy 15		Phy 20	Phy 34	Phy 50	Phy 102		

If no courses are circled, skip to page ____.

Additional services included in this questionnaire section were:

- A service which identifies and locates background material from the professional literature
- A service which identifies and locates secondary sources (e.g., critical reviews, contextual materials, etc.)
- A service which identifies and locates articles from magazines and newspapers
- A service which obtains references which you have identified as useful
- A service which identifies and locates films, slides, etc.
- A service which answers brief questions.

The next section of the questionnaire dealt with student assignments and the services which could be made available to students in performing these assignments. In each case, course/assignment combinations were listed. Sample services available to students included:

- A service which would help narrow-down a selected topic
- A service which would direct students to appropriate bibliographic sources and instruct them in the use of these sources.
- A service which would locate and obtain materials which the student identified as useful
- A service which would answer brief reference questions.

For the courses with laboratory sections an additional set of questions was included. These questions concerned (1) the frequency with which research problems changed or were modified and (2) the information services required for each laboratory task.

3. Survey Results. Part II of the questionnaire was responded to by 60 faculty members. These responses contained a description of both the information service requirements and the frequency of those requirements for 307 academic courses. Of the 307 courses 81% were perceived by the faculty

as needing some search, guidance or location services for their tasks and/or the tasks of their students. A further breakdown of these data shows the following results:

- For faculty: 63% of the courses had some literature or audio-visual search requirements; 6% of the courses had a requirement for document location only.
- For students: 63% of the courses had some requirements for guidance in defining topics, for development of search strategies and/or for document location and dissemination.
- For faculty and student: 42% of the courses had some information support requirements for both faculty and students.

Table 3 provides a detailed summary of faculty information service requirements. The first half of the table deals with the frequency of need for each service in terms of how many courses require a specific service every year, every two years, or every three years. Approximately 85% of the courses requiring some form of information service need to receive that service every year. The service selected by the most courses (153) was the Location of Articles Selected by the Faculty Member. This was followed in demand frequency by Search for Audio-Visual Aids (96 courses) and Searches for Secondary Source Materials (76 courses). Search for Popular Material was selected by 65 courses, Current Search by 60 courses and Retrospective Search by 43 courses. For 9% of the courses all four search services were judged as useful while, in 7% three search services were selected, in 25% two search services were selected and in 22% one search service was selected. The second half of Table 2 describes the number of courses for which faculty members judged each service as useful in changing topics, in modifying topics, in preparing lectures, in selecting student reading and in answering student questions. In many cases a service was selected to support more than one course task. That is, a search for current materials

TABLE 3

SERVICE REQUIREMENTS (Results Based on 307 Courses)

Services	Frequency of Need				Purpose of Need					
	Total Courses	Every Year	2 yrs	3 yrs	Topic Change	Topic Mod.	Disc. Prep.	Reading Selection	Student Question	Total
Search of Current Materials (Scholarly)	60	46	11	3	36	38	22	42		138
Search of Background Materials (Scholarly)	43	35	7		29	29	8	24		90
Search of Secondary Source Materials	76	50	25	1	40	46	45	48		179
Search of Popular Materials	65	53	8	4	24	34	36	46		140
Search for Audio-Visual Aids	96	65	21	10	45	76	46	-		167
Location of Articles Selected by User	153	114	26	13	89	93	64	107		353
Answers to Questions	58	57	1		18	26	7		52	103

might have been judged useful for topic modification as well as for selection of student reading. The final column shows the total number of times each service was selected by the faculty. Here again, the service in greatest demand was the Location of Articles Selected by the Faculty. However, these data indicate a substantial requirement for course task support through the provision of a variety of information search services.

The specific breakdown of faculty service demand level for each of the three academic divisions is presented in Table 4. Searching for Current Literature and Locating Selected Articles were the two services which were judged by science faculty to be of most use in their course tasks; social scientists selected Searches for Audio-Visual Materials and Document Location most frequently; fine arts and humanities faculty selected Secondary Source Materials Searches and Document Location services. In all three cases these selections reflect the nature of the disciplines and the general sources of information associated with the disciplines. Scientists are interested in new research results and current theoretical structures. This information is generally found in the current professional journal literature. Social science disciplines deal with a wide variety of topics such as inter-racial cooperation, political campaigns or urban problems for which films and recordings can provide a valuable supplement to lectures and discussions. In the fine arts and humanities the major reliance is on primary source material. Interpretation of these works is aided by an understanding of the context surrounding their development. This contextual material, is provided by secondary sources, and includes descriptions of the social, economic and intellectual conditions of the periods in which selected authors, artists or musicians worked.

The summary of student assignments and the amount and type of service the faculty would like the system to offer students is presented in Table 5. The major categories of assignments include laboratory reports, term papers

TABLE 4
INFORMATION SERVICE DEMAND BY ACADEMIC DIVISION

Service	Total Courses with Some Requirement	Topic Change	Topic Modification	Disc. Prep.	Reading Selection	Student Questions
Current Search						
• Science	26	15	16	8	17	-
• Social Science	27	19	19	13	21	-
• Fine Arts and Humanities	7	2	3	1	4	-
Retrospective Search						
• Science	13	11	13	3	8	-
• Social Science	27	16	15	4	16	-
• Fine Arts and Humanities	3	2	1	1	-	-
Secondary Source Search						
• Science	-	-	-	-	-	-
• Social Science	-	-	-	-	-	-
• Fine Arts and Humanities	76	40	46	45	48	-
Popular Search						
• Science	18	8	12	4	11	-
• Social Science	18	9	12	9	15	-
• Fine Arts and Humanities	29	7	10	23	20	-
Audio-Visual Search						
• Science	19	10	12	10	8	-
• Social Science	32	16	28	8	-	-
• Fine Arts and Humanities	45	19	36	28	-	-
Location Service						
• Science	26	19	13	1	22	-
• Social Science	35	19	25	7	23	-
• Fine Arts and Humanities	92	50	55	56	62	-
Answers to Questions						
• Science	12	7	5	3		11
• Social Science	18	5	11	-		18
• Fine Arts and Humanities	28	6	10	4		23

TABLE 5
STUDENT ASSIGNMENTS

Assignment	No. of Courses	No. of Students per Service			
		Define, Search Locate	Define and/or Search	Locate	Total
Laboratory Reports					
- Science	14	160	45	-	205
- Social Science	1	-	32	-	32
- Arts & Humanities	-	-	-	-	-
Total	15	160	77	-	237
Term Papers/Oral Reports					
- Science	8	57	45	-	102
- Social Science	33	529	391	-	920
- Arts & Humanities	81	677	764	-	1,441
Total	122	1,263	1,200	-	2,463
Exercises/Homework					
- Science	9	20	64	40	124
- Social Science	11	67	100	90	257
- Arts & Humanities	30	73	345	17	435
Total	50	160	509	147	816
Critical Reviews					
- Science	-	-	-	-	-
- Social Science	-	-	-	-	-
- Arts & Humanities	22	192	179	12	383
Total	22	192	179	12	383

and oral reports, homework exercises, and critical reviews of literary works. The types of services offered to students are broken down into three groupings. The first grouping is composed of all three services: Helping to Define and Narrow-Down the Topic of Interest, Aiding in the Selection of Bibliographic Sources and the Development of Search Strategies, and Locating and Disseminating Selected Titles. The second service grouping

includes the first two services listed above while the third service group is limited to material location and dissemination activities. The first column of the table lists the number of courses in each of the three academic divisions by type of assignment; the remaining columns present the number of students projected for each service grouping. In the Science Division the Laboratory Report assignment category occurs most frequently. Science faculty indicated in the questionnaire that 78% of the science students working on laboratory reports should receive all three services offered by the system. The Term Papers and Oral Report assignment category was selected most frequently for both the social sciences and the arts and humanities. In the social sciences 58% of the students fell in the three service grouping while in the arts and humanities only 46% of the students were placed in this service grouping by the faculty. Overall, the faculty indicated that 1,775 student assignment units should be supported by all three services, that 1,965 should receive guidance on topic definition and on the selection and use of bibliographic tools, and that 159 should receive only document location and dissemination services.

The results obtained from the second part of the questionnaire provided a general picture of the information services desired by faculty and students, and the level of demand associated with each one of these services.

B. System Staffing Projections

The data obtained during the experimental system operation on the allocation of information specialist and clerical time to system functions was used as a basis for projecting personnel levels required to extend information service to a broader base of faculty and students. Table 6 shows the major system functions and the mean times associated with the performance of each of these functions. The mean time involved in contact with faculty and students, and in the general clerical functions of typing, filing, completing

TABLE 6
MEAN PERSONNEL TIME PER SYSTEM FUNCTION

Functions	Mean Time
Information Specialist	
• Discussions with Faculty and Students	16 hours per course
• Attending Class	6 hours per course
• Current Searching	2.5 hours per search
• Retrospective Searching	2.5 hours per search
• Audio Visual Searching	2.5 hours per search
• Filling Out Forms	1.75 hours per course
• Developing Teaching Aids	1.7 hours per course
• Coordination	3.2 hours per course
• Evaluating Documents	5.5 minutes per document
Clerical	
• Locating and Ordering Material	16 minutes per document
• Processing Material	19 minutes per document
• Xeroxing	6.6 minutes per document
• Typing and Filing	14 hours per course
• Putting Materials on Reserve	4 hour per course
• Filling Out Forms	4 hours per course
• Coordination	3.4 hours per course

forms and putting requested materials on reserve was calculated on a per course basis. Material location, processing, xeroxing and evaluation times were averaged per document. The mean time associated with each searching service was computed per search.

The personnel projections for extending system services were obtained by multiplying the mean time per function required in the experimental operation by the number of courses, searches and documents involved in the system expansion. Twenty-five percent was then added to each of these projections to allow for personnel downtime. The selection of this figure was based on the finding that system personnel were only able to account for 75% of their time. The number of courses requiring some service each year and the number and type of searches associated with these courses was obtained from the generalization survey; an average of 65 documents per course was obtained from the results of the experimental operation.

Three alternative expansion plans were developed. The first plan involved providing full information support to all faculty, students and courses requiring service; the second plan was to select one or two of the three academic divisions and provide full information support to all faculty, students and courses in that division; the third plan called for supporting one course for each interested faculty member per academic term.

The level of personnel required to provide support for each division and on a campus-wide basis is presented in Table 7. These personnel time projections are based on 46 science courses requiring 184 searches, 44 social science courses requiring 228 searches and 76 fine arts and humanities courses requiring 332 searches. Both the number of courses and the number of searches used in this projection represent the yearly service requirements for the system. Several of the courses described in the survey required service on a less frequent basis. The results of the projections indicated a requirement of 1.6 information specialists and 2.7 clerks to support the

TABLE 7
STAFFING REQUIREMENT BY ACADEMIC DIVISION

System Function	Science		Social Science		Fine Arts and Humanities		Campus Wide	
	Profes-sionals	Clerks	Profes-sionals	Clerks	Profes-sionals	Clerks	Profes-sionals	Clerks
Discussions with Faculty and Students	116		110		190		416	
Attending Class	34		33		57		158	
Searching Literature	62	12	78	16	112	20	252	48
Locating and Ordering Materials		126		120		206		452
Processing Materials		148		142		246		536
Evaluating Materials	40		38		66		144	
Putting Materials on Reserve		30		28		48		106
Developing Teaching Aids	14		10		18		42	
Xeroxing		56		52		86		194
Filling Out Forms	14	30	12	28	22	48	48	106
Typing and Filing		100		96		166		362
Coordination	24	26	20	24	38	40	82	90
Total Days	304	528	301	506	503	860	1142	1894
No. of Personnel	1.6	2.7	1.5	2.6	2.6	4.4	5.8	9.7

science division over a nine month period, 1.5 information specialists and 2.6 clerks to support the social sciences, and 2.6 information specialists and 4.4 clerks to support the fine arts and humanities. The provision of full information support, campus-wide, would require 5.8 information specialists and 9.7 clerks. Table 8 presents the personnel projections associated with supporting one course per faculty member per term. The figures listed are based on the service requirements of 120 courses. The system personnel needed to provide these services include four information specialists and 6.7 clerks for nine months. This third set of projections was developed to offer a compromise position between full support, campus-wide, and full support to part of the faculty and student body. Although the plan does not meet all information needs on the campus, it does put the system in direct contact with all faculty and students and the personnel cost projection for offering this level of service is approximately one-third less than for the full support, campus-wide system. Additionally, the third alternative allows for the development of a more complete integration of the system with the traditional library operation than would be possible if only some of the faculty and students were receiving system information services. Based on these considerations, the university administration selected this plan for implementation with the understanding that full support to all faculty and students could be offered at a later time when adequate funds were available.

TABLE 8
STAFFING PROJECTIONS FOR SUPPORTING 120 COURSES

Functions	Professional	Clerical
Discussions with Faculty and Students	300 days	
Attending Class	90	
Searching Literature	182	30days
Locating and Ordering Materials		316
Processing Materials		374
Evaluating Materials	100	
Putting Materials on Reserve		74
Developing Teaching Aids	28	
Xeroxing		134
Filling Out Forms	32	74
Typing and Filing		250
Coordination	56	62
Total Days	797	1314
No. of Personnel	4	6.7

IV. IMPLEMENTATION OF AN EXPANDED SYSTEM

A. General Description

The purpose of the system implementation phase was threefold: (1) to expand the system to include all interested faculty and their students at a support level of one course per academic term, (2) to test the accuracy of the personnel projections based on the results of the experimental operation and (3) to assess the effectiveness of the expanded system. The expansion of the system was accomplished over three academic terms. During the first term, three information specialists provided information support services to 37 courses; in the second and third terms the professional staff was increased to four information specialists and support was offered to 49 and 60 courses. The number of clerical personnel employed was adjusted to correspond to work load requirements. At the end of each term clerical personnel time projections were recomputed based on the work requirements of that term. These projections were used to estimate staffing needs for the next period of support.

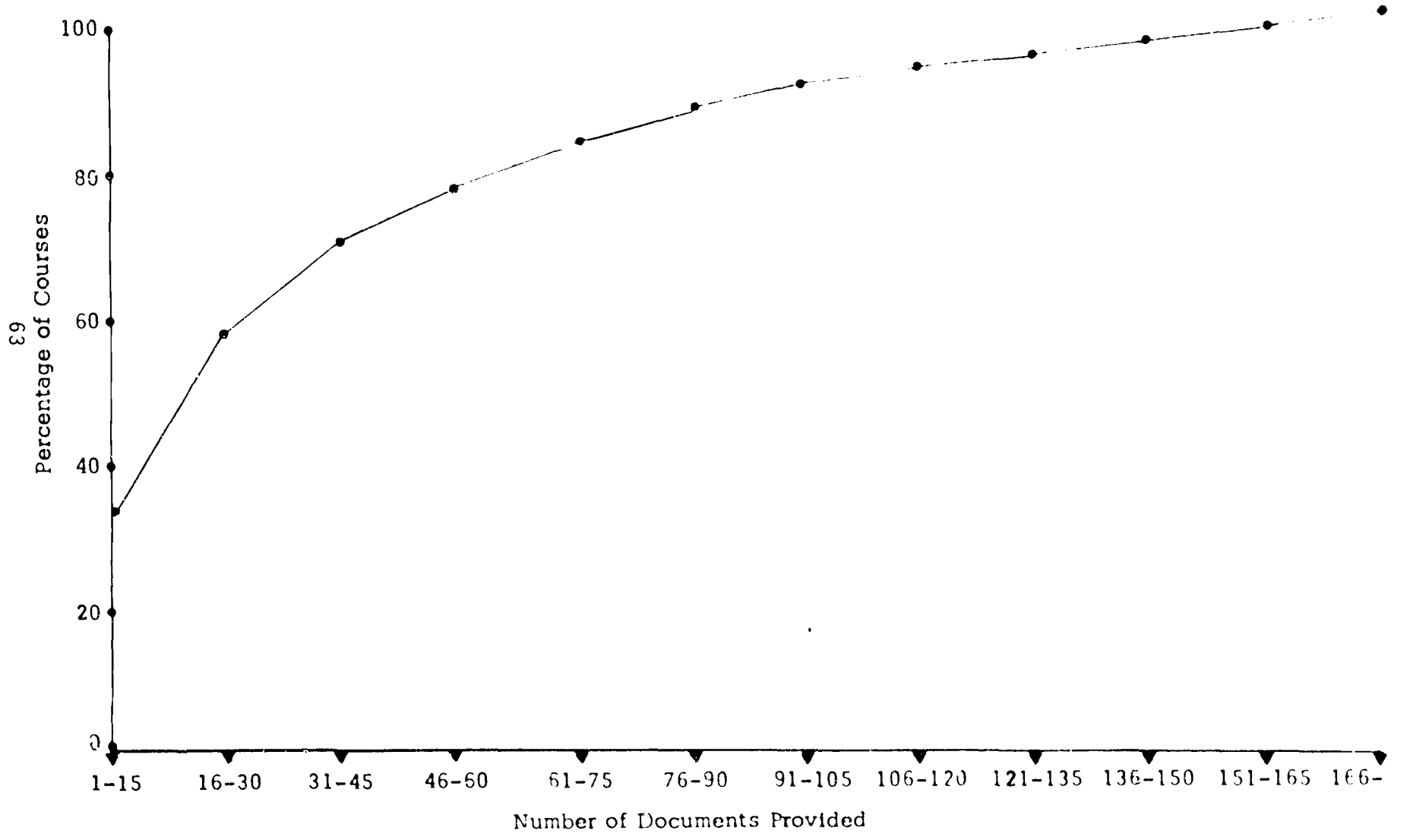
The system functions performed in the implementation phase corresponded to those delineated in the experimental operation. The information specialists worked closely with faculty and students in describing courses, building course task models, and diagnosing information needs. In provision of services, their responsibilities included matching specified needs with relevant sets of materials, creating responsive information packages and setting priorities for ordering, processing and disseminating selected material. The clerical section of the system worked primarily in the areas of locating, ordering, processing and disseminating requested material. Additionally, system clerks performed simple literature searching tasks for the information specialists. The procedures used in accomplishing each system function were also taken from the experimental system. Many of these procedures were modified during the implementation to allow for a more efficient flow of work.

Throughout the implementation phase detailed records were kept on all materials processed by system personnel. These records included cost, ordering and processing time, resources used and faculty and student evaluations. This information was organized on a course, topic-request basis. Additionally, both professional and clerical personnel were asked to complete daily time sheets indicating how their time was allocated to each of the system functions.

B. System Performance

The system provided information support services to 146 courses during the implementation phase. This support resulted in the selection, location and processing of 5,666 unique documents at a materials cost of $6,492. The average number of documents provided on a per course basis was 39 and the average cost of support per course was $44.50. These averages differ significantly from the results obtained in the experimental system operation where the average number of documents per course was 65. This decrease in the average amount of support provided was accounted for by two factors. First, approximately 50% of the courses included in the implementation phase received support for more than one term. Some of these courses were supported during the experimental operation, others were supported twice during the implementation phase. In most cases there were more task and topic areas needing extensive support in the first support period than in subsequent terms where only general updating was required. Secondly, most of the experimental system courses were selected on the criterion of high information need perceived by the faculty member. It is probable that these courses did not represent the distribution of information requirements for all courses. Figure 13 shows the cumulative frequency distribution of the 146 courses according to the number of materials provided in one support period. This distribution ranges from 2 to 242 documents with a median of 25. Thirty-four percent of the courses received between one and 15 documents

Figure 13. Cumulative Distribution of Courses by Materials Provided



during one support period, 58% received 30 documents or less and 85% received under 76 documents.

The average per item cost of materials ordered during the implementation phase was $1.15 as compared to a cost of $0.93 for the materials obtained for the experimental operation. This difference is attributed to the fact that a larger portion of the materials budget was used for the higher priced items included in the audio-visual category during the system implementation phase. Table 9 shows a comparison of these figures for the two operations.

TABLE 9
COMPARISON OF MATERIAL COSTS

Cost Categories	Experimental System	Implementation System
Books	$ 318.87 (18%)	$1033.31 (16%)
Films, Slides, Etc.	263.59 (15%)	1624.11 (25%)
Loans Copies	1204.82 (67%)	3835.52 (59%)
Total Material Cost	$1786.66	$6492.94
Avg. Cost per course	$ 59.56	$ 44.47
Avg. Cost per item	$ .93	$ 1.15

A summary of faculty and student evaluations of material provided to support course tasks during system implementation shows that 95% of the disseminated materials were evaluated and that 88% of the evaluated materials were judged useful. A comparison of these data with the data obtained during the experimental operation (see Table 10) indicates a slightly higher performance effectiveness for the implementation system. This greater effectiveness may be attributed to better communication between faculty, students and information specialists. When information specialists work repeatedly with the same faculty and students an increased understanding of information

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TABLE 12
A COMPARISON OF MEAN PERSONNEL TIME PER SYSTEM FUNCTION

Functions	Experimental System	Implementation System
Information Specialist		
• Discussions with Faculty and Students	16 hrs. per course	16.2 hrs. per course
• Searching Print and Non-Print	2.5 hrs. per search	2.4 hrs. per search
• Evaluating Documents	5.5 min. per doc.	5.1 min. per doc.
• Filling-Out Forms	1.75 hrs. per course	2.1 hrs. per course
• Developing Teaching Aids	1.7 hrs. per course	.5 hrs. per course
• Coordination	3.2 hrs. per course	3.75 hrs. per course
Clerical		
• Locating and Ordering Material	16 min. per doc.	11.8 min. per doc.
• Processing Material	19 min. per doc.	13 min. per doc.
• Xeroxing	6.6 min. per doc.	3.8 min. per doc.
• Typing and Filing	14 hrs. per course	5.4 hrs. per course
• Putting Materials on Reserve	4 hrs. per course	4.5 hrs. per course
• Filling-Out Forms	4 hrs. per course	1 hr. per course
• Coordination	3.4 hrs. per course	1.7 hrs. per course

per course basis, the results indicated a 61% decrease in typing and filing time, a 75% decrease in filling-out forms and a 50% reduction in carrying-out coordination activities. These increases in efficiency for the implementation phase are based on two factors. First, system forms and procedures were constantly undergoing modification in an attempt to simplify the performance of

system functions. Second, many of the clerical personnel worked for the system over several terms and gained experience in its operation. Additionally, the make up of the clerical staff shifted from a clerical supervisor with several part-time clerks to a mix of both full-time and part-time clerical workers. The full-time clerks helped provide continuity in the performance of the clerical functions.

The increases in efficiency for the clerical functions coupled with the need to order and process fewer materials on a per course basis resulted in a reduction in clerical staffing requirements. The initial projections from the experimental data indicated that 6.7 clerical workers were needed for a system providing support to 120 courses over two academic terms. Projections based on the results of the system implementation phase indicated a requirement for 2.9 clerks to provide the necessary support services. Table 13 shows a comparison between the first set of clerical projections and the

TABLE 13

CLERICAL STAFFING PROJECTIONS

	Experimental System	Implementation System
Locating & Ordering Material	316 days	139 days
Processing Material	374	153
Xeroxing	134	45
Putting Materials on Reserve	74	85
Typing and Filing	250	92
Filling Out Forms	74	19
Coordination	62	32
Total Days	1314	565
No. of Personnel	6.7	2.9

projections resulting from the system implementation experience. Both sets of projections were computed by multiplying the per function time by the number of documents and courses involved and adding 25% to allow for personnel down time. The average number of documents per course was 39 in the implementation phase as compared to 65 in the experimental system.

D. Plan for Integrating System and Library Functions

The final step in system implementation involved the development of a plan for effectively integrating library and system functions. Operation of the system in parallel with the traditional library operation required the duplication of a number of functions. The responsibilities of the information specialists in the areas of task analysis, need diagnosis, literature search and the provision of guidance to students overlapped in many respects with the work areas of the general reference librarian. Additionally, both system clerical staff and library personnel were involved in acquiring materials for the permanent collection, ordering copies or borrowing needed materials from the local network, renting films and other audio-visual aids, and putting requested materials on reserve. It was felt that if these functions could be centralized, the personnel required to operate the library and provide the needed information services could be utilized more efficiently.

The proposed functional organization for the integrated library information service system is presented in Table 14. In this organization the four information specialists take responsibility for insuring adequate information support services to faculty and students in their assigned departments. These department groupings are as follows:

- Information Specialist 1: English, Speech, Philosophy, Education, Music
- Information Specialist 2: Psychology, Political Science, Economics, Modern Language
- Information Specialist 3: Anthropology, Sociology, History, Art
- Information Specialist 4: Biology, Chemistry, Physics, Mathematics, Physical Education

TABLE 14
FUNCTIONAL ORGANIZATION

Departments	General Functions
• Reference	• Work with faculty and students to obtain task descriptions and identify need • Select relevant titles • Develop information packages • Guide students in use of bibliographic sources and the development of search strategies • Obtain evaluative feedback from faculty and students • Maintain request files and book order file.
• Circulation	• Circulate stack books to Hamline students • Circulate stack books, copies of journals, etc. to students from other colleges through CLIC • Control reserve materials • Maintain circulation records
• Ordering/Processing	• Order, process and disseminate copies or loans from external resources • Coordinate with circulation to provide Hamline materials to support course activities • Maintain records of all material by course and request
• Instructional Service	• Order, process and disseminate films, slides, etc. • Create audio visual aids • Maintain records of all materials by course and request

TABLE 14
FUNCTIONAL ORGANIZATION (Continued)

Departments	General Functions
• Acquisitions	• Order books, microfilm for permanent collection • Maintain acquisition files • Coordinate with information specialists and cataloging on ordered materials
• Serials	• Order periodicals and standing orders for permanent collection • Maintain serials files • Coordinate orders with information specialists
• Cataloging	• Catalog books and standing orders for permanent collections • Mark materials • Maintain public catalog.

For the courses selected to receive full support services, the information specialists' work would require in-depth analysis; for non-supported courses general reference service would be provided with the assistance of two part-time reference librarians. Additionally, information specialists would coordinate all faculty and student needs for library service with other library departments. The major areas of coordination include: acquisitions, serials (instructional services), circulation, audio-visual and the borrowing/processing desk.

Each of these library-system divisions would keep records for the material processed by their personnel. Acquisitions and serials would provide information specialists with a file copy of all material ordered by the

academic departments under their responsibility and would notify the appropriate information specialist when material was received by the library. Both the audio-visual department and borrowing/processing desk would maintain citation card files similar to those developed during the experimental system. All materials processed through these two sources would be linked to courses and to faculty and student requests. Evaluation forms would be completed by faculty and students to indicate the usefulness of these materials in performing course tasks. The circulation division of the library would maintain files on reserve materials and compile statistics on the usage of these materials by students.

APPENDIX A

TASK ANALYSIS INTERVIEW AIDS

Task Analysis Checklist

I. Purpose and Organization

A. Objectives for the course. Ways in which the students should be influenced or modified by the course. The skills, knowledge and attitudes that should be acquired by the students as a result of the course. It is important to determine which of the professors' objectives receive the most emphasis.

1. Acquiring knowledge of concepts and principles
2. Acquiring knowledge of factual or empirical information
3. Acquiring skill in using the methods and techniques of the field
4. Developing ability to critically analyze and solve problems
5. Developing open-minded, educated attitudes
6. Developing a basic understanding of the field (e.g.: What sociology is as a discipline; What sociologists do)
7. Learning to use the professional literature in the field
8. Understanding the relationship among disciplines

B. Principal methods for conducting the course. It is important to determine the relative emphasis placed on the selected methods for teaching students and the ways in which these methods help implement the course objectives. Some methods follow:

1. Lecture
2. Discussion
3. Laboratory
4. Reading
5. Preparation of individual student projects (e.g.: term papers; oral reports)

II. Lecture/Discussion

A. Selection of topics to be covered in lecture/discussion. Guidelines for selecting (including) topics. Some topic selection guidelines follow:

1. Conceptual; theoretical
2. Empirical (factual)
3. Methodological
   Application of methods to content areas
4. Broad in scope
5. Narrow in scope
6. Historical in perspective
7. Current in perspective
8. Related to student background and interest
9. Related to one another; integrated, building on one another

B. Selection of reading material to be used in the course. Determine the purpose of the reading and the guidelines for selection.

1. Preferred sources are professional; popular; primary; secondary
2. Time frame is current; historical
3. Coverage is general (survey level); in depth
4. Content is theoretical; factual; methodological
5. Purpose is to reinforce lecture/discussion; supplement lecture/discussion; show relationship between topics; give students a feel for the literature of the field
6. Level of sophistication is geared to student background

C. Preparation of Lectur./Discussion. Guideline for preparation.

1. Order of topic presentation
2. Level of sophistication of topic presentation
3. Depth of treatment of topics
4. Modification and updating of topics presented in previous terms (frequency of)
5. Degree of student participation desired
6. Relationship between lecture/discussion and reading; laboratory

D. Selection of audio-visual aids. The role of these aids and the guidelines for their selection.

1. Provide specific examples for topics covered in the course (e.g. show what an organism looks like, how it behaves, etc.)
2. Provide a general overview in a topic area (film on the reproductive process)
3. Provide students with a more realistic feeling of others attitudes and beliefs (tape of a black panther speech)
4. Provide a basis for discussion and analysis (slide of painting in an art history course)

E. Selection and development of student assignments (e.g.: term papers, oral reports, short papers, critical reviews, exercises). What the professor is trying to achieve through the assignment. The performance the professor expects from the students.

1. Develop an interest in a subject area
2. Learn how research is done in the discipline
3. Learn how to use the literature of the field

4. Learn how to write a professional article
5. Learn how to critically analyze a problem area

III. Laboratory

A. Selection and development of problem areas and exercises for the laboratory. Guidelines for selection and development.

1. Integration with lecture
    a. Schedule laboratory exercises to correspond with lecture/discussion topic presentations
    b. Provide examples of principles covered in lectures
    c. Provide a basis for discussion sessions
2. Scope of problems
    a. Broad to allow students to work at different levels depending on their ability and interest
    b. Narrow to provide a specific example of a method, process, analysis
3. Purpose of problems
    a. Provide a demonstration of a method, process, principle, etc.
    b. Provide a vehicle for students to learn to analyze problems, do research, etc.
4. Degree of student participation in exercise/problem selection
    a. Professor selects general exercise topics and specific exercises

b. Professor selects general exercise topics; students select specific exercises
c. Students select general exercise topics
d. Students do independent laboratory projects

B. Selection of reading for laboratory.

1. Reading should be a part of every laboratory exercise
2. Reading should be in the professional journal literature dealing with the selected problem area
3. Reading should deal primarily with research methods and their application.

Work Session Guidelines

. Convey the idea to the professor that he is going to get a good thing, an individually tailored service, responsive in detail to his particular information needs. However, the procedure for getting to that stage takes some work and time. Avoid giving the impression that the session consists of the information specialist asking penetrating questions and the professor giving precise answers. Basically the professor has to work to understand what the information specialist is getting at, and the information specialist has to work to understand what the professor does and how he thinks about what he does.

. No matter how secure the professor is his initial responses are going to be defensive and apprehensive. In most cases the professor is not sure why he is there, and until he is sure what's happening, he is going to be protective. This problem is exaggerated when there are two or more people from the library and only one of him. The information specialist must convince the professor that the work of constructing a task model is not easy and that it has to be done together. Let he professor know that the process will not be nice and neat and that questions will be asked over again for clarification. Learning how the professor plans and conducts his course will come slowly and more than one work session will be required.

. The basic idea of the task model the information specialist and the professor are building is that it represents a shared understanding of how the professor works. The information specialist should make the professor understand that a structured description of what he does provides a concrete basis for examining his needs and the ways in which these needs can be met. This idea should be presented early as the common goal of the session.

. The information specialist must have a clear structure in his head about what information is needed from the professor: categories - objectives, tasks, criteria, etc., as well as lists of items per category. The job of the information specialist is to elicit information about these categories as it applies to the professor. In most cases the professor's responses will not correspond to the question. The information specialist may ask about objectives and the professor may respond with descriptions of how the class is conducted or who is in it or the list of topics covered or whatever. The information specialist should write down what the professor is saying and mark in the margin the category or categories of information that have been provided. As the session progresses, the information specialist should scan the margin to see what categories have a lot of material and which have not been covered (covered by his responses not your questions). If one or two categories have not been responded to, the information specialist should let the professor know that more information is needed. One way is to review the notes showing that certain categories of information are needed. This will give the professor an idea of how his responses are being structured.

. In general it is a good idea for the information specialist to write notes out in the open. The information specialist should sit where the professor can see what is being written down. This helps the work session in several ways. First it gives the professor a chance to see what part of what he has said matters (selective reinforcement in a sense) and he is encouraged to say more about that. Second, it gets rid of some of the professor's anxieties about what the process is really all about (am I on candid camera). Third, it gives the professor a chance to clarify or elaborate the item. Fourth, while the information specialist is writing the professor gets a chance to think.

. The information specialist should not be panicked by silence. This is not a social event and a constant flow of conversation will not be the mode. When a question is asked the professor will probably think about it before answering. When the answer is given the information specialist will write it down, mark the category in the margin and think about the next logical question to ask based on the professor's response. If the professor's response was about student composition the next question should not be about text selection. The information specialist should find a natural follow-up on the student theme; their level of sophistication in the content, are they majoring in the subject, how does the professor plan to have the course change them (before and after kind of way to get Objectives), etc.

. Finish the session by reviewing the notes. Essentially both the information specialist and the professor review the information produced by the session. It's a little clumsy because it is a first run through. So much the better, a little clumsiness on the part of the information specialist is great for the professor's ego. The information specialist should close the session with a promise to polish up the notes and construct a rough model of the course. At this point an appointment should be made to review the rough model.

APPENDIX B

GENERALIZATION QUESTIONNAIRES

APPENDIX B

GENERALIZATION QUESTIONNAIRES

The generalization questionnaire was developed in two parts. Part I was designed to obtain a detailed description of all courses taught by Hamline faculty members; Part II was designed to provide an overall picture of the information service requirements associated with courses described in Part I. There were three forms of Part I: Science, Social Science, Fine Arts and Humanities. All three forms are included in this appendix. Part II of the questionnaire was individually tailored to the course descriptions. Approximately 40 different question combinations were assembled. Two examples are included in this appendix.

Description of Courses

Science

Name _____

Number of years teaching at college level (not including present year) _____

Percent of total time devoted to Hamline spent in preparation and teaching (does not include counseling, research, committee work) _____

Percent of time spent in ordering, setting up and maintaining laboratory equipment and supplies _____

It is recommended that the following questions be answered for one course at a time.

1. Number of times you have taught the course.						
2. Average number of students each term (give range, e.g., 20-15).						
3. Level of majority of students (F, So, J, Sr).						
4. Objectives for the course (rank order, 1 = most important). If two or more objectives are of equal importance, they may be assigned the same rank.						
a. Students should acquire knowledge of concepts and principles.						
b. Students should acquire factual information.						
c. Students should acquire skill in using the methods and techniques.						
d. Students should develop the ability of critical analysis and problem solving.						
e. Students should develop openminded, educated attitudes.						
f. Students should learn to deal with professional literature.						
g. Students should learn to construct models to explain experimental observation.						

h. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
5. Principal methods for conducting the course (check those appropriate, if more than one method checked, circle the most appropriate ⊘ .						
a. Teaching student through lecture						
b. Teaching student through laboratory						
c. Teaching student through discussion groups						
d. Teaching student through student reading						
e. Teaching student through student preparation of oral and written reports, term papers, etc.						
f. Teaching student through field work						
g. Teaching student through class and/or homework exercises						
h. Teaching student through programmed instruction						
i. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
6. Characteristics of topics included in lecture/discussion part of the course (check those that are appropriate).						
a. Topics treat basic principles and theories in the field						
b. Topic treat methods and techniques						
c. Topics included application of methods to content areas.						

Description of Courses - Science (continued)

d. Topics are related through a common approach (e.g., problem orientation)						
e. Each topic presented builds on the previous topics						
f. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
7. Characteristics of topics for laboratory or field exercises (check those that are appropriate).						
a. Exercises correspond to topic treated in lecture or discussion						
b. Exercise problems are broad enough to allow students to work at different levels depending on their ability.						
c. Exercise problems are narrow.						
d. General exercise topics are selected by the professor.						
e. General exercise topics are selected by the students.						
f. Specific exercises are selected by the professor						
g. Specific exercises are selected by the student						
Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
8. Characteristics of supplementary reading (check those that are appropriate).						
a. Supplementary reading provides broad coverage of topics (breadth).						

Description of Courses - Science (continued)

b. Supplementary reading provides narrow coverage of selected topics (depth)						
c. Supplementary reading is primarily in primary sources						
d. Supplementary reading deals with methods and techniques						
e. Supplementary reading deals with theories and principles						
f. Supplementary reading aims at showing relationships between topics						
g. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
9. Student assignments (check those that are appropriate).						
a. Laboratory or field reports based on independent projects.						
• Required						
• Optional						
b. Reports based on assigned laboratory or field exercises.						
• Required						
• Optional						
c. Term papers						
• Required						
• Optional						
d. Oral reports						
• Required						
• Optional						

Description of Courses - Science (continued)

e. Supplementary reading						
o Specific readings required						
o Specific topic required						
o Optional						
f. Homework problems						
g. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						

Description of Courses

Social Science

Name _____

Number of years teaching at college level (not including present year) _____

Percent of total time devoted to Hamline spent in preparation and teaching (does not include counseling, research, committee work) _____

It is recommended that the following questions be answered for one course at a time.

1. Number of times you have taught the course						
2. Average number of students each term (give range, e.g., 10-15).						
3. Level of majority of students (F, So, J, Sr).						
4. Objectives for the course (rank order, 1 = most important). If two or more objectives are of equal importance, they may be assigned the same rank.						
a. Students should acquire knowledge of concepts and principles.						
b. Students should acquire factual information information.						
c. Students should acquire skill in using the methods and techniques of the field.						
d. Students should develop openminded, educated attitudes.						
e. Students should develop the ability to analyze problems critically.						
f. Students should learn to deal with professional literature in the field.						
g. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						

5. Principal methods for conducting the course (check those appropriate, circle the most appropriate ⓥ).						
a. Teaching student through lecture						
b. Teaching student through performing/ practicing methods and techniques.						
c. Teaching student through student reading.						
d. Teaching student through student preparation of oral and written reports.						
e. Teaching student through discussion groups.						
f. Teaching student through class exercises.						
g. Teaching student through programmed instruction.						
h. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
6. Characteristics of topics included in the course (check those that are appropriate).						
a. Conceptual-factual content						
• Most of the emphasis is on basic concepts and principles.						
• Most of the emphasis is on factual information.						
• Equal emphasis is placed on facts and concepts.						
• Concepts and facts are integrated.						
b. Scope						
• Most of the topics ar e broad in scope (e.g., wide social, political, economic influence).						

• Most of the topics are narrow in scope scope.						
• Historical and current issues are given equal treatment						
• Historical and current perspectives are integrated.						
d. Topics relate to student background, experience, attitudes.						
e. Each topic presented builds on the previous topic.						
f. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
7. Characteristics of supplementary reading (check those that are appropriate).						
a. Supplementary reading is aimed at providing broad coverage.						
b. Supplementary reading is aimed at providing depth of coverage on single topics.						
c. Supplementary reading emphasizes historical perspective.						
d. Supplementary reading emphasizes current perspective.						
e. Supplementary reading gives equal coverage to historical and current material.						
f. Supplementary reading is mainly in primary sources						
g. Supplementary reading aims at showing relationships between topics.						

Description of Courses - Social Science (continued)

h. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
8. Student assignments (check those that are appropriate)						
a. Term papers						
• Required						
• Optional						
b. Oral reports						
• Required						
• Optional						
c. Class exercises (short papers, etc.)						
• Required						
• Optional						
d. Supplementary reading						
• Specific readings required						
• Specific topic required						
• Optional						
e. Homework problems						
f. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						

Description of Courses

Arts and Humanities

Name _____

Number of years teaching at college level (not including present year) _____

Percent of total time deveoted to Hamline spent in preparation and teaching (does not include counseling, research, committee work) _____

It is recommended that the following questions be answered for one course at a time.

1. Number of times you have taught the course.						
2. Average number of students each term (give range, 3.g., 10-15).						
3. Level of majority of students (F, So, J, Sr).						
4. Objectives for the course (rank order, 1 = most important). If two or more objectives are of equal importance, they may be assigned the same rank.						
a. Students should acquire knowledge of theories, concepts, principles.						
b. Students should acquire factual in information.						
c. Students should develop the ability to analyze problems critically.						
d. Students should develop skill in the use of research and scholarly methods.						
e. Students should develop a sensitivity or appreciation; a critical perspective.						
f. Students should develop openminded, educated attitudes.						
g. Students should learn to deal with primary source materials.						
h. Other (specify)						
Other (specify)						

Description of Courses - Arts and Humanities (continued)

Other (specify)						
Other (specify)						
5. Principal methods for conducting the course (check those appropriate. Circle the most appropriate ✓.						
a. Teaching student through lecture.						
b. Teaching student through performing methods and techniques.						
c. Teaching student through discussion groups.						
d. Teaching student through exercises.						
e. Teaching student through student reading.						
f. Teaching student through student preparation of oral and written papers.						
g. Teaching students through programmed instruction.						
h. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
6. Characteristics of topics included in the course (check those that are appropriate).						
a. Conceptual-empirical						
• Most of the emphasis is on basic concepts and theories.						
• Most of the emphasis is on factual, empirical information.						
• Equal emphasis is placed on theory and facts.						
• Concepts and facts are integrated.						

b. Breadth-depth						
• Most of the topics are broad in scope (as compared to other courses in your department)						
• Most of the topics are narrow in scope						
• There are an equal number of broad and narrow topics.						
c. Classical-contemporary						
• Most of the topical content is classical						
• Most of the topical content is contemporary						
• Equal emphasis is placed on classical and contemporary work.						
d. Topics are treated in context (e.g., influence or relationship of social, economic, political, intellectual, scientific, etc. factors).						
e. Topics are examined from an historical perspective.						
f. Topics relate to the cultural backgrounds and experiences of students.						
g. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
7. Characteristics of reading for the course (check those that are appropriate).						
a. Standard text for the course (reference books, literary works, etc.)						
• Secondary works (No. ____)						
• Primary works (No. ____)						
b. Supplementary reading is aimed at providing broad coverage.						

Description of Courses - Arts and Humanities (continued)

c. Supplementary reading is aimed at providing depth of coverage on single topics.						
d. Supplementary reading includes primary sources.						
e. Supplementary reading includes secondary sources.						
f. Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						
g. Student assignments (check those that are appropriate).						
(1) Term papers						
• Required						
• Optional						
(2) Oral reports						
• Required						
• Optional						
(3) Critical reviews						
• Required						
• Optional						
(4) Class exercises						
• Short papers						
• Homework problems						
(5) Supplementary reading						
• Specific readings required						
• Specific topic required						
• Optional						

Description of Courses - Arts and Humanities (continued)

(6) Other (specify)						
Other (specify)						
Other (specify)						
Other (specify)						

INFORMATION SERVICES

NAME_____ DATE_____

Lecture/Discussion

1. How frequently do you introduce new major topics into your discussion sessions? (Please check the appropriate frequency for each course listed below.)

Every yr.								
2 yrs.								
3 yrs.								
More than 3 yrs.								

2. How frequently do you modify or update the detailed material covered in your discussion sessions? (Please check the appropriate frequency for each course listed below.)

Every yr.								
2 yrs.								
3 yrs.								
More than 3 yrs.								

3. How frequently do you change your student reading lists? (Please check the appropriate frequency for each course listed below.)

Every yr.								
2 yrs.								
3 yrs.								
More than 3 yrs.								

4. When preparing for your discussion sessions, do you find it necessary to go beyond the materials you have at hand? (For each task listed below please circle those courses where additional resources are required.)

   a. Preparing for discussions sessions.

   b. Selecting student reading.

If no courses are circled, skip to page _____.

5. Below is a list of information services which might be useful to you in preparing the lecture and/or discussion sections of your courses. For each service listed please circle those courses for which you would find the service useful. It is recommended that you read the list of services prior to answering.

a. A service which identifies and locates secondary sources (e.g. critical reviews; contextual material on the times in which selected literary pieces were produced, etc.)						
(1) Introducing new lecture topics.						
(2) Updating lectures.						
(3) Preparing for discussion sessions.						
(4) Selecting student reading.						
b. A service which identifies and locates materials from popular sources (e.g. magazines, newspapers).						
(1) Introducing new lecture topics.						
(2) Updating lectures.						
(3) Preparing for discussion sessions.						
(4) Selecting student reading.						
c. A service which obtains materials (books, articles, etc.) which you have identified as useful.						
(1) Introducing new lecture topics.						
(2) Updating lectures.						
(3) Preparing for discussion sessions.						
(4) Selecting student reading.						

d. A service which identified and locates films, slides, etc. (1) Introducing new lecture topics						
(2) Updating lectures.						
(3) Preparing for discussion sessions.						
e. A service which provides answers to questions (1) Introducing new lecture topics.						
(2) Updating lectures.						
(3) Preparing for discussion sessions.						
(4) Responding to student questions arising in class.						

Student Assignments

1. When students are doing projects, which of the following services would you consider to be useful to them? Please circle those courses where a service is useful.

   a. A service which would help students narrow down a selected topic.

Lab Reports	____	____	____	____	____	____	____	____
Term Paper	____	____	____	____	____	____	____	____
Oral Reports	____	____	____	____	____	____	____	____
Homework	____	____	____	____	____	____	____	____

   b. A service which would help students in searching through the literature (e.g. direct them to appropriate bibliographic sources and teach them how to use these sources).

Lab Reports	____	____	____	____	____	____	____	____
Term Paper	____	____	____	____	____	____	____	____
Oral Reports	____	____	____	____	____	____	____	____
Homework	____	____	____	____	____	____	____	____

   c. A service which would locate and obtain materials which the students identified as useful.

Lab Reports	____	____	____	____	____	____	____	____
Term Paper	____	____	____	____	____	____	____	____
Oral Reports	____	____	____	____	____	____	____	____
Homework	____	____	____	____	____	____	____	____

   d. A service which would answer specific student questions.

Lab Reports	____	____	____	____	____	____	____	____
Term Paper	____	____	____	____	____	____	____	____
Oral Reports	____	____	____	____	____	____	____	____
Homework	____	____	____	____	____	____	____	____

INFORMATION SERVICES

NAME_____ DATE_____

Lecture/Discussion

1. How frequently do you modify or update the detailed material covered in your lectures? (Please check the appropriate frequency for each course listed below.)

Every yr.	____	____	____	____	____	____	____	____
2 yrs.	____	____	____	____	____	____	____	____
3 yrs.	____	____	____	____	____	____	____	____
More than 3 yrs.	____	____	____	____	____	____	____	____

2. How frequently do you change your student reading lists? (Please check the appropriate frequency for each course listed below.)

Every yr.	____	____	____	____	____	____	____	____
2 yrs.	____	____	____	____	____	____	____	____
3 yrs.	____	____	____	____	____	____	____	____
More than 3 yrs.	____	____	____	____	____	____	____	____

3. When preparing for your lectures, do you find it necessary to go beyond the material you have at hand? (For each task listed below please circle those courses where additional resources are required.)

   a. Introducing new lecture topics.

   ____ ____ ____ ____ ____ ____ ____ ____

   b. Updating lectures.

   ____ ____ ____ ____ ____ ____ ____ ____

   c. Selecting student reading to supplement lectures.

   ____ ____ ____ ____ ____ ____ ____ ____

If no courses are circled, skip to page_____.

4. Below is a list of information services which might be useful to you in preparing the lecture and/or discussion sections of your courses. For each service listed, please circle those courses for which you would find the service useful. It is recommended that you read the list of 6 services prior to answering.

a. A service which identifies and locates current materials from the professional primary source literature (research papers, technical reports).						
(1) Introducing new lecture topics.						
(2) Updating lecture.						
(3) Selecting student reading to supplement lecture.						
b. A service which identifies and locates background material from the professional literature (e.g. review articles, texts, handbooks).						
(1) Introducing new lecture topics.						
(2) Updating lectures.						
(3) Selecting student reading to supplement lecture.						
c. A service which identifies and locates articles from magazines (e.g. Science News).						
(1) Introducing new lecture topics.						
(2) Updating lecture.						
(3) Selecting student reading to supplement lecture.						

d. A service which obtains material which you have identified as useful.						
(1) Introducing new lecture topics.						
(2) Updating lecture.						
(3) Selecting student reading to supplement lecture.						
e. A service which identifies and locates films, slides, etc.						
(1) Introducing new lecture topics.						
(2) Updating lectures.						
f. A service which provides answers to questions.						
(1) Introducing new lecture topics.						
(2) Updating lectures.						
(3) Responding to student questions arising in class.						

Laboratory

1. How frequently do you introduce new research problems in the laboratory? (Please check the appropriate frequency for each course listed below.)

Every yr.	____	____	____	____	____	____
2 yrs.	____	____	____	____	____	____
3 yrs.	____	____	____	____	____	____
More than 3 yrs.	____	____	____	____	____	____

2. In setting up new laboratory exercises, would any of the following services be of use to you? (Please circle those courses where service is useful.)

   a. A service which identifies and locates:

Current journal articles	____	____	____	____
Background material	____	____	____	____
Films, slides, etc.	____	____	____	____

   b. A service which locates references which you have identified as useful.

____	____	____	____

   c. A service which answers questions.

____	____	____	____

3. When students select their own research problems in the laboratory, would it be useful to have a service which would aid them in searching through the literature?

____	____	____	____

   In locating materials that they identified as useful?

____	____	____	____

Student Assignments

1. When students are doing projects, which of the following services would you consider to be useful to them? Please circle those courses where a service is useful.

   a. A service which would help students narrow down a selected topic.

   Lab Reports _____ _____ _____ _____ _____ _____ _____ _____
   Oral Reports _____ _____ _____ _____ _____ _____ _____ _____

   b. A service which would help students in searching through the literature (e.g. direct them to appropriate bibliographic sources and teach them how to use these sources).

   Lab Reports _____ _____ _____ _____ _____ _____ _____ _____
   Oral Reports _____ _____ _____ _____ _____ _____ _____ _____

   c. A service which would locate and obtain materials which the students identified as useful.

   Lab Reports _____ _____ _____ _____ _____ _____ _____ _____
   Oral Reports _____ _____ _____ _____ _____ _____ _____ _____

   d. A service which would answer specific student questions.

   Lab Reports _____ _____ _____ _____ _____ _____ _____ _____
   Oral Reports _____ _____ _____ _____ _____ _____ _____ _____

APPENDIX C

COURSES PARTICIPATING IN EXPERIMENTAL SYSTEM

LIST OF SUPPORTED COURSES

Fine Arts and Humanities

Arts of the United States
The Black Church
Contemporary Black Literature
Development of Modern Art
Seminar on Confrontation
Survey of Dramatic Literature

Science

Biochemistry
Biology of Cells - Non Majors
Biology of Organisms - Non Majors
Cell Structure and Function - Majors
Chemical Principles
Comparative Animal Physiology
Ecology
General Physics
Genetics
Microbiology
Organismic Form and Function - Majors
Seminar in Teaching Biology
Special Studies in Biology
Special Studies in Chemistry

Social Science

Age of Revolution
Cultural Anthropology
Economic Institutions and Issues
Historical Evidence and Analysis
Introductory Sociology
North American Indian
Prehistoric Man and His Culture
Racial and Cultural Minorities
Special Studies in Education
Seminar in Anthropology