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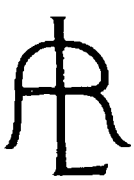
ABSTRACT

A study was made of the use of time-sharing computer systems as a means of communication, accounting, message switching, and referral in a System for Inter-Library Communication (SILC). The purpose of the study was to develop data on which to evaluate the feasibility of such a system; the results are reported in terms of four issues: technical feasibility, operational feasibility, management feasibility, and economic feasibility. The evaluations are essentially positive with respect to all four issues, and the report recommends proceeding further in development and pilot test of the operation. The report starts with an introduction, in which the background for the study is presented, the conclusions concerning feasibility are summarized, and the recommendations made. It is followed by a section presenting specifications for SILC: the concept, the functions, the parameters of operation. The results of study of each of the four issues with respect to feasibility are then presented. The report concludes with several appendixes: a bibliography of references, a glossary, a draft program for steps in future development, and a draft operations manual. (Author)

A SYSTEM FOR INTER-LIBRARY COMMUNICATION (SILC)

By

Robert M. Hayes



THE ASSOCIATION OF RESEARCH LIBRARIES
1527 New Hampshire Avenue, N.W.
Washington, D.C. 20036

FINAL REPORT ON
A STUDY OF A
SYSTEM FOR INTER-LIBRARY COMMUNICATION
(SILC)

R. M. HAYES

15 December 1973

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FOREWORD

This report has been prepared at the request of the Association of Research Libraries. Members of the ARL Advisory Committee, the ARL staff and others have contributed in various ways to the conduct of the study and the preparation of the report.

The conclusions and recommendations of the report are those of the contractor. They do not necessarily represent the views of the Association of Research Libraries.

In light of the findings of this and other studies of the interlibrary loan problem, the Association hopes to proceed with a pilot testing program of SILC at an early date. If the outcome of such a test is positive, the Association would hope that the SILC system could be established as soon as may be practicable.

Stephen A. McCarthy
Executive Director

February 22, 1974

ACKNOWLEDGEMENTS

There are many people who have contributed to the development of this report. In fact, without their help it could not have been completed. I wish therefore to thank them and hope that the value to them was even a small part of the value they meant to the study.

First, I want to thank Miss Marion Rice, especially for her work with the various libraries. Beyond that, I want to thank her for her careful attention to detail without which many errors and inconsistencies would not have been recognized. I want to thank Dr. Sarah K. Thomson who served as a consultant but did far more than was expected, responding to the needs in a remarkable way. I want to thank Professor G. Edward Evans and Professor Harold Borko who provided such valuable commentary and advice as well as personal support.

Second, I want to thank the members of the ARL Advisory Committee: David Weber (Chairman), Richard Chapin, David Heron, Jay Lucker, and Vern Pings. Leslie W. Dunlap served as liaison with the National Commission on Libraries and Information Science. Their willingness to review and comment upon the drafts of this report as they were developed was one of the pleasures of working on it. Without their input, it is unlikely that the study would have recognized the real needs or problems. I am especially grateful to Stephen A. McCarthy, who was willing to commit himself and the time and resources of the ARL staff to this project. C. Dake Gull, who served as consultant to the ARL staff and to the Advisory Committee, was extremely helpful in his perceptive, objective comments and evaluations. Mr. Edward D'Alessandro served as an observer for the Library of Congress, but he provided so much valuable advice that he was really a member of the Advisory Committee in fact, if not in name.

Third, although they will be kept anonymous, I want to thank the various time-sharing companies and their technical staffs that were so willing to cooperate in this study--spending a significant amount of time and money in doing so. Their contribution, in the form of informal proposals and willingness to discuss technical details, was absolutely essential to the completion of this study. Without that input, it would have been impossible to arrive at any meaningful conclusions about technical feasibility.

Fourth, although they will also be kept anonymous, I want to thank the seven libraries that were willing to work with us. The time that was spent by their ILL staff in discussion of their operations with us was a gift of immense value. Without their help, it would have been impossible for us to have any idea of the realities of inter-library loan service and practice.

Fifth, I want to thank the organizations and the people in them who were so willing to cooperate in discussion of the requirements for management of SILC: the Library of Congress, the Center for Research Libraries, EDUCOM, the System Development Corporation, and the ARL.

Finally, I want to thank Carole Bailey, without whose willingness to work with me in producing this report as a readable document it simply could not have been done.

Robert M. Hayes
Los Angeles, California

ABSTRACT

This is the final report on a study of the use of time-sharing computer systems as a means for communication, accounting, message switching, and referral in a "System for Inter-Library Communication" (SILC). The purpose of the study was to develop data on which to evaluate the feasibility of such a system; the results are reported here in terms of four issues: (1) technical feasibility, (2) operational feasibility, (3) management feasibility, and (4) economic feasibility. The evaluations are essentially positive with respect to all four issues, and the report recommends proceeding further in development and pilot test of the operation.

The report starts with an Introduction, in which the background for the study is presented, the conclusions concerning feasibility are summarized, and the recommendations made. It is followed by a section presenting specifications for SILC: the concept, the functions, the parameters of operation.

The results of study of each of the four issues with respect to feasibility are then presented in the succeeding four sections. Each includes an analysis of the results and an evaluation of feasibility.

The report concludes with several appendices: a bibliography of references, a glossary, a draft program for steps in future development, and a draft "Operations Manual". The latter is especially important as the basis for evaluation of the effects of SILC upon day-to-day ILL operations.

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1. INTRODUCTION AND SUMMARY

Under funding from the National Science Foundation, the Association of Research Libraries, with Becker and Hayes, Inc. as sub-contractors, conducted a study of the feasibility of a computer-based System for Inter-Library Communication (SILC). This report is the Final Report on that project, as submitted by Becker and Hayes, Inc. It is intended to provide the basis for evaluation of the feasibility of SILC and for decision concerning whether to proceed further toward development and test of such a system.

In this section, we will first present a description of the general character of inter-library loan (ILL), especially in terms of the problems that have led to consideration of SILC and other possible answers. Specifically, in the past, inter-library loan has been predicated on a more or less reciprocal relationship between libraries. The fact that a relatively few libraries were consistent net lenders was not particularly bothersome as long as the level of use was relatively low. During the last several years, however, the level of ILL has increased at a substantial rate, and the costs to the major net lenders can no longer be absorbed by them. The growth of library networks and consortia implies that the level will continue to

increase, but it also suggests that a means for facilitating communication within and among consortia will be required if for no other reason than the need to monitor and account for traffic. Later in this section, we will present a summary of the conclusions and recommendations resulting from the study of the feasibility of SILC as an answer to this problem.

In the second section of this report we provide a specification for SILC and its functions. In summary, SILC uses a national computer time-sharing system for message switching, automatic referral, and accounting for the messages involved in inter-library loan (and other inter-library communication).

The third section of this report provides the results of informal discussion of SILC with various computer time-sharing systems and presents criteria for evaluation of them for SILC development and operation.

The fourth section of this report discusses some of the organizational and procedural problems involved in implementing and using SILC. It provides the results of analyses of key libraries in a number of existing consortia that could serve as means for identifying these problems as well as for testing and evaluating SILC operation. Everything indicates that the participation of these consortia is the most important part of the SILC project, since the really difficult problems are not the technical ones but the organizational and procedural ones.

The fifth section of this report summarizes the requirements for management of the development and operation of SILC. It then presents descriptions of a number of organizations that could each meet these requirements. It concludes with an evaluation of the feasibility of managing SILC development and operation.

The sixth section of this report provides an analysis of the costs of operation of SILC in comparison with the costs presently incurred in inter-library loan and the costs that might be involved in the operation of a number of other alternatives. It concludes with an evaluation of the economic feasibility of SILC.

The Appendices provide a variety of supporting data: (A) a bibliography of references and relevant documents, (B) a glossary, defining terms as used in this report, (C) a tentative developmental program, outlining the steps which might be taken if further development and pilot-test seems warranted, and (D) a draft operations manual, summarizing the procedures that might be required in a library using SILC.

References to the bibliography are indicated by superscripts in the text, referring to the reference number in Appendix A, except when specific page numbers are significant in which case the reference number and page number have been included in the text. (This is true especially of Reference 1, the "Westat Study", to which frequent reference is made).

BACKGROUND

Context for the Study. The concept of SILC is the result of the coincidence of the following conditions:

(1) The critical need for the establishment of an accounting system to permit the continued existence, growth, and improvement of the existing interlibrary loan activities and to equalize the burdens among the participating libraries.

(2) The recent development of time-sharing computing networks which are capable of handling and improving the communication and accounting requirements of the existing and future inter-library loan activities.

(3) The development of a number of "science information dissemination centers" that also have interest in sharing resources.

(4) The developing interest in making data bases available on-line in support of library ILL bibliographic search and data base access.

Inter-library Loan. Inter-library loan (ILL) is the process by which libraries share their resources. To date, it has generally been predicated on the view that a library could borrow, on behalf of its own constituency, material from another library without charges (except for the cost of photocopy or other special needs) and similarly would lend its own materials to other libraries in a reciprocal manner. The ILL process has been formalized as a standard procedure, the "National Inter-library Loan Code". First promulgated in 1917, it has been revised several times, most recently in 1968.[2]

The basic concept of the National Interlibrary Loan Code is to reduce the burden on the lending library to the least possible since it is being asked to provide a free service to the borrowing library, whose users lie outside the constituency and support of the lending library. The main requirements are that the borrowing library assure that the material is properly identified and that it is indeed something held by the lending library, before transmitting its request.

As long as the level of ILL was small enough, the gentlemanly belief in reciprocity or at least in noblesse oblige could be maintained. For several reasons, it has become increasingly difficult to do so:

(1) The level of ILL has increased significantly in the last several years and the fact that a few libraries are major net lenders has caused them significant financial problems.

(2) The growth of library networks and consortia has reached the point where the level of ILL promises to increase even more explosively.

(3) A few consortia have begun to establish a basis of payment for ILL services, the prime example in point being the Regional Medical Library system in which services are paid for by the National Library of Medicine.

Concern about the magnitude of ILL costs for the major lending libraries led the Association of Research Libraries to determine what they are. The results have been reported in a book that we will refer to as "The Westat Study" (reference 1). In it, on page 3, the costs were roughly summarized as follows:

> "The average lending cost per request for large academic libraries, based on direct costs and a 50 percent overhead rate, was as follows:
>
> $2.12 for an unfilled loan request
> $4.67 for a filled loan request."

When it is considered that a major lender may handle as many as 6000 requests per month, it is clear that reciprocity is no longer an acceptable fiction to such a library.

The basis of such costs is shown in Figure 1-1, a listing of the major tasks carried out in ILL by both borrowing and lending libraries. The major costs are in professional staff time required for verification of bibliographic description. In fact, if any real answer is to be found to the problem of ILL cost, it may be in the development of on-line catalogs that will facilitate these tasks, as we will discuss later.

In the meantime, however, the problem still exists: How can the major lenders be reimbursed for their costs? Whatever the answer may be, whether fee or subsidy, it will require that the ILL traffic be monitored and objectively accounted for. This is already an integral part of the operation of the Regional Medical Libraries (RMLs), for example, since the payment to them from the National Library of Medicine (NLM) is based in part on the reported level of services provided.[3]

It would seem clear that an accounting system maintained by each library would be cumbersome, inconsistent, and a significant barrier. Through use of SILC, the necessary accounting data can be acquired from the ILL messages handled by a time-sharing computing network, without incurring additional costs of input.

FIGURE 1-1

ILL COSTS

(Copied from the Westat Study, reference 1, pages 19-21)

Percentage distribution of labor over tasks for borrowing and lending for large main libraries

ILL functions	Level of personnel: Professional (percent)	Nonprofessional (percent)	Student (percent)
BORROWING			
I. Making Request	39	14	16
a. assistance to patrons	7	4	1
b. determining location, verifying	26	2	5
c. completing form, filing	5	7	10
d. mailing	1	1	0
II. Receiving Item	7	10	3
a. receiving and unwrapping	3	5	2
b. checking records	3	4	1
c. notifying patron	1	1	0
III. Payment	1	2	0
a. keeping records	1	2	0
b. making payment, mailing	0	0	0
IV. Returning Item	2	3	4
a. changing records	2	2	2
b. wrapping and sending	0	1	2
V. Other	2	2	4
Total borrowing	51	31	27
LENDING			
I. Receiving Request	25	27	28
a. receiving and verifying	7	6	1
b. checking catalogue, locating	5	10	7
c. searching shelves, pick-up	2	4	15
d. keeping records, check-out	11	7	5
II. Photocopying	2	15	19
a. checking pages requested	1	2	7
b. sending to photocopy	0	2	0
c. copying	0	4	8
d. keeping records	1	2	2
e. preparing, logging invoice, filing	0	3	2
f. processing payment upon receipt	0	2	0
III. Sending	1	3	6
a. wrapping	0	2	4
b. distributing or mailing	1	1	2
IV. Follow-up	0	1	2
a. sending overdue notices	0	0	1
b. keeping records	0	1	1
V. Returned Items	2	3	8
a. unwrapping and inspecting	0	1	2
b. changing records	2	1	2
c. discharging	0	0	2
d. reshelving	0	1	2
VI. Other	19	20	10
Total lending	49	69	73
Total, borrowing & lending	100%	100%	100%

FIGURE 1-1 (Continued)

Total projected annual costs for borrowing activities for universe of 113 large academic libraries, 1970-71

Cost category	Amount (thousands)	Total (thousands)
Direct salaries and wages	$1,310	
Fringe benefits (13%)	170	
Total salaries and wages		$1,480
Other direct cost		141
Total direct cost		$1,621
Overhead (50% of direct salaries)		655
Total projected annual borrowing cost		$2,276

Total projected annual costs for lending activities for universe of 113 large academic libraries, 1970-71

Cost category	Amount (thousands)	Total (thousands)
Direct salaries and wages	$2,036	
Fringe benefits (13%)	265	
Total salaries and wages		$2,301
Other direct cost		438
Total direct cost		$2,739
Overhead (50% of direct salaries)		1,018
Total projected annual lending costs		$3,757

Science Information Data Bases. A separate line of development, but one with a significant inter-action with inter-library loan, is that involved in the use of data bases. During the past ten years, the development of mechanized means of production of indexing and abstracting journals has created a variety of "reference data bases"; in addition, a number of numerical data bases have been produced as a natural by-product of the acquisition and processing of socio-economic data and technological data (a prime example being the 1970 census tapes). Taken together, these data bases constitute information resources of exceptional value.

To provide information services using these data bases, a number of universities have established "information dissemination centers" to acquire the data bases and process them to meet the needs of their faculty, staff, students, and in some cases industrial community. As a group, they now coordinate their activities through an "Association of Scientific Information Dissemination Centers" (ASIDIC).[4]

Among the issues with which ASIDIC has been concerned is finding the most effective means of sharing their acquisition and use of data bases. The data bases are expensive to acquire, and the feeling therefore is that some counterpart of "inter-library loan" for data base use may permit sharing of acquisition costs. Even more important, however, is the fact that the cost of processing is in large part independent of the number of information requests being processed; by sharing

resources and depending upon single institutions for the processing of single data bases, requests can be more effectively batched, at a much lower processing cost per request. The next logical step to be taken by these centers, and the research libraries with which they are associated, is to create an information network through which they can share their data bases and computing capabilities. At the simplest level, therefore, there is an interest in the communication of requests and the accounting for them comparable to that in inter-library loan. The ASIDIC centers, taken as a consortium, could therefore be users of SILC for exactly the same purposes and functions as a group of libraries.

On-line Access. But at a more complex level, another development in the use of data bases raises another set of functions--access to and use of on-line data bases--that has value not only in the context of ASIDIC but in that of inter-library loan as well. Specifically, for many kinds of services, an on-line data base provides improved effectiveness and even economy of operation in comparison with batch processing of tapes (which at this time is the predominant mode of operation of the ASIDIC Centers). At least one data base--the MEDLINE service of the National Library of Medicine--is available in an on-line mode throughout the country.[3] It seems very likely that, if cooperative arrangements are established among the ASIDIC centers, among them will be assignment of responsibility for providing on-line access to specific data bases at specific centers. If so, a multiplicity of technical problems in

relating a SILC-type operation to such a function would need to be solved.

From the standpoint of inter-library loan, however, the potential availability of on-line data bases has an importance fully equal to that it has for the ASIDIC centers. Specifically, as the data reported in the Westat study (summarized earlier in this section) showed, the major cost in inter-library loan is the bibliographic checking and identification of the source of desired material. If a means can be found to reduce these costs, it will have a profound effect upon the inter-library loan function. The fact is that on-line bibliographic data bases are not only being created, they are operational. The OCLC service has demonstrated that they can be both economic and effective.[5] And there are already underway a number of efforts, throughout the country, to duplicate the OCLC operation. Beyond that, there are other, independent efforts directed at creating on-line bibliographic data bases, union catalogs, and union lists of serials. If the means can be developed for referring inter-library loan requests to such on-line data bases for search and identification of sources, the great bulk of the costs of inter-library loan could, at least in principle, be eliminated.

As a specific example of what may be feasible, since the middle '60s the Library of Congress has published the Register of Additional Locations as a part of the National Union Catalog, based on LC Card Numbers. Presumably a major part of this--perhaps all--is already in machine readable form. Based on the same system, Louisiana has come out with a state union list. New Jersey, among others, is seriously considering starting a similar project. If some combination of these data bases were on-line, then borrowing libraries could merely input the LC Card Number, and the computer could identify the locations of possible lending libraries, determine which was closest to or part of the consortium of the borrowing library, and route accordingly. It would also be possible to add the LC Card Numbers to new editions of Books in Print, so that even the smallest library could have available the LC Card Numbers for a great many of the things it wants.

Taken together--the interest in the library community for access to union catalogs and that in the ASIDIC community for access to both numerical and reference data bases, defines the need for another function in SILC--the provision of a capability

for access to on-line data bases. It is a function much more difficult to achieve, both technically and operationally, and much more speculative, but also potentially much more valuable than those discussed earlier.

CONCLUSIONS

Each of the following sections of this report covers a specific issue in evaluation of the feasibility of SILC: technical, operational, management, and economic. Each section concludes with an analysis of the results of study, which we summarize here.

Technical Feasibility. Even before the study was started, it seemed clear that SILC was well within the capabilities of almost any of the existing national time-sharing computer systems. There were still a number of questions, however, that could be raised about technical feasibility. To answer those questions, each of a dozen of the companies providing national time-sharing computer system services was asked to submit an informal proposal describing how it would handle the functional requirements of SILC. Based on the resulting proposals and subsequent detailed discussions with each of the systems that showed an interest in SILC, we arrived at the following conclusions:

(1) The functional requirements of SILC operation can be met by any one of at least five or six of the existing commercial national time-sharing systems and possibly of several similar non-profit systems.

(2) Each of the companies whose systems could meet SILC requirements is financially viable and likely to continue to provide operational services for the indefinite future.

(3) Each of the companies whose systems could meet SILC requirements would be willing to accept responsibility for the applications programming required to bring SILC to an operational stage (under an appropriate contract and payment of costs), and each has the technical staff and competence to do so successfully.

(4) Each of the systems that can meet SILC requirements is capable of absorbing an operation of the size of SILC without significant problem and, in particular, without an unacceptable overload on its communication or computing facilities.

(5) At least three or four of the systems that can meet the functional requirements of SILC operation provide a coverage of the entire United States and Canada (with the exception of Alaska and Hawaii).

(6) Each of the systems will accept input from a wide variety of terminal devices including specifically standard teletype terminals, such as are located in many libraries today. Thus, use of such systems would not require installation of different devices in those libraries with existing teletypes.

(7) The range of estimated costs for SILC operation was from $.30 to $.75 per inter-library loan request handled. This appears, on a superficial comparison with the overall costs of inter-library loan, to be an acceptable range of costs (being about 10% to at most 20%). Later, we will discuss the issue of economic feasibility in more detail.

These conclusions are all essentially positive in their answers to the questions that are relevant to an assessment of technical feasibility. We must therefore conclude that SILC is indeed feasible from a technical standpoint.

Operational Feasibility. Before the study was started, it seemed to be debatable whether SILC would be sufficiently consistent with present practices and procedures in libraries to be feasible from the standpoint of its operation. In particular, there were a number of questions that could be asked about its usefulness, the extent to which it was consistent with present practice, the desirability of using such a complex approach to a task already handled by mail or teletype, etc. To answer those questions, each of seven libraries (representing a broad range of types of library and types of inter-library loan practice) was examined in detail with respect to its present policies and practices in inter-library loan. It would have been most gratifying if the results of that examination could have been an unequivocal conclusion, comparable to that concerning technical feasibility, about the operational feasibility of SILC. Unfortunately, the issue will really be resolvable only on the basis of actual operational experience. However, the following conclusions can be stated:

(1) There is at least one operational prototype of SILC in the library network of one state. It has involved the use of teletype communication for message switching and referral and the use of a computer for monitoring traffic and accounting for payments due. The plan in this particular case is to involve the use of computers even more as a part of the functions of message switching and referral. The operation appears to be successful, useful, and accepted by the participating libraries.

(2) Each of the libraries examined participates in a number of different compacts (consortium arrangements), for each of which it must maintain records, must account for payments due and paid, and must provide some kind of reporting. In some of the libraries, the different arrangements have required the establishment of correspondingly different procedures and even of different processing groups within the libraries.

(3) In most of the libraries, referral is a crucial element in serving inter-library loan requests, and in the two state libraries examined such referral is explicitly called for in the administrative organization.

(4) The procedures required to use SILC (as represented in the draft procedure manual presented in Appendix D), while perhaps different in detail from present procedures in use of teletype, are not so greatly different as to be unacceptable.

These conclusions all suggest that, while we cannot unequivocally state that SILC will be accepted by libraries or can be easily used by them, it appears that SILC would serve useful functions in accounting, message switching, and referral for some specific groups of libraries. We must therefore conclude that SILC may be feasible from an operational standpoint, and a pilot-test would be likely to demonstrate operational feasibility (recognizing that various procedural problems would need to be resolved during the pilot-test itself).

Management Feasibility. The development and operation of SILC requires that an organization either be established to assume responsibility for it or that an existing one be willing to do so. To determine whether this was feasible, five existing organizations were approached to determine their willingness to accept such responsibility and their capabilities for handling the requirements for management of SILC. Recognizing

that these discussions were informal and do not represent commitments on the part of any of the organizations, there was positive interest expressed in each case. We must therefore conclude that SILC could be effectively managed by any one of several existing organizations or by a comparable one established especially for the purpose.

Economic Feasibility. The final issue in evaluation of SILC is whether it is economically feasible. To answer that question requires a comparison of the costs of SILC operation with those of other alternatives, principal among them being the costs of present operation of inter-library loan. Based on an analysis of the costs reported in the Westat study (reference 1, pages 19-21) into various categories of function and types of response to requests, together with an analysis of the costs of SILC operation and estimates of the costs of other alternatives, we arrived at the following results:

The costs per request of various accounting alternatives were estimated as shown in Figure 1-2.

The costs per request of various message switching alternatives were estimated as shown in Figure 1-3.

The costs per request of various alternatives for handling referrals were estimated as shown in Figure 1-4.

FIGURE 1-2

TOTAL COSTS (PER ILL REQUEST) UNDER

ALTERNATIVE ACCOUNTING SYSTEMS

WITH FULL ACCOUNTING FOR EACH REQUEST

Alternative Accounting Systems	Bibliogr. Searching	Physical Handling	SILC Related	Other (Unalloc.)	Total
Present System	$3.59	1.93	1.98	1.27	8.77
Present System (with full accounting)	3.59	1.93	2.68	1.27	9.47
Clearinghouse (with use of coupons)	3.59	1.93	2.33	1.27	9.12
SILC (only for accounting)	3.59	1.93	2.16	1.27	8.95

FIGURE 1-3

TOTAL COSTS (PER ILL REQUEST) UNDER

ALTERNATIVE MESSAGE SWITCHING SYSTEMS

WITH FULL ACCOUNTING FOR EACH MESSAGE

Alternative Message Switching Systems	Bibliogr. Searching	Physical Handling	SILC Related	Other (Unalloc.)	Total
Present System	$3.59	1.93	1.98	1.27	8.77
Full use of teletype plus clearinghouse accounting	3.59	1.93	2.79	1.27	9.58
SILC (for message switching and accounting)	3.59	1.93	2.52	1.27	9.31

FIGURE 1-4

TOTAL COSTS (PER ILL REQUEST) UNDER

ALTERNATIVE REFERRAL SYSTEMS

WITH ABOUT 15% OF THE REQUESTS BEING REFERRED

AND WITH FULL ACCOUNTING FOR EACH REQUEST

Alternative Referral Systems	Bibliogr. Searching	Physical Handling	SILC Related	Other (Unalloc.)	Total
Present System	3.59	1.93	1.98	1.27	8.77
Full use of teletype for message switching and referral & Clearinghouse for accounting	3.59	1.93	3.09	1.27	9.88
SILC (for message switching, referral and accounting)	3.59	1.93	2.55	1.27	9.34

These conclusions suggest that the addition of new functions (such as accounting and referral) to the present mode of operation is likely to increase costs beyond the present ones under any alternative. However, the use of SILC would be significantly less in operating costs than other alternatives. Even if the costs of development, pilot-test, and capital input to handle cash flow were amortized over the likely traffic handled by SILC during a five-year period, the costs of use of SILC would still be less than those of other alternatives. We must therefore conclude that SILC is feasible from an economic standpoint.

Evaluation of Benefits. Evaluation of the benefits to be expected from one or another system for ILL is complicated by the fact that there are different institutions involved with different interests. In particular, the borrowing libraries are interested in getting a higher rate of fills with a faster response time; the lending libraries are interested in recovering some of the costs they incur in serving other libraries; both are interested in reducing the costs they incur; sponsoring agencies are interested in improving the overall quality of ILL service and encouraging the sharing of resources, a social objective for which they are willing to pay, to one extent or another, provided there is adequate proof of services provided. It is difficult, if not impossible, to put such an array of differing interests into a single "cost/benefit" evaluation,

nor will we attempt to do so. In the following paragraphs, therefore, we will simply define the benefits to be expected from the alternative ILL systems defined earlier and evaluate, in a qualitative way, the extent to which each alternative provides those benefits.

The primary benefit to the net lenders of any ILL system is found in the repayment of their costs by either subsidy or a fee. This benefit requires a full accounting system rather than the present situation in which, generally, financial accounting is provided only for requests that involve copying and even then, only a portion of the associated costs are included. It is difficult to quantify this benefit in the form of an effectiveness measure, since it is represented by a transfer of costs from one part of the system (the net lender) to other parts (either a funding agency or the net borrowers). However, it is clear that it has significance to the maintenance of service, since without it some of the major net lenders could become increasingly reluctant to provide service or even incapable of doing so. This benefit would obtain equally under any system that provided a capability for full accounting, whether by each library, by a Clearinghouse use of coupons, or by SILC.

The present costs of bibliographic search are the major single element in ILL costs. The reduction of them is therefore a most significant benefit. Any ILL system that provided capability for extensive, easy use of bibliographic centers should result in reductions of those costs. First, a bibliographic center should be more efficient than most of the net borrowers, because of economies of scale and more streamlined

processing by trained personnel; this should therefore mean a net savings in comparison with the costs presently incurred by borrowing libraries. Second, the bibliographic center would also be more accurate because it would have available better, more extensive, and more accurate bibliographic resources; this should result in a reduction of the costs presently incurred by the lending libraries. It would seem that of all the alternatives, SILC provides the most significant improvement of the capability for referral through bibliographic centers.

Improvement in the fill rates (from the present average of about 65% to 70% as shown in Reference 1, pages 23 and 43) has significant value to the borrowing library in its service to its patrons; it has value to the economics of the ILL process as a social resource by reducing the waste of effort that unfilled requests represent. First, the more accurate identification of both materials and sources that the bibliographic center can provide should improve the fill rate; evidence for this comes from our examination of the operation of one state network, in which the use of better bibliographic tools resulted in fill rates of 75% rather than the more typical 65% to 70%. Second, the capability for extensive use of referrals not only through bibliographic centers but to alternative sources should significantly improve the fill rates by ensuring that more potential sources are gotten to.

The response times of the present system of operation are primarily determined by the speed of the U. S. Mail in delivery of material. However, they are adversely affected by the

corresponding slow speeds in delivery of (1) mailed requests, (2) mailed responses of non-availability, and (3) mailed referrals. The use of teletype should significantly improve at least the first two of those and to some extent the third. The use of SILC should significantly improve all three. Therefore, of the alternatives, it would seem that SILC would provide the greatest improvement in response time.

RECOMMENDATIONS

As a result of the analyses presented in the following sections and the conclusions based on them (as summarized above), it would seem that SILC is feasible and that further steps should be taken. We therefore have the following recommendations:

(1) This report should be presented to the members of the Association of Research Libraries, commented upon and critically reviewed by them, and a policy decision made concerning the desirability of continuing further. Under the assumption that their general evaluation is positive and that the decision is made to continue further, the following step should be taken.

(2) Discussions should then immediately be started with one of the organizations discussed in Section 5, Management Feasibility, to determine the extent to which it is willing to accept responsibility for management of the subsequent phases for SILC. For a number of reasons, the most logical candidate and the one that is recommended as the first alternative to be considered is the Library of Congress. Under the assumption that an appropriate organization is found, willing to accept responsibility for further development, pilot-test, and operation, the following step should be taken.

(3) The SILC manager should then immediately begin discussion with one or more existing consortia to explore their willingness to serve as the base for pilot-test of SILC operation. In parallel, discussions should be initiated with an appropriate funding agency for support of the costs of development and pilot-test. Under the assumption that an appropriate test base has been found and that a funding agency is willing to support the costs of development and pilot-test, the following step should be taken.

(4) A formal "Request for Proposal" should then be submitted to potential contractors for the national computer time-sharing service on which SILC operation depends. It should embody specifications comparable to those in Section 2 of this report, modified as necessary to reflect the results of evaluation by ARL members, the SILC manager, and the group of libraries serving as the base for pilot-test.

(5) Further steps should then follow a sequence of events comparable to those outlined in Appendix C, Development Program.

As part of the procedure for review of this report by members of the ARL, a questionnaire could be prepared referring to the services of SILC and to the cost data presented in this report and requesting an evaluation by each ARL member of the significance of those results.

2. SPECIFICATIONS FOR SILC

THE ISSUES

The question is, "What is SILC, and how does it function?" To answer that question, we must consider a number of issues:

(1) What is the general concept of SILC?

(2) What are the functions SILC provides?

(3) What are the operating parameters for SILC?

The approach taken to answering these questions was to prepare "Preliminary Specifications" as the first progress report in this study. They form the basis for this section of the Final Report, but have been modified to reflect the knowledge and detail gained as a result of work done.

Some of the revisions of the specifications were based on the discussions with the various time-sharing companies. During those discussions, questions were raised about the format of accounting reports, for example, or the basis for estimations of work loads, or the meaning of terminologies used, and so on. This section of the report therefore reflects the result of those communications as well as results from review of the resulting proposals and from the analyses of the libraries visited in the study.

CONCEPT

The operation of the present system of inter-library loan or of either a fee system or a system of lending libraries could be greatly enhanced if there existed a computer-based communication network available to and used by the participating libraries. The aim would be to facilitate the communication of inter-library loan requests and related messages, monitor the traffic in order to produce statistical reports and centralized clearinghouse accounting for fees, provide means for referral of requests to bibliographic centers, and provide access to on-line data bases. The availability of several national distributive networks using on-line, time-shared computers--commercial, academic, and governmental--makes it feasible to use one of them as the basis of such a system. In order to visualize how it would function, the following is a model of a System for Inter-library Communication (SILC).

SILC would permit users to submit requests by teletype terminal to the SILC system at any time. The computer network would then process and store the requests and forward them to the lending libraries designated by the borrowers. Lending libraries would receive their requests and send their responses to the computer network by teletype terminal. SILC would transfer the responses to borrowing libraries and maintain all statistical and accounting records automatically.

SILC would use the hardware and some of the software of an existing national time-sharing system (TSS). SILC, therefore, would not require an investment in either computer hardware or system software, although development of application programs would be required.

In addition to facilitating communication of inter-library loan requests among libraries, the system embodies the following features:

(1) Automatic logging and analysis of traffic and loads.

(2) Automatic statistical summary, accounting, and billing. Each participant would receive at stated intervals reports which could cover data on services used and provided, charges such as net borrowing fee or net lending credit, copying fees, and reference fees for bibliographic center referrals.

(3) Automatic referral to alternative libraries either as designated by the request or as determined through controlled reference points in regional networks.

(4) Automatic checking of bibliographic completeness

(5) Automatic referrals of incomplete requests to state, regional, or national bibliographic centers.

These functions are illustrated in Figure 2-1 with levels of service listed in approximately the order of difficulty in development.

The first level of service is the use of SILC by the major lending institutions for the purpose of accounting for their services. This service might be used, for example, by a

Figure 2-1

Schematic of SILC Services

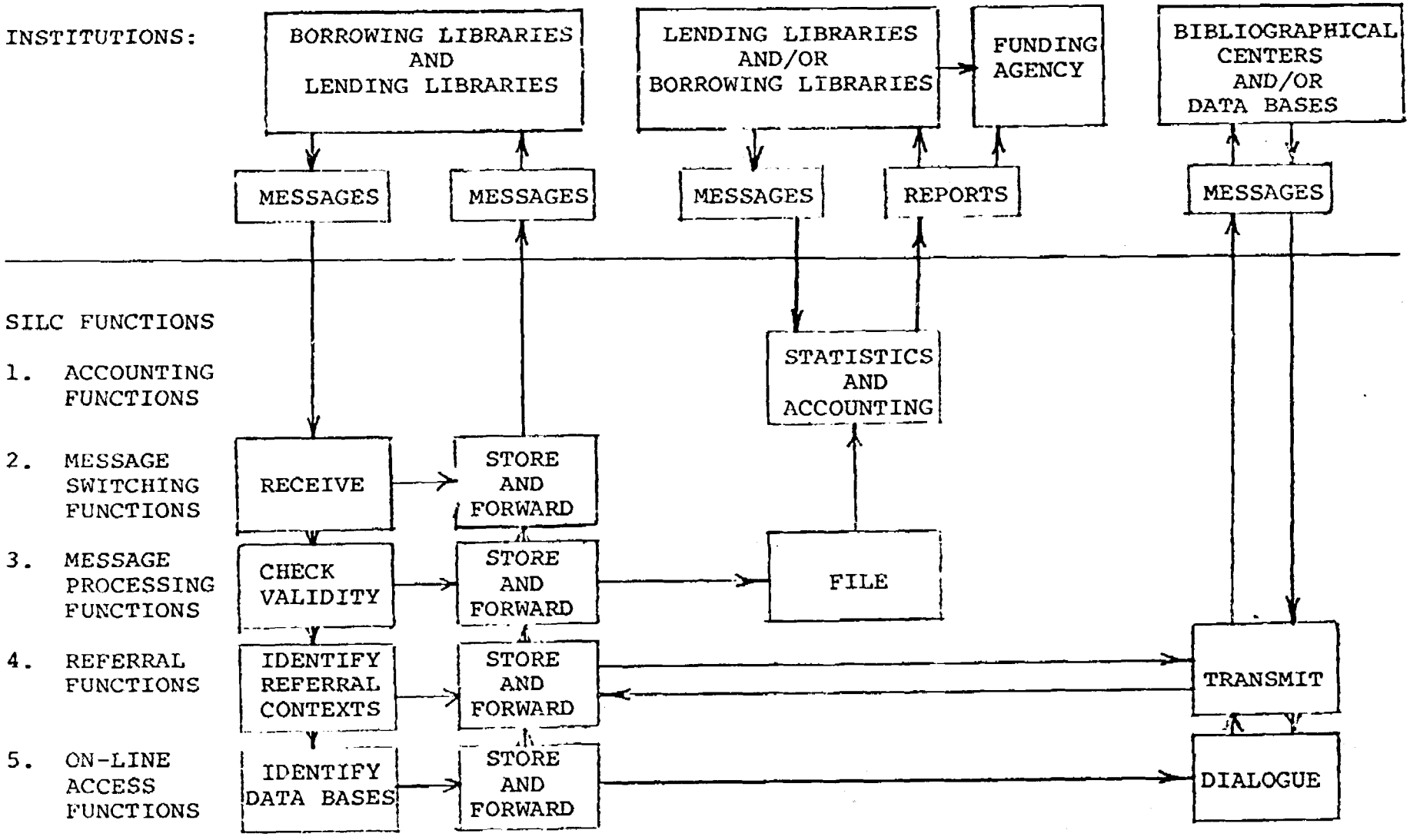


FIGURE 2-1 (continued)

LIBRARY AS A BORROWER

SENDS	RECEIVES
Original Requests	Request Filled Notices
Corrections to Requests	Not Available Notices
Acknowledgments of Loans	Invalid Request Notices
Renewal Requests	Bibliographic Corrections
Acknowledgments of Renewals	Referral Notices
Loan Return Notices	Overdue Notices
Tracer Requests	Acknowledgments of Returns
	Tracer Requests

LIBRARY AS A LENDER

SENDS	RECEIVES
Request Filled Notices	Original Requests
Not Available Notices	Corrections to Requests
Bibliographic Corrections	Acknowledgments of Loan Receipts
Acknowledgments of Returns	Renewal Requests
Tracer Requests	Acknowledgments of Renewals
	Loan Return Notices
	Tracer Requests

BIBLIOGRAPHIC CENTER

SENDS	RECEIVES
Location Notices	Search Unfilled Requests
Bibliographic Corrections	
Not Available Notices	

Regional Medical Library for the purpose of producing its reports to the National Library of Medicine. It is a service that can be implemented without requiring the cooperation of other institutions; it is a service already being provided to commercial organizations by every one of the national computer time-sharing systems, and thus could be implemented without essential technical difficulty; it is a service that could have direct economic value in itself, as well as serving as a natural step in development of the total SILC system.

The second level of service is simply the transfer of a message from one library to another. The example of primary interest, of course, is that of a request from borrower to lender and the reverse transfer of the response from lender to borrower.

A third level of service would add two processing functions:

(1) The input is checked for validity for system errors and certain bibliographic elements.

(2) The communication system is monitored to derive automatically the data necessary for the accounting and statistical reports produced at the first level of service.

The fourth level provides automatic referral to alternative lending libraries, bibliographic centers, or other consortia. Referral might be by request only, or referral to a bibliographic center could be automatic when SILC detects erroneous or incomplete messages.

The fifth level of service provides the means by which institutions using SILC can gain access to on-line data bases, bibliographic for inter-library loan and reference and numerical for science information centers.

Beyond these services is the potential of others:

(1) Transmission of messages to publishers and book distributors for ordering of material.

(2) Direct tie-in of other kinds of organizations and even individuals, with established needs for access to material and contractual arrangements with libraries to borrow from them.

It is obvious from the above discussion that SILC would lay the groundwork for an inter-library communication system which can grow in services and benefits to all participants. SILC offers many advantages and benefits in the control and channeling of inter-library communications:

(1) SILC is a flexible system forming the basis for future enhancements as participation grows.

(2) There is likely to be significant saving in time for users who submit requests through the system rather than the mails, especially with SILC's ability for automatic successive referral to additional designated libraries.

(3) System users may submit requests and receive output whenever the system is in operation--elaborate scheduling is unnecessary.

(4) There will be a complete and objective set of statistics available on traffic and loans on a national basis.

(5) SILC could provide the facility for single source billing and payment for all fees and charges to each user.

(6) SILC can be a mechanism for routing requests to libraries using predetermined priorities, thus providing a buffer where needed.

(7) System users can access bibliographic centers through automatic referral by SILC.

SILC FUNCTIONS

In this section, we provide a preliminary specification of SILC functions in eight categories:

(1) Accounting

(2) Message Switching

(3) Validity Checking

(4) Special Service Reports

(5) Security Control

(6) Referral

(7) Management

(8) On-line Access

Accounting. The first function is an "accounting service". This service would provide accounting reports of two types--a monthly statement of ILL activity, costs, and charges; and a series of analytical and statistical reports.

The monthly statements could serve two functions. One, they would provide net-lending libraries a basis for recovery of their ILL costs, either by fee or subsidy, should they so desire. Secondly, the statements are a financial accounting record of payments due and payments made on services, photocopy and filming charges, etc. SILC will automatically maintain and update this financial record for each library and funding agency.

SILC will obtain the necessary information for statements from the formatted portion of all requests submitted to SILC for processing. To obtain the accounting statement service for

requests that by-pass SILC, lending libraries would periodically input to SILC data about non-SILC requests in the standard format to be described later in this section. In a similar manner, if SILC were to be established first as solely an accounting service, libraries could input just the formatted information about each request for which an accounting was desired.

In preparing accounting reports, SILC is able to handle either a fixed, uniform fee or a variable fee established by each consortium or even each library. It is suggested, however, that a departure from a uniform fee should result in higher charges for the accounting functions for those libraries or groups of libraries that choose to use their own fee structure. One way of doing so would be to establish a "one-time set up" charge for initiating such special service.

In producing these statements, normal accounting practice would be followed, with proper audit trails and supporting detail. The statements themselves could have a form comparable to that shown in Figures 2-2 and 2-3. That is, statements to libraries would list number of services requested from and provided to other libraries, in each of the consortia in which the library participates and any special service charges incurred by the library. Costs and charges would be calculated on the basis of the contractual agreement between SILC and each library or consortium using such a service.

FIGURE 2-2

STATEMENT FORMAT (Libraries)

TO: University Library
Attention: ILL Accounting
Address

Statement of SILC Transactions
For: Month, Year

Consortium A

Service	Borrowing		Lending		Referrals	Net Charge
	Requests	Filled	Requests	Filled		
Lending	125	100	2100	2000	75	$_____(CR)
Biblio-graphic	10		200			$_____(CR)
Copying		500		10000		$_____(CR)
Special Service Charges						$_____(CR)

Consortium B

Service	Borrowing		Lending		Referrals	Net Charge
	Requests	Filled	Requests	Filled		
Lending						$_____(CR)
Biblio-graphic						$_____(CR)
Copying						$_____(CR)
Special Service Charges						$_____(CR)

Total Net Charges $_____(CR)
Balance Forward _____(CR)
Payments Made - _____(CR)
New Net Total $_____(CR)

FIGURE 2-3

STATEMENT FORMAT (Consortium)

TO: Consortium
Attention:
Address

Statement for SILC Transactions
For: Month, Year

Library 1

Service	Borrowing		Lending		Referrals	Net Charge
	Requests	Filled	Requests	Filled		
Lending						$_____(CR)
Biblio-graphic						$_____(CR)
Copying						$_____(CR)
Special Service Charges						$_____(CR)

Library 2

Service	Borrowing		Lending		Referrals	Net Charge
	Requests	Filled	Requests	Filled		
Lending						$_____(CR)
Biblio-graphic						$_____(CR)
Copying						$_____(CR)
Special Service Charges						$_____(CR)

Total Net Charges $_____(CR)
Balance Forward _____(CR)
Payments Made -_____(CR)
New Net Total $_____(CR)

As Figures 2-2 and 2-3 imply, the accounting must accommodate cost and/or charges for a variety of services, including specifically: (1) lending, (2) copying, and (3) bibliographic services. Each of these would require input of data by the lending library on which the accounting would be based. For example, the lending library may want to input "number of pages photocopied" or "number of hours spent in bibliographic searching" or some other defined set of data for such accounting.

Because the input form for use of the accounting services of SILC would be identical with the portion of a more general SILC message (specifically, the "formatted portion"), the description of it will be presented in the next sub-section.

The other type of accounting service available from SILC will be a series of analytical and statistical reports. These reports would be prepared on a monthly, quarterly, or annual basis. The reports would analyze and summarize all requests by libraries and consortia and give data on fill rates, referral activity, subject analysis, response times, loans by format, etc. One such report might show each library and consortium the libraries to which it loaned and from which it borrowed. This report would be substantial in size and would be prepared by the TSS contractor on multiple-part forms so that copies could be torn off and distributed to each consortium and library by SILC. Figures 2-4 and 2-5 illustrate what this report might contain; first for lending and then for borrowing.

FIGURE 2-4

REPRESENTATIVE REPORT FORMAT:

REQUESTS BY CONSORTIUM AND LIBRARY

LENDING

LIBRARY 1:

LENDING REQUESTS _____

LENDING REQUESTS FILLED _____

REQUEST-RELATED MESSAGES--LENDING _____

LOANS OUTSIDE CONSORTIUM A BY INSTITUTION (OVER 10 LOANS PER MONTH):

CONSORTIA B _____

CONSORTIA J _____

CONSORTIA M _____

LIBRARY 820 _____

LIBRARY 907 _____

LOANS WITHIN CONSORTIUM A BY INSTITUTION:

LIBRARY 2 _____

LIBRARY 3 _____

LIBRARY 4 _____

FIGURE 2-5

REPRESENTATIVE REPORT FORMAT:

REQUESTS BY CONSORTIUM AND LIBRARY

BORROWING

CONSORTIUM A:

LIBRARY 1:

BORROWING REQUESTS _____

BORROWING REQUESTS FILLED _____

REQUEST-RELATED MESSAGES--BORROWING _____

BORROWING FROM INSTITUTIONS OUTSIDE CONSORTIUM:

CONSORTIUM B _____

CONSORTIUM J _____

CONSORTIUM L _____

CONSORTIUM Z _____

LIBRARY 16 _____

LIBRARY 225 _____

LIBRARY 639 _____

BORROWING FROM INSTITUTIONS WITHIN CONSORTIUM:

LIBRARY 3 _____

LIBRARY 9 _____

LIBRARY 10 _____

SILC analytical and statistical reporting would require data from all SILC files. The reports would be prepared on a batch basis by the TSS contractor according to a pre-set schedule or on-demand at the discretion of the SILC manager. Costs are included in SILC overhead charges.

Message Switching. This function would use SILC to receive, store, and forward messages for communication among libraries. The messages usually will relate to inter-library loan activity. In particular, a SILC "Request" is a borrowing library's request for a loan. This is usually a request for a volume, but the request may also be for a title or part of a volume, as is the case with a periodical or serial article. A "message" is one of the series of communications, to and from SILC, taken on a request at each step in the processing of a request. Each request involves a minimum of four messages: (1) the request is input to the system by the borrowing library; (2) the request is then processed and a message is output to the lending library; (3) the lending library inputs a response message which is then (4) output to the borrowing library.

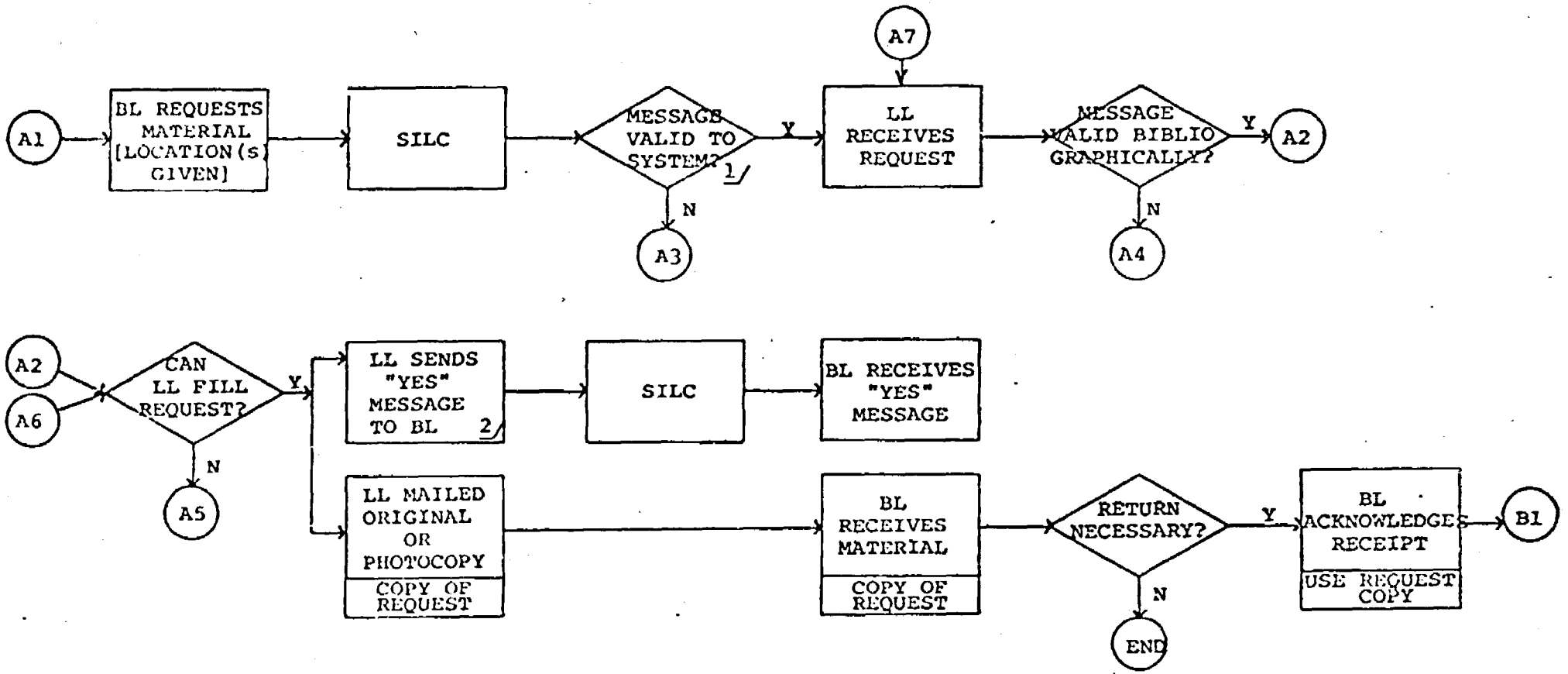
The accompanying flow chart in Figure 2-6 shows the processing of typical requests when the lending library is designated.

FIGURE 2-6

FLOW CHART OF SILC OPERATIONS

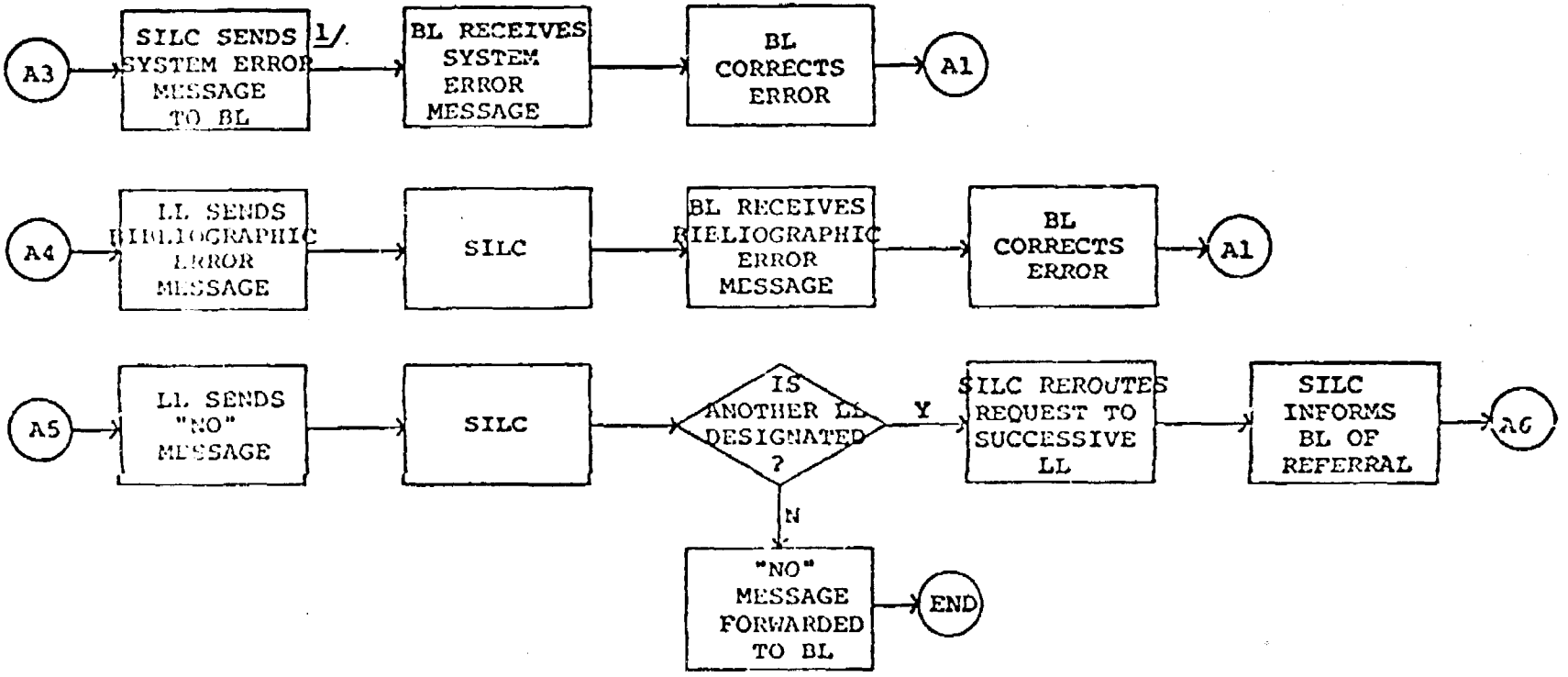
REQUESTS TO DESIGNATED LOCATIONS

(BL: Borrowing Library; LL: Lending Library)



- Continued on Next Page -

FIGURE 2-6 (continued)



1/ SILC will perform automatic error checking for presence of necessary types of bibliographic elements in the request, as well as for errors of concern only to the system.

2/ "Yes" message will include form of material being sent (e.g., book, film, microform, photocopy), date due, special instructions, etc.

The processing of SILC is initiated by an input message. From that, a "SILC record" is then generated as the form that each message takes when it is in a file or being transferred from one location in the system to another. A message consists of two parts: a formatted section and a text section. The structure of the formatted section is shown in Figure 2-7. It and the resulting SILC record will identify the following:

--Format Type Code. This is a single character code which is included as part of the record to provide flexibility and easy addition to or change of the record.

--Date and Time. This would be generated automatically by the computer and added to the message. In fact, doing so is a part of all present time-sharing system operation. Twelve characters are included.

--Borrowing Library. The NUC symbols of American Libraries may be used for identifying libraries. The NUC codes consist of upper and lower case letters. If a terminal has only upper case letters, a special character (e.g., ":", or "/") will be used immediately preceding each lower case letter. With this notation, up to 15 characters will be needed for library codes. For internal processing, a four digit numeric code will be assigned to each library. Libraries may use either the NUC code or the 4-digit code when sending a message. The code could be keyed in by the library at the start of a set of message transmissions or generated automatically by SILC (from the identification of the input terminal) and added to the message as transmitted.

--Request Code Number. This number is assigned by the library originating the request and then a check digit is assigned by the SILC system at the time the new request is input. The assigned number and check digit must be included in all subsequent messages that refer to the request. The number assigned by the library may be up to six digits. It, together with the check digit and the borrowing library's four digit identification code, serve to identify the request uniquely.

Figure 2-7

FORMATTED SECTION OF MESSAGES

KEYING (TOTAL CHARACTERS: 43)

	FORMAT TYPE	DATE & TIME	REQUEST CODE #	REQUEST DATE	BORROWING LIBRARY	CONSORTIUM CODE #	LENDING LIBRARY	MESSAGE TYPE	MATERIAL FORMAT	DEWEY EQUIV.	CONTINUATION INDICATOR
SAMPLE	N	ADDED BY SYSTEM	104617	30/11/73	ADDED BY SYSTEM	201	N:JP or NjP or 2665	ILLRQ	1	410	X
# CHAR.	1		6	8		3	15	5	1	3	1

DISK AND TAPE RECORD (TOTAL CHARACTERS: 47)

	FORMAT TYPE	DATE & TIME	REQUEST CODE #	REQUEST DATE	BORROWING LIBRARY	CONSORTIUM CODE #	LENDING LIBRARY	MESSAGE TYPE	MATERIAL FORMAT	DEWEY EQUIV.	CONTINUATION INDICATOR
SAMPLE	N	301173153045	1046176	301173	1463	201	2865	ILLRQ	1	410	X
# CHAR.	1	12	7	6	4	3	4	5	1	3	1

PRINT OUT (TOTAL CHARACTERS: 77)

	FORMAT TYPE	DATE & TIME	REQUEST CODE #	REQUEST DATE	BORROWING LIBRARY	CONSORTIUM CODE #	LENDING LIBRARY	MESSAGE TYPE	MATERIAL FORMAT	DEWEY EQUIV.	CONTINUATION INDICATOR
SAMPLE	N	30/11/73 15:30:45	104617-6	30/11/73	N:JP:A:RB or NjPaRB or 1463	201	N:JP or NjP or 2865	ILLRQ	1	410	X
# CHAR.	1	17	8	8	15	3	15	5	1	3	1

--Lending Library. The same sets of standard codes would be used. Normally, this data will be provided by the sending library. It is possible that some functions of referral may call for the borrowing library to specify several receiving libraries; if so, these will call for a continuation indication and inclusion of special data items (see below). It is also possible that some messages as input will not specify a destination and that the computer will need to supply a destination automatically, based upon various decision rules.

--Consortium. Normally, a borrowing library which wishes to have its request handled within the framework of a consortium must identify it. (It is possible that identification of consortium could be automatically determined by the computer [by comparing the sending and receiving pair with various consortia], but this appears to be more complicated than desirable). Three decimal digits should suffice. A standard list of participating consortia, with their codes, would need to be established.

--Message Type. A five character code should be input as part of the message identifying the type of message. The following are typical types:

An accounting input
A request
A referral
A positive response
A negative response
A notice of receipt
An overdue notice
A general communication
A query

--Dewey Equivalent (or other Subject Class Identification). The first three numbers of the Dewey Decimal Classification, a comparable portion of an LC Class Number, or similar subject identification would enable SILC to perform rudimentary subject analysis on the types of request being made through ILL. SILC programs would incorporate tables of equivalent classes for producing reports, whatever the acceptable class codes used may be.

--Material Format. A one character code will indicate the format of the material requested. This code will be used to sort the messages by format (monographs, serials, theses, technical reports, etc.)

--Continuation Indicator. When an "X" is typed in the last position of the formatted part of the message, it is an indication that there are some special data items to follow. Special data items include codes for referral libraries, a due date, photocopy charges, etc.

The content of the text portion of a message depends upon the type of transaction. A "request", for example, would include the bibliographic description of the wanted material; a "positive response" would indicate the form in which material could be sent; etc. The size of the text portion, therefore, will vary from message to message. However, two basic types of transaction can be identifed:

--Those containing bibliographic data (requests and referral outputs) which are inherently variable, but average about 300 characters.

--Those referring to requests (responses and referral inputs) which can be of relatively fixed length and relatively short (perhaps no more than 20 characters).

Five files are maintained by SILC (see Figure 2-8):

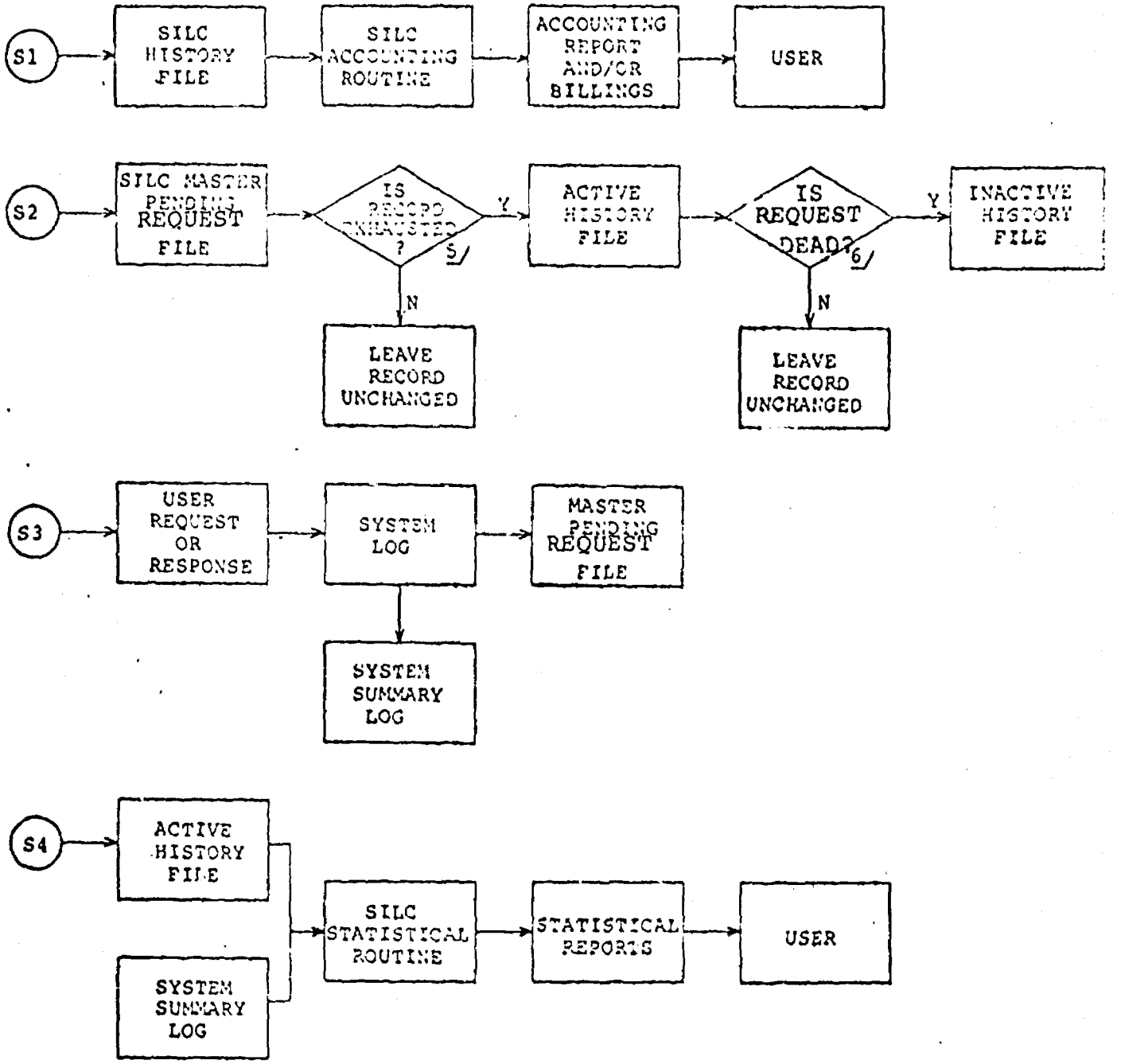
(1) The records in the Master Pending Request File contain the complete and current status of each request. Each time an action is taken on a request the record is updated (e.g., the request is referred to a second library--the Master Record shows that a negative response was received from the first lending library and the response transferred to the borrowing library along with the referral message. It also shows that the same request was then referred to the second library). When a final negative or positive response to a request is received by the borrowing library, the request record is transferred from the Master Pending Request File to the Active History File.

(2) Periodically SILC reviews the request messages stored in the Active History File for overdues and other active loans and processes them accordingly. The data in this file are used for accounting reports and billing (if billing has been inaugurated). After records have been processed for accounting reports, they are transferred to the Inactive History File and purged from the Active History File.

FIGURE 2-8

FLOW CHART OF SILC OPERATIONS:

SYSTEM RECORD HANDLING



5/ Record exhausted = request has been filled or request has no further lending libraries designated.

6/ Record dead = request has been filled, material returned, statistical and accounting routines completed.

(3) Records in the Inactive History File are kept in request number order for backup and for statistical analysis of loan traffic.

(4) All incoming requests and return messages are logged into the System Log regardless of their content. The Log provides a means of restoring transactions should the system go down. The System Log is also the input information for the System Summary Log.

(5) Statistics on SILC traffic and loads are compiled from the Active History File (completed requests) and the System Summary Log. This latter file contains a borrowing record and a lending record for each participating library and is updated with each incoming message if the message indicates a request or a loan or any other type of information on which statistics are desired.

The library codes used for identification of sending library and receiving library are the primary basis for message switching and for accounting. The codes for identification of consortia are an additional criterion, in cases where they may be used.

The development of these codes will require a joint effort of the library communities involved as well as of the SILC contracting manager and time-sharing system. There is an existing code in the National Union Catalog library location symbols, which in many respects would be a natural starting point.[6] It is the code used in the NUC to identify libraries holding particular books, and most if not all of the net lenders are covered by it. On the other hand, the coding system is quite complicated for the United States and even more so for Canada. It is an alphabetic code, based on geographic locations and using abbreviations for state or provincial names. It includes exceptions for certain classes of libraries for which the

mnemonics are for city names. All of the symbols are alphabetic, with significant distinctions in meaning between upper case and lower case characters, which complicates the use of the code, especially with teletype printing.

Because of all these complications, it may appear to be desirable for any contractor implementing SILC to consider a new coding system which would be more efficient. Before doing so, however, the issues of operational efficiency must be weighed against the fact that literally millions of the existing codes are already recorded in the NUC (especially, in the new volumes published by Mansell).[7]

Validity Checking. Two levels of validity checking are contemplated: message validity and bibliographic completeness. The first is to be provided in any event, since it simply confirms that the formatted part of the message is complete and that acceptable codes have been used, including the request code.

The second is more speculative. It would involve checking the text portion of a request message to assure that all elements of bibliographic description have been included or, if not, that suitable comments have been included. To do so would require that a format for bibliographic description be established, that the data be entered in that format, and that decision rules be established for checking it. The most likely format to use would be MARC II, with a small set of specified MARC tags being included with the bibliographic description.[8]

Special Service Reports. In addition to the accounting reports, each library that wanted them could also request special listings on the status of active ILL transactions, or make queries regarding a particular outstanding request.

(1) Lists by borrower ID

(2) Lists by request number

(3) Lists by institution and/or consortium

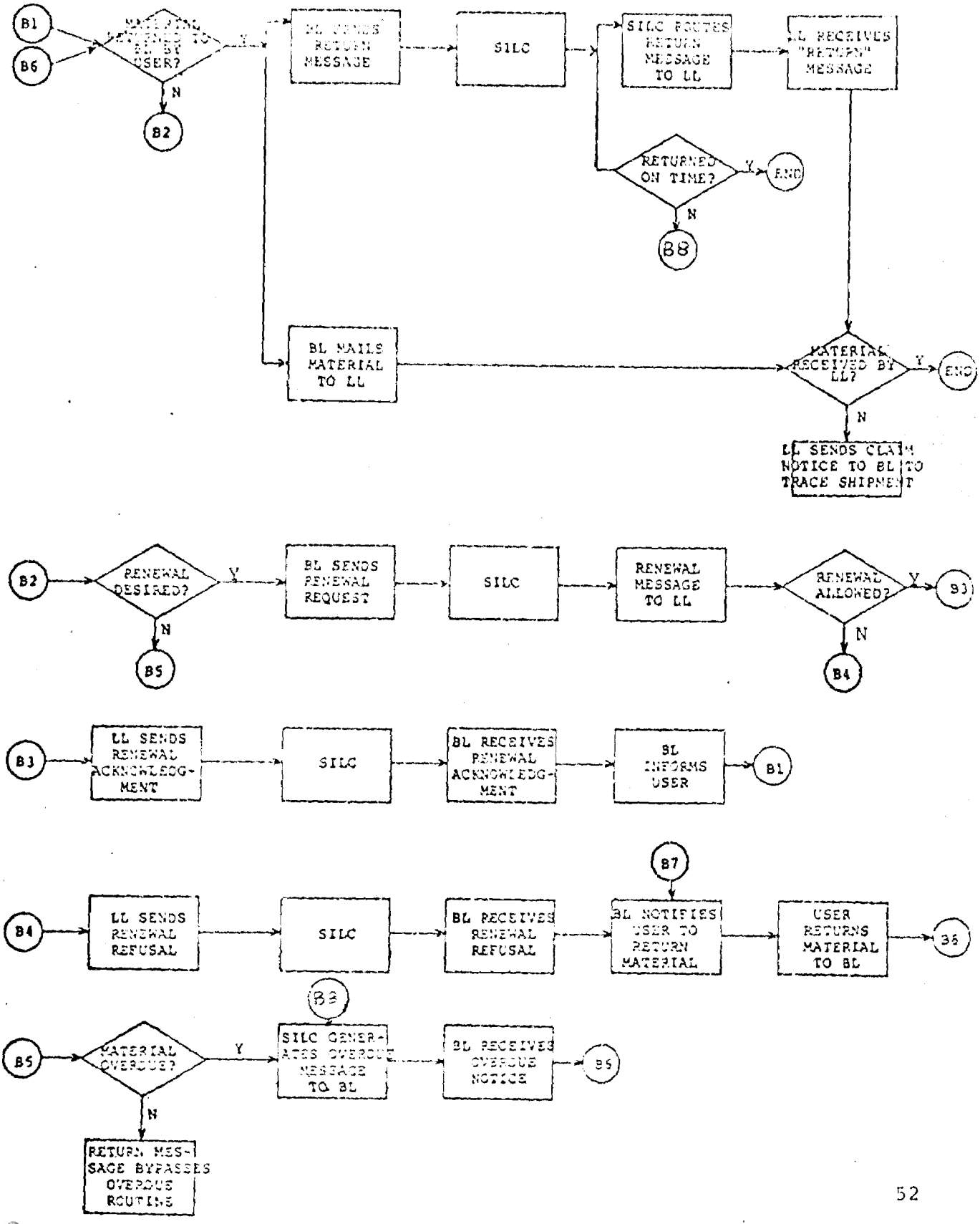
(4) Lists by date

Of course, each library could maintain its own files, perhaps using the messages taken off the printing terminal, copying them, and arranging them in various sequences. However, the record keeping capabilities in SILC could also maintain such files, printing them out on request.

A specific type of service of this kind is that involved in keeping track of the overdue status of material. As illustrated in Figure 2-9, when material is lent and must be returned, the lending library may specify a "due date". The system could provide the capability to monitor messages relating to such a request and, if one has not been transmitted indicating a return within the due date period, to output an overdue notice. Alternatively, due notices could be sent out just prior to the due date, thus alerting the borrowing library to the need to recover the material and return it. In either event, the system would perform a significant processing function, relieving the libraries of another burden.

FIGURE 2-9

FLOW CHART OF SILC OPERATIONS:
RETURNS, RENEWALS, OVERDUES
AS SPECIAL SERVICE REPORTS



Referral. SILC is to provide the capability of referral, either by request or automatically, of messages from one library or bibliographic center to another. At least three kinds of referral are contemplated:

--Multiple lending sources. Roughly 30% to 35% of present requests are unfilled by the library from which they are requested. Presently, the requester is informed and then must either forget about the need or turn to an alternate source. The SILC system is to provide the capability for a requester to specify alternate sources, either at the time of initial request or when one source fails. The computer is to refer the request to each alternate in turn if prior ones fail to satisfy the request. When doing so, it will send an appropriate message to the requesting library. Each referral will not require input of bibliographic data, but will draw on that in the original request.

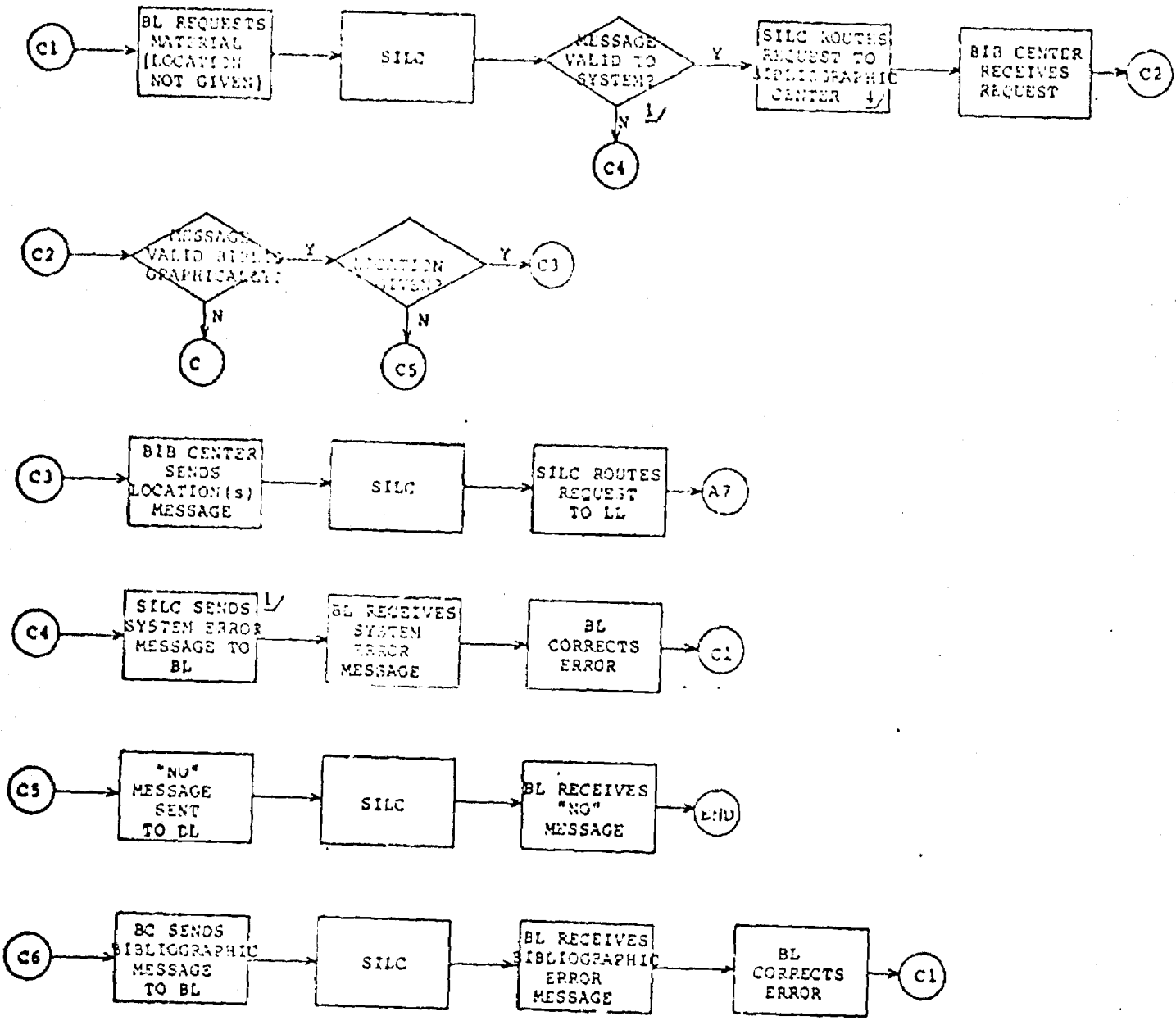
--Bibliographic centers. When the agreement between SILC and a consortium includes provision for it, SILC will provide the capability of referring requests to a bibliographic center where the tools are available for determining which library may be able to satisfy the request. This referral may be determined by the requester if he includes the identification of the bibliographic center as the receiving library, but it may be determined by the computer if the requester fails to identify a lending library as illustrated in Figure 2-10. When the bibliographic center has determined a potential source or sources, it inputs a message identifying them for addition to the request. (Note that there is no need to input the bibliographic data again, unless it is to be changed). At some future time, it is possible that the "bibliographic center" may be a mechanized catalog, on-line or off-line. Examples might include the Ohio College Library Center or the National Library of Medicine union list of serials.

--Non-consortium library. A library may request material from another library not a member of the consortium identified with the requester. Assuming suitable inter-consortia arrangements have been established, it may automatically be referred to a point of contact for subsequent referral to the desired library.

FIGURE .2-10

FLOW CHART OF SILC OPERATIONS:

REFERRAL OF REQUESTS TO UNKNOWN LOCATIONS



1/ "Bibliographic center" is used in the sense of any service for searching union catalogs, directories, or locations, whether manual or automated.

Management. Operation of SILC will require a manager responsible, among other things, for monitoring the day-to-day performance of SILC and making operating decisions to maintain service. Among the system functions must, therefore, be facilities to support management, including specifically:

--Daily, on-line access to data on present level of activity, file capacity utilization, failures, etc.

--Weekly, exception reporting on non-processed requests.

--Monthly, statistics on activity and costs of operations, status of financial accounts, statements to libraries and consortia.

--Yearly, summaries of all activity and costs.

The TSS contractor would supply SILC management with this information as required. Some of the reports would be redistributed to libraries by SILC management. In addition, SILC management would, of course, have to maintain a complete set of accounting records on its own operations (i.e., journals, ledgers, registers, income statements, a trial balance, controls on delinquent accounts, personnel records, etc.). Some or all of these accounts might be automated.

Altogether there are five categories of SILC reports:

(1) Fiscal reports--monthly statements to libraries and consortia (described under "Accounting" earlier in this section).

(2) Statistical and analytical reports--lending and borrowing by library and consortium, referral activity, response time analysis, subject analysis of loans, etc. (described earlier in this section under "Accounting").

(3) Special service reports--library-initiated listings of loans by borrower ID or outstanding loans by request number date, institution and/or consortium, and queries (described under "Special Service Reports" earlier in this section).

(4) Operational status reports--on-line reporting for SILC management on traffic in the system, file capacity utilization, status of network lines and equipment, CPU and connect times, etc.

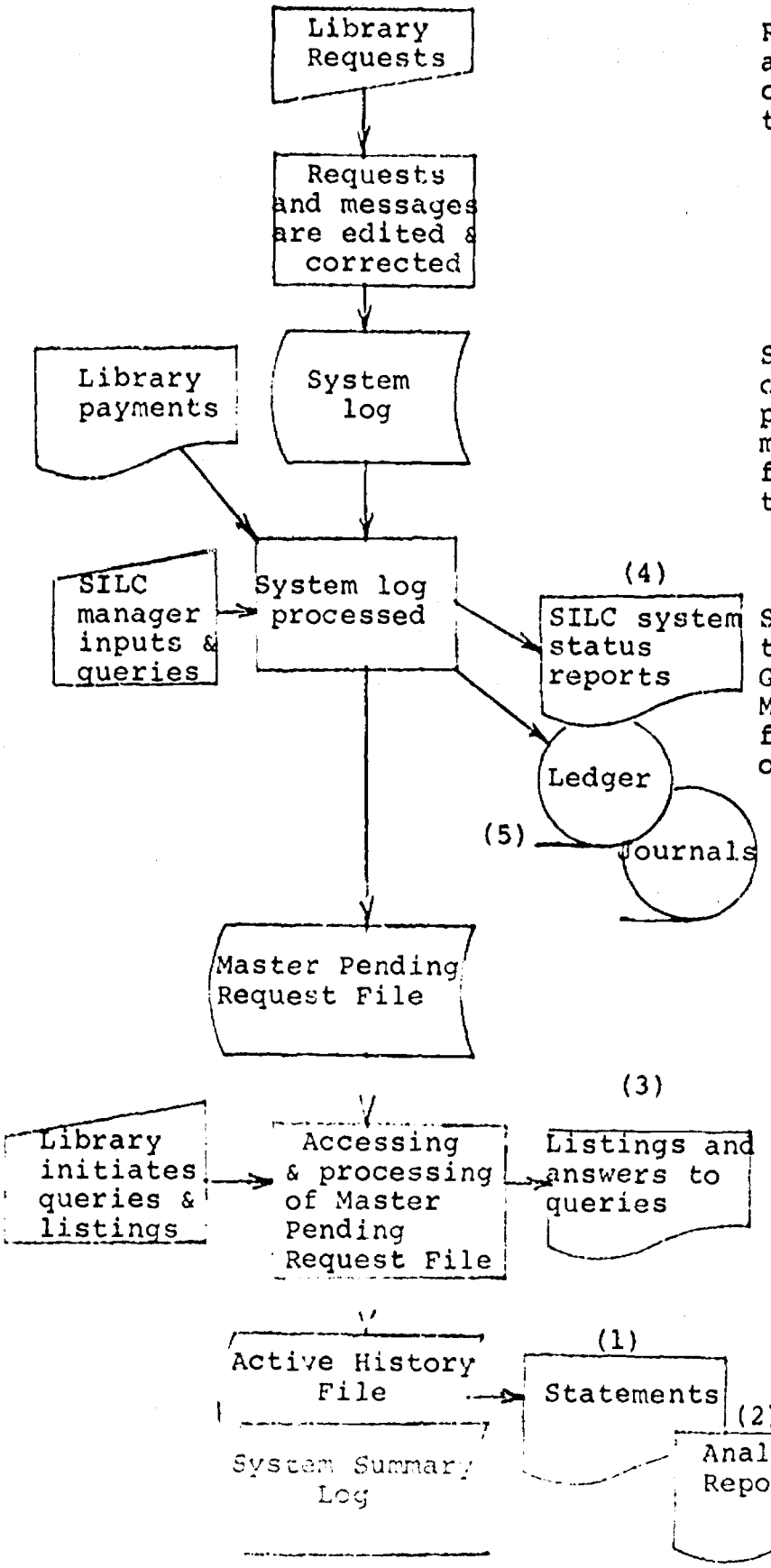
(5) SILC bookkeeping--journals, ledgers, registers, balances, audit controls, etc.

A general schematic showing all the reporting mechanisms follows (Figure 2-11). Numbers, (1)-(5) refer to the classes of reports defined above.

Security Control. SILC would need to have security provisions on input so that libraries must identify themselves to get access to their files and to prevent requests being added to the system which would be accounted against those libraries statistically or financially. The most likely means of handling this is for the transmitting library code to be identified by the terminal identification and not simply by the data input by the library. At least, the SILC programs must check library code against terminal identity to assure that they match. In this way, only the library originating requests (or the SILC manager) should be able to learn about the status of its requests.

Figure 2-11

Reporting System Schematic



Requests and messages are keyed on paper tape or magnetic tape, and the tape is input to SILC

SILC stores all messages on the system log for periodic processing for message switching (also for restoring files if there is a system failure)

System log is processed to update Daily Journals, General Ledger, and the Master pending request file, and to produce operational status reports

Libraries may query SILC regarding outstanding requests or may ask for various listings of them

System summary log and active history file are processed for statements and analytical reports

Only the SILC manager should be able to make changes in the files. This means that all messages referring to a request will generate "postings" to the record for the request and not changes to it. In particular, if a referral were to include a "correction" of the bibliographic content of the request, it would not result in an actual change but only in the addition to the existing request of the "correct" data.

The names or other identity of the "borrowers"--i.e., of the patron being served by the borrowing library--may be revealed to the lending library but not to any other, third party. However, the input record could (and in many cases, would) contain the name or other identification of the borrower for use in printouts provided to the borrowing library.

Access to On-line Data Bases. The most complex and speculative functions to be included among SILC services are those involved in access to on-line data bases:

(1) On-line access

(2) On-line dialogue and feedback

(3) On-line profile formulation

In addition to these, the counterparts of the accounting functions will also be involved, to include the costs of computer processing at the "host" data base as well as charges due the owner of the data base.

PARAMETERS

The following data provide quantitative parameters for SILC operation in terms of: (1) geographic distribution, (2) volume of activity, (3) schedules and response times, and (4) file sizes.

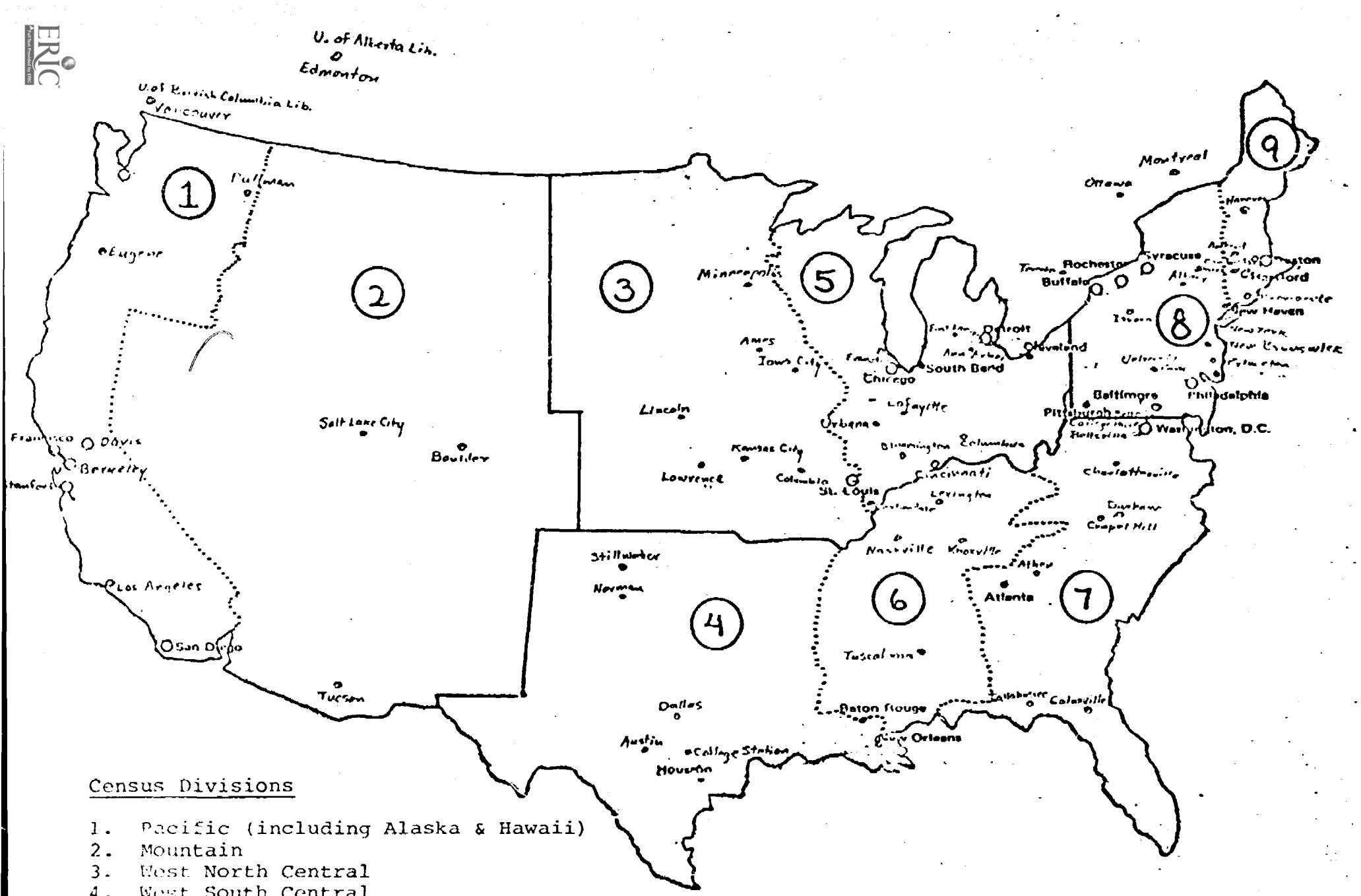
Geographic Distribution. Figure 2-12 is a map of the U.S. showing the location of the ARL libraries, the largest group of major lending institutions by Census divisions. These have then been grouped into four regions: Northeast, North Central, South, and West, as shown in Figure 2-13. Figure 2-14 presents the pattern of loans among these four areas and the distribution of the institutions into three strata:

--Those with 20,000 to 99,000 volumes and under 5,000 transactions.

--Those with either 20,000 to 99,000 volumes and over 5,000 transactions or those with 100,000 to 499,000 volumes.

--Those with 500,000 volumes or more.

Activity. Figure 2-15 presents the reported and projected volume of ILL transactions at the time of the first Westat study (Reference 1, page 52). (The Westat study done in parallel to this study of SILC will provide more recent data.) Of this activity, approximately 20% are presently communicated by telephone or teletype, and are, therefore, likely candidates for immediate use of SILC. Within the next few years, this percentage should substantially increase. Furthermore, if SILC in fact serves a real need, those requests sent by mail will be input to SILC by the lending library for purposes of accounting.



Census Divisions

1. Pacific (including Alaska & Hawaii)
2. Mountain
3. West North Central
4. West South Central
5. East North Central
6. East South Central
7. South Atlantic
8. Middle Atlantic
9. New England

FIGURE 2-12: LOCATIONS OF ARL LIBRARIES BY CENSUS DIVISIONS

FIGURE 2-13

DEFINITION OF STATES COVERED

BY GEOGRAPHIC REGIONS

Geographical regions				
Region	1970 population	Census divisions included	States included	
1	48,999,999	New England Middle Atlantic	Maine Vermont Rhode Island New York Pennsylvania	New Hampshire Massachusetts Connecticut New Jersey
2	56,577,067	East North Central West North Central	Ohio Illinois Wisconsin Iowa North Dakota Nebraska	Indiana Michigan Minnesota Missouri South Dakota Kansas
3	62,798,347	South Atlantic East South Central West South Central	Delaware D. C. Georgia Florida Kentucky Alabama Arkansas Oklahoma	Maryland Virginia West Virginia North Carolina South Carolina Tennessee Mississippi Louisiana Texas
4	34,809,339	Mountain Pacific	Montana Wyoming Arizona Utah Washington California	Idaho Colorado New Mexico Nevada Oregon

Region 1 includes Census divisions 8 & 9 of Figure 2-12
2 includes Census divisions 4, 6, & 7 of Figure 2-12
3 includes Census divisions 3 & 5 of Figure 2-12
4 includes Census divisions 1 & 2 of Figure 2-12

FIGURE 2-14

Geographical flow pattern* of loans by regions (percent of total requests)

Loaning region (x)	Requesting region (y) 1	2	3	4	Other
1 Northeast	78.2	5.7	7.5	2.7	5.9
2 North Central	4.4	76.3	8.6	7.5	3.2
3 South	4.7	8.3	83.8	2.3	0.9
4 West	2.0	4.6	3.6	86.4	3.4

* Explanation of table: The entry in each (x, y) cell is the flow of loan requests from region (x) to region (y). For example, the 4.7% in cell entry indicates that 4.7% of the loan requests received in region 3 originated in region 1.

Percent of loan requests received from in-state and out-of-state libraries by collection size of lending library

Collection size of lending library (volumes)	Percent of loan requests originating In-state	Out-of-state	Total loan requests (000's)
20,000–99,999	88.1	11.9	174
100,000–499,999	74.1	25.9	310
500,000 and over	59.2	40.8	1,463
Total loans	64.1	35.9	1,947

FIGURE 2-15

Estimated magnitude of interlibrary loan activities in academic libraries (number of items or volumes)

Year	Volume of requests *		
	Borrowing	Lending	Total
Reported			
1965–66	691,000	1,039,000	1,730,000
1966–67	764,000	1,191,000	1,955,000
1967–68	951,000	1,488,000	2,439,000
1968–69	1,022,000	1,750,000	2,772,000
1969–70	1,266,000	2,122,000	3,388,000
Projected			
1970–71	1,369,000	2,217,000	3,586,000
1971–72	1,503,000	2,461,000	3,964,000
1972–73	1,641,000	2,691,000	4,332,000
1973–74	1,794,000	2,946,000	4,740,000
1974–75	1,928,000	3,202,000	5,130,000

* Requests are interlibrary loan requests *sent* by the borrowing library or *received* by the lending library as opposed to requests filled.

Geographically, the activity is likely to be distributed roughly proportional to population and in the percentages shown in Figure 2-14. Seasonally, the activity is likely to be distributed roughly as shown in Figure 2-16. Daily, the distribution of request input might follow the pattern of Figure 2-17.(in each time zone), but there is no reason to expect that the use of SILC would necessarily follow this particular pattern.[9]

FIGURE 2-16

ESTIMATED PRESENT AVERAGE MAGNITUDE OF

INTERLIBRARY REQUESTS PER DAY

DURING EACH MONTH OF THE YEAR

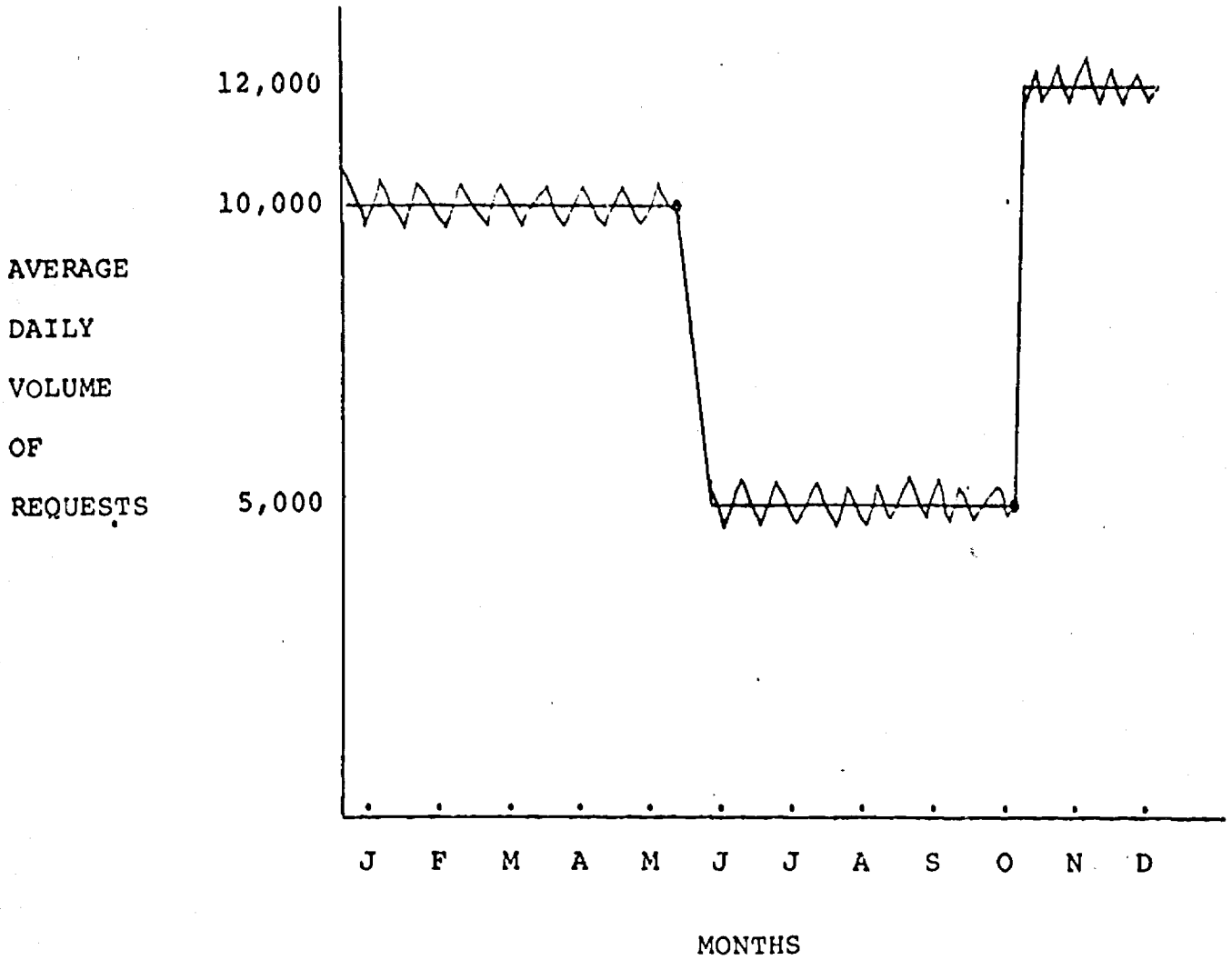
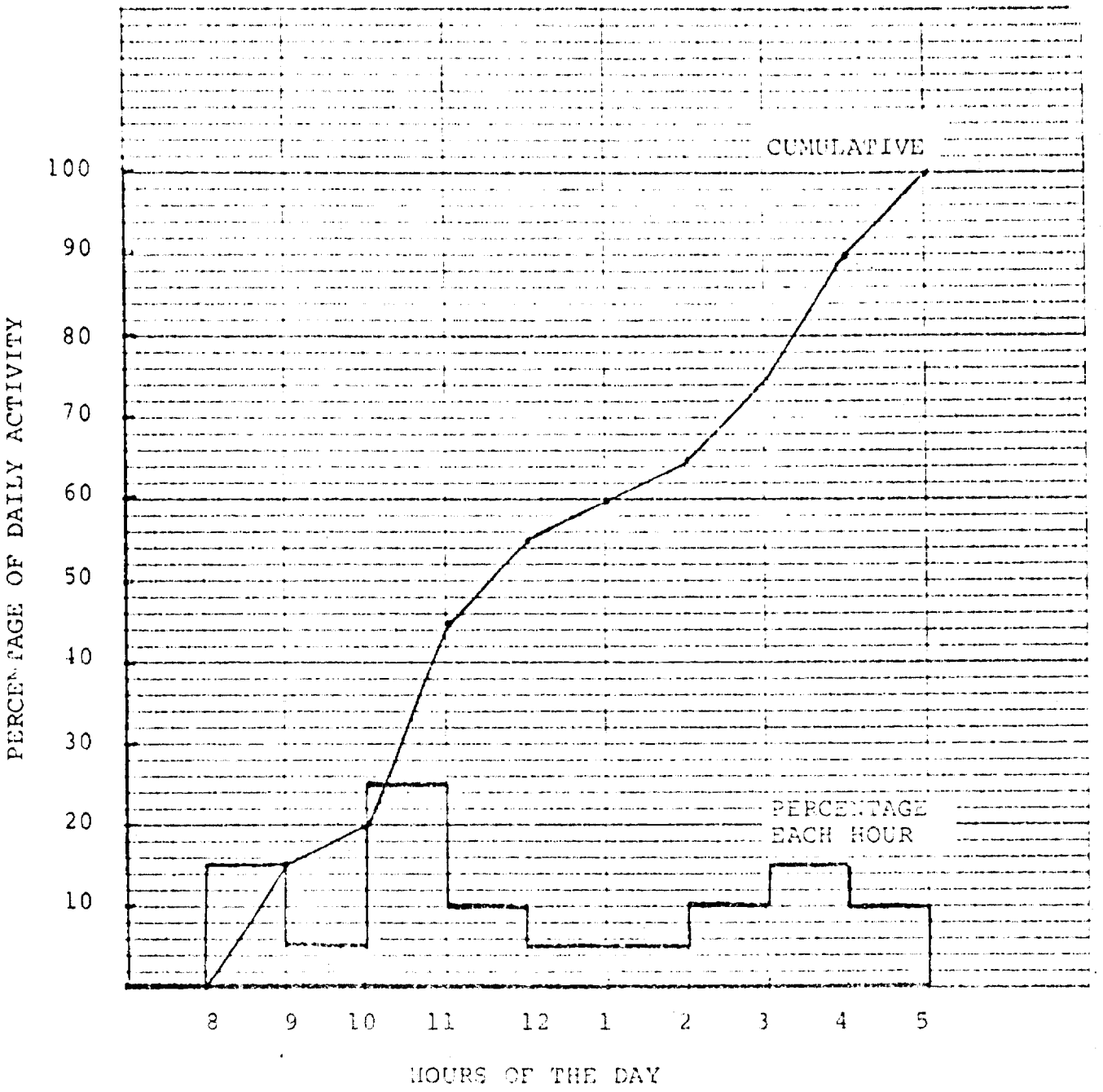


FIGURE 2-17

ESTIMATED DISTRIBUTION OF REQUEST ACTIVITY

BY PERCENTAGE DURING EACH HOUR OF THE DAY



The distribution by type of message is difficult to estimate. However, each request will involve at least two messages with full bibliographic data (up to an average of say 300 characters total), one in and one out. Referrals will occur in about 25% of the cases and involve at least one more 300 character message out. Normally, we would expect at least one additional message, with minimal text, for each one with bibliographic data. Hence, if we assume SILC handles a yearly volume of say 1,000,000 requests, we would have a number of messages as shown in Figure 2-18.

Schedules and Response Times. For purposes of defining requirements for schedules and response times, it is sufficient to define the following categories of operation:

(1) Message input

(2) Interrogation

(3) Store and forward

(4) Accounting

(5) Reporting

Message input must be essentially on-line and at the convenience of the library inputting the message. Ideally, this means that input should be allowed at any time of day or night, but it is recognized that some systems will limit such use to the period 6AM to midnight. Input should not require any schedule beyond that, however. During input, system response should be such that the user can input at teletype speed, from either keyboard or pre-punched tape, without significant delays. Thus response times for system response

FIGURE 2-18

ESTIMATED NUMBER OF MESSAGES BY MESSAGE TYPE

(Per 1,000,000 Requests)

	MESSAGES INPUT	MESSAGES OUTPUT	TOTAL CHARACTERS TRANSMITTED
Requests	1,000,000	1,000,000	600,000,000
Referrals		250,000	75,000,000
Responses	1,250,000	1,250,000	75,000,000
Interrogations	100,000	100,000	10,000,000

to a message must be less than one second on the average and less than ten seconds at the maximum.

Despite the requirement that message input be essentially on-line, it is not expected that the operation within the library will involve direct keying at the terminal. Rather it is anticipated that transactions will be accumulated, probably on paper tape or similar medium, during the day. The batch of transactions could then be transmitted at the library's convenience, or placed on-call at the terminal for input at the request of the SILC system. This alternative means of operation would not negate the requirement for the library to have on-line access to the system, even while transmitting such a batch. It merely suggests that the general nature of the requirement is consistent with batch operations.

Interrogation typically will involve a requester asking what the status of his request is. Since this involves file access as well as message input, it is expected that response time may be slower. The average response should not be significantly longer than 5 seconds, and the maximum no longer than 15 seconds.

The message switching, store, and forward functions can be handled more or less as batch operations. There are no stringent requirements for response time, since in most cases an overnight communication ought to suffice. On the other hand, SILC should include facility for more rapid handling of messages if the situation warrants, perhaps as specified

by a message type code identifiable as "priority". In summary, the following seem to be reasonable requirements:

--Average delay between input of a message and availability to the recipient of one hour.

--Maximum, delay of twelve hours.

--Priority, delay of less than one minute.

Accounting will be handled as a batch run of transactions (requests, messages relating to requests, and all other messages) once a month. A closing date will be established for each month (presumably the last day of the month), and all messages through that date will serve as input to the accounting. The results of the accounting run should be available within three working days of that date. Statements should be delivered to the SILC manager in no more than five working days from the closing date.

Reporting will be on a quarterly, semi-annual, and annual basis. No specifications have yet been established on the content or organization of reports beyond the general one that they will certainly include statistical and financial reports on the activity of the reporting period. They may include analyses of the substantive content of bibliographic text of requests.

File Sizes. Messages and related data must be stored at a variety of levels of processing and access:

(1) During message receiving, storing, and forwarding.

(2) During the time until a request has been satisfied.

(3) During the time until a request has been resolved.

(4) During an accounting period.

(5) During a reporting cycle.

During message handling, the full content of a message must be maintained essentially on-line, until it has been delivered and all affected file records have been updated.

During the time until a lending library has responded positively to a request or until all alternatives have been completed, the full content of a request and of all updating messages referring to it must be maintained in a store accessible in consistency with the message handling function--presumably on-line.

Once a request has been positively satisfied, the formatted portion of its original request message must be maintained in a comparable level of accessibility--again presumably on-line. The full content (including text) should be stored in a history file for subsequent analysis as part of the reporting cycle.

Once a request has been completely resolved, either because the book has been returned to the lending library or a retainable copy was sent, the formatted part of the request message and of all associated messages must be stored in a file accessible to the monthly accounting process.

All messages must be stored on a history tape until a reporting cycle has been completed. Normally, this will be either yearly or semi-yearly.

Figure 2-19 summarizes the estimated times during which a message will be active at each of these levels of processing together with an estimate of file capacity per 1,000,000 requests.

FIGURE 2-19

STORAGE REQUIREMENTS (PER ONE MILLION REQUESTS)

PROCESSING FUNCTION	FORM OF ACCESS	TIME PERIOD	AVERAGE NUMBER OF MESSAGES STORED	ESTIMATED FILE SIZE
Message Handling	on-line access	1 to 3 Days	60,000	6,000,000 Characters
Request Satisfaction	on-line access	2 to 10 Days	200,000	20,000,000 Characters
Request Resolution	batch access	10 to 30 Days	600,000	60,000,000 Characters
Accounting	batch access	30 to 90 Days	1,800,000	180,000,000 Characters
Reporting	batch access	90 to 365 Days	7,600,000	760,000,000 Characters

In addition to the requirements for message handling, accounting, and reporting, the system must also store the data required for producing statements. Essentially, this can be considered as involving a record for each participating library and consortium.

The number of participating libraries (and, therefore, of library accounts) is unknown, but is likely to be in the range of 2,000 to 5,000. The number of consortia is likely to be in the range of 200 to 500.

SILC PROGRAMS

No specifications have been established for the programs needed to perform the functions outlined above. There are, however, some general principles that can be given now:

--The application programs should be as independent as feasible from the operating system of any specific time-sharing system. The extent to which they do depend upon the special features of the time-sharing system must be clearly identified and should be modularized.

--The application programs should be generalized and table-driven to the maximum feasible extent. The addition of new codes, new consortia, and new accounting algorithms ideally should require no new programming but simply filling in forms describing new tables or replacements for old tables.

--The application programs should be as machine independent as possible. This obviously implies that they be written in a widely used, higher level programming language.

EVALUATION OF SPECIFICATIONS

These functional specifications should serve as the starting point for preparation of any formal RFP (Request for Proposal) to be submitted to potential bidders for development and operation of the time-sharing computer services it involves. In order to evaluate the extent to which these specifications would be satisfactory for that purpose, the preliminary version of them was discussed with each of the five time-sharing computer system companies that were willing to participate in the study (as is presented in the next section of this report). As part of the discussion, they were each asked to comment on the adequacy and completeness of the specifications. The general reaction was very positive, represented by phrases such as,

> "The work performed thus far in system definition makes an early start on implementation work a very real possibility; certainly closer than the title 'Preliminary Specifications' implies."

However, during the technical discussions, some specific points were raised that led to modification of the specifications in order to provide more detail. Further changes should be expected as a result of evaluation of the specifications by library administrators and ILL staff (especially of the ARL libraries). Any final RFP, of course, should be prepared by the organization chosen to be SILC manager. However, the results of this study indicate that the general form and level of detail provided in

the specification presented in this report is adequate for purposes of a formal RFP. It should therefore serve as a reasonable starting point for the SILC manager.

3. TECHNICAL FEASIBILITY

THE ISSUES

The question is, "Is SILC technically feasible?" To answer that question, we must consider a number of issues:

(1) Can time-sharing organizations meet the preliminary specifications on SILC?

(2) Do the time-sharing systems have the economic and operational stability to support a continuing service?

(3) Can the time-sharing organizations provide adequate support to the development of an operational SILC system?

(4) Can time-sharing systems handle the volume of traffic that SILC, in full scale operation, would represent?

(5) Do the time-sharing systems provide the national (and international, if we include Canada) coverage that is required, especially in terms of communication costs?

(6) Can time-sharing systems accept input from the variety of terminal devices now available at most participating libraries (i.e., teletypes) and from computers (as would be required for participation of some existing networks or, eventually, of on-line data bases)?

(7) Are the estimated costs for computer usage within reasonable economic limits?

The approach taken to answering these questions was to send a copy of the Preliminary Specifications on SILC to each of the commercial time-sharing companies that could be identified, with the request that they prepare informal proposals in response to them.

Commercial time-sharing computer system companies were used to determine the data on which to evaluate technical and economic feasibility for the following reasons: (1) they are in the business of providing such services as SILC involves, (2) they have established price schedules as a formal basis for estimating costs, (3) they have, to one extent or another, histories of performance for a number of customers, (4) they were ready, willing, and able to prepare the kind of informal proposals that the study required for obtaining the necessary data, (5) they are available, in principle, for service to any customer without the restrictions that more specialized networks might impose.

However, commercial organizations are not the only possible alternatives to be considered. There are a variety of on-going developments in the federal government (e.g., ARPANET),[9] state government (e.g., some of the state library networks),[11] and in the academic community (e.g., OCLC)[5] that are creating computer time-sharing systems to provide services to a range of users, including libraries. Therefore, the fact that the data presented are derived *from* commercial examples should not be construed as a recommendation that a commercial organization be the necessary choice. There may be advantages in such a choice but there may also be other advantages in the choice of one of the possible non-profit examples and, therefore, non-profit alternatives should be included among the organizations to which a formal Request for Proposal may be sent.

Figure 3-1 is a list of those commercial companies that were solicited. In requesting their participation, it was made clear that there was no obligation or commitment on the part of Becker and Hayes, the ARL, or any funding agency; on the other hand, there was also no obligation on the part of the time-sharing company. The proposals were to be regarded as purely informal and solely for the purposes of evaluating the feasibility of SILC. They were not to be regarded as binding nor even necessarily as the form or content of any subsequent formal proposal. All data provided were to be treated as confidential and not identified with any single company.

During the ensuing several months, informal discussions were held with each of those companies that expressed a willingness to participate. The Preliminary Specifications were presented to them in person, as well as in written form. Questions were discussed that they had about the nature of the project, the expected future stages, and the roles of the various participants as well as those they had about technical details of the specifications.

SUMMARY OF RESULTS

Of the companies listed in Figure 3-1, five provided responses to one extent or another. Figure 3-2 provides a summary of the nature of these responses. The first column presents the "range of responses"; the second presents a

FIGURE 3-1

TIME-SHARING COMPANIES

Allen-Babcock Computing, Inc.
Los Angeles, California

Computer Science Corporation
Infonet Division
El Segundo, California

Com-Share, Inc.
Ann Arbor, Michigan

Control Data Corporation
Minneapolis, Minnesota

Datran Corporation
Vienna, Virginia

General Electric Corporation
Information Services Division
Bethesda, Maryland

Leasco Response, Inc.
Washington, D. C.

National CSS, Inc.
Norwalk, Connecticut

Service Bureau Corporation
Harrison, New York

Tymshare, Inc.
Palo Alto, California

United Computing Systems
Kansas City, Missouri

Western Union
Arlington, Virginia

FIGURE 3-2

TABULATION OF PARAMETERS CHARACTERIZING

FIVE TIME-SHARING COMPANIES

BASED ON INFORMAL RESPONSES FROM THEM

PARAMETER	RANGE OF RESPONSES	REPRESENTATIVE RESPONSE
Organization start data	1965-1967	
Founder	From computer company to major manufacturer to utility to software firm	
Profitability	Some consolidate with parent company; some have been profitable for 2-3 years; some are still losing money	Will have been profitable by time of Formal SILC Contracting
Customers	From 700 to over 4000; users (i.e., terminals) from 700 to over 10,000	1000 customers 4000 terminals
SILC-sized customers	Some did not identify number of SILC-sized customers; for those that did, ranged from 3-5	5 SILC-sized customers
SILC as % of capacity	No estimates provided	B & H estimates that SILC will take about 10% of system capacity
Government Contracts	Some have federal government contracts; some do not	5 Federal contracts
Total Staff	From 225 to over 470; from 80% to 30% technical; from 10% to 60% sales; from 10% to 30% administrative	About 300 total; 50% technical 30% sales 20% administrative

PARAMETER	RANGE OF RESPONSES	REPRESENTATIVE RESPONSE
Implementation Support	Proposals varied from very specific, obviously knowledgeable proposals to simple statements of willingness to consider	Proposal, with work done by applications programming department
Data Centers	From one center to seven centers; broad range of sales offices	Two computer centers twenty sales offices
Computer Facilities	Virtually every manufacturer is represented: Univac, IBM, XDS, PDP, CDC	
Storage Capacities	From 400 million (at one computer facility) to nearly 20 billion characters on-line	5 billion characters on-line
Communication Concentrators	Every one of the systems uses both remote and centralized concentrators	Both remote and centralized concentrators
Terminal Facilities: Low speed	Every one of the systems accepts almost any make terminal in the speed range from 10 to 30 cps	Almost any make terminal in the speed range from 10 to 30 cps
Terminal Facilities: Medium speed	Some accept IBM 2780; some, readers and printers in the range of 1200 to 2400 cps	Displays; readers and printers up to 2400 cps
Terminal Facilities: High Speed	Some do not identifv a high speed capability; some identified tie-in to computers at rates up to 9600 baud	Tie-in to computers at rates up to 9600 baud
Communication Network	Each system uses a dedicated network for system components and centers, with dial-up backup. Some have automatic rerouting. Some use WATS/IN	Leased lines, dial up for system back-up

PARAMETER	RANGE OF RESPONSES	REPRESENTATIVE RESPONSE
Geographic Distribution	Essentially, all of the systems provide coverage of the entire contiguous United States and Canada except for Alberta and the adjacent northern plains states	Coverage of the entire contiguous United States and Canada, except for Alberta and the northern plains
Codes	All systems accept either ASCII or EBCDIC	Either ASCII or EBCDIC
Storage Increments	From 512 characters to 120,000 characters	1000 characters
Hours of Operation	Ranges from 7 AM to 1 AM for six days a week, at the most limited, to 24 hours a day every day	6 AM to 3 AM every day
Operating System	Various specialized systems, some based on IBM/OS	IBM/OS or compatible with it
Languages	Every system supports all standard languages: BASIC, FORTRAN, COBOL; all support an assembler language; some support PL/I; some, ALGOL	Virtually every major language is available and some specialized languages
Security	All systems provide an extensive capability for security: user ID, password, file controls, read-only access controls, etc.	Extensive capability for security
Backup	Proposals varied from very specific coverage of procedures for protection of service, back-up for files, and procedures for restoration to a cursory reference to the problem	Extensive capabilities for back-up protection and established procedure for restoration of service

PARAMETER	RANGE OF RESPONSES	REPRESENTATIVE RESPONSE
Initiation Fee	The systems differ widely in the fee they charge for initiation of service to a customer, ranging from zero to $2500. In most cases, the fee, if it exists, may be negotiated	No initiation fee, or at most nominal
Minimal Monthly Charge	Minimal monthly charges range from zero to $100 per contract (SILC as a whole being one contract), except for one system that charges $100 per user (i.e., per terminal), but they are willing to negotiate	No minimal monthly charge, or at most nominal
Sign-on Charges	Only one of the systems has a "sign-on" charge	No sign-on charge
Connect Time Charges	The charge for connect time varies from $7.50 per hour to $16.00 per hour	$12.00 per hour
CPU Time Charges	Charges for CPU time vary from $.04 per second to $.50 per second, depending upon the system and the level of use (on-line, batch, or 24 hour turn around)	On-line time: $ .40/sec Batch time: .20/sec 24 hr time: .15/sec
On-line Storage Charges	Systems vary in their charges for on-line storage from $.16 per month per 1000 char. to $1.20 per month per 1000 char.	$.40 per month per 1000 characters
Off-line Storage Charges	Systems vary from no charges (for customer supplied data files) to $5.00 per month for rental of tapes and $30,00 for rental of disks	No charge for customer supplied data files; $5.00 per month for tape rental; $20.00 for disk rental

PARAMETER	RANGE OF RESPONSES	REPRESENTATIVE RESPONSE
Card input Charges	Systems vary from $1.00 to $2.00 per 1000 cards	$1.00 per 1000 cards
Card punching Charges	Systems vary from $4.00 to $6.00 per 1000 cards	$4.00 per 1000 cards
Printer Output Charges	Systems vary from $.10 to $1.00 per 1000 lines	$.25 per 1000 lines
Estimated Costs per SILC request (as first presented)	Estimated costs as first presented by each of the systems varied from $.16 per request to $2.00 per request	
Estimated cost per SILC request (as revised after discussion	Estimated costs, after discussion of parameters of operation, varied from $.30 to $.75 per request	$.50 per request

"representative response", that is, the kind of response that might be found in a successful formal proposal (but not necessarily that found in any specific informal proposal considered in this study). In the following sub-sections, we will discuss each of the relevant parameters listed in Figure 3-2 in turn, describing the general nature of the range of answers received and concluding with a discussion of the significance of each parameter to SILC operation.

Organizational Parameters

Organization Start Date. All of the time-sharing systems began operation in the period 1965 to 1967. This is significant to SILC operation to the extent that it suggests that any potential contractor will have a number of years of operating experience and a number of customers able to evaluate the effectiveness of service.

Profitability. As Figure 3-2 indicates, the companies differ in the extent to which data is available about their profitability, since for some of them such data is consolidated in the report of a parent company. In general, however, time-sharing services seem to have "turned the corner" on profitability. This has importance to SILC to the extent that profitability is a necessary basis for continued operation. The data available suggests that several of the potential contractors are or will be sufficiently profitable to assure continuation of service.

Customers. The number of customers served presently by each of the companies ranged from 700 to over 4000. This is important to SILC operation in at least two respects. First, the fact that a company has a large number of customers is reassuring to the extent that it demonstrates a reliability and quality of service and provides a number of organizations with which the quality of the service can be discussed. But second, on the other hand, it raises a potential problem in system overload. In general, the range of responses would seem to be a positive factor in evaluation of technical feasibility of SILC.

SILC-sized Customers. The number of SILC-sized customers is obviously an important factor in the demonstration of an ability to handle a workload of the magnitude that SILC represents. Generally, the number of customers of this size appears to be large enough to give confidence in the ability of the potential contractors to handle SILC-sized tasks.

SILC as Percentage of Capacity. None of the time-sharing systems that responded gave any indication of the percentage of its capacity that SILC would use. The estimate provided in Figure 3-2 (i.e., 10% of capacity) is therefore solely an estimate made by Becker and Hayes, based on an evaluation of other data provided (such as total number of customers).

Government Contracts. This may or may not be a relevant issue. Certainly a federal agency, as a customer, is not significantly different from others. However, one question

does arise in the event that the SILC manager were to be a federal agency. Would it be necessary to choose a time-sharing company with a GSA contract? If so, this would severely limit the freedom of choice among potential contractors.

Total Staff. The answers from the time-sharing systems to the question about the number of staff and their distribution among various functions ranged widely. This issue is important to SILC operation in the extent to which it shows a capability of providing technical service and assistance. In general, most of the time-sharing systems have an adequate number of technical staff and customer relations staff to assure that they can meet SILC needs.

Implementation Support. One choice for development of SILC programs is to assign responsibility for it to the time-sharing system. The companies were therefore each asked to indicate whether they were willing to accept that responsibility and how they would handle it. The proposals submitted were informal and not necessarily indicative of the character of any formal proposals, but they were indicative of the present knowledge and interest. They varied widely in their quality, from very knowledgable ones to very perfunctory ones. The best of them were exceptionally well done, showing a good understanding of the requirements and providing a detailed analysis of the means by which it was proposed to meet them. This issue should be one of paramount importance in the evaluation of any formal proposals and it should be expected

that the formal proposals will show an exceptionally responsive knowledge of the requirements, since at least some of the informal ones did.

Hardware Parameters

Data Centers. This issue is relevant to the extent that a large number of centers may provide a degree of reliability, or at least of back-up, for operations. The distribution of sales offices provides some measure of the extent to which support by technical staff and customer relations staff may be available to a local area, and thus to individual libraries.

Computer Facilities. The kind of computer used by the time-sharing system is probably not a significant issue as far as SILC operation is concerned, except to the extent that it may imply difficulty or ease in transfer of SILC programs to other time-sharing facilities at later points in time. Of course, the issue is one of great importance to the time-sharing companies, and presumably each of them is continually evaluating its configuration of equipment with the aim of improving efficiency, reliability, and capacity. If a time-sharing contractor were to change its facilities, the same issue of transferability of SILC programs would arise, but presumably the time-sharing contractor would assure such transferability without degradation of performance. Such an assurance might therefore be a criterion in evaluation of proposals.

Storage Capacities. This parameter is an extremely important one. Fortunately, the storage requirements for SILC operation are not exceptional, as far as message switching, referral, and accounting functions are concerned. (Of course, for on-line data base functions, the storage requirements could be astronomical). For the initial SILC functions, any of the systems has plenty of storage capacity, including consideration of other system users and their needs.

Communication Concentrators. As a technical aspect in the design of time-sharing computer networks, communication concentrators are necessary to provide efficient usage of both the communication lines and the computer input channels. All of the systems embody the use of them, so this is unlikely to be a significant issue in evaluation of formal proposals.

Terminal Facilities: Low Speed. This is certainly one of the most crucial issues in evaluation of the operational feasibility of SILC. Will the time-sharing system be able to accept input from terminals that libraries are likely to have available (e.g., standard teletype)? The answer was clearly YES. Each of the systems accepts input from a wide array of terminals, including standard teletype and other standard equipment as well.

Terminal Facilities: Medium Speed. This is also an important issue for those libraries that may have cathode-ray-tube, display terminals. The systems differ significantly in

the extent to which they will accept input or provide output to such terminal devices or to readers and printers operating at medium speeds.

Terminal Facilities: High Speed. This is also a significant issue. First, some of the library consortia that might effectively use SILC are already to some extent using computers as part of their inter-library loan procedures. It would be almost essential that the time-sharing system be able to communicate directly with those computers, so the ability to communicate at high speed is an important factor in evaluation of any potential contractor. At least some of them are indeed able to do so. Second, as the tie-in to on-line data bases becomes a part of SILC operation, communication at high speeds becomes essential.

Communication Network. Since each of the systems uses a dedicated communication network, the nature of it is probably not a significant issue as far as SILC is concerned. The availability of WATS/IN, however, is an important feature of some systems, since it facilitates communication from otherwise remote points.

Geographic Distribution. This is a very significant issue, since libraries found in all parts of the United States and Canada are interested in borrowing from each other. The systems differ to some extent in their present geographic coverage. However, enough of them presently provide coverage of the entire

contiguous United States and Canada to conclude that any potential contractor will provide such coverage, if not now at least by the time of SILC full-scale operation.

Codes. The codes for data turn out to be no problem, since all of the systems accept either ASCII or EBCDIC.

Storage Increments. This is a significant operational issue, since it affects the means by which the SILC manager (or the time-sharing system) will allocate storage resources. In principle, the smaller the increment that can be added to storage, the more flexible the allocation of resources can be. However, the general range of the responses is such that almost any of the systems provides adequate flexibility.

Software Parameters

Hours of Operation. Although in principle one might like to communicate through SILC at any time of the day or night, in practice the schedule for hours of operation of almost any of the time-sharing systems appears to meet the needs of SILC operation.

Operating System. While the operating system in one respect is simply a technical aspect of the time-sharing system, in other respects it has a significant effect upon the nature of the SILC application programs and of their transferability to other systems. Unfortunately, even where one operating system may appear to be compatible with another, all too frequently "minor" differences turn out to have major effects.

At this time, there is virtually no way of even guessing what the limitations imposed by one or another time-sharing system's operating system may be. It should, however, be one of the issues in evaluation of formal proposals.

Languages. This issue also relates primarily to the transferability of programs. Since it is likely that SILC application programs will be written in a higher level language and since all of the time-sharing systems support all of the standard languages, this issue should not be a significant one.

Security. This is obviously a most important issue, but it is one so important that each of the time-sharing systems provides facilities for control of access completely adequate to the needs of SILC operation.

Back-up. This is an extremely important issue because of the operational importance that SILC would have. SILC is not simply the use of computers for computation; it's an integral part of the day-to-day service of the library. The informal proposals varied widely in their coverage of this issue. In general, however, those that responded to it in detail showed extensive capabilities for back-up and for recovery in the event of system failure. It is therefore to be expected that in any formal proposals the issue would be thoroughly covered. In any event, based on the responses available, it seems clear that adequate back-up and recovery would be provided by any of the time-sharing systems.

Cost Algorithm Parameters

Before discussion of the cost parameters in detail, it is desirable to point out that the costing algorithms of the various time-sharing systems differ from one another in major respects, primarily because of the different kinds of customers and usage that each would like to encourage and attract. It is almost impossible to make unqualified judgments about the meaning of any one parameter in the costing algorithm without considering the others at the same time. Thus, any ultimate cost comparison must be on the basis of the "cost per request". However, we will here discuss each of the cost parameters in turn for its likely effect upon SILC operation.

Initiation Fee. This is the first of several parameters in the costing algorithms of the various time-sharing systems. It varies from zero to as much as $2500 (or perhaps more). Although, as a one-time charge, any value in that range would not have a significant effect upon over-all SILC costs, it appears that an initiation fee is not called for. At least some of the systems presently do not charge one, and the contractor should be willing to base his income on system usage.

Minimal Monthly Charge. This could be a very significant factor in cost evaluation, especially for those systems that have a monthly minimal charge per terminal. For SILC, with potentially hundreds of individual libraries, each with a terminal using the system, such a cost parameter would be disastrous. For most of the systems, however, there is either

no charge or else it is a minimal one, applying to the entire SILC contract. It is in fact in those cases so minimal that the time-sharing system should be willing to forego it.

Sign-on Charges. Although only one of the systems had an identified "sign-on charge" as part of its charging algorithm, it is possible that more of them would do so in their formal proposals. This would have a significant effect upon SILC costs, especially for requests from those libraries with only a few requests to input, since then even a "minor" charge for sign-on could become a major element in the cost per request.

Connect Time Charges. This is probably the single most significant element in the cost per request of SILC operation. It represents the charge by the time-sharing system incurred during actual transmission of data between computer and terminal, and thus is the primary cost incurred in message transmission.

CPU Time Charges. The primary basis for variation in these costs, within the algorithm of a given system, is the level of service called for (i.e., on-line, batch, or 24 hour turn around). Since the nature of SILC processing is completely consistent with batch service or even with 24 hour turn-around, CPU costs are likely to be a relatively small factor in overall costs.

On-Line Storage Charges. If not properly managed, these costs could become a significant burden. The SILC manager should therefore be especially alert to the allocation of on-line storage and attempt to keep it as well utilized as possible.

Off-Line Storage. For producing the kind of reports that SILC operation and management will require, there will be extensive off-line storage (tape storage, primarily). Every effort should be made to ensure that the tapes are owned and supplied by the SILC manager and that the charges by the time-sharing system for storing those tapes are either zero or minimal.

Card Input Charges. This is unlikely to be a significant factor in SILC costs.

Card Punching Charges. This is unlikely to be a significant factor in SILC costs.

Printer Output Charges. In general, it appears that the volume of paper output, in the form of reports, lists, and accounting statements, should be small enough that the costs of printer time should be a negligible factor. However, if large amounts of printing are inadvertently or irrationally called for, these costs could be excessive.

Estimated Costs per SILC Request. The time-sharing companies each included more or less detailed estimates of the cost per request for SILC operation. These varied from $.16 per request to over $2.00, obviously because of widely

different interpretations of the functional requirements of SILC. These estimates were therefore discussed in detail with technical staff from each time-sharing system, with the purpose of clarifying the basis of their estimates and assuring that the requirements were properly interpreted. The result of those discussions was a revision of the initial estimates and a narrowing of their range to $.30 to $.75 per request.

Based on those estimates, we arrived at a nominal figure of $.50 per request for all message switching, referral, and accounting functions relative to it. For accounting functions alone, the costs were estimated at $.10 (covering connect time for input of the formatted data about each request for which an accounting was wanted, the storage of that data off-line until it could be processed, and the CPU time for receiving the input and processing the accounting reports). These are the estimates used in Section 6 of this report, the evaluation of economic feasibility.

A representative calculation of these estimates (based on the cost parameters listed in Figure 3-2 as "Representative Responses", but comparable in form to those submitted in various proposals) would be as shown in Figure 3-3.

FIGURE 3-3

REPRESENTATIVE CALCULATION OF

ESTIMATED TIME-SHARING SYSTEM

COSTS OF SILC PROCESSING

(1) Connect time charges for input and output, assuming that an average request involves about three messages with bibliographic data (each of 300 characters, as an average) and six other messages (each of 60 characters):

$$\frac{(300 \text{ char.})(3 \text{ messages})(\$12 \text{ per hour})}{(10 \text{ char. per sec.})(3600 \text{ sec. per hour})} = \$.30$$

$$\frac{(60 \text{ char.})(6 \text{ messages})(\$12 \text{ per hour})}{(10 \text{ char. per sec.})(3600 \text{ sec. per hour})} = .12$$

(2) CPU time charges for message switching, referral, and accounting:

(20 msec.)(9 messages)($.20/sec.) = .04

(20 msec.)(9 mess.)(15% referrals)($.20/sec) = .006

(1 msec.)(9 messages)($.20/sec)(3 reports) = .006

(3) On-line storage charges until resolution of a request, assuming that the average length of a record is about 1000 characters (300 for the initial bibliographic message and 9 times 60 for the subsequent postings), and that it is on-line for an average of 20 days:

$$\frac{(20 \text{ days})(1000 \text{ char.})(\$.40 \text{ per month/1000 ch.})}{(30 \text{ days per month})} = .03$$

Total $.502

EVALUATION OF FEASIBILITY

Technical Feasibility. Even before the study was started, it seemed clear that SILC was well within the capabilities of almost any of the existing national time-sharing computer systems. There were still a number of questions, however, that could be raised about technical feasibility. Based on the results summarized above, we arrived at the following conclusions regarding the questions enumerated at the beginning of this section.

(1) The functional requirements of SILC operation can be met by any one of at least five or six of the existing commercial national time-sharing systems.

(2) Each of the companies whose systems could meet SILC requirements is financially viable and likely to continue to provide operational services for the indefinite future.

(3) Each of the companies whose systems could meet SILC requirements would be willing to accept responsibility for the applications programming required to bring SILC to an operational stage (under an appropriate contract and payment of costs), and each has the technical staff and competence to do so successfully.

(4) Each of the systems that can meet SILC requirements is capable of absorbing an operation of the size of SILC without significant problem and, in particular, without an unacceptable overload on its communication or computing facilities.

(5) At least three or four of the systems that can meet the functional requirements of SILC operation provide a coverage of the entire United States and Canada (with the exception of Alaska and Hawaii).

(6) Each of the systems will accept input from a wide variety of terminal devices including specifically standard teletype terminals, such as are located in many libraries today. Thus, use of such systems would not require installation of different devices in those libraries with existing teletypes.

(7) The range of estimated costs for SILC operation was from $.30 to $.75 per inter-library loan request handled. This appears, on a superficial comparison with the overall costs of inter-library loan, to be an acceptable range of costs (being about 10% to at most 20%). Later, we will discuss the issue of economic feasibility in more detail.

These conclusions are all essentially positive in their answers to the questions that are relevant to an assessment of technical feasibility. We must therefore conclude that SILC is indeed feasible from a technical standpoint.

CRITERIA FOR EVALUATION OF FORMAL PROPOSALS

The results from these informal proposals are, as we have indicated, not necessarily representative of what would be received from the same companies in response to a formal RFP (Request for Proposal). However, they do point up the need for any RFP to include specification not only of the requirements for SILC itself but for the proposal evaluations.

Criteria for evaluating time-sharing systems can be grouped into the following categories: (1) organizational stability, (2) technical features of hardware, communications, and system software, (3) implementation of application (SILC) programs and customer support services, (4) costs, (5) contractual considerations. The following is a listing of possibly relevant factors in each of these categories:

Organizational Stability. These criteria are focussed on one basic issue: Is the time-sharing system likely to continue to provide the service? The data needed concern capitalization, length of time service has been provided, history of reliability and performance, profitability, turnover of personnel, etc.

SILC would be one customer with 1000-2000 terminals in the U.S. and Canada, 10 million messages per year, and accounting for 2.5 million transactions per year. How many customers does the network now have with these characteristics?

Relevant Organizational Parameters

--History of development and operation of services
--Balance sheet data for the company since the service became operational
--Number of customers, both in total and of the size represented by SILC
--History of customer experience
--Staff size, distribution of staff among types of professional capabilities

Technical Features. The system computer hardware used by the system seems to be a relatively minor criterion, except insofar as it affects performance and reliability. However, data on the system hardware should be provided. Of somewhat more importance is the system storage capacity, although it is likely that any of the alternatives will have more than enough available. Of very great importance are the kinds of terminal devices that the system will accept. Of equally great importance are the provisions for hardware backup.

An important issue is the geographical distribution of system hardware or, at the least, the facilities for access to it and for communication within the system across country. Are the services available with essentially "toll-free" communication? A related issue is an ability to handle a large number of users--perhaps 200 to 300--logged in simultaneously for reading from and writing into the same data base.

Of great importance are the software facilities--the operating system; the languages supported; the system software for communication, message switching, file access, de-bugging capabilities and aids, conversational mode operation, background job control, system administration and resource allocation, system accounting, security, etc. Are the coding systems compatible with MARC data?

Relevant Hardware Parameters

--Computer system, number of different types and geographic distribution
--Storage equipment and capacities, by kind and by level of access
--Terminals accepted
--Provision for hardware back-up

--Schedule for maintenance of equipment
--History of unscheduled down time
--Procedures for automatic re-start
--Procedures for message security
--Procedures for notification of customers when system is down, including notification of time from which reconstruction will be necessary
--Number of terminals that the system can accommodate

Relevant Communications Parameters

--Capabilities for local dial access, including WATS/IN
--Communications line security provisions
--Acceptable transmission rates
--Variety of communication codes acceptable--ASCII, EBCDIC, TWX, etc.
--Character set available--upper and lower case, special characters, etc.

Relevant System Software Parameters

--Operating system--number of them provided, ease of use, flexibility in use, range of options
--Message switching facilities
--Languages supported--how long has each been operational on this system, what is the quality of the compilers, what is the effectiveness of object code, can multiple language programs be accepted, level of language implemented
--File access procedures
--File up-date and collation procedures
--File security and back-up procedures
--De-bugging capabilities and aids
--Conversational mode operation--compile, load, execute, halt, continue
--On-line text editing, procedures for handling corrections of input data

Implementation and Customer Support Services. The development of the application programs could be handled in a number of ways. The SILC manager could do it; it could be contracted to a software programming corporation; it could be done by the computer time-sharing system itself. For many reasons, but especially to avoid

issues of responsibility for system failures, it could well be decided that the time-sharing computer system contractor should do it. An important criterion is, therefore, the willingness and demonstrated capability to perform the contracting for this work. The cost for doing so, the estimated schedule for completion, performance guarantees, understanding of the system requirements, ability to maintain demonstrated history of performance on comparable work--all are involved in making this evaluation.

Relevant Implementation Parameters

--Demonstration of an understanding of SILC requirements
--Demonstration of an ability to write SILC programs, to maintain and modify them
--History of performance on comparable tasks
--Estimated schedule for completion
--Cost, preferably a fixed price
--Performance guarantees and penalties
--Acceptance tests
--Turn-key contract preferred

Relevant Customer Support Parameters

--Quality and completeness of system documentation
--Documentation of applications (SILC) programs
--User manuals--use, log-in, interpretation of error messages, etc.
--Distribution of sales and services staff, geographically
--Location of bulk output printing and distribution points, schedule of delivery
--Service schedule--time of day, weekly schedules
--Customer training--training staff, training manuals

Costs. The operating costs are the ultimate economic criterion. This involves two things: the general cost-price structure and the specific cost estimates for SILC operations, perhaps as confirmed in bench mark tests.

The estimate of SILC operating costs of primary importance, because of the sheer volume of activity and level of processing, is that of message handling cost. Other estimates are for the accounting and reporting functions.

Relevant SILC Cost Parameters

--General price structure--connect time, CPU time, I/O calls, line charges, storage charges, basic fees--quanta and units in each case
--Differential prices--level of service, prime time, batch vs. background, vs. on-line
--Specific and itemized cost estimates for SILC operation--by time, by message unit, by cost factor
--Costing algorithms within SILC

Contractual Provisions. The nature of the contract between the SILC manager and the time-sharing company should be explicitly covered in a formal proposal. Special attention should be paid to the following issues:

Relevant Contractual Parameters

--What methods of testing SILC performance, including SILC application programs are to be provided--bench mark tests, system tests, acceptance tests
--How long a test period
--What recourse, if the programs are delivered late or fail to meet acceptance tests
--Provisions for contract termination
--Provisions for ownership of programs and data bases
--Provisions for system modifications--due to changes in the time-sharing, due to changes requested by SILC

4. OPERATIONAL FEASIBILITY

THE ISSUES

The question is, "Will SILC be accepted at the operational level?" To answer that question, we must consider the following issues:

(1) Are the operations required in the libraries using SILC consistent with the present ILL procedures used by various libraries?

(2) Are the services provided by SILC useful to Libraries?

(3) Is SILC consistent with both the present pattern of relative independence among libraries and the growing pattern of creating library networks?

(4) Will SILC be able to provide service not only to libraries in general but to more specialized consortia as well?

(5) Do the major libraries, at least, have available the terminal equipment needed to communicate with SILC?

The approach taken to answering that question was primarily to identify a number of libraries which represented different kinds of requirements and, with their approval and participation, to analyze their present policies and procedures and requirements with respect to ILL. The results of these analyses were then evaluated for the compatibility of SILC with them. Then, based on the existing procedures and the inherent requirements of communications with SILC, a draft procedure manual (included as Appendix D to this report) was developed. The following sub-

sections present the results of these analyses and conclude with an evaluation of operational "pros and cons" with respect to SILC.

ORGANIZATIONAL CONCEPT

The preliminary organizational concept, given that the functional abilities of SILC have been implemented on a national time-sharing system, is not only that any library in the country can participate, but that they can do so as members of consortia if they want to. What does this mean? From an operational standpoint, it means that two libraries that have been defined as belonging to a consortium can communicate with each other through SILC, more or less directly, within the agreements of that consortium. Two libraries not belonging to a consortium can communicate with each other either through agreements between consortia on referral protocols and agencies or simply as individual libraries within the boundary conditions of the National Inter-library Lending Code.[2]

To see how this would operate, let's consider a typical state university campus. It belongs or is likely to belong to a number of different consortia:[12]

(1) The state university multi-campus library network, which functions as a closely integrated operation, funded by the library budgets of each campus but supplemented by state-wide budgets (for photocopying, for example).

(2) A state-wide academic library network, established to provide service among the campuses of the state funded university and the private universities as

well. The funding of services could involve contributions from the state university system and the private colleges, and subsidy from state appropriations.

(3) A State Library Network, oriented primarily to the public library systems of the state, but drawing on university resources as well as those of the State Library and the major public library systems. The funding of services could come from the State Library, under provisions of LSCA Title III, and from state appropriations.

(4) A Regional Medical Library network, including medical libraries throughout several states. Funding comes from the National Library of Medicine under provisions of the Medical Library Assistance Act.

(5) An ARL network, with services possibly funded by some kind of fee structure.

(6) An ASIDIC network for access to data base services and document delivery in support of SDI services provided by the various dissemination centers. Again, funding could be provided by some kind of fee structure.

Several aspects of SILC operation are illustrated by this. First, a library may participate in several consortia. Second, the funding of the library's services may come from several sources--its own budget, that of a parent organization, fees from the users of the services, subsidy from state or federal agencies. Third, the variety of services and protocols for calling on them will differ from one consortium to another.

This organizational approach seems to be consistent with the entire trend in the development of library networks. The effects of the Library Services and Construction Act Title III, of the Medical Library Assistance Act, of inter-university arrangements all have been directed at this aim. Will this

continue to be the case? Can reasonable procedures for handling of services be defined for each of them? Will SILC functions, as defined, be capable of providing those services?

To develop data for answering these and similar questions, seven libraries participating in existing consortia were visited. Because of the variety of consortia in which each participated, a total of fourteen individual inter-library loan centers were analyzed.

SUMMARY OF CHARACTERISTICS

In this sub-section, we summarize the results from examination of the policies and practices of the seven institutions and fourteen ILL centers that were analyzed. The parameters and characteristics to be presented are as follows:

Definitions (Request, Referral)

Consortium Factors (Funding Sources, Types of Agreement, Policy or Procedure Manuals, Billing Practices)

Institutional Factors (Type of Institution, Number and Type of Users, Collection Size, Number and Location of Branches, Administrative Location of ILL, Fiscal Year, Union Catalog Bibliographic Center, Physical Organization and Facilities)

Interlibrary Loan Factors (User/Frequency of Use, Type of Equipment Used, Number of Personnel Assigned to ILL, Ratio Loans/Borrows, Funding, Interaction with Other Departments)

ILL Policy and Procedures (Degree of Verification, Priorities when More Than One Source, Form(s) Used, Average Time to Secure an Item; Incoming Requests: Forms Accepted, Requests for Items "Not in the Catalog(s)", Policy: Borrowers who Consistently Send "Inadequate Bibliographic Data", Policy: Requests with "Could Not Verify",

Priorities When More Than One Request for an Item, Billing Procedures, Average Time to Answer a Loan Request, Costs to Handle a Filled Request/Search, Costs to Handle an Unfilled Request, Percent of Requests Not Filled, Referral Procedures)

Reporting (Frequency/Destination, Nature of Reports, Coding for Mechanized Reporting)

In summarizing the answers for each parameter or characteristic, care has been taken to preserve the anonymity of the institutions.

Definitions

Request. Generally each bibliographic item or citation on a form requesting material is counted as a request. Most libraries require that each item be on a separate form. Successive articles by the same author in the same journal title and volume are sometimes counted as one request because only one search is involved, but more often each article is counted as a separate request. A multiple-volume set is usually counted as one request.

There were some variations from this general pattern:

(1) Reference questions may be counted as "requests".

(2) Photocopies may be excluded from the ILL count.

(3) "Transactions" may be counted rather than requests (a transaction being a completed request).

(4) Forms may be counted as requests with each form containing one or more items.

(5) Sometimes in-person lending and loans to other libraries are counted together.

(6) Occasionally requests from faculty for photocopies in lieu of the original are regarded as ILL.

It is important to note that most ILL requests get counted twice--once by the borrowing library as a request to borrow and again by the lending library as a request for a loan.

Referral. Usually a referral is the forwarding of an unfilled request to another library. Sometimes the referral is automatic, but more often the referral must be requested by the borrower. In most cases, forwarding a request to another library on the same campus does not constitute a referral, but sometimes it does.

It is important to note that many libraries fill in missing bibliographic information on the initial request before returning it to the sender, even though they cannot fill the request themselves. These libraries may also suggest potential lenders.

When a referral is made, new forms must be typed or the original form modified in such a way as to show the non-fill and referral and the new address. If the request is sent by TWX, it must be re-keyed in its entirety.

A library receiving a referral seldom counts the request as a referral. More often it is counted as a "request" which is filled or unfilled as the case may be.

Consortium Factors

The word "consortium" was seldom used by these libraries, but almost all of the libraries had at least one, more or less formal agreement (written or unwritten) to lend and borrow from particular institutions on a special basis. The agreements and relationships were extremely varied.

Some libraries were members of formally chartered groups with uniform and well-defined obligations such as CRL, NLM, a multi-campus university system, a state-wide network, etc. Some agreements were for specific services among cooperating libraries on a voluntary basis--e.g., a union catalog of oriental collections, a union list of serials for medical libraries in a metropolitan area, a city-wide cooperative acquisitions program, etc.

Another type of agreement is for lending on a free basis and/or delivery of loans between specific libraries. These agreements generally arise because of geographical proximity rather than any organizational affiliation. The agreements may be quid pro quo between libraries of fairly equal resources or they may represent the dependency of one or more libraries on a major resource library. In the latter case some subsidization or remuneration is involved.

Funding Sources. Funding sources vary with each inter-library agreement. In some cases the libraries simply absorb whatever costs are incurred in executing the agreement. In the more formal agreements, service costs are usually reimbursed at a set rate by the parent organization (NLM, a

university system, a state library, etc.) from its own funds--i.e., Federal, state, or city appropriations or grants or, in the case of privately-funded institutions, endowments and membership fees. In a few cases, cooperative efforts are supported through subscriptions or membership fees assessed by the member libraries upon themselves. Some agreements entail direct charges for all services.

Types of Agreement. Inter-library agreements for inter-library lending almost always include other services as well. Often the libraries answer reference questions referred from other member libraries. Bibliographic searching and verification is frequently part of the agreement. Sometimes in-person borrowing or library use is permitted. In some cases ILL is extended to undergraduates or others not qualifying for ILL under ALA code regulations. Union lists of serials and union catalogs are quite common.

Policy or Procedure Manuals. Most inter-library agreements had written policy statements regarding ILL and other services, stating who was eligible, listing fees, and outlining what services would or would not be performed. A few of the groups of libraries had detailed procedure manuals or were preparing manuals. In almost every library, the staff felt the need for a procedure manual--one which dealt with ILL on two levels--the overall policy level and the operator's level.

Billing Practices. Most often libraries bill directly per transaction. A few libraries require pre-payment and a few keep accounts on regular borrowers and bill monthly. Occasionally coupons or deposit accounts were used for photoduplication costs. Membership fees and subscriptions were usually billed annually.

Reimbursements for ILL charges from sponsoring agencies were usually made on a monthly or quarterly basis after the library had filed a report showing its ILL activity during the accounting period.

Institutional Factors

Type of Institution. The seven libraries analyzed fell into the following groups:

--One institution is a private university

--Two institutions are state supported universities

--Two institutions are State Libraries

--One institution is a public library

--One institution is a consortium of intertype libraries

--Three institutions are Regional Medical Libraries

--Two institutions are on the West coast

--Three institutions are in the Middle West

--Two institutions are on the East coast

--Three institutions are members of ASIDIC

--Six institutions are members of ARL

--Two institutions are members of the ARPANET

Number and Type of Users (Library). Almost without exception, anyone could use anything in the library in-person, but circulation and ILL were limited to qualified persons. In a few libraries,

any adult who obtained a library card could borrow materials but more often circulation was limited to the library's own clientele. ILL was often restricted to those having a "serious research purpose" usually defined as a graduate student working on a thesis or a faculty member (academic libraries). A few libraries charged profit-making business and industry libraries a per-loan fee for borrowing in-person or by ILL.

Sometimes a library would loan and circulate materials to otherwise unqualified users where a special agreement existed between libraries for lending to each other's clients. The agreement might extend ILL to undergraduates or provide faculty members free library cards or enable a student to use his own institution's ID to check materials out from another institution's library, etc.

In a few cases only members of the institution could borrow or qualify for ILL. All others could get photocopies or use the material on the premises.

Collection Size. The libraries studied varied from 11,000 volumes with 3000 current subscriptions to one with over five million volumes and close to 30,000 current subscriptions. Most of the collections were from one to two million volumes.

Number and Location of Branches. In this study, the public and state libraries usually consisted of a single library or building. Some had storage facilities in another building, and some had separate libraries within one building. In university

library systems there were four or more libraries or branches, each located in a different building. In addition, a number of the libraries had storage facilities outside. Generally, multiple locations were felt to be a hindrance to filling ILL requests rapidly.

Administrative Location of ILL. Sometimes an ILL unit was under reference, but more often it was an independent section reporting to the library director or head of public services.

ILL borrowing was nearly always handled by reference, but lending might be conducted by reference, acquisitions, library photographic departments, or a separate ILL unit.

Fiscal Year. There is a surprising variation in the fiscal year from one library to another. Some institutions were in the process of changing fiscal years; in one case there were two fiscal years; and in another case one library on the campus had a different fiscal year from the other libraries on campus. With one exception all fiscal years began on a calendar quarter--April, July, or September.

Union Catalog/Bibliographic Center. Four of the libraries studied offered MEDLINE bibliographic searching. Three of these libraries were regional medical libraries and, therefore, bibliographic centers for their regions. Two also had regional union catalogs. Two libraries were the administrative hubs of state networks and served as research sources as well; one distributed its catalog in microform. Another library surveyed was also a resource center for one of the state networks and published its catalog.

Because all the libraries were large, all were viewed as outstanding bibliographic resources, at least in their areas of specialization. Most of the libraries in this study participated with other libraries in union lists of serials and also contributed to NUC.

Physical Organization and Facilities. Almost all of these libraries were pressed for space both for staff and for the collections. Whenever the collection was arranged in several sequences or overcrowded or divided among several libraries there were delays in filling ILL requests. Sometimes the requests would be forwarded to other staff for processing, involving time delays and double processing.

ILL Factors

Users/Frequency of Use. There is no standard for measuring the number of ILL users or the frequency of use. A number of libraries kept records on the number of lending and borrowing requests to or from other institutions but most did not. However, all the libraries felt a need for this type of information but found it very time-consuming to develop it or were simply unable to do it.

Where statistics were kept, the number of institutions lent to far outweighed the number of institutions borrowed from.

Type of Equipment Used. Eight of the fourteen centers used TWX regularly for ILL. One library ILL had a TWX available, but seldom used it. One library used terminals for MEDLINE but not ILL.

Seven of the libraries had photoduplication equipment within the ILL section. All others had photocopiers available in other areas of the library. In the latter case, there were time delays in filling ILL requests because the material had to be sent or taken to another area and record keeping was more complicated because the request had to be handled by two departments.

Automatic bookkeeping equipment was used in one library's photoduplication department. In all other libraries, bookkeeping for ILL was entirely manual or was handled by another department which required manually-prepared input from ILL.

Very little microfilming was done for ILL and where this did occur, it was usually done by an outside commercial firm. Microfilming was generally done when preservation of the original was a special concern. University Microfilms was used by all academic libraries, but infrequently by other libraries.

Number of Personnel Assigned to ILL. Among the studied libraries the number of ILL staff was often in flux reflecting changes in total library staff as well as in the ILL load. In several libraries, staff salaries came from various sources and, consequently, the number of staff varied with the availability of the grants or endowments involved. In one library the ILL unit was expected to be self-sustaining so the number of staff varied with the amount of service rendered (including some non-ILL services).

In many libraries some ILL processing is done by non-ILL staff--e.g., bibliographic searching by bibliographers in the

acquisitions department or by reference staff, paging and charging by the circulation staff, photocopying by the library photographic department, bookkeeping by the accounting or circulation records department, network analysis and policy-making by the development division, etc. The reverse is true also. Sometimes the ILL staff perform non-ILL related tasks--photocopying for other library departments, reference work, bibliographic searching, union catalog or list maintenance and publication, MEDLINE searches, network administration and analysis, etc. With all these variables, the number of staff ranged from .09 to .94 FTE per 1000 lending or borrowing requests per year, with an average of .46 FTE. (If we take an average FTE, plus 50% for benefits and overhead, at $12,000, the average cost per request would be $5.52.)

Ratio Loans/Borrows. The libraries varied from a ratio of 50 loan requests for every borrowing request to about 1 to 1. An average ratio is quite meaningless but calculates at 27 to 1. (However, even though meaningless, if we apply Westat's data on costs per transaction, for the ratio of 27 lending requests to 1 borrowing request, we get an average as follows:

$$\frac{(2.12)(.35)(27) + (4.60)(.65)(27) + (7.61)(.65)(1)}{28} = 5.61$$

This can be compared to the average cost of $5.52 calculated above, certainly a remarkably close comparison).

Funding. ILL operations were generally funded from the library's operating budget except in the regional medical libraries and the state network resource libraries where some salaries were provided, and reimbursement on a per search and fill basis was made by NLM or the state.

In most of the remaining libraries (non-NLM and non-network) the costs were charged to the borrower through direct billing, subscriptions, membership fees, coupons, or pre-payment for photocopies and microfilms and sometimes for originals as well. A service fee plus a per-exposure charge was common. Fees seldom paid for all ILL costs, so library budgets absorbed the difference.

Interaction with Other Departments. In every library studied, tasks assignable to ILL were performed in several departments; commonly the ILL, reference, circulation, accounting, and photoduplication departments and the mail room. The division of tasks among departments varied within each library.

In the libraries where the ILL section performed most of the tasks with its own staff and equipment, the number of requests processed per staff member tended to be higher--perhaps because the procedures were more streamlined. (In one library the catalog is distributed on microfilm and a hard copy printout of the filmed catalog card is used to request an item. Consequently, verification is unnecessary and the proportion of filled requests is high.)

ILL Policies and Procedures

Degree of Verification. The amount of verification on borrowing requests varied considerably among this group of libraries. All four of the medical libraries and the three state network resource libraries verified the items and

references wherever possible, even at the expense of exhaustive searching. Verification in the remaining libraries varied from some checking of the patron's own verification to complete checking of each request by professional bibliographers.

Priorities When More Than One Source. The libraries in this study always tried to borrow materials from other libraries in the same network, consortium, system, or group before going to "outside" libraries. When going to outside libraries the preference went to libraries with a good record of quick response.

Forms Used. All of the studied libraries except one preferred to transmit requests by TWX when available. Otherwise ALA forms were used. When the request was to CRL, its special form was used by most of the member libraries.

Average Time to Secure an Item. In the studied libraries, it usually took 2 to 4 weeks to borrow an item which was sent by mail. Where local delivery systems existed, items could be secured in from one day to a week.

Longer delays were experienced often enough to be of concern to all libraries--the U. S. Mail being the primary source of delay.

Incoming Requests--Forms Accepted. In every library studied, ALA forms were preferred if the request is by mail. In most libraries having a TWX machine, the Bird format or a format derived from that described by Bird was specified.

Without exception, the libraries preferred the request in writing and, in most cases, a phoned "RUSH" request had to be followed up with a written one.

"Not in the Catalog". In medical or state network libraries requests for items not in the catalog were verified and referred if eligible for referral.

In four other libraries (academic) unfilled requests were checked for other entries or additional bibliographic information and then returned to the sender with the added information.

In the remaining libraries requests which were not found in the catalog were returned to the sender without further checking.

Policy: Borrowers Who Consistently Send "Inadequate Bibliographic Data". Most libraries rejected all requests with inadequate bibliographic information with a form stating the reason for rejection. Three libraries (private) attempted to find more information by a brief search, but then rejected the request if still unable to fill it.

Four libraries contacted borrowing libraries which consistently sent "inadequate bibliographic information" and tried to instruct them in verification techniques. In the two networks the instruction was by regional seminars or on-site visits. Phone calls were made by the two medical libraries with verification instructions. One of the medical libraries has developed a programmed instruction booklet on verification and is sending it to all medical libraries in its region.

Policy: Requests with "Could Not Verify". Eleven of the fourteen centers will attempt to locate or verify a request for which the borrowing library has indicated it "could not verify". All of the libraries preferred that the item be verified, not just the reference, but all would accept a verified source of reference.

The remaining three libraries rejected all unverified requests if they were unable to fill them after checking the catalog or serials list. No verification was attempted.

Priorities when More Than One Request for an Item. It is rare that two requests for the same item are received at the same time. Material was always sent to the first requestor. In the rare instances when two requests were received in the same mailing or TWX transmission the material went to libraries in the same system or consortium first, then to the "outside library".

Billing Procedures. Four libraries required prepayment of all charges. Three libraries billed on a monthly basis for "regular borrowers" and on a per-request basis for infrequent borrowers. Five libraries billed directly on a per-request basis. One library and a library consortium had annual billings for membership fees.

Average Time to Answer a Loan Request. The time a library took to fill a request was reported in a variety of ways. Two libraries had a detailed, computerized analysis of response times; two libraries had no records on response times; the remaining libraries had all gradations in between. One network

(computerized analysis) recorded the time from initial transmission of the request to the time the lending library reported to the system its action on the request. Some libraries could give estimates only.

With all these qualifiers, the libraries reported that on the average from 2% to 90% of the requests were processed within 24 hours and from 70% to 99% within one week. The remaining requests took one to four weeks to process.

The four medical libraries and the three state network resource libraries tended to report that almost all requests were processed within one week. No other pattern in response times was discernible.

Costs to Handle a Filled Request/Search. Westat survey figures are available on five of the libraries in this study. The cost per fill varied from $3.64 to $4.67. Three other libraries had conducted or commissioned surveys which set the costs per fill at $2.27, $2.98, and $3.50. These cost figures are not comparable because different factors were included or excluded in the various surveys.

Two other libraries estimated that a fill cost $2.00 within their own systems. One estimated that it cost $5.00 to fill a non-system request.

One network library determined in a survey that a referral cost $8.19 per fill.[13]

Costs to Handle an Unfilled Request. Westat survey figures for these libraries ranged from $2.09 to $2.12 per unfilled request. Commissioned survey figures were $0.69 and $3.75 (does not include overhead).

No other figures are available.

Percent of Requests Not Filled. In the surveyed libraries, the percent of requests not filled varied from 16% to 60% for monographs and serials of which 0 to 68% were referred to another library. (Mean average 30% unfilled).

One of the lowest unfilled ratios occurred in a state network library which distributes its catalog to other network resource libraries on microfilm. A card copy printout of the microfilmed catalog card is used to request an ILL, therefore no verification is needed on these requests.

Referral Procedures. The three regional medical libraries and the three state network resource libraries all have referral procedures. The remaining libraries made no referrals with very few exceptions--i.e., for foreign requests, to University Microfilms, or to other campus libraries.

In all referrals the borrower must qualify for referrals and the request must be verified. In medical libraries the request must also be "in-scope" (health-related, hospital administration, etc.).

Most referrals are by teletype. In one of the state networks, requests which are eligible for referral are punched out on paper tape which is used for transmitting the referral should it be necessary to make a referral. All non-TWX referrals require that the referring library retype or adapt the ALA form for the referral library.

Reporting

Frequency/Destination/Nature. Monthly and annual statistical reports to the administrative unit under which ILL is located are nearly always required. Where funds are collected or billing is conducted, an accounting report is required each month.

Quarterly and annual statistical reports are required by NLM of the three regional medical libraries.

When a library uses state or federal appropriations and grants, quarterly and annual fiscal reports are required.

Where reimbursements for loans and searches exist, a statistical report is required monthly or quarterly.

Coding for Mechanized Reporting. Only three of the libraries involved in this study had any mechanized reporting. The two state networks had analytical and exception reporting (overdues, unprocessed requests, statistical analysis, etc.). In one library the input was from the circulation records. In the other library, all "unit sheets" for requests during a three month period were punched by library development personnel for input to the reporting system.

The remaining library with mechanized reporting filled out coding sheets for every request processed. The coding was done by all ILL staff. Keypunching was done by non-ILL personnel from the coding sheets.

AVAILABILITY OF TERMINALS

A specific operational issue is the extent to which teletype terminals are presently available to libraries, or at least, to the major lending libraries. To answer that question, each of the 89 ARL libraries was looked for in each of several teletype directories. Those not found were then called (on the telephone) to determine whether they in fact did have terminals either in the library or readily available to it. The result is the tabulation in Figure 4-1, following. As it shows, only 8 of the 89 did not have a teletype in the library (although another one had an unlisted number) and only 2 of the 89 didn't have a teletype readily available to them (or, at least, available in their institution).

FIGURE 4-1

AVAILABILITY OF TERMINALS (ESPECIALLY TELETYPE)

Library	Terminal? Yes	Terminal? No	In library? Yes	In library? No	TWX Call Number
1. University of Alabama Library	x		x		810-733-3613
2. University of Alberta Library	x		x		073-2723
3. University of Arizona Library	x		x		910-952-1143
4. Boston Public Library	x		x		710-321-0513
5. Boston University Library	x		x		
6. University of British Columbia Library	x		x		04-53296
7. Brown University Library	x		x		
8. University of California Berkeley Library	x		x		910-366-7337
9. University of California Davis Library	x		x		
10. University of California Los Angeles Library	x		x		910-342-6897
11. Case Western Reserve Library	x		x		810-421-8818
12. Center for Research Libraries	x		x		910-221-1136
13. University of Chicago Library	x		x		
14. University of Cincinnati Library	x		x (med)		810-461-2417
15. University of Colorado Library	x		x		910-940-5892
16. Columbia University Libraries	x		x (med)		710-581-4157
17. University of Connecticut Library	x		x		710-420-0571
18. Cornell University Libraries	x		x		510-225-9301
19. Dartmouth College Libraries	x		x		710-366-1829
20. Duke University Libraries	x		x		510-927-0916
21. University of Florida Libraries	x		x (med)		810-825-6334
22. Florida State University Library	x		x		810-931-3622

Figure 4-1 (cont.)

Library	Terminal? Yes	Terminal? No	In library? Yes	In library? No	TWX Call Number
23. Georgetown University Library	x		x		710-822-9284
24. University of Georgia Libraries	x			x	810-754-3915
25. Harvard University Library	x			x	92-1496
26. Howard University Libraries	x		x		710-822-9798
27. University of Illinois Library	x		x		910-245-0780
28. Indiana University Libraries	x		x		810-351-1386
29. University of Iowa Libraries	x		x		910-525-1391
30. Iowa State University Library	x		x		910-520-1159
31. John Crerar Library	x		x		910-221-5131
32. Johns Hopkins University Library	x		x		710-234-1090
33. Joint University Libraries	x		x		810-371-1224
34. University of Kansas Library	x		x		910-749-6571
35. University of Kentucky Libraries	x		x		510-476-8816
36. Library of Congress	x		x		710-822-1969
37. Linda Hall Library	x		x		910-771-2177
38. Louisiana State University Library	x		x		510-993-3539
39. McGill University Library	x		x		05-268-510
40. University of Maryland Library	x		x		710-826-1128
41. University of Massachusetts Library	x			x	510-290-2345
42. Massachusetts Institute of Technology Libraries	x		x?		710-320-0058
43. University of Michigan Library	x			x	810-223-6056
44. Michigan State University Library	x		x		810-251-0875
45. University of Minnesota Libraries	x		x(med)		910-576-2875
46. University of Missouri	x		x		910-760-1451

Figure 4-1 (cont.)

Library	Terminal? Yes	Terminal? No	In library? Yes	In library? No	TWX Call Number
47. National Agricultural Library	x		x		710-828-0506
48. National Library of Canada	x		x		610-562-1657
49. National Library of Medicine	x		x(med)		710-824-9616
50. University of Nebraska Libraries	x		x		910-621-8232
51. New York Public Library	x		x		710-581-6026
52. New York State Library	x		x		710-441-8269
53. New York University Libraries	x		?		12-7587
54. University of North Carolina Libraries	x		x		510-920-0760
55. Northwestern University Libraries	x			x	910-231-0040
56. University of Notre Dame Libraries		x		x	
57. Ohio State University Libraries	x		x		810-482-1767
58. University of Oklahoma Library	x		x?		7-1351
59. Oklahoma State University Library	x		x		910-831-3178
60. University of Oregon Library	x		x		
61. University of Pennsylvania Libraries	x		x(med)		
62. Pennsylvania State University Library	x		x		510-650-4923
63. University of Pittsburgh Library	x		x(med)		710-664-4262
64. Princeton University Library	x		x		609-459-3216
65. Purdue University Library	x		x		810-342-1892
66. Rice University Library	x		x		910-881-3766
67. University of Rochester Library	x		x(med)		510-253-2295
68. Rutgers University Library	x		x		710-955-4506
69. St. Louis University Library	x		x(med)		910-761-0434
70. Smithsonian Institution		x		x	

Figure 4-1 (cont.)

Library	Terminal? Yes	Terminal? No	In Library? Yes	In Library? No	TWX Call Number
71. University of Southern California Library	x		x(med)		910-321-2434
72. Southern Illinois University Library	x		x		510-520-5773
73. Stanford University Library	x		x		910-373-1787
74. State University of New York at Buffalo Library	x		x(med)		710-522-1226
75. Syracuse University Library	x		x		710-541-0497
76. Temple University Library	x		x		710-670-1773
77. University of Tennessee Libraries	x		x		810-583-0176
78. University of Texas Libraries	x		x		910-874-1304
79. Texas A&M University Library	x		x		910-880-4429
80. University of Toronto Libraries	x		x		02-29273
81. Tulane University Library	x		x(med)		810-951-5283
82. University of Utah Library	x		x		910-925-5172
83. University of Virginia Libraries	x		x		510-587-5453
84. University of Washington Library	x		x(med)		910-444-1385
85. Washington State University Library	x			x	510-774-1092
86. Washington University (St. Louis) Libraries	x		x(med)		910-761-2160
87. Wayne State University Library	x		x(med)		810-221-5163
88. University of Wisconsin Libraries	x		x(med)		910-286-2778
89. Yale University Libraries	x		x(med)		710-465-1145

OPERATING PROCEDURES

One product of the SILC evaluation project is a "Draft Operations Manual", included as Appendix D to this report. To develop it with some degree of assurance that it would be consistent with the practice of each of the seven libraries examined as well as with the National Inter-library Lending Code, data were acquired on the present procedures they each followed. Where there are existing procedures manuals, copies were acquired and analyzed to establish the patterns for request, delivery, and payment or funding. Where there were not procedure manuals, the actual operation was briefly reviewed with the ILL staff and then described.

The draft procedures that resulted are presented in Appendix D. Reviewers of them should consider at least the following questions:

(a) data pre-processing requirements--How much data preparation will the library staff do prior to entering requests into SILC? Will the data be punched on paper tape or keyed in? How much editing will SILC or the TSS perform on the data?

(b) manual forms design--What forms will be needed and what is their content? Are the forms convenient and easy to use? Are the forms complete? What information is required and what is optional?

(c) terminal operator procedures--How does the library sign on and sign off? What error messages will the terminal operator receive? How will errors be corrected? How will exceptions be handled? What should the operator do if line problems prevent data transmission?

(d) communication procedures--When and how will libraries learn of system and procedural changes? How will SILC users communicate with SILC management? Will any analytical data be available to users on-line?

(e) Modification and expansion handling--How will changes be announced and incorporated into the system? How will new services be added. How will additional libraries and/or terminals be added and monitored? Who will assign user ID's and passwords?

(f) printed form distribution--Who will distribute computer printer output? What listings will be made on the printer? How will delivery charges be paid? Will accounting and statistical reports be sent to participants?

(g) billing--If and when billing is instituted, how will charges be assessed? How will the list of users and their addresses and codes be maintained, updated, and distributed? How will bills and receipts be processed and distributed? How will records be kept for reporting and auditing? Who will audit the books? How will user charges be reported to the SILC manager? What user charges will be reported? How, where and when will receipts be deposited?

PILOT-TEST

General acceptance of SILC by the library community as a whole will depend upon the extent to which it has been demonstrated that the operating procedures outlined in Appendix D do not impose an excessive burden on the participating libraries, that the costs are within reasonable limits and that they can be afforded, that the operation of the time-sharing system is reliable, that the SILC programs provide the services they are supposed to, and that the staff of the participating libraries can be trained to operate the system effectively.

The purpose of a pilot test, then, is to provide a means of evaluating the manner in which SILC and the time-sharing system it uses will function and of evaluating its operational effectiveness and cost. Appendix C lists a set of potential criteria to be used in any such pilot test, grouped into three categories: (1) costs, (2) times, and (3) effectiveness.

A pilot-test could be divided into three sub-phases designed to deal with functions which can be separated from each other and developed and tested independently: (1) accounting, (2) message switching, and (3) referral.

Initiation of a pilot-test depends upon a sequence of prior events essentially external to Phase 2 itself.

(1) The SILC manager must have been identified before the pilot-test is initiated, and be prepared to contract for and monitor the pilot-test.

(2) The time-sharing computer system contractor must have been selected.

(3) An appropriate group of libraries must have accepted the responsibility of serving as the test bed for the pilot-test of SILC.

(4) The costs of the development of SILC, the costs of SILC operation during the pilot-test, and the costs of the pilot-test consortium should all be funded by some appropriate funding agency.

Among those prior events, the selection of an appropriate group of libraries to serve as the test bed is especially important. It was primarily for this reason that the seven libraries examined as part of the study of operational feasibility were chosen to include a wide array of different consortia, each representing a potential pilot-test environment. Each was a participant in one or more major consortia; each was an example of a particular kind of requirement; and each could provide an effective pilot-test.

Another reason for choice of at least three different sets of them was the potential for funding of the development and pilot-test from a Federal agency with which they had an established relationship. Since the National Library of Medicine has special interest in this area, three of the Regional Medical Libraries were included among those examined during this feasibility study. Another interested agency was the Office of Education, therefore two state library networks were included. A third group were the libraries associated with ASIDIC members, because of the interest of NSF as a natural follow-on to the present study.

Initially, it was even visualized that there might be several pilot-tests, each with participation by an associated federal agency. However, viewing it now, in the light of the problem which would be faced by the SILC Manager in handling even one pilot-test, such a multiplicity appears to be both unnecessary and irrational. At this stage, therefore, it seems that a single pilot-test will serve the needs adequately, although this is not a decision that should be made without discussion.

Which brings us to the basic point:

> Under the assumption that the results of this phase, as they are presented in this final report, are positive and that the ARL recommends proceeding further into Development and Pilot-Test, what criteria should be used by the SILC manager and the ARL in selecting an appropriate group of libraries for Pilot-Test?

At this time, the following appear to be relevant issues:

(1) Would the group of libraries provide a sufficiently representative environment to demonstrate to the library community at large that SILC was operational?

(2) Is the group willing to devote the time and energy of key professional and clerical staff to what would essentially be a parallel, duplicative handling of its ILL activity?

(3) Would the group of libraries have the confidence of the library community as one that was professionally competent and a worthy test bed?

(4) Is there sufficient value to the group itself in use of SILC to assure some degree of success in the pilot-test, so that it doesn't become an exercise in futility?

(5) Is the group of libraries geographically near to the SILC manager and/or the offices of the computer time-sharing system, so that communication and monitoring is easy and convenient? Or is this really a necessary consideration.

(6) Is the volume of ILL traffic involved of a size--neither too small nor too large--to provide a proper evaluation?

PROS AND CONS

In the visits to the seven libraries and in the discussions with various other librarians, including the members of the Advisory Committee, several issues were raised both pro and con concerning the operational feasibility of SILC. The pros represented possible advantages or benefits that SILC might provide; the cons, possible disadvantages. In this sub-section, we will present the ones that appear to be most significant to evaluation of SILC, under the following categories:

--Effects upon service
--Effects upon operations and procedures
--Effects upon costs and financing of ILL operations
--Effects upon inter-library cooperation

The judgment of operational feasibility at this time, without the experience of a pilot-test on which to base a more precise evaluation, must be essentially qualitative and depends upon each individual's own picture of what is important. Therefore, in presenting each issue, we have tried to be as objective as possible, and have presented them in a parallel form so the pro and con can be directly compared. This will permit the reviewer to arrive at his own assessment of the relative importance of each with respect to operational feasibility.

FIGURE 4-2

PROS AND CONS OF SILC OPERATION

Effects upon Service

PROS	CONS
SILC, through its capability for referral, is likely to improve the fill rate.	SILC does nothing that mail or teletype would not do equally as well.
SILC is likely to improve response times, especially because of its ability for automatic referral to alternative sources.	The major factor in response time is the delivery of material, which SILC doesn't affect at all.
SILC, as such, would not determine the policies or procedures for identifying acceptable requests.	SILC could be used as a means of limiting borrowing or types of borrowers.
SILC referral protocols could be used to help equalize lending loads by referring requests to lesser used alternate sources.	SILC referrals could increase the ILL load on some libraries

Effects upon Operations and Procedures

PROS	CONS
For those libraries participating in several consortia, SILC could simplify operations and make them more uniform, especially where there may be requirements for reporting to external agencies.	SILC simply adds one more procedure to those a library must already handle. Instead of just mail and teletype, a library would need to handle mail, teletype, and SILC.
SILC will allow a library to use any of a variety of communication means--mail, teletype, or SILC--and for use of SILC, any of a variety of terminal devices, the choice depending solely upon the actual advantages to the library of each.	In order to use SILC, a library would need to acquire a terminal and the costs for doing so could be extremely great for a library with a relatively small volume of ILL activity.
SILC provides an opportunity for establishing a high level of competence and uniformity in ILL processing	SILC will require extensive training of staff in what could be an inordinately complex, new method of operation.
SILC requires parallel processing only in those cases where there would be tangible benefit in doing so (such as recovery of costs).	SILC will complicate operations by requiring parallel, sometimes duplicative handling of requests, such as the need to input data on requests not received through SILC.
SILC would provide a number of services in keeping track of the status of requests and related messages and in informing libraries of their status.	SILC provides no guarantee that a receiving library will get a message directed to it, whereas teletype would.
SILC processing will include some means for checking validity and completeness of requests and thus would reduce the burden of inaccurate or incomplete requests.	SILC provides no real means for checking bibliographic validity, the major cause of poor requests.

FIGURE 4-2 (continued)

Effects upon Costs and Financing of ILL Operations

PROS	CONS
SILC provides the most economical way of serving additional functions of referral and accounting.	SILC will increase the costs of operation.
SILC should reduce the overall costs of inter-library service for the desired functions and result in improvements in service.	SILC could transfer dollars from support of the internal staff of the library to the support of an external bureaucracy and a commercial computer company.
SILC budget estimates have been designed to make it a self-sustaining operation.	If the estimates of SILC costs or income are significantly wrong, it will require a subsidy of its operation, and where will that subsidy come from?
SILC would provide the means by which to justify subsidization of ILL operations and services.	SILC development and operation will simply divert funds--already greatly limited--from more important problems, among them the financing of ILL itself.
SILC provides the means for accounting for costs.	SILC could be used to place the costs on small libraries, those least able to afford the costs.
SILC provides the means by which referral to bibliographic centers and on-line catalog data bases can be rapid and economic.	SILC fails to answer the most significant factor in the cost of ILL service--bibliographic searching.

FIGURE 4-2 (continued)

Effects upon Inter-Library Cooperation

PROS	CONS
SILC provides the means for integrating the existing and planned use of computers for inter-library cooperation into a national network.	SILC cuts across and would duplicate both existing and future developments of computer-based systems--on-line catalogs, existing network accounting and referral systems, etc.
SILC allows libraries to use its service as individual libraries or as members of consortia.	SILC might force libraries to participate in consortia.
SILC allows libraries to establish special agreements on services, accounting, referral, and payment.	SILC could foster the development of arrangements that favored certain groups of libraries and excluded others.

EVALUATION OF OPERATIONAL FEASIBILITY

Before the study was started, it seemed to be debatable whether SILC would be sufficiently consistent with present practices and procedures in libraries to be feasible from the standpoint of its operation. In particular, there were a number of questions that could be asked about its usefulness, the extent to which it was consistent with present practice, the desirability of using such a complex approach to a task already handled by mail or teletype, etc. Unfortunately, the issue will really be resolvable only on the basis of actual operational experience. However, the following conclusions can be stated, each related to one of the questions posed at the beginning of this section:

(1) The procedures required to use SILC (as represented in the draft procedure manual presented in Appendix D), while perhaps different in detail from present procedures in use of teletype, are not so greatly different as to be unacceptable.

(2) In most of the libraries, referral is a crucial element in serving inter-library loan requests and in the two state libraries examined such referral is explicitly called for in the administrative organization.

(3) There is at least one operational prototype of SILC in the library network of one state. It has involved the use of teletype communication for message switching and referral and the use of a computer for monitoring traffic and accounting for payments due. The plan in this particular case is to involve the use of computers even more as a part of the functions of message switching and referral. The operation appears to be successful, useful, and accepted by the participating libraries.

(4) Each of the libraries examined participates in a number of different compacts (consortium arrangements), for each of which it must maintain records, must account for payments due and paid, and must provide some kind of reporting. In some of the libraries, the different arrangements have required the establishment of correspondingly different procedures and even of different processing groups within the libraries.

(5) The ARL libraries, with very few exceptions, have terminals available for communication to time-sharing system.

These conclusions all suggest that, while we cannot unequivocally state that SILC will be accepted by libraries or can be easily used by them, it appears that SILC would serve useful functions in accounting, message switching, and referral for some specific groups of libraries. We must therefore conclude that SILC may be feasible from an operational standpoint, and a pilot-test would be likely to demonstrate operational feasibility (recognizing that various procedural problems would need to be resolved during the pilot-test itself).

5. MANAGEMENT FEASIBILITY

THE ISSUES

The question is, "What is required to manage SILC?" To answer that question, we must consider a number of issues:

(1) What are the functions required to manage SILC as an operational service?

(2) What is required to manage the development of SILC?

(3) To what organizations should these functions be assigned?

(4) What relations, contractual and otherwise, should exist among these organizations at various points in time?

The approach taken to answering these questions was two-fold: First, we have ourselves analyzed the requirements for management of SILC during both development and operation to the aim of developing a "business plan". Although it is evident that SILC, as a service to libraries, will probably best be operated as "not for profit", it is also evident that there are important financial and organizational requirements that must be identified. The purpose of this analysis has been to establish those requirements.

The second approach was to discuss the management requirements with five organizations that represented potential SILC managers, because of their expertise, their experience, and their relationship

to the academic and library community. These organizations were: the Library of Congress, the Center for Research Libraries, the Association of Research Libraries, System Development Corporation, and EDUCOM. In each case the specifications for SILC were presented to the technical staff of the organization, and the management requirements and how they would meet those requirements were discussed with them. Based on those discussions, write-ups on each organization were developed and then submitted to the organization for their review and comment.

SILC MANAGEMENT

In summary, the management of SILC would be the responsibility of an organization either chosen or established for this purpose. Figure 5-1 presents a schematic of relationships between the SILC manager and other organizations. The exact nature of the SILC manager organization itself is not yet determined, but later in this section various possible alternatives will be discussed. But, whatever form the organization will take, it would be responsible for the following functions:

(1) Day-to-day operational management

(2) Liaison and contractual relationships with consortia and individual libraries

(3) Liaison and contractual relationships with the computer time-sharing system

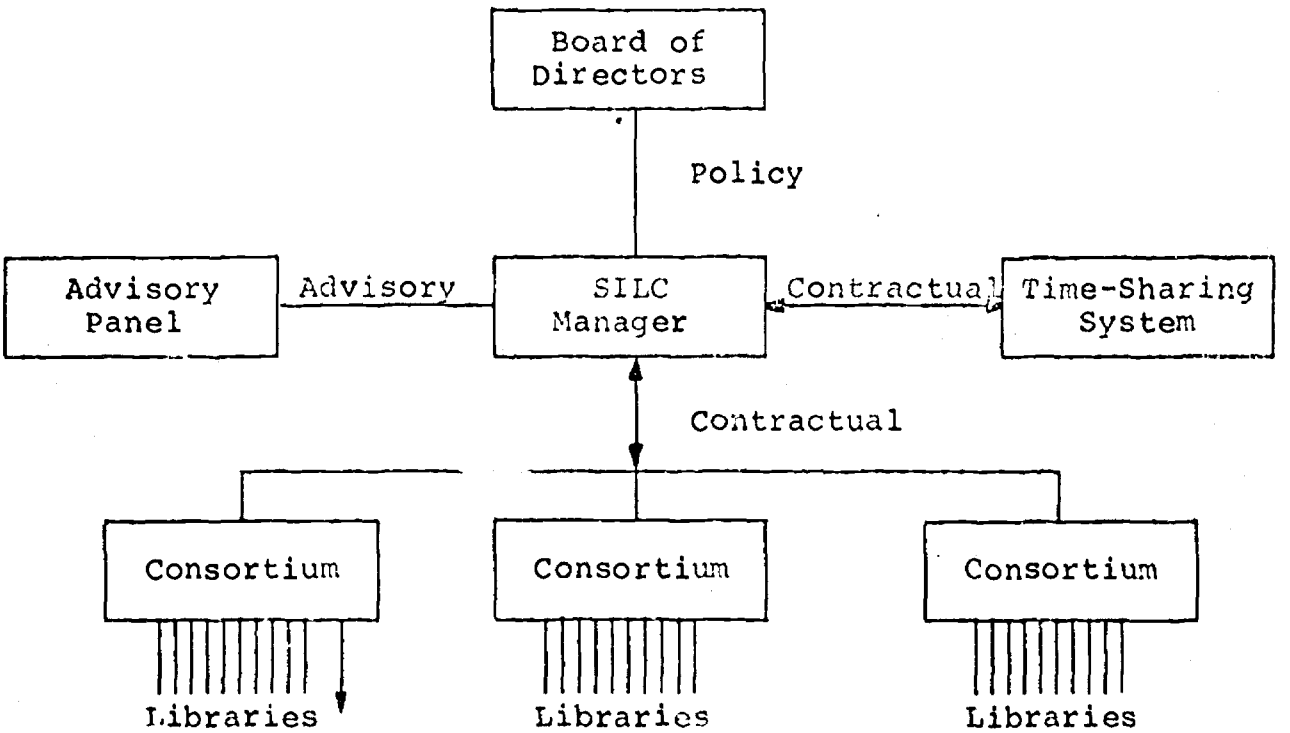
(4) Financial management

To that end, the organizational schematic shown in Figure 5-1 is intended to describe the following working relationships within each of those functions:

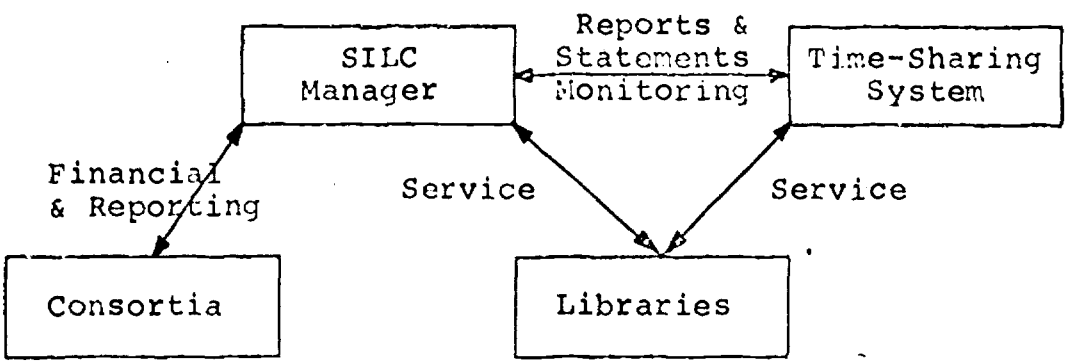
FIGURE 5-1

SILC MANAGER: SCHEMATICS FOR ITS

RELATIONSHIPS TO OTHER AGENCIES



OPERATIONAL SCHEMATIC



Operational Management. Specification of the tasks for SILC management in day-to-day operations are presented later in this section. In summary, they will involve working relationships with the time-sharing system and with the libraries in system monitoring and in system recovery from failures; they will involve relationship with the time-sharing system alone in assignment of resources to meet peak load demands, in maintenance of programs, and in similar activities.

Liaison with Consortia. The SILC management will be responsible for working with consortia and individual libraries within them. It will work with existing consortia or new ones to establish working relations among the participating libraries, fee structures, referral protocols, etc. It will provide procedure manuals, code books, and similar documentation to support operational use of SILC by libraries. It will provide materials for training library staff in the use of SILC and assist in the use of those materials in training programs.

It will deliver statements each month to each consortium and library and, where appropriate, be responsible for payments to and from them.

Liaison with Time-Sharing System. The SILC manager will be the agency with which the time-sharing system will contract. All use of the computer system for SILC functions, by the SILC manager or any participating library or consortium, will be billed to the SILC manager and paid by it. Resolution of problems in use of the system by any participant will be the joint responsibility of the SILC manager and the time-sharing system contractor, within conditions spelled out in the contract.

Financial Management. In principle, there is a major requirement for financial management. First, the costs of usage of the time-sharing system must be covered by the SILC manager, presumably as part of the charges to participants. Second, the costs of SILC management itself must be covered, again presumably as part of the charges to participants. Third, if fees for inter-library loan services are indeed to be charged and paid, they are best handled by a single-point "clearinghouse" for which the SILC manager presumably will be responsible.

In the following sub-section, we provide a detailed listing of the functions involved in carrying out the tasks outlined above. Budgets required for each have been estimated for the time of full-scale, self-sustaining operation.

THE MANAGEMENT FUNCTIONS

1. What are the management functions in operation?

   a. Marketing, public relations, and generally work with libraries and groups of libraries in convincing them that the use of SILC will be of operational and economic advantage to them.

      --This management function is perhaps the most fundamental. The assumption in it is that the SILC operation will indeed be of value, but that libraries must be convinced that it is to their advantage to use it. There is a further assumption that the job of convincing will involve working primarily through library "consortia", such as state-wide library networks, and convincing the consortia rather than the individual libraries. The primary selling point in such cases is that SILC will provide the consortium with the data and the ability to monitor operations that will allow it to be more effective.

      --It seems clear that this management function will require an organization which the library community respects and is ready and willing to work with. That means that it cannot be done by the time-sharing system, whose interests are the exploitation of its commercial services. It suggests that it could best be done through the ARL or some other library organization.

--The costs of this management function are difficult to estimate. However, it would seem likely that no more than one key individual, with the support of appropriate clerical staff and an expense budget for travel and publication, would be adequate. This suggests a promotional budget of around $50,000 per year.

b. Indoctrination, training, and similar work with the staff of participating libraries and library consortia.

--This is perhaps the most important function from the standpoint of success in operation of the SILC on a day to day basis. Only if the key professional and clerical staff of a library know how to use the system, how to get results from it, how to handle problems in operation of it, etc. will it function at all.

--On the other hand, this function could be the most expensive to handle, unless the support of professional societies on both a national and regional basis could be involved. This suggests that added to the promotional budget should be sufficient funds to support the development of training seminars and similar presentations which could be given by the professional societies and the various agencies that represent consortia and state-wide networks.

--Perhaps the most important part of that budget would be for publication of printed and audio-visual material to support such seminars.

--Another part of the budget should be for several meetings per year at which selected instructors could be trained in the means for indoctrinating the working and professional staffs of libraries.

--Another part of the budget could be for individualized training programs for specific libraries that, for one reason or another, are regarded as especially crucial in the operation of the system.

--Putting these all together suggests that a training program budget of around $100,000 per year should be considered.

c. Monitoring of the day to day operation of the time-sharing system and its performance, the allocation of resources, the handling of problems which will arise.

--This is almost equal in importance to the training of librarians in the day to day success of operation. The nature of time-sharing systems is that they must be monitored and that the problems which will arise will require informed decisions to handle them.

--To some extent, of course, these functions are the responsibility of the time-sharing computer system. For example, the allocation of resources, such as disk memory capacity is part of the operation of the operating system. But this is true only within limits. If costs are really to be controlled, the SILC manager will need to establish those limits and to do so will need to keep informed on a day to day basis of the volume of traffic and the commitment of resources. Similarly, if problems arise, the time-sharing system will, in principle, be the organization responsible for correction of them, but the SILC manager will need to be aware of them as they occur and, in some cases, will need to handle them directly.

--The nature of this task is that it can probably be handled, for the amount of traffic which the SILC system is likely to handle for some time to come, with no more than two or three people. A likely budget is therefore about $100,000 to $150,000.

d. Maintenance (in the technical computer sense)

--This is a standard function of system management in any computer based system. Although it is expected that the time-sharing system will be responsible for the programming of the "application programs" for SILC, the SILC manager will need to identify operational bugs and either correct them or call on the time-sharing system to do so. The SILC manager will want to identify new programs for additional applications of the SILC capabilities. The SILC manager will want to improve the efficiency of operation by appropriate changes in programs.

--In addition to these normal functions of program maintenance, there is the requirement of establishing tables or other means of specializing the SILC programs to represent the needs of particular libraries and consortia. For example, the SILC programs will provide the capability for handling a variety of referral protocols, but the specification of the one to be used by a particular consortium will require that the SILC manager establish the tables, or other means, which identify the rules to be used; similarly for the format of reports, which may be specially

tailored for the needs of particular consortia. Or, as another example, the accounting programs will be designed to handle a variety of rules for charging for services provided (by the system, by the lending libraries, by bibliographical centers, etc.); the specific rules to be used in each case must be specified by the SILC manager. This kind of "programming" is at a different level from that involved in either the initial programming of the application programs or in their maintenance.

--This function ought to be within the capacity of no more than one or two people, assuming that the rate of growth of SILC customers and the extent of program maintenance required are both within reasonable bounds. A budget of about $50,000 should be adequate.

e. Operations

--In addition to the operational functions of the time-sharing system, which the SILC manager will need to monitor, there are operational functions for which the SILC manager will be directly responsible. For example:

(1) Contractual negotiations with the time-sharing system and payment to it for the services provided

(2) Receiving the accounting reports, for distribution to libraries and consortia, from the time-sharing system, reviewing them for accuracy and then distributing them to the libraries and consortia.

(3) Receiving statistical reports on system activity and preparing management reports based on them

--These functions can certainly be carried out by a limited number of people, unless the number of participating institutions becomes very large. The magnitude of the tasks involved can perhaps best be measured by the number of reports that must be handled--one for each participating library and consortium, a total of perhaps as many as 500 per month. This size task can be handled by one or two clerical level people under the supervision of the person primarily responsible for SILC management. A budget of $15,000 should be adequate.

f. Financial management

--If the kind of "clearinghouse" operation which has been visualized for SILC is indeed effected, there will be a requirement for financial management--for receiving and disbursing funds as called for by the accounting reports produced by SILC.

--The size of this task is probably equivalent to that in handling the reports, as far as clerical level work is concerned, but there is obviously much more involved than merely the handling of pieces of paper. Assuming that there is a volume of traffic amounting to about 100,000 inter-library loan requests per month, there may be a requirement to handle payments received and disbursed amounting to as much as $200,000 each month. These funds must be properly accounted for, which requires an accountant, an association with a banking institution, and proper auditing. A budget of about $35,000 should be planned for.

g. Administration

--What has been defined in the above enumerated list of functions represents a sizeable organization which must be administered, with proper organization, with supporting functions of accounting, personnel administration, management.

--It is therefore visualized that there will be a person responsible for administration--let's call him the president of SILC--with proper supporting staff functions, and with an organization chart. Tentatively, the organization chart might look as shown in Figure 5-2. A likely administrative budget would be $50,000.

--This produces an organization amounting to 17 persons, with an operating budget of about $450,000 per year, as summarized in Figure 5-3.

FIGURE 5-2

SILC MANAGER:

ORGANIZATION CHART

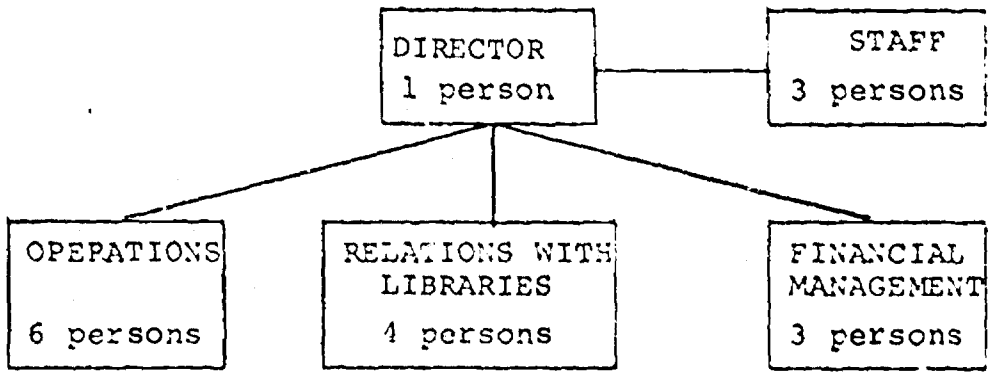


FIGURE 5-3

SILC MANAGER:

OPERATING BUDGET

Administration	$ 50,000	
Marketing	50,000	
Training	100,000	
Monitoring	100,000	to $150,000
Maintenance	50,000	
Operations	15,000	
Financial Management	35,000	
	$400,000	to $450,000

2. What are the management functions in development?

a. Contracting for pilot-test

--The choice of a pilot-test consortium will be a major task. In Section 4 of this report we identified some of the criteria that might be applied in that selection. Several potential test groups would need to be considered and choice made among them.

--An appropriate agency would need to be identified that would be willing to fund the development and pilot test. A proposal would need to be prepared, agreed to by the pilot-test consortium, submitted to the funding agency, and funded.

b. Choice of time-sharing system contractor

--The results of this feasibility study would need to be reevaluated, especially with respect to the specifications outlined in Section 2.

--A formal "Request for Proposal" would need to be prepared and submitted to the various time-sharing systems, both commercial and non-profit. The resulting proposals would then need to be evaluated and a contractor chosen.

--A formal contract would need to be negotiated between the SILC manager and the time-sharing system.

c. Operation of the pilot-test

--All of the operational activities outlined under (1) above would need to be implemented and tested during the pilot-test.

--The work of the participating libraries would need to be monitored during the pilot-test to be sure the operation is working as it should, that the data necessary for evaluation is being acquired, and that all problems that need to be solved have been identified.

--The results of the pilot test would then need to be objectively evaluated and decision made concerning the later steps for moving into fully operational status.

THE FINANCIAL REQUIREMENTS

In the outline of functions given above, we have included an estimate of the manpower and associated budget required for each. Taken together, they total 17 persons and $450,000 per year, at the start of the self-sustaining phase of operation. During the early years of operation and during the developmental stage, of course, a considerably smaller budget would be adequate. (See Appendix C for a likely developmental budget.) The question now is, given the aim of an eventual self-sustaining operation, what are the capital requirements for handling cash flow? To answer that question for purposes of this feasibility study we have had to make a number of assumptions and then, based on them, have projected likely cash flow and resulting cash needs.

Assumption Concerning Charges. First, we have assumed that the operations of SILC would be financed, in principle, by a surcharge on each ILL request which would cover the actual costs charged by the time-sharing computer system plus a standard allocation to cover the costs of SILC management. The data presented in Section 3 of this report (concerned with Technical Feasibility) suggest that a likely average charge for the costs of the computer operation would be $0.50. If we establish a standard allocation of $0.30 to cover the costs of SILC management, the average income per transaction would then be $0.80. We have used this figure in our subsequent calculations. In particular, in Figure 5-6 we have estimated the capital requirements for handling cash flow based on a fixed charge of $0.80 per request.

Assumption Concerning Level of Utilization. Second, we have had to make an estimate of the likely level of utilization of SILC and its growth over time. There is absolutely no existing experience, beyond the data available on present inter-library loan traffic, on which to estimate the utilization of SILC. However, in order to have some rational basis, we have assumed that the present maximum market is equivalent to the volume of inter-regional traffic shown in the Westat study of inter-library loan costs (shown as about 20% in their Table 4.2). This suggests a present market of about 440,000 requests (20% of the total received by the lending libraries, estimated at about 2,200,000 in Table 4.23).

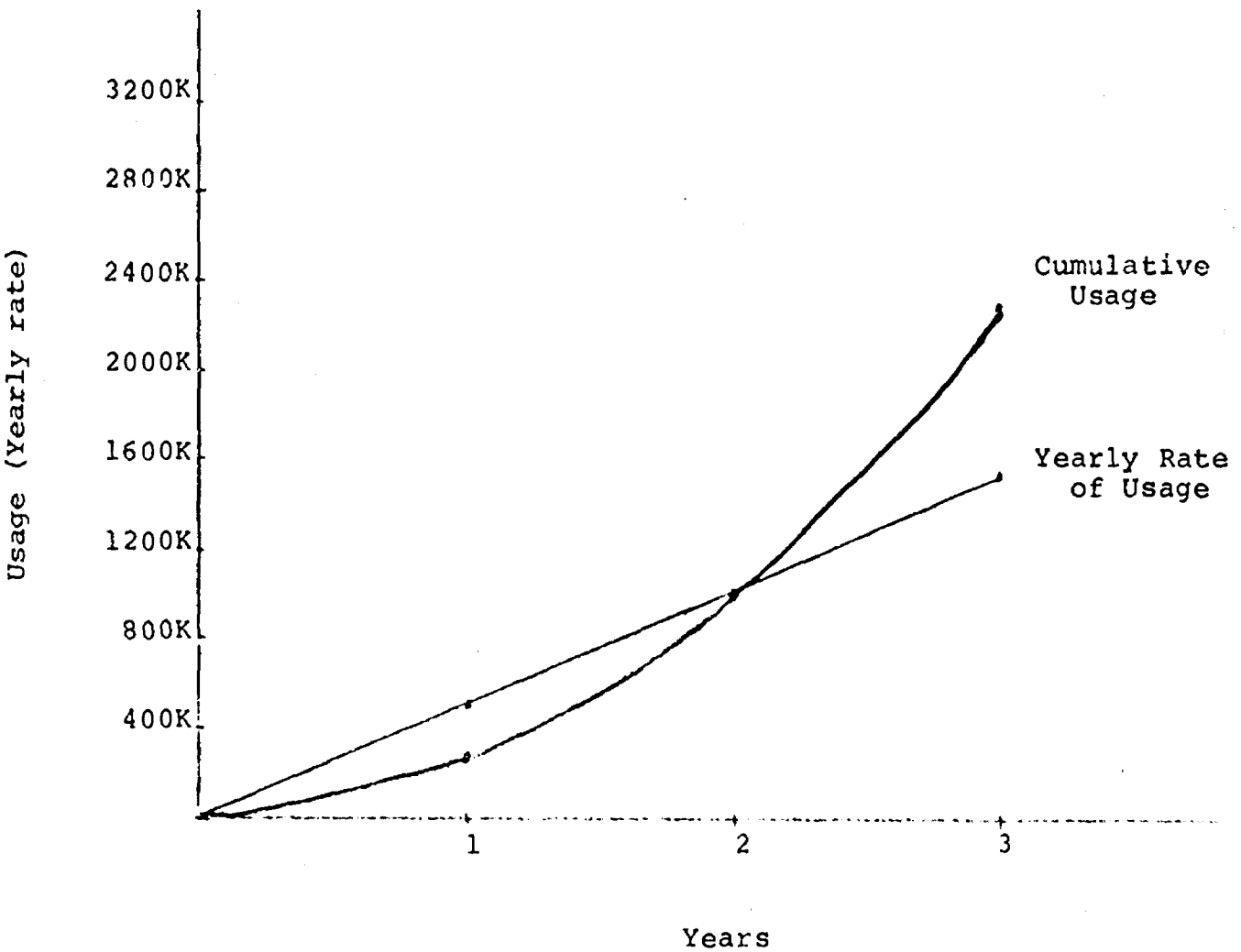
Obviously, SILC operations will not begin at that level, but instead will be at a level of zero in the beginning and then gradually increase. We have assumed that the increase would be linear, rising from zero at the beginning to one million by the end of two years and continuing to grow at the same rate thereafter. This is pictured in Figure 5-4.

Assumption Concerning Costs. The costs of operation after pilot test can be easily considered in two parts: (1) costs which are roughly independent of the volume of traffic (these include most of the management costs and a very small proportion of the computer costs) and (2) costs which are dependent upon the volume of traffic (these include almost all of the costs of computer operation and a small, but significant, proportion of the costs of management). Figure 5-5 shows our assumption concerning these separate costs.

FIGURE 5-4

PROJECTED NUMBER OF ILL REQUESTS HANDLED BY SILC:

YEARLY RATE OF USAGE & CUMULATIVE TOTAL OF USAGE



Yearly Rate of Usage = (500,000)(Number of Years)

Cumulative Usage = $\frac{(500,000)}{2}$(Number of Years)^2

FIGURE 5-5

COSTS OF SILC OPERATION

	Fixed Costs	Variable Costs	Total*
SILC Management Costs	$280,000/year	$.10/request	$440,000/year
Time-Sharing Computer System Costs	0	$.50/request	$800,000/year

*At 1,600,000 requests per year, the estimated traffic at the time that self-sustaining operation begins (i.e., P/L is positive).

Assumption Concerning Cash Flow. The nature of any operation is that costs must usually be paid before the income that those costs have generated will be received. This is certainly true with respect to SILC: Management staff will be paid before income is received from the surcharges on the SILC traffic during the same period; the SILC manager will be billed by the time-sharing system at the end of the month and only then can SILC bill the users of the system for those costs; the users will pay for the charges some time, usually longer than a month, after being billed.

We have assumed that the time delay between incurring costs or paying bills and receiving income will average three months.

Under these conditions, Figure 5-6 shows the resulting cash flow.

CRITERIA FOR EVALUATION OF POTENTIAL MANAGERS FOR SILC

Several kinds of alternatives can be considered for managers of SILC development and operation:

(1) A special non-profit corporation could be established with appropriate capitalization and staffing.

(2) A contract could be made with an existing non-profit corporation with appropriate technical capabilities.

(3) A contract could be made with an existing profit-making corporation with appropriate technical capabilities.

(4) In either of the last two cases, the contractor could be required to establish the organization of the SILC manager as an entity, to be spun-off subsequently, as well as to serve in the interim as manager.

FIGURE 5-6

CASH FLOW FOR FIRST THREE YEARS AFTER

COMPLETION OF PILOT TEST &

INITIATION OF FULLY OPERATIONAL SERVICE

Years:	1				2				3				
Quarters:	1	2	3	4	5	6	7	8	9	10	11	12	
Usage[1] (in thousands of requests)	00	50	100	150	200	250	300	350	400	450	500	550	By Quarter
				300				1100				1900	By Year
				300				1400				3300	Cumulative
Costs[2] (in thousands of dollars)	70	100	130	160	190	220	250	280	310	340	370	400	By Quarter
				460				940				1420	By Year
				460				1400				2820	Cumulative
Billings[3] (in thousands of dollars)	00	40	80	120	160	200	240	280	320	360	400	440	By Quarter
				240				880				1520	By Year
				240				1120				2640	Cumulative
P/L[4] (in thousands of dollars)	-70	-60	-50	-40	-30	-20	-10	00	+10	+20	+30	+40	By Quarter
				-220				-60				+100	By Year
				-220				-280				-180	Cumulative
Receipts[5] (in thousands of dollars)			40	80	120	160	200	240	280	320	360	400	By Quarter
				120				720				1360	By Year
				120				840				2200	Cumulative
Cash Flow[6] (in thousands of dollars)	-70	-100	-90	-80	-70	-60	-50	-40	-30	-20	-10	0	By Quarter
				-340				-220				-60	By Year
				-340				-560				-620	Cumulative
Cumulative[7] Total Cash Commitment (in thousands of dollars)	70	170	260	340	410	470	520	560	590	610	620	620	
Average Cost Per Request[8]				1.53				.86				.75	

(1) See Figure 5.3
(2) See Figure 5.4
(3) Based on $0.80 per request
(4) Billings-Costs
(5) Based on Billings from prior quarter
(6) Receipts-Costs
(7) Cumulative Cash Flow
(8) Yearly Costs/Yearly Usage

The following is a list of possible criteria to use to evaluate the best choice among the alternatives as well as among the possible candidates as contractors:

(1) Technical Capabilities

--Is the organization able to perform and/or manage the development of time-sharing applications programs?

--Does the organization have an understanding of the operational requirements of the library community?

--Is the organization able to build and manage a staff combining knowledge of computer time-sharing system operation and use with knowledge of library operations?

--Is the organization able to establish a business plan for building the staff and carrying forward the operation of SILC?

(2) Financial Capabilities

--What capitalization or sources of financial support would be available to the organization?

--What facilities for accounting management and control does the organization have?

--How well does the business plan recognize the financial requirements of the operation, with special emphasis on the cash flow?

(3) Contractual Capabilities

--How knowledgeable is the organization of the problems in contracting for time-sharing services?

--Are there limitations on the contracting ability of the organization?

--Is there a qualified contracts manager?

--Is there experience in the management and monitoring of time-sharing computer contracts?

(4) Acceptability to the Library Community

--Is the organization one acceptable to the library community?

--Is the key staff capable of convincing libraries and library consortia that they should participate in SILC?

--Is the organization acceptable to government agencies with which it must work?

--Does the business plan include adequate recognition of the need for working with the library community?

ALTERNATIVE MANAGERS

In order to evaluate the feasibility of managing SILC, five organizations were identified as potential managers: the Library of Congress, the Center for Research Libraries, the Association of Research Libraries, the System Development Corporation, and EDUCOM. The specifications for SILC were presented to the technical staff of each of these organizations and the requirements for management of SILC were then discussed with them. The purpose of these discussions was to determine the willingness of the organization to consider undertaking the management of SILC and to evaluate the advantages and possible disadvantages of each as an alternative.

Each of the five organizations was willing to consider undertaking management of SILC as an appropriate responsibility and was willing to be included among the alternatives. Drafts of the following descriptions of the advantages and disadvantages of each were submitted to them for their correction, addition, or modification. What appears here, however, does not represent an

official position of any of them nor a commitment on their part to participate in any manner in the future. It simply represents a willingness on their part to cooperate with this study to the extent of being included as a possible alternative.

Taking the five organizations, it is clear that to some extent or another any of them is completely capable of managing SILC during both development and subsequent operation. The study must therefore conclude that it indeed is feasible to manage SILC, assuming one of them, or some other equally capable organization, can be selected and accepts the responsibility.

The final alternative which must be considered is that of establishing a totally new organization, presumably a non-profit corporation, to serve as SILC manager. While such an alternative is certainly a possibility, for the purposes of this study it does not seem necessary to spell out the advantages or disadvantages of it. The fact that it is a possibility, however, simply serves to emphasize the conclusion that it is feasible to manage SILC.

Library of Congress

Among the alternatives for management of SILC development and operation, the Library of Congress represents perhaps the most significant. Because of its central position in the library network of the entire country, because it has the largest collection of library materials, because of its national role in catalog production, because of its pre-eminent position

as the library of "last resort", because of its Federal responsibilities, because of all these things it is natural to view it as the first and most important alternative. What are the advantages (and possible disadvantages) in this choice?

Charter. The basic charter of the Library of Congress is precisely what the name implies. It is the Library of Congress, and therefore its functions and services beyond that charter must supplement and certainly not conflict with it. In particular, those functions such as the National Program for Acquisitions and Cataloging (NPAC), card distribution, MARC tape production and distribution, library service to the blind and physically handicapped, and any other functions appropriate to the Library of Congress in its role as the national library can be undertaken and maintained only to the extent that they are consistent with the basic charter and approved and funded by the Congress.

The card production service, for example, is a natural byproduct of the internal technical processing of the Library of Congress; it must do the cataloging and card production for its own needs and therefore distribution beyond the Library is acceptable as a more or less independent, self-sustaining operation. The maintenance of the National Union Catalog is a necessary part of its own means of gaining access to material needed to meet its primary responsibilities; making the same data available to other libraries again is acceptable as an independent operation. The production of MARC tapes is a necessary part of the program in the Library of Congress for

mechanization of its own catalog and technical processing; the distribution of those tapes, the RECON project, and the National Serials Data Program are equally necessary efforts if the conversion of basic data is to be accomplished economically. NPAC and service to the blind and physically handicapped already have a national service orientation.

Would the management of SILC be equally consistent with the primary responsibilities of the Library of Congress? On the surface, the answer is debatable. It could be argued that the services which SILC would provide are ones that the Library of Congress will need for its own rapid, efficient access to material, especially to on-line data bases being developed elsewhere. In fact, in certain respects the Library of Congress, through the National Union Catalog and the National Referral Center for Science and Technology, is already performing manually some of the functions that are implied by SILC. Furthermore, in distributing copies of the National Union Catalog to libraries in the country and identifying them as regional referral centers, it is actively involved in establishing the kind of referral network that will require the capabilities of a SILC-like operation in order to be effective.

On the other hand, it could equally well be argued that the kind of continuing operational management that SILC requires is definitely outside the present scope of the Library of Congress. It might be something that the Library needs and that it would use if it were available, but not something appropriate for it

to manage. In fact, it is said that there is a tendency to look to LC for too many things that should not be done by it or could be better done by other institutions.

To some extent, the real question is the extent to which the Library of Congress is or should be or should become the "National Library". Ultimately, this issue would require a decision by Congress itself concerning the values to the country and to the constituency of each congressman of having the Library of Congress increase further its national services rather than maintain the present balance. It may well be appropriate to consider SILC as one among the set of national services to be considered in evaluating the more fundamental issue.

Confidence of the Library Community. The importance of this factor is probably self-evident, but it deserves some emphasis. Librarians are rightly conservative. They have operational responsibilities of major magnitude and limited funds and staff with which to meet them. They are therefore reluctant to depend upon new services and new technologies which are likely to damage their effectiveness and their ability to manage their own responsibilities. If the evidence of this report is valid, SILC is not a speculative idea but instead one which could provide a useful service. However, if the library community is to believe in SILC and use it, they must feel confidence in the organization responsible for SILC and in the ability of that organization to appreciate the interests of libraries.

Among all of the alternatives for SILC management, the Library of Congress is the one most likely to have the confidence of the library community of the country. It is identified with the entire library community and not simply with one part or another; it is a library, staffed and managed by librarians; it has a history of effective service to the library community; it has the position and prestige to warrant the confidence.

Technical Competence. The actual work of development--computer programming, production of manuals, even perhaps pilot test--is likely to be done by other organizations, perhaps under contract to the SILC manager but certainly under the technical monitoring of the SILC manager. However, competence in both the computer field and interlibrary loan practice is essential if the development is to be successful. Competence, again in both computer usage and ILL practice, is equally essential during operation of SILC. Even though the computer operation, as such, is the responsibility of the time-sharing system contractor, it is essential that the SILC manager have a base of knowledge from which to evaluate performance, identify problems, and call for the allocation of computer facilities and resources.

Without question, the Library of Congress has the technical competence required to manage the development and then, later, the operation of SILC. The computer competence is embodied in the MARC Development Program and the Information Systems Office; the capabilities have been so well demonstrated by the success of the MARC distribution service that they hardly need be

commented on. The inter-library loan competence is almost proverbial; the Library of Congress has probably the finest collection of bibliographical access tools in the world and the experience in handling large numbers of both loan requests and bibliographical requests.

Capability for Indoctrination and Training. The experience of the MARC Development Project in presenting the MARC Seminars to librarians throughout the country, in cooperation with the Information Science and Automation Division of the American Library Association, is a clear demonstration of the ability of the Library of Congress to manage this vital aspect of SILC operation. An important point is the fact that it involved cooperation with the library professional societies in such an effective manner.

Financing. Since the SILC service, once fully operational, is intended to be self-sustaining, the financing of operations should represent no more or less of a problem for the Library of Congress than it would for any other potential manager, assuming adequate capital investment to handle the cash flow. The Card Distribution Service, as a comparable self-sustaining operation, would seem to demonstrate that the Library of Congress is completely capable of handling the cash flow requirements of a SILC service.

The development funding on the other hand may represent a different kind of problem. To develop SILC, the Library of Congress or almost any other management organization would

require outside funding. In this respect, SILC is comparable to the MARC Development Project which was initiated with the stimulus of funds from the Council on Library Resources, rather than from appropriated funds and was very successfully brought to an operational status. (It is possible that a commercial organization might have the resources to speculate on development of SILC as a commercially profitable service, but other factors make this possibility an unlikely one until a sufficient market has been demonstrated by actual usage).

Staffing and Space. Staffing may represent the most significant problem that would be faced by the Library of Congress. The key professional staff are already well committed to various developments of primary importance to the program of the Library of Congress--MARC Development, RECON, Information Systems, etc. It could represent a serious dilution of an important management capability to add yet another program of major national importance. On the other hand, the Library has demonstrated an ability in the past to bring along junior people in these areas to levels of major competence and to attract new staff with proven capability. In terms of recruiting, training, salary levels, qualifications, etc. there is no reason to anticipate serious problems beyond those which may have been experienced in the past.

On the other hand, space may represent an almost insurmountable problem. It would be almost impossible to accommodate even the relatively small staff projected for the

SILC management task within the confines of the existing LC facilities. The new building may be available for occupancy by the time SILC were to become operational, but not until then.

Center for Research Libraries

Because of its existing central role in the sharing of research library materials, the Center for Research Libraries is a logical choice for the management of SILC development and operation. It has a long history of providing centralized loan services; it has proven operational experience; it is already experimenting with extended operational services (along the lines of the British National Lending Library); it has experience with the problems in computer usage, through its work in cooperation with DUALabs, Inc., in distribution of 1970 Census data in magnetic tape form; it has managed several projects without damage or disruption of its basic mission. What are the advantages (and possible disadvantages) of this choice?

Charter. The basic purpose of the CRL is defined in its Articles of Incorporation under the Illinois General Not-For-Profit Corporation Act as Follows:

> "The purpose or purposes for which the corporation is organized are:
>
> To establish and maintain an educational, literary, scientific, charitable and research interlibrary center;

> To provide and promote cooperative, auxiliary library services for one or more non-profit educational, charitable, and scientific institutions;
>
> To establish, conduct, and maintain a place or places for the deposit, storage, care, delivery, and exchange of books, pamphlets, photographs, motion picture film, phonograph records, and other articles or documents containing written, printed, or recorded matter, and services with respect thereto, and circulate and distribute any and all educational, literary, scientific or scholarly publications, books, catalogs, and periodicals dealing with the books and other material deposited in said library or available in participating or other libraries."

The SILC operation would be a natural, and perhaps even necessary, extension of these functions. On the surface then, SILC would seem to be sufficiently consistent with the basic charter of the CRL.

The effect upon the non-profit status of the CRL of the addition of an income-producing (even though not profit-making), operational service to its activities is a possible problem to be considered. However, on the surface, SILC would appear to be sufficiently consistent with the charter and present operational activities of the CRL so that it ought not to adversely affect the non-profit status.

Confidence of the Library Community. As an operational agency, serving the library community for a number of years, the CRL should be in an ideal position to have the confidence of the library community. Although its primary constituency is the research libraries of the country, it already includes some college libraries, some public libraries, and some

special libraries among its associate members. There has been a continuing growth in the Center's membership since it started, a growth which has been accelerating within the last few years, including an increasing number of libraries of all types.

Based on this, it is even more likely that the addition of SILC to its range of services would be viewed with confidence by the library community as a whole.

Technical Competence. The CRL has proven operational experience in the processing of inter-library loan, at a high level of activity. It has the management capability to handle the various tasks associated with at least the operational phases. With respect to computer technology, the CRL as such has no special expertise. However, there has been a recent association with DUALabs in the distribution of census data in magnetic tape form, under contract with the CRL. The success of that project suggests that the CRL has the management capability to monitor the performance of a sub-contractor with the expertise in the computer aspects. DUALabs, in particular, might be such a sub-contractor; System Development Corporation, to be discussed later, might be another possible choice.

Financial Management. The budget of the CRL, considering only the operational services, is large enough to demonstrate that CRL has the capability for management of the financial aspects of SILC operations. Beyond that, the CRL has received

several grants for independent projects of a size comparable to that involved in SILC development. These have been well managed from a financial standpoint as well as a technical one. There is therefore every reason to believe that the CRL would be capable of doing the same for SILC.

Staff and Space. There would be need to add staff to CRL for essentially all of the requirements for SILC management. This includes staff concerned with communication with the library community, accounting and financial management (although some of these functions could be handled by the existing accounting staff of the CRL), and computer related management functions. It seems likely that the CRL should have no difficulty in finding staff with requisite library experience; staff with requisite computer experience would probably be obtained through a sub-contract. The only significant problem in the latter respect would be the one of geographical locations--Chicago vs. East Coast or West Coast sub-contractors.

The present facilities of the CRL would not be able to handle the addition of even the relatively small staff that is required for SILC management. Other space would therefore be needed. It seems unlikely, however, that this would constitute a problem of any magnitude.

Interuniversity Communications Council (EDUCOM)

Because of the significant role that EDUCOM has played in the development of inter-university communication networks, and especially in those involving the use of computers, it is a natural choice to consider for management of SILC. It has a long history of managing several studies in networking. A closely affiliated organization, the Educational Testing Service, has experience in providing operational computer services with a high level of demand and requirements for rapid communications. EDUCOM is an important representative of the university community in general and, as such, it covers a major segment of the library community.

Charter. The charter of EDUCOM calls for it to undertake studies, developments, and operational services of precisely the kind that SILC represents. The only possible question might be the extent to which EDUCOM can encompass communities beyond the universities as such. However, as evidenced by a number of studies (such as those undertaken for the National Library of Medicine and the National Agricultural Library), EDUCOM has been ready, willing, and able to provide services for a wider constituency than the universities alone. There is therefore every reason to feel that SILC would also be compatible with the objectives of EDUCOM.

On the other hand, a problem is the fact that EDUCOM's basic financing comes from relatively small membership dues from the participating universities (ranging from $250 per year

from small single-campus institutions to $5,000 per year from large multi-campus ones). Its financial viability has therefore depended upon grants from foundations and its future has always been somewhat uncertain. It is therefore questionable whether, with its existing charter and financing, EDUCOM has the stability and guaranteed staying power that the library community will require in an essential operating service.

Confidence of the Library Community. EDUCOM has not been sufficiently identified with the library community in general to have developed a basis of confidence in its knowledge of library needs or in its ability to serve them. In fact, there are probably many librarians who have never even heard of "EDUCOM". It would therefore require a close affiliation with an organization or institution with which the library community could identify to overcome this significant barrier.

Technical Competence. There is no basis for expecting EDUCOM or Educational Testing Service to have any particular competence in library work or in inter-library loan practice in particular although there has been some association of their staff with library automation projects.

With respect to competence in computer technology, the Educational Testing Service is a highly successful, operational service with demonstrated effective and economic use of computers. There is therefore every reason to think that EDUCOM would be more than capable of handling these requirements, through sub-contract to ETS.

Financial Management. Both EDUCOM and ETS have long experience in handling budgets of the size involved in both development and operation of SILC. They each have the accounting capacity and the financial stability to absorb a SILC-sized effort without significant difficulties.

Staff and Space. EDUCOM would need to add staff with the competence in library work (especially in inter-library loan service). The present staff of ETS would almost certainly be able to manage the work load involved in SILC development and operation.

EDUCOM and ETS in combination probably have sufficient space for SILC management. Their facilities at Princeton are superb and ought to be able to handle the addition of staff which SILC management might call for without any difficulty.

Association of Research Libraries

The ARL is a logical choice for the management of SILC development and operation. It is the sponsor of the present study of feasibility, and it would be natural for it to continue in the same role through the later stages. It is the national spokesman for the research library community, the group of libraries whose participation is the sine qua non for the success of any system for inter-library loan. What are the advantages (and possible disadvantages) in this choice?

Charter. The Certificate of Incorporation for the ARL calls for it to represent the interests of the research library community. While in one sense this is a reason for considering

the ARL as an alternative for management, it may also be a significant hurdle. If the ARL were to undertake an operational responsibility, such as SILC, might that not interfere with its more fundamental mission? As it presently is, the ARL has not undertaken operational responsibilities, in large part for this reason.

Furthermore, since SILC would be a system intended to serve all libraries, and not simply the large research libraries, there could develop significant conflicts of interest.

Another problem that must be considered is the effect of an operational, income producing activity upon the non-profit status of the ARL. Typically, when a professional society or other non-profit corporation undertakes activities which are both peripheral to its original mission and income producing, the IRS raises many questions about the separability of activities and requires more complex accounting and reporting procedures. The problems faced by the American Library Association and the Sierra Club with their publication activities represent cases in point.

While not unresolvable, these issues of basic mission and possible conflicts could be a disadvantage to the choice of ARL and would need to be resolved before a definite decision could be made.

Confidence of the Library Community. The ARL would certainly enjoy the confidence of the research library community. It is identified with their interests; it has the knowledge of their requirements; it has a history of service to them. On the other hand, because it is so identified with the research library community, other libraries--small academic, public, special, governmental--might be concerned about whether their interests would be properly considered.

Technical Competence. Because the ARL does not have a history of operational responsibilities, there is no large technical staff on which to draw. This means that the ARL would need either to add staff--with all the problems of finding and evaluating personnel that that implies--or would need to contract with other organizations to meet the technical requirements of SILC management (perhaps with the intent of creating the cadre of staff to then become employees of the ARL). In the past, the ARL has shown the ability of finding and working with organizations with technical competence, and there is no reason to think that it would not continue to be successful in this respect. Furthermore, in this respect, the ARL is not much different from most of the alternative organizations to be considered, since each of them would be likely to sub-contract much of the technical work (at least, during development) to other organizations.

Capability for Indoctrination and Training. For much the same reasons as mentioned above (with respect to technical competence), there is no specific capability for indoctrination and training. These functions would therefore also need to be sub-contracted, perhaps to professional societies (such as the Information Science and Automation Division of the ALA) or to programs of extended education through the various library schools or state library associations.

Financing. As with any other alternative organization, the financing of the operation of SILC is intended to be self-sustaining. It should therefore represent no more or less a problem for the ARL than for other alternatives, except that it would require establishing procedures for accounting and control significantly different from those presently used by the ARL.

The development funding, on the other hand, may be relatively simpler. The ARL in the past has successfully handled projects comparable to the development of SILC, and the problems in obtaining grant funds and accounting for them should not be very different.

Staffing and Space. The problem for ARL in staffing a SILC management function has already been commented upon. It is a difficult one, solvable in part by sub-contracting. That of space is probably not a serious problem. Presumably, if staff to manage SILC were added to ARL, new space would be found (in Washington, probably) for the total ARL staff.

The amount of space required is not great enough to constitute any kind of problem. The management of the total ARL operation, as a single facility would also not be a problem.

System Development Corporation

Because of the variety of projects involving both computer expertise and knowledge of library needs in which SDC has been involved, they represent an especially important example of a commercial, profit-making organization to serve as manager of SILC. The extent of their involvement in library automation activities will be reviewed in detail under "technical qualifications".

Charter. The charter of SDC is so consistent with both development and operation of SILC that it hardly needs to be commented on. Developments of this kind have been, historically and presently, the entire focus of SDC's activities. As a profit-oriented corporation, they are able to undertake this kind of management function without conflict with other commitments.

Confidence of the Library Community. Since SDC is a profit-making corporation, there may be some question on the extent to which the library community would be confident that its interests, rather than those of profitability, would be paramount. On the other hand, the fact of extensive and successful involvement of SDC in library related activities suggests that they would be more likely than most commercial enterprises to have the confidence needed for successful operation.

Technical Competence. System Development Corporation (SDC) has wide experience in the particular field of developing and managing computer-based systems for the support of library operations and

information networks. They also have experience in time-sharing network operation and facilities management. SDC has developed many different systems for customers of many kinds, ranging from the massive SAGE system for defense of the U.S. air space down to the SPORTSTAT program for preparing player statistics for softball teams. SDC has contributed to library and information science over the last fifteen years by conducting research in library and information use and by developing and operating automated systems to support library and information center operations. While they have worked with some libraries on an individual basis, the bulk of their projects have been concerned with information networks. Five years ago they developed the LISTS system to experiment with the use of computer time-sharing to provide a reasonably "total" library automation package to libraries of various types and sizes, without infringement upon each participant's autonomy. They have developed and improved the ORBIT II® information retrieval system, used it to support the AIM-TWX project for the National Library of Medicine (NLM) and the development of NLM's MEDLINE system, and are currently using it to operate the SDC On-line Bibliographic Search Service on a nationwide basis for the ERIC, MEDLINE, and Chemical Abstracts Service's Condensates data bases. They are currently developing the MEDLARS II system for NLM, to improve and extend to a high degree the capabilities of MEDLARS I. In all of these projects, they have concentrated on the design

and cost-effective development of human-engineered interfaces between man and machine, both for on-line and for off-line interaction.

Financial Management. The breadth and depth of SDC experience in automation practices in general and library uses in particular is exceptional. To supplement the functional expertise, they also have a staff of administrative specialists who can be called upon for assistance in performing the many business operations tasks that would constitute a large proportion of the SILC management responsibility: contract preparation, internal accounting and auditing, purchasing and monitoring of supplier performance, financial management, and legal considerations.

Staff and Space. These issues represent almost no problem for SDC. They have adequate management staff, adequate technical staff, and ready access to available staff in the Los Angeles area. They have excellent physical facilities with apparent capacity to handle the requirements of SILC.

6. ECONOMIC FEASIBILITY

THE ISSUES

The question is, "Is SILC economically feasible?" To answer that question, we must consider the following issues:

(1) What is the cost of operation of SILC and to what extent does that cost represent replaceable costs of present inter-library loan operation?

(2) What is the cost of management of SILC operation?

(3) What is the cost of development of SILC? How should it be amortized?

(4) How can these various costs be paid for?

(5) What are the compensating benefits, and what is the cost/benefit ratio by which SILC can be evaluated?

The approach taken to answering these questions was to analyze the operations involved in inter-library loan into a set of relatively independent modules, for each of which a number of alternative sub-systems could be defined. By choice of one or another alternative for each module, a set of total ILL systems can be identified.

The next step was to evaluate the costs of operation for some of the alternative sub-systems, insofar as cost data was either available or could be estimated or inferred from available data. By combining costs for each module in a system, an estimate can then be provided of the total cost of system operation.

The third step was to identify and evaluate qualitative benefits that would be provided by each alternative system, so that some basis would be available for comparing their effectiveness, as well as their costs.

Among the functions are the following: (1) bibliographic identification of material, (2) identification of source, (3) communication, (4) payment of costs, (5) methods of accounting, and (6) delivery of material. Among the alternatives for each of these functions, two are of primary interest: first, the present mode of operation and second, the use of SILC. In the following sub-sections, each of the functions and the various alternatives for handling them will be discussed.

DEFINITION OF FUNCTIONAL ALTERNATIVES

Bibliographic Identification

The cost of this function in the present mode of operation represents the largest single element in the total cost of inter-library loan. As it now is, both the borrowing and the lending library must perform this function to one extent or another, primarily because the borrowing library all too frequently does not have bibliographic references adequate to do a complete job of identification of material wanted.

Three alternative sub-systems can be considered for performing this function:

(1) the present method in which the borrowing and and lending library both to some extent perform the function. The costs involved in doing so have been estimated by Westat in their first study of the costs of inter-library loan. (reference 1)

(2) the use of bibliographical centers with the resources available to determine both what material a request involves and where it may be available.

(3) the use of on-line bibliographic data bases which, while still speculative now, could in principle provide a means of matching requests with stored catalog data to identify what is wanted and also determine the location of the desired material.

For the purposes of this study, we limit our attention to the first alternative, since it is the only one for which cost data is available.

Identification of Source

As it now is, the sources to which a borrowing library will turn for requesting material are, in general, other libraries. I say "in general" because the Center for Research Libraries (in the United States) and the National Lending Library (in Great Britain) represent existing, operational alternatives. A third alternative is the designation of some libraries as "regional centers". Thus, there appears to be three possible alternatives for sources:

(1) the use of other libraries in general

(2) the use of designated regional libraries

(3) the use of a national lending library

The costs of these alternatives are primarily reflected by the allocations of the costs of acquisition against the inter-library loan service in each case.

For the purposes of this study, we limit our attention to the first alternative, since the other alternatives are being studied independently.

Communication

Presently, communication among libraries is by mail, teletype, or telephone. The purpose of SILC is to provide another alternative to these. For this analysis, three alternatives are considered:

(1) the use of mail (for the purposes of communication, not for the delivery of material)

(2) the use of teletype

(3) the use of SILC

For the purpose of this study, we consider all three alternatives, with the first two being treated in various mixes (one at the present 80% mail and 20% teletype; a second at 100% teletype).

Payment of Costs

Presently, except for a few specific contexts that will be discussed in a moment, the costs of inter-library loan operation are paid for by both the borrowing and the lending institution. It is this situation in particular that has led to interest in alternatives, because the total of the costs for the large net lenders has become so great that they can no longer be afforded. A second alternative, represented in present operation by support to Regional Medical Libraries by the National Library of Medicine, is contract subsidy of inter-library loan service by a federal agency; other examples of this alternative are provided by the various state networks, in which the services of the major state resource libraries are subsidized in support of network operation. A third alternative, presently

operational only in the context of a few private libraries but being explored by a number of academic libraries, is the institution of a fee system, in which the costs would be to a major extent paid for by the borrowing library. There appear, then, to be three alternatives:

(1) the present method, in which the costs are assumed by the institution, whether it is borrowing or lending

(2) subsidy by centralized agencies with responsibility for assuring economic access to information by all segments of a defined constituency

(3) a fee system, in which the borrowing institution essentially covers the costs of its request for services

As far as evaluation of SILC is concerned, the second and third alternatives are essentially equivalent, since they will differ only with respect to the requirements for accounting that they will impose.

Methods of Accounting

Presently, the accounting for inter-library loan charges includes the accumulation of statistics, which are then reported to parent institutions or national societies (such as the ARL), and financial accounting on charges made for specific services (such as photo-copying). To the extent that such charges are made (at the moment, apparently on about one-third of the requests) "one-to-one" accounting is required in which each institution must keep track of the charges and payments made to each other institution. One alternative to this would be the use of deposit accounts or, what is roughly equivalent,

the use of a coupon system. Another alternative is some form of "clearinghouse" based upon accounting, on a centralized basis, of the usage made by each institution and the services provided by it; again, an alternative means of accomplishing roughly the same thing is the use of a coupon system, but on a centralized basis. There appear, then, to be three alternatives:

(1) no accounting, except for limited reporting of statistics

(2) one-to-one accounting, in which each institution keeps track of its relation with respect to every other institution, either by individual billing or by a pre-paid coupon system

(3) clearinghouse accounting, again, either by individual billing or by a pre-paid coupon system

All three alternatives will be considered.

Delivery of Material

Presently, material is delivered in one of two forms: the original or a photocopy (microform or printed). A third alternative is the use of facsimile transmission. There appear, then, to be three alternatives:

(1) original

(2) photocopy

(3) facsimile

Only the first two are presently operational and the third is not directly affected by SILC operation.[14] We therefore limit our attention to the first two alternatives.

DEFINITION OF ALTERNATIVE SYSTEMS

If all possible combinations of the alternatives for each of the six functional modules were to be included, there would be a total of 729 systems to be considered. However, it is clear that the functions are sufficiently interrelated so that not all combinations need to be considered. Furthermore, since the purpose of this study is to determine the feasibility of SILC as a means of inter-library communication, it seems important to focus on those systems with which SILC should be compared. The following systems are therefore the ones which will be evaluated:

(1) the present system (borrowing and lending libraries do the bibliographic searching; the sources are libraries in general; teletype and mail are the means of communication; costs are assumed by the institutions, except for the cost of copying; there is limited accounting; and material is delivered in both original form and copy, about half and half)

(2) accounting systems (the borrowing and lending libraries do the bibliographic searching; the sources are libraries in general; teletype and mail are the means of communication; cost recovery requires a full accounting; and material is delivered in original form and copy, about half and half)

(3) message switching systems (the bibliographic searching is done by the borrowing and lending libraries; the sources are libraries in general; either teletype or SILC is used for communication; cost recovery requires a full accounting, and material is delivered in original form or copy, about half and half)

(4) referral systems (the bibliographic searching is done by a bibliographic center for a significant proportion of the requests; the sources are libraries in general; cost recovery requires a full accounting; services are accounted for on a clearinghouse basis; and material is delivered in original form or copy, about half and half)

EVALUATION OF COSTS

In order to evaluate the economic feasibility of SILC, it is necessary to compare the costs of a SILC operation with those of various alternatives and especially with those of present operation. Although it emphasizes academic libraries, the most valuable source of data on the latter is the Westat study (reference 1), but unfortunately the costs as presented there are not in the form most useful for making such comparisons. It has therefore been necessary to analyze the Westat data (with particular attention to the data in Table 3.5 on pages 19 and 20 and the tabulation of expense categories on page 23 of their report) in order to identify costs with various functions and various request results. Figure 6-1 is a listing of the results of that analysis, presented in the form of a set of "cost per Request" estimates. Subsequently, we will compare them with the various estimates of "cost per Transaction" as presented by Westat.

The data presented in Figure 6-1 include all elements of cost: direct labor, benefits at 15% of direct labor, overhead at 50% of direct labor, and supplies and expenses. These are the figures used by Westat and permit a direct comparison to be made between their total costs per Transaction and the total costs, on the average, as will be calculated from Figure 6-1.

FIGURE 6-1

ESTIMATED COSTS PER REQUEST, PRESENT OPERATIONS

(BY PROCESSING FUNCTION, INSTITUTION, & REQUEST RESULT)

	Bibliogr. Searching	Physical Handling	Other	Handling Expenses	Commun. Expenses	SILC Related	Total
Borrowing Library							
Filled Original	$2.87	1.00	.27	.50	.16	1.24	6.04
Filled Copy	2.87	.25	.27	.05	.16	1.34	4.94
Unfilled	2.87		.27	.05	.16	.69	4.04
Lending Library							
Filled Original	.72	1.30	1.00	.33		.90	4.25
Filled Copy	.72	1.50	1.00	.85		1.00	5.07
Unfilled	.72		1.00	.05	.16	.22	2.15
Total							
Filled Original	3.59	2.30	1.27	.83	.16	2.14	10.29
Filled Copy	3.59	1.75	1.27	.90	.16	2.34	10.01
Unfilled	3.59		1.27	.10	.32	.91	6.19

If we assume 35% Filled Original, 30% Filled Copy, and 35% Unfilled, we get the following Average "Cost per Request":

Average	3.59	1.33	1.27	.60	.22	1.76	8.77

Of course, if different percentages were to be used for estimating benefits or overhead, different costs per request would result.

The allocations (of the costs tabulated by Westat in their Table 3.5) on which the analysis was based are shown in Figure 6-2. As it shows, the function "Bibliographic Searching" is defined to include all personnel costs (and associated benefits and overhead) involved in relationship to the original requestor, including the work of the professional librarian in filling out the initial request form. The function "Physical Handling" is defined to include the labor (and associated benefits and overhead) involved in getting the book, copying it or preparing it for mailing, receiving it, and reshelving it. It would have been desirable to include the costs of "Circulation Control" in this category as well, but the Westat data did not separately identify those costs, including them with other record keeping functions. The function "Other" is self-explained by the entry in the Westat data. The category of "Handling Expenses" has been defined to include all expenses associated with copying and with mailing the material. The category of "Commun. Expenses" has been defined to include those costs associated with communication of the requests and of responses to them, including mail and teletype. Finally, the "SILC Related" functions have been defined to include all personnel costs (and associated benefits and overhead) involved in communication, record keeping (including circulation control),

FIGURE 6-2

ALLOCATION OF PERCENTAGES FROM WESTAT TABLE 3.5

TO VARIOUS PROCESSING FUNCTIONS

		Bibliogr. Searching	Physical Handling	Other	SILC Related
Borrowing Library					
I.	A, B	x			
	C (prof)	x			
	C (cler, stud)				x
	D				x
II.	A		x		
	B, C	x			
III.	A, B				x
IV.	A				x
	B		x		
V.				x	
Lending Library					
I.	A, B	x			
	C		x		
	D				x
II.	A, B, C		x (copy)		
	D, E, F				x (copy)
III.	A, B		x		
IV.	A, B				x
V.	A		x (orig)		
	B, C				x
	D		x (orig)		
VI.				x	

and accounting. Given these allocations, it was then assumed that the costs of comparable functions would be the same for every request, independent of its particular outcome.

Obviously, these estimates, since they are derivative and based upon assumptions concerning the functions included under the rather broad categories of the Westat Table 3.5, should be treated with a great deal of caution. The purpose for making them here is simply to identify those costs which would be directly affected by SILC operation.

To compare the results of this analysis with the "cost per Transaction" as reported by Westat, it is necessary to make some further assumptions concerning the relative distribution of results. Taking the data reported by Westat, approximately 65% of the requests were filled and, of those, 54% were filled by originals and 46% by some form of copy. Multiplying (.65)(.54) and (.65)(.46) yields a distribution among the three types of results as follows:

(1) filled by original: 35%

(2) filled by copy: 30%

(3) unfilled 35%

If we apply these weights to the total costs shown in Figure 6-1, we get the following:

Total costs for lending (both filled and unfilled requests) per filled lending transaction

$$\frac{.35(4.25) + .30(5.07) + .35(2.15)}{.65} = \$5.79$$

(to be compared with Westat's $5.82)

Total costs for borrowing (both filled and unfilled requests) per filled borrowing transaction

$$\frac{.35(6.04) + .30(4.94) + .35(4.04)}{.65} = \$7.71$$

(to be compared with Westat's $7.61)

Lending costs only for filled requests, per filled request

$$\frac{.35(4.25) + .30(5.07)}{.65} = \$4.63$$

(to be compared with Westat's $4.67)

Lending costs only for unfilled requests, per unfilled request

$$\frac{.35(2.15)}{.35} = \$2.15$$

(to be compared with Westat's $2.12)

Total costs (borrowing and lending) for filled requests

$$\frac{.35(6.04 + 4.25) + .30(4.94 + 5.07)}{.65} = \$10.16$$

(to be compared with a total, calculated from Westat data directly, of $10.26).

These all appear to be sufficiently close to warrant accepting them for the purpose of comparison of alternatives.

SILC Related Costs in Present Operation. In order to do so, however, we must analyze those SILC related costs in more detail. As reported by Westat, they cover a number of more specific functions that will be differently affected under different modes of operation. Figure 6.3 presents a subdivision of the Communication Expenses and the SILC Related costs (the fifth and sixth columns of Figure 6-1) among the functions of (1) communication, (2) input clerical processing, (3) record keeping (for control and statistics), (4) accounting (for copying costs), and (5) circulation control.

FIGURE 6-3

COSTS PER REQUEST THAT WOULD BE AFFECTED BY OR RELATED TO THE USE OF SILC

(BY PROCESSING FUNCTION, INSTITUTION, & REQUEST RESULT)

	Commun. Expenses	Input	Record keeping	Account-ing	Circul-ation	Total
Borrowing Library						
Filled Original	$.16	.50	.34		.40	1.40
Filled Copy	.16	.50	.34	.50		1.50
Unfilled	.16	.50	.19			.85
Lending Library						
Filled Original			.50		.40	.90
Filled Copy			.50	.50		1.00
Unfilled	.16	.12	.10			.38
Total						
Filled Original	.16	.50	.84		.80	2.30
Filled Copy	.16	.50	.84	1.00		2.50
Unfilled	.32	.62	.29			1.23

If we assume 35% Filled Original, 30% Filled Copy, and 35% Unfilled, we get the following average "Cost per Request":

Average	.22	.54	.64	.30	.28	1.98

These estimates are based on the following assumptions: (1) communication costs are a mix of U.S. Mail (80%) and teletype (20%) (as shown, approximately, in Westat's Table 4.7, page 38 of their report), (2) input costs are represented by clerical time (in the borrowing library, to type the request--estimated at an average of 300 characters--in standard format; in the lending library, to type "not available" notices for unfilled requests), (3) record keeping costs are based upon estimates from the review of sample libraries of the time spent on record keeping functions, (4) accounting costs are based upon the data reported by Westat in connection with repayment of copying costs, (5) circulation control costs are based on independent estimates of the costs of a typical academic library circulation control system. In distributing costs for the lending library, it was assumed that communication (and associated input) would be required in present operation only for the requests that were not filled, since the sending of the material itself would provide the reply in the other cases.

Costs of SILC Operation. The portion of the costs of SILC operation that are represented by SILC Management and by computer system operation have been estimated in earlier sections of this report. For the purposes of comparison with alternatives, we are going to assume that these costs are treated as follows:

(1) The costs of SILC management will be treated as a surcharge of $.30 on each request that involves either message switching or referral, but will not be charged against any message input solely for accounting or record keeping purposes.

(2) The costs for the time-sharing system operation for message switching and referral will be taken as $.50 and for accounting and record keeping as $.10.

(3) The costs of development will not be charged against the handling of any single request or message. (Later in this section, we will explore the issue of cost/benefit, and at that time will consider the effects of amortization of the capital investment in development, pilot-test, and cash flow.)

Beyond those costs, however, are the costs incurred in the individual library using SILC. These show up primarily as added clerical costs for input (especially in the lending library that wants to use SILC for accounting of requests that do not come in through SILC). Counterbalancing those costs is the possible reduction in costs in the library for record keeping and accounting. The problem, however, is in estimating the extent to which a library will be willing to forego its own file maintenance activities and rely on an external service. In evaluating the alternatives, it has been assumed that the libraries would maintain a proportion (taken at 50%) of the file maintenance activities they otherwise would have had.

One set of costs, important though they are, have not been included in these estimates. They are the costs of teletype terminals in the library. For libraries that do not presently have teletypes, adding them solely to support SILC operation would be an extremely large burden; for libraries that already have them, the use of them for SILC communication is simply one among many uses. Unfortunately there does not

appear to be any completely equitable way of handling this large a discrepancy.

Comparison of Alternatives. We can now move t. a comparison of various functional alternatives. As described earlier, we will consider them as follows:

(1) the present system

(2) three alternative accounting systems

- the present system, but modified to provide an accounting in both the borrowing and lending library for every request rather than simply for those that involve copying
- the present system, but modified to use a coupon system, with centralized accounting, for every request
- SILC, used solely for accounting purposes, with input by the lending library of data about every request it receives

(3) two alternative message switching systems

- the present system, but modified to use teletype for every request, as well as to use a coupon system, centralized accounting for every request
- SILC, used for full message switching as well as accounting functions

(4) two alternative referral systems

- the present system, modified to include a significant use of Bibliographical Centers (for searching and then referral of requests) as well as full use of teletype and accounting
- SILC, used for referral as well as accounting and message switching

The equations that we will use to make the comparisons among these alternates are summarized in Figure 6-4.

To illustrate the derivation of these equations, consider the first one (for M_1): In it, the cost of communication of a message is expressed as a weighted average of the cost of mailing it (taken at \$0.08) and the cost of teletype (taken at \$0.50). The weighting is determined by the percentage of the messages transmitted by the two means (i.e., by C_m and C_t respectively). The number of messages transmitted is then calculated as a product: first, the sum of 1 (i.e., the original request) and P_a (the percentage of times that the lender replies); then second, since referrals are involved as well, this sum must be multiplied by a similar addition of the percentage of referrals to the original request. In the remaining equations, the costs for input, record keeping, accounting, and circulation have been taken from Figure 6-3. Those for Clearinghouse accounting have been taken as \$0.15.

EQUATIONS FOR ESTIMATING COSTS PER REQUEST IN PRESENT OPERATIONS OR MODIFIED PRESENT OPERATIONS AND IN USE OF SILC

Function	Equations for costs of (modified) present operation
Communication	$[1+P_r][1+P_a][C_m(.08) + C_t(.50)] = M_1$
Input	$[1+P_r][.50 + P_a(.12)] = M_2$
Record keeping	$[F_o+F_c][.84] + [1-(F_o+F_c) + P_r][.29] = M_3$
Accounting	$[1+P_r][A_i][A_jA_k + (1-A_j)][1.00] = M_4$
Circulation	$F_o[.80] = M_5$
Clearinghouse	$[A_i][A_j][.15] = M_6$
	Total equals summation $\sum_i M_i$

Function	Equations for costs of SILC
Communication	$[1+P_a][C_m(.08) + C_t(.50)] + C_s[0] = S_1$
Input	$[.50] + C_s[.12] + [1+A_i][C_m+C_t][.12] = S_2$
Record keeping	$A_k[(F_o+F_c)(.84) + (1-[F_o+F_c]+P_r)(.29)] = S_3$
Accounting	$[A_i][A_k][1.00] = S_4$
Circulation	$F_o[.80] = S_5$
SILC	$[A_i][C_m+C_t][.10] + C_s[.80] = S_7$
	Total equals summation $\sum_i S_i$

These equations depend upon the values of the following percentages:

How requests are communicated: C_m by mail, C_t by teletype, C_s by SILC

How requests are filled: F_o by originals, F_c by copies

How accounting is handled: A_i accounting desired, A_j by Clearinghouse
A_k internal records maintained

Whether requests are referred: P_r referrals

Whether lender replies: P_a percentage of times replied to

As Figure 6-4 shows, the estimations of the costs of various alternatives have been expressed as functions of several percentages that describe the requirements for service. In the following pages, we will describe the alternatives and then develop estimates for each under the assumption that they are characterized by the values for those percentages as shown in Figure 6-5.

In each case, we will compare the present system with the alternatives (among which the use of SILC is included).

Figure 6-6 presents the relevant costs for the various alternative systems for accounting (under the assumption that other costs, not related to SILC operation, are independent of the method of accounting). Those for the present system have been taken as a weighted average of those in Figure 6-3, but include a cost for accounting on every request comparable to that presently incurred in accounting for copying costs (i.e., $1.00). The cost of using a coupon system through a clearinghouse has been taken at $.15 (based on the results from a parallel study by Westat and on various published data on the costs of handling centralized processing of credit card transactions); the local accounting costs (in the individual libraries) have been taken at 50% of what they would have been with full internal accounting. The use of SILC would require

FIGURE 6-5

CHARACTERIZING PERCENTAGES

FOR VARIOUS ALTERNATIVE SYSTEMS

OF ACCOUNTING, MESSAGE SWITCHING, OR REFERRAL

Percentage	Present system	Present, plus Accounting	Present, plus Clearinghouse	SILC, used for Accounting	Teletype for Messages	SILC for Messages	Teletype for Referrals	SILC for Referrals
C_m (request by mail)	.80	.80	.80	.80				
C_t (request by teletype)	.20	.20	.20	.20	1.00		1.00	
C_s (request by SILC)						1.00		1.00
F_o (filled by original)	.35	.35	.35	.35	.35	.35	.35	.35
F_c (filled by copy)	.30	.30	.30	.30	.30	.30	.30	.30
$1-(F_o+F_c)$ (unfilled)	.35	.35	.35	.35	.35	.35	.35	.35
A_i (accounting desired)	.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00
A_j (Clearinghouse used)			1.00		1.00		1.00	
A_k (internal records kept)	1.00	1.00	.50	.50	.50	.50	.50	.50
P_r (percentage referrals)							.15	.15
P_a (percentage of replies)	.35	.35	.35	.35	.35	1.00	.35	1.00

FIGURE 6-6

SILC RELATED COSTS PER REQUEST FOR ALTERNATIVE SYSTEMS FOR ACCOUNTING

	Commun. Expenses	Input	Record keeping	Account-ing	Circul-ation	SILC	Total
Present System	.22	.54	.64	.30	.28		1.98
Present System (with full accounting)	.22	.54	.64	1.00	.28		2.68
Clearinghouse (with use of coupons)	.22	.54	.64	.65	.28		2.33
SILC	.22	.74	.32	.50	.28	.10	2.16

that the lending library input the data necessary for accounting (at a cost taken at $.12), for every request, thus increasing the costs for input, but the lending library could then take advantage of the reports that SILC could produce to reduce its own costs of record keeping and accounting.

Figure 6-7 presents the relevant costs for the alternative systems for message switching. Basically, the choice is between the present system (a mix of 80% U. S. Mail and 20% teletype or delivery service), a system with full use of teletype, and SILC. The costs for SILC must now include a full allocation of management as well as computer system costs. On the other hand, the costs for communication have been eliminated, since the costs of SILC include all associated communication costs (except that of a local telephone call, the effective cost of which is a fraction of a cent per request).

Figure 6-8 presents the relevant costs for alternative systems for referral, using the operation of a bibliographical center as the illustration. It has been assumed that, if SILC is not used, the bibliographical center must re-type the full text of the message, augmented with its own identification of source, for transmittal as a referral. Other modus operandi are obviously possible, with their alternative distribution of costs among input, record keeping, etc. Unfortunately, there are no data readily available from which to estimate the amount of referral that a network of bibliographical centers would handle. In the case of one state library network

FIGURE 6-7

SILC RELATED COSTS PER REQUEST FOR ALTERNATIVE SYSTEMS

FOR MESSAGE SWITCHING

	Commun. Expenses	Input	Record keeping	Account-ing	Circul-ation	SILC	Total
Present System	.22	.54	.64	.30	.28		1.98
Full use of teletype plus Clearinghouse accounting	.68	.54	.64	.65	.28		2.79
SILC		.62	.32	.50	.28	.80	2.52

FIGURE 6-8

SILC RELATED COSTS PER REQUEST OF ALTERNATIVES

SYSTEMS FOR REFERRAL

	Commun. Expenses	Input	Record keeping	Account-ing	Circul-ation	SILC	Total
Present System	.22	.54	.64	.30	.28		1.98
Full use of tele-type for message switching and referral and Clearinghouse for accounting	.78	.62	.70	.73	.28		3.09
SILC		.62	.35	.50	.28	.80	2.55

examined as part of the study of Operational Feasibility, the state library handled about 10% of the total ILL traffic, serving as both a bibliographical center and a resource center in doing so. On the other hand, it thereupon referred at least 30% to 40% of the requests it received on to other institutions. For the purposes of this study, we have taken the percentage of the total traffic that would go through some form of referral at 15%.

In a manner similar to the analysis of the various alternatives outlined above, other assumptions can be made about the relative use of services (i.e., the percentages in Figure 6.4). It is thus possible to arrive at an overall assessment of the financial viability of SILC under a variety of circumstances. Figure 6.9 presents one such assessment, based on the assumption that an accounting system would cover 75% of the total volume of requests (i.e., $A_i = .75$), that the reports produced by SILC would satisfy all but a part of the record keeping requirements in each library (i.e., $A_k = .50$), that at most 50% of the requests would be sent by mail (i.e., $C_m = .50$), and that at least 15% of the requests involve or require referral (i.e., $P_r = .15$).

Amortization of Capital Costs. In other sections of this report, we have estimated the costs for development, pilot-test, and input of capital to cover cash flow requirements. With a contingency of 25%, they total about $1,500,000 as shown in Figure 6-10. The assumption of the development program is that the total would be covered by one or more granting

FIGURE 6-9

REPRESENTATIVE ASSESSMENT OF SILC RELATED COSTS PER REQUEST FOR ALTERNATIVE SYSTEMS

(A_i=.75, C_m=.50, others by Figure 6-5)

	Commun. Expenses	Input	Record keeping	Account-ing	Circul-ation	SILC	Total
Present System	.22	.54	.64	.30	.28		1.98
Present System, plus Clearinghouse accounting and use of teletype for communication and referrals	.45	.62	.70	.58	.28		2.57
SILC (including accounting, message switching, and referral)		.67	.35	.38	.28	.44	2.12

FIGURE 6-10

SUMMARY OF CAPITAL REQUIREMENTS

Phase II.	Development and Pilot Test (See Appendix C)	$ 578,000
Phase III.	Operational Cash Flow (See Figure 5-6)	620,000
Contingency		300,000
		$1,498,000

agencies because of the importance of improved inter-library loan as a total national resource. If this is the case, there is no need for the costs of operation to include any consideration of amortization of that capital investment. However, in the interests of a complete evaluation of cost/effectiveness, there is value in seeing whether there would be a net saving over some period of time. If, even considering the capital investment made by the granting agency, there turned out to be a cost saving, the decision to proceed further could be made with less reliance on intangible benefits. Therefore, simply to include recognition of this factor, we may add $.25 per request for that purpose. This figure is based on the assumption that SILC would handle, during a five year period after completion of development and initiation of full-scale operation, a traffic totalling 6,000,000 requests (based on Figure 5-4).

FINAL ASSESSMENT OF COSTS

To present any final assessment of costs in a useful manner, we must compare total costs of SILC operation with total costs of other alternatives (including the total costs of present operation of inter-library loan). If we consider the costs of each of the various categories of function and kinds of request, we arrive at the following conclusions, presented in Figure 6-11.

FIGURE 6-11

TOTAL COSTS PER REQUEST FOR ALTERNATIVE SYSTEMS

Alternative Accounting Systems	Bibliogr. Searching	Physical Handling	SILC Related	Other (Unalloc.)	Total
Present System	$3.59	1.93	1.98	1.27	8.77
Present System (with full accounting)	3.59	1.93	2.68	1.27	9.47
Clearinghouse (with use of coupons)	3.59	1.93	2.33	1.27	9.12
SILC (only for accounting)	3.59	1.93	2.16	1.27	8.95

Alternative Message Switching Systems	Bibliogr. Searching	Physical Handling	SILC Related	Other (Unalloc.)	Total
Present System	$3.59	1.93	1.98	1.27	8.77
Full use of teletype plus clearinghouse accounting	3.59	1.93	2.79	1.27	9.58
SILC (for message switching and accounting)	3.59	1.93	2.52	1.27	9.31

Alternative Referral Systems	Bibliogr. Searching	Physical Handling	SILC Related	Other (Unalloc.)	Total
Present System	3.59	1.93	1.98	1.27	8.77
Full use of teletype for message switching and referral & Clearinghouse for accounting	3.59	1.93	3.09	1.27	9.88
SILC (for message switching, referral and accounting)	3.59	1.93	2.55	1.27	9.34

These conclusions suggest that the addition of new functions (such as accounting and referral) to the present mode of operation is likely to increase costs beyond the present ones under any alternative. However, the use of SILC would be significantly less in operating costs than other alternatives. Even if the costs of development, pilot-test and capital input to handle cash flow were amortized at a rate of $.25 per request over the likely traffic handled by SILC during a five-year period, the costs of use of SILC would still be less than those of other alternatives. We must therefore conclude that SILC is feasible from an economic standpoint.

EVALUATION OF BENEFITS

Evaluation of the benefits to be expected from one or another system for ILL is complicated by the fact that there are different institutions involved, with different interests.

In particular, the borrowing libraries are interested in getting a higher rate of fills with a faster response time; the lending libraries are interested in recovering some of the costs they incur in serving other libraries; both are interested in reducing the costs they incur; sponsoring agencies are interested in improving the overall quality of ILL service and encouraging the sharing of resources, a social objective for which they are willing to pay, to one extent or another, provided there is adequate proof of services provided. It is difficult, if not impossible, to put such an array of differing interests into a single "cost/benefit" evaluation, nor will we attempt to do so. In the following paragraphs, therefore, we will simply define the benefits to be expected from the alternative ILL systems defined earlier and evaluate, in a qualitative way, the extent to which each alternative provides those benefits.

Equity of Funding

The primary benefit to the net lenders of any ILL system is found in the repayment of their costs by either subsidy or a fee. This benefit requires a full accounting system rather than the present system, which accounts for only a portion of the costs associated with requests that involve copying. It is difficult to quantify this benefit in the form of an effectiveness measure, since it is represented by a transfer of costs from one part of the system (the net lenders) to

other parts (either a funding agency or the net borrowers). However, it is clear that it has significance to the maintenance of service, since without it some of the major net lenders could become increasingly reluctant to provide service.

This benefit would obtain equally under any system that provided a capability for full accounting, whether by each library, by a Clearinghouse use of coupons, or by SILC.

Reduction of Costs of Bibliographic Search

The present costs of bibliographic search are the major single element in ILL costs. The reduction of them is therefore a most significant benefit. Any ILL system that provided capability for extensive, easy use of bibliographical centers should result in reductions of those costs. First, a bibliographical center should be more efficient than most of the net borrowers, because of economies of scale and more streamlined processing by trained personnel; this should therefore mean a net savings in comparison with the costs presently incurred by borrowing libraries. Second, the bibliographical center should also be more accurate because it would have available better, more extensive, and more accurate bibliographic resources; this should result in a reduction of the costs presently incurred by the lending libraries.

Improved Fill Rates

Improvement in the fill rates (from the present average of about 65% to 70% has significant value to the borrowing library in its service to its patrons; it has value to the economics of the ILL process as a social resource by reducing the waste of effort that unfilled requests represent. First, the more accurate identification of both materials and sources that the bibliographical center can provide should improve the fill rate; evidence for this comes from our examination of the operation of one state network, in which the use of better bibliographical tools resulted in fill rates of 75% rather than the more typical 65% to 70% (as estimated by Westat). Second, the capability for extensive use of referrals not only through bibliographical centers but to alternative sources should significantly improve the fill rates by ensuring that more potential sources are gotten to.

Of all the alternatives considered, SILC appears to be the one most likely to result in improved fill rates, because of its capability for referral.

Improved Response Times

The response times of the present system of operation are primarily determined by the speed of the U. S. Mail in delivery of material. However, they are adversely affected by the corresponding slow speeds in delivery of (1) mailed requests, (2) mailed responses of non-availability, and (3) mailed referrals. The use of teletype should significantly

improve at least the first two of those and to some extent the third. The use of SILC should significantly improve all three. Therefore, of the alternatives, it would seem that SILC would provide the greatest improvement in response time.

APPENDICES

A. References

B. Glossary

C. Draft Development Program

d. Draft Procedure Manual

APPENDIX A

REFERENCES

1. Association of Research Libraries, A Study of the Characteristics, Costs, and Magnitude of Interlibrary Loans in Academic Libraries. Westport, Conn.: Greenwood Publishing Co., 1972.
2. Thomson, Sarah K., Interlibrary Loan Procedure Manual. Chicago: American Library Association, 1970.
3. Library Network/MEDLARS Technical Bulletin, National Library of Medicine, no. 33 (January 1972) p. 6ff.
4. Williams, Martha E. and Alan K. Stewart, ASIDIC Survey of Information Center Services. Chicago: ASIDIC, June 1972.
5. Kilgour, Frederick G., and others, "The Shared Cataloging System of the Ohio College Library Center", Journal of Library Automation, vol. 5, (September 1972), pp. 157-182.
6. "New England Library Information Network Plans Test of Transferability of Ohio College Library Center System", Recent Developments/CLR, no. 320 (7 January 1972).
7. Jarmy, Imre (ed.), Symbols of American Libraries. Washington, D.C.: Library of Congress, 1969.
8. The National Union Catalog Pre-1956 Imprints; A Cumulative Author List Representing Library of Congress Printed Cards and Title Reported by Other American Libraries Vol. 1 - 1898-1957. London: Mansell, 1968- .

9. Avram, Henriette, and others, The MARC II Format. Washington, D.C.: Library of Congress, January 1968.

10. Lipetz, Ben-Ami, User Requirements in Identifying Desired Works in a Large Library. Yale University Library, 1970, 121 pages (available from ERIC Document Reproduction Service).

11. Networks for Research and Education: Sharing Computer and Information Resources Nationwide. Princeton: EDUCOM, May 1973.

12. NYSILL: New York State Interlibrary Loan Network Manual. Albany: University of the State of New York, May 1970.

13. Delanoy, Diana D. and Carlos A. Cuadra, Directory of Academic Library Consortia. Santa Monica, Calif.: System Development Corp., 1972.

14. Palmour, Vernon E. and Lucy M. Gray, Costs and Effectiveness of Interlibrary Loan and Reference Activities of Resource Libraries in Illinois. Rockville, Md.: Westat, Inc., March 15, 1972.

15. Schieber, William D. and Ralph M. Shoffner, Telefacsimile in Libraries. Berkeley, Calif.: Institute of Library Research, University of California, February 1968.

APPENDIX B

GLOSSARY

Standard definitions are needed for the various terms used in description of inter-library loan activities, whether SILC is involved or not. Rolland Stevens comments this way about terminology and standards used in ten studies he analyzed for the ARL:

> "A second observation is that the findings of these various studies can be compared only roughly and with no exactness. One reason for this is that they have been conducted with varying degree of scientific rigor . . . A further problem limiting the trust that can be put in the comparison of findings is that all of the studies do not report on the same characteristics, and when they purport to, they choose different units of reporting . . . or present different groups of data . . ."

Unfortunately, there do not appear to be any standard definitions of units in ILL work. There are none applying to the kinds of things with which SILC is concerned in Library Statistics: A Handbook of Concepts, Definitions, and Terminology', ALA 1966; nor are there any in the draft model National and Regional Codes of 1968, where this text is used:

> "Definition. Interlibrary loans are transactions in which library materials are made available by one library to another; for the purposes of this code they also include the provision of copies as substitutes for loans of the original materials."

There are a number of professional committees that might consider the problem of standardizing terminology for inter-library loan whether SILC is involved or not:

(1) The ARL ILL Committee
(2) The ALA Interlibrary Cooperation Committee
(3) The ALA Interlibrary Loan Committee
(4) The SLA Research Committee
(5) The SLA Standards Committee

Without attempting to determine the direction that any of these committees might want to take with respect to the problem of terminology for ILL activities, the following are definitions for terms as they are used in this report. In arriving at these definitions, every effort was made to assure that they would be consistent with the usage of Westat in their parallel study of various alternatives for funding ILL services and of the feasibility of a counterpart of the 'National Lending Library of Great Britain.

APPENDIX B

GLOSSARY

accounting (cycle, period) - The time interval from the closing date of an accounting report to the next closing date.

accounting reports - Fiscal or analytical reports which provide a statistical summary of transactions and financial data.

accounting run - The processing required to produce an "accounting report" (q.v.). Usually, the accounting run will produce the accounting reports for a number of libraries and consortia as one "batch". The run will also sort relevant data from the account records summarizing the data for each library and consortium, and print the requisite accounting reports.

Active History File - The set of records, one for each request, in which data about the request is stored from the time it has been either satisfied or resolved until all activity related to the request has ceased and its accounting completed. It includes a "posting", or added entry, for each message or other kind of transaction relating to the request. It serves as a means for checking the status of the request while it is active. Once all activity involving a request has ceased, the corresponding record is removed from the Active History File and transferred to an inactive history file.

application program - A program concerned with the substantive needs of a user of a time-sharing computer system, in contrast to operating system programs which are independent of the needs of a specific customer.

ARL - See Association of Research Libraries

Association of Research Libraries - The organization representing the joint interests of: the larger research libraries of the country, the three great national libraries, the major university libraries, and several of the major public libraries.

automatic referral - The process of transmitting a request to a destination other than that originally specified, based on rules pre-established for the decision and carried out by the SILC system without need for additional manual input.

audit trail - The means by which a sequence of message records provides a complete picture of related financial activity. It is used as a means for verifying that funds were credited and debited to the appropriate account as required.

automatic successive referrals - The process by which the SILC program can transmit a request to alternative sources if the first source is unable to satisfy the request. Typically, it will be based on the identification of alternative sources by the borrowing library at the time of initial request.

batch operation - A mode of computer operation in which a group of transactions is processed as a group, rather than individually. Typically, it involves sorting the transactions and processing the total group with one program and in one machine run.

bibliographic centers - Institutions with union catalogs and other resources needed to determine holdings information and designated as points to which requests may be referred when the borrowing library is unable to identify a lending institution.

billing routines - The programs by which the SILC system produces invoices for each library and consortium on the status of its provision or use of interlibrary loan services.

borrowing cost per request - The total cost incurred by the borrowing institution in identifying material wanted through interlibrary loan, in determining where that material may be available, in requesting the material, in handling the material, and in accounting for the request.

borrowing library - A library desiring to obtain material or other services through interlibrary loan, normally as a service to a member of its own constituency.

borrowing library code - That code in the formatted portion of a message that identifies the library submitting a request to which the message relates (see also "lending library code").

centralized clearinghouse accounting - The process of producing a single accounting record and associated reports for each library and consortium, providing a net balance, rather than separate balances for each borrower-lender pair of institutions.

check digit - A means for the SILC system to verify the accuracy of a request number. Specifically, at the time that a number is first assigned to a request, an additional digit is calculated by a standard algorithm and is made an integral part of the request number. In all subsequent messages relating to that request, the check digit is recalculated and compared with the one input; if any error occurs in input of the request number (or of its check digit), it will usually be detected by a difference between the check digit as input and the one calculated at that time.

closing date (for accounting and billing) - The date after which no messages will be included in the accounting report for which the date is the closing date. To be distinguished from the "statement date", i.e., the date on which the accounting report is produced.

computer-based communication network - A communication system built around the use of a time-sharing computer for control of the flow of messages.

constituency (of library) - The group of individuals or institutions to which a library owes its primary responsibility and which is either its source of funding or the group for which the library's services are provided.

consortium account record - The record maintaineded by SILC for a specific consortium. It includes a complete history of all reports involving any library that is a member of the consortium. It provides an accounting for the requests according to the rules for the consortium.

controlled reference point (regional network) - A designated referral point to which requests will normally be sent for referral to other possible sources, including those which have been designated in the request itself.

copying fee - A charge for services rendered by a library in producing a photocopy (or other form of copy) of requested material. Normally, it will cover the actual costs of the copy; it may include additional costs for personnel time; and in some cases, it may include a basic fixed charge, independent of the number of pages.

decision rules for checking format - The means by which the SILC program can check the bibliographic content of a request in order to determine whether all of the necessary bibliographic elements are present. Also, the comparable, though simpler, means by which the SILC program can determine whether the data required for message switching, referral and accounting are present in a message.

due date - The date, specified by a lending library, when borrowed material must be returned.

failure (system) - An error or set of errors in the time-sharing system caused by a fault in equipment, communications or software (programs). To be distinguished from errors in the data itself or failures due to operational mistakes.

feasibility phase - The state in the development of the SILC system during which estimates are made of its cost of operation, of its effectiveness as a service to libraries, of problems involved in the use of it, and the requirements for management of it.

fee - A charge made for services.

file capacity utilization - The extent to which an assigned disk storage space is used. If it is under-utilized, the operational costs will be greater than they need to be; if it is over-utilized, there may not be sufficient capacity to handle peak-load demands (q.v.).

financial management - The functions associated with the transfer of money from libraries to one another and to the time-sharing system for its services. Also, the functions involved in financing the operations of the SILC manager.

financial record - A record of the status of financial activity for each library and consortium. It will include data concerning payments due and payments made for the library or consortium, both to it and from it.

format for bibliographic description - See MARC II format

formatted section of record - That portion of a message or related records which contains the data necessary for the computer to carry out the operations in message switching, referrals, and accounting. It will include at least the following elements of data: date and time, borrowing library code, lending library code, request code number, check digit, consortium code, and message type.

full-scale system - The operation of SILC after feasibility evaluation, development, and testing have been completed and SILC is being used as an integral part of library interloan practice.

generalized application programs - Programs written so that they do not depend upon the specific characteristics of a situation remaining fixed or invariant from one time to the next. One way of effecting this is through the use of "tables" (see "table-driven application programs").

hardware - The equipment used in a computer system, especially the computer itself and its associated peripheral equipment (disk units, tape units, printer, etc.).

higher level programming language - A language in which application programs can be written in a form reasonably close to the nature of the application and reasonably independent of the specific machine on which they will be run.

ILL - See interlibrary loan

incomplete request - A request which, for one reason or another, does not include all necessary elements of bibliographic data or formatted (control) data.

interlibrary loan (ILL) - The process by which one library borrows materials from another in behalf of its constituents.

interlibrary loan request - See request.

interrogation - A message requesting data about the status of a request, another message, an account, or any other data about the operation of SILC in its handling of user messages by computer.

lending cost per request - The cost incurred by the lending library in verifying the bibliographic description of material requested from it, in determining whether it is available, in responding to the request, in handling or copying the material, and in accounting for the request.

lending library - A library to which a request for material or other services is directed in an interlibrary loan system.

lending library code - That code in the formatted portion of a message that identifies the library to which a request is or was directed (see also "borrowing library code").

liaison (with consortia) - The functions performed by the SILC manager in defining the services that each consortium desires the system to perform, in assuring that the day-to-day operation provides those services, and in assuring that the staff of each library is aware of the procedures that it must use. Includes functions spelled out in the contract between the consortium and the SILC manager.

liaison (with TSS) - The functions performed by the SILC manager in monitoring the daily operation of the time-sharing system, in correcting problems or errors involved in that operation, and in adding to or improving the operation. Includes functions spelled out in the contract between the time-sharing system and the SILC manager.

library account record - The record maintained by SILC for a specific library. It includes a complete history of all messages (requests; responses to requests, both borrowing and lending; referrals; bibliographic services; etc.). It provides an accounting for requests in each of the consortia of which the library is a member, including any resulting in financial commitments implied by those requests under the rules of the consortium to which they relate.

library consortium - A formal affiliation among a group of libraries for the sharing of resources. A library network (q.v.) is an example of a consortium; a group of libraries with a common institutional affiliation is another; a specific contractual agreement for services is a third; etc. In general, then, consortium is the term used for referring to any formal agreement among the parties involved.

library network - Formal organization among libraries for cooperation and sharing of resources, usually with an explicitly hierarchical structure, in which the group as a whole is organized into sub-groups with the expectation that most of the needs of a library will be satisfied within the sub-group of which it is a member.

machine independent application program - See higher level programming languages

MARC II format - The standard machine readable format for recording bibliographic data for communication among libraries. Individual fields of data are identified by "MARC tags" (q.v.), recorded in a header to the record of the data elements themselves.

MARC tags - The means by which fields of data are identified in a MARC record (i.e., in records of bibliographic data in MARC format). Tags are required because a MARC record is essentially variable, with fields occuring in some records and not in others. The tags are themselves recorded in a "header" for each record, identifying those fields which appear in the record itself.

Master Pending Request File - The set of records, one for each request, in which data about the request is stored from the time the request is first received until it is either satisfied or resolved in some other way (e.g., no source has been found). It includes a "posting", or added entry, for each message affecting or relating to the request. Once the request has been resolved, the corresponding record is removed from the Master Pending Request File and transferred to the Active History File (q.v.).

message - A set of data regarded as a "logical unit" and either input to the SILC system or output from it. Messages include requests, communications relating to or involving requests, communications about the status of the SILC system, responses to interrogations, etc.

message handling - Those operations in the time-sharing system involved in receiving a message from a library, storing it, transmitting it to its destination, and keeping track of it during these processes.

message switching - All SILC system operations involved in receiving messages, sorting them into groups according to their destinations, and placing them in the proper output queues.

message type - The code that identifies the kind of message being transmitted. Specific examples include: a request, a positive response, etc.

modularized programs - Programs written to consist of individual parts that function independently of each other, so that any one part can be modified without the necessity of modifying other parts. The individual parts are called "modules".

monitoring - The process in management of SILC needed to assure that the day-to-day operation is performing according to specification.

multiple lending sources - A set of alternate lending libraries which may be identified by the borrowing library at the time of initial request as the basis for "automatic successive referrals" (q.v.) if the first of them gives a negative response.

National Interlibrary Loan Code - The set of procedures and agreements under which one library can borrow material from another in situations not governed by any other, overriding agreement. (Formulated by the American Library Association.)

negative response - A message from a library to which a request has been sent, indicating it cannot, for one reason or another, send the requested material.

net borrower - A library that borrows more often than it lends.

net borrowing fee - The status of the account of a library that borrows more than it lends and thus an indication that the library (or some appropriate funding agency) should provide a payment for the excess of borrowing over lending.

net lender - A library that lends more than it borrows.

net lending credit - The status of the account of a library that lends more than it borrows, and thus an indication that the library should receive a payment.

NLM - See National Library of Medicine

National Library of Medicine (NLM) - National Library of Medicine, 8600 Rockville Pike, Bethesda, Maryland 20014.

notice of receipt - A type of message which may be required from a borrowing library in order to confirm that material which has been sent by the lending library has been received by the borrowing library.

OCLC - The Ohio College Library Center--the service providing on-line access to catalog data in MARC format to the consortium of participating libraries.

on-call input - The process of input in which the data is made available by the sender at a terminal, but not transmitted to the time-sharing system until the system itself calls for the data to be transmitted.

on-line access (for management) - The means by which the SILC manager can determine the current level of activity, utilization of file capacity, and status of requests. It is necessary so that the SILC manager can call for the allocation of additional resources and handle problems that may occur during a day's activity.

on-line input - The normal process of data input to a time-sharing system, in which there is more or less direct communication between the terminal and the computer.

on-line operation - The terminal user and the SILC system work together interactively, opposed to batch operation (q.v.).

overdue notice - A message sent to a borrowing library when material has not been received by a lending library by the date established as the "due date".

peak load demands - The load placed on the SILC system at times of maximum utilization.

pilot test - The stage in the development of SILC during which SILC will be tested by a limited set of libraries for the purposes of assuring that it meets specifications and that any errors in its operation will be found and corrected.

positive response - A message from a lending library indicating that it can and is sending the requested material.

priority message - A message which the sender specifies as "priority" with the intention that it be delivered to the recipient within a defined, short time. An additional fee may be charged for these expedited requests.

priority message response time - The time taken from input of a priority message (q.v.) until receipt of it at the message queue for the destination. In principle, this time should be shorter than for other requests. The SILC specifications have set this time as a maximum of one minute.

program maintenance - Those functions required to assure that the programs used by the time-sharing system perform correctly. Normally, these functions include program modifications to correct errors, to add functions, and to accommodate changes in the operating system of the computer. They also will include changes to improve the efficiency with which the programs carry out their operation.

query - See interrogation

receiving library - The destination to which a message is intended to go.

reference fee - A charge for services rendered by a library in identifying possible sources from which desired material may be obtained or in providing other answers to reference questions.

referral - A message transmitted by the SILC system to a library, other than that originally designated by the request, and containing bibliographic data as input originally or as modified or corrected subsequently.

referral protocols - The set of decision rules by which the SILC system can determine where a request should be sent, in addition to or instead of the "lending library" designated in the message itself.

Regional Medical Library - A library designated by the National Library of Medicine to be the primary point of referral for medical libraries in its region.

renewal - The process by which a "due date" (q.v.) may be changed to a later one.

reporting cycle - The time interval from production of one report of a given kind to the production of the next report of the same kind.

request - A message sent for the purpose of obtaining an inter-library loan service--the lending of material, the copying of material, the provision of a reference service, etc. Normally, it will include bibliographic data describing the request.

request code number - The number assigned to a request at the time of initial input. All subsequent messages relating to that request will include the request number as the means of identifying that relationship. The request number will include a "check digit" (q.v.) as a means of assuring that it will be correctly entered in subsequent messages.

resource assignment - The functions required to assure that the SILC operation has adequate storage space assigned to it for the data which must be on-line. They depend upon knowledge of the traffic, of the available capacity already assigned, and of the increments with which additional capacity may be added. Other resources include tape units, printers, communication lines, etc.

response time - The time between initiation of a kind of operation or message transmission and the completion of it. For example, an interrogation may take ten seconds from input of the question until receipt of the answer.

RML - See regional medical library

sending library - The library sending a message (see also receiving library).

SILC manager (management) - The formal organization (together with its staff and operational procedures) responsible for SILC operation including the contract with the time-sharing system, monitoring of its performance, the contracts with the various library consortia, and the management of finances associated with SILC operation.

SILC - See System for Inter-library Communication

single (source, point) accounting, billing, payments - The processes by which libraries can be compensated for services rendered without the necessity of having each library maintain records of the activity of every other library that it serves or that it is served by. Instead, the SILC system provides each library with a single statement summarizing all activity in which it is involved.

special data items - Items of information required for certain messages but not for all messages. Examples may be codes for identifying multiple referral libraries, charges for specific services, dates due, etc. Such items are placed in the text portion of a message, but marked with tags so they can be identified and processed by SILC.

statement date - The date on which a fiscal accounting report is produced.

store and forward - The operations involved in receiving a message storing it until time for delivery to its destination, sorting it with other messages, and transmitting it to its destination.

subsidy - A payment made by a funding institution to a library for coverage of its costs in providing services to other libraries. The subsidy may be based on an accounting of services rendered; it may be based on a contract.

system failure and recovery - The frequency with which failures occur in time-sharing systems, while relatively low in general, is high enough to require that the time-sharing system include formal procedures for protection of the users and for assistance to them in recovering data which may have been "in process" at the time of a failure. These procedures may specify a time after which no data or processes upon data can be trusted, and thus the time to which users must return for entry of data and initiation of processing.

System for Inter-Library Communication (SILC) - A means for facilitating communications among libraries for the purposes of interlibrary loan and providing statistical reports and an accounting system for the use of interlibrary loan.

system monitoring - Those functions required to assure that the system is operating correctly, that all users are being served as they are supposed to be, and that the system has resources adequate to meet the needs.

system software - Those programs used by a time-sharing computer system for control of its own operation and for providing capabilities of use to a large number of customers.

System Summary Log - A recording of activity, in which each message, as it occurs, is listed in chronological sequence. It is a means of recovering data in the event of a system failure; it can also serve as the basis for statistical data about the activity, such as its distribution by time of day.

table-driven application programs - Programs written to accomodate a variety of specialized situations, without the necessity of re-programming, in which the specific situations are defined to the programs by "tables", or lists of characteristics. The program is able to process the requirements in a new situation simply by referring to the table defining it. An example would be a table defining the charging algorithm for one consortium (which could thus be different for each consortium). Another would be a table giving the rules for deciding when requests would be referred to bibliographical centers and to which ones.

text portion of record - That portion of a message or related records in which the bibliographic data or other substance of the message is recorded. It is distinguished from the "formatted" section which contains the data necessary for message switching, referral, and accounting. (See the definition of "formatted section".)

time-sharing system (TSS) - A computer system designed to serve a number of users effectively simultaneously. A specific example is any one of the commercial services which provide access to such a system through the telephone, many on a nation-wide basis.

traffic and loads, automatic logging and analysis of - The programs by which the SILC system will produce statistical reports concerning the nature of interlibrary loan--distribution by time of day or other time period, by geographic location, by type of message, by type of library, etc.

transaction - Either a filled loan or a filled borrowing (i.e., the activity related to a satisfied request as accounted for in the borrowing or the lending library). A request thus generates two transactions.

TSS - See time-sharing system

TSS independent application programs - Programs which do not depend upon the specific characteristics of the machinery or operating system of the time-sharing system. They thus are programs that, in principle, could be transferred from one system to another without the necessity of being re-written.

validity (bibliographic), automatic checking - The process for identifying that the bibliographic (text) portion of a request is complete and accurate.

validity checking (system errors, message) - The process by which the SILC system confirms that a message is complete and contains no errors and that its own operations in handling a message have been correct.

verification (of bibliographic description) - The process of determining that bibliographic data is complete and accurate.

APPENDIX C

DRAFT DEVELOPMENT PROGRAM

THE ISSUES

The question is, "What is required to bring SILC to an operational status?" To answer that question, we must consider a number of issues:

(1) What are the various phases through which the development should proceed, and what are the results to be expected from each phase?

(2) Within each phase, what are the events (and associated activities) required to meet the objectives of that phase, and what are the interdependencies among them?

(3) What are the estimated requirements, in terms of manpower and other resources, time, and financial support, for each phase?

(4) What is the feasibility of satisfying those requirements?

The approach taken to answering these questions was the following: First, the developmental program was analyzed into phases in a more or less standard manner; the results of that analysis are presented later in this Appendix. Second, the requirements of the development were discussed with a number of organizations capable of performing one or another of the tasks to determine their capability and willingness to do so. In particular, each of the time-sharing systems (as outlined in Section 3 of this report), which were approached in terms of their interest in meeting the operational requirements, were also asked about their willingness to meet some of the tasks in system development. Similarly, each of the organizations

approached about their interest in managing SILC development and operation was also asked about their interest in meeting the requirements of various developmental tasks. Third, the requirements for pilot test were discussed with one existing library consortium with the purpose of determining their interest in serving as the test environment (under the assumption of suitable financial support for their costs in doing so). Finally, the requirements for financial support for various phases have been informally reviewed with various funding agencies to determine the extent to which they fell within their scopes of interests and willingness to consider a formal proposal. The following sub-sections of this Appendix present details of the results obtained.

PHASES

The developmental program for SILC, as it is now visualized, consists of three phases, the first of them being the study for which this is the final report:

(1) Feasibility study and evaluation of alternatives,

(2) Development and pilot test of the accounting, message switching, and referral functions of SILC,

(3) Research on and development of the tie-in to on-line data bases from SILC.

Feasibility. The results of the first phase are embodied in this report, but in summary they provide an evaluation of the feasibility of SILC in terms of (1) technical issues,

(2) operational issues, (3) management issues, and (4) economic issues. As part of those evaluations, various alternatives were considered and to some extent compared for each.

Development and Pilot Test. The purpose of the second phase is to produce an operational service, one that could in principle be used by any group of libraries in the country, and then to test its operation in a working environment in order to identify and correct problems in its operation. The results to be expected are therefore two-fold: (1) an operational system and (2) a basis of experience in its operation. In addition, a tested operations manual and associated procedures and a recommended training program would also result from this phase. These would all be embodied in a final report that presented the detailed specifications of the operational system, to the extent possible the actual operational SILC programs, the statistical results of the pilot test (including the identification of various problems, when they occurred, why they occurred, and how they were corrected), the final operations manual, and the organization and content of the training program.

Phase 2 is predicated on the evaluation, resulting from the Phase 1 study, that the functions of accounting (both statistical and financial), message switching, and referral do not represent technical problems in so far as the programming and operation of the time-sharing system are concerned. In fact, as the discussions reported in Section 3 of this report demonstrated, to a large extent those functions are provided as a part of the operating

system and standard packaged programs of every one of the potential time-sharing system contractors. On the other hand, they do represent significant problems, as we discussed in Section 4 of this report, in so far as library operations and the acceptability of the concept of SILC in the library community are concerned. General acceptance of SILC by the library community as a whole therefore will depend upon the extent to which it has been demonstrated that the operational procedures do not impose an excessive burden on the participating libraries, that the costs are within reasonable limits and that they can be afforded, that the operation of the time-sharing system is reliable, that the SILC programs provide the services they are supposed to, and that the staff of the participating libraries can be trained to operate the system effectively.

Initiation of Phase 2 depends upon a sequence of prior events (all part of the "SILC management" events), essentially external to Phase 2 itself:

(1) The SILC manager must have been identified before the Phase 2 activities are initiated, and Phase 2 will have been contracted for and monitored by the SILC manager.

(2) The time-sharing computer system contractor must have been selected.

(3) An appropriate group of libraries must have accepted the responsibility of serving as the test bed for the pilot-test of SILC.

(4) The costs of the development of SILC, the costs of SILC operation during the pilot test, and the costs of the pilot-test consortium must all be funded by some appropriate funding agency.

Phase 2 has been divided into three sub-phases designed to deal with functions which can be separated from each other and developed and tested independently: (2A) accounting, (2B) message switching, and (2C) referral.

The purpose of a pilot test, then, is to provide a means of evaluating the manner in which SILC and the time-sharing system it uses will function and of evaluating its operational effectiveness and cost. The following are a set of potential criteria to be used in any such pilot test, grouped into three categories: (1) costs, (2) times, and (3) effectiveness:

(1) Costs, Especially in Comparison with Present Costs

--Personnel costs in each of the levels of staff and functional area--bibliographic searching, maintenance of records, accounting

--Equipment costs--terminals, supplies, etc.

--Training costs

--Management costs

(2) Times, Especially in Comparison with Present Times

--Preparation time for input to system, including bibliographic search, key-boarding, and communication with the system

--Communication time for delivery of message and receipt of replies

--Referral times--follow-up after initial failures, bibliographic center

--Delivery of materials

(3) Effectiveness

--Ease of use of the system by the staff

--Acceptability to the staff

--Acceptability to the constituency served

Tie-in between SILC and On-line Data Bases. The purpose of Phase 3 is to identify the problems involved in tying SILC to various on-line bibliographic data bases for the purpose of access to them and for use of them in bibliographic search. The results of this phase should be (1) the identification of the existing and future on-line data bases to which tie-in would be desirable, (2) the functional specification of the methods for tie-in and use of them, (3) development of an experimental tie-in to a selected set of them, (4) development of a full-scale capability to tie-in to the full range of them.

Phase 3 is predicated on an evaluation, resulting from the Phase 1 study, that the functions in access to and use of on-line data bases represent significant technical problems, the solution of which will require extensive study, development, and experimentation. Furthermore, whereas the functions of concern in Phase 2 are well established, already in large part embodied in the services of the time-sharing systems and unlikely to change significantly as the technology changes, those involved in the use of on-line data bases are hardly defined much less established, and are likely to change significantly as the technology of computer-based networks develops over the next five to ten years. As a result, Phase 3 activities are directed more toward analysis and research than toward development, test, and operation.

Phase 3, like Phase 2, is predicated on a sequence of prior events (all included among the "SILC manager" events), essentially external to Phase 3 itself:

(1) The SILC manager must have been identified before the Phase 3 activities are initiated and, while those activities may be independently contracted for, they will be monitored by the SILC manager and will include consideration of input from the development, pilot-test, and operation of SILC as an integral part of the study.

(2) The costs of Phase 3 activities must all be funded by some appropriate funding agency.

SCHEDULE OF EVENTS

The events required to meet the objectives of the developmental program can be classified into the following groups:

(1) Events associated with management of the program
(2) Events associated with Phase 2
(3) Events associated with Phase 3

The lists of these events (Figures C-1 to C-8) are presented at the end of this Appendix.

Management Events. Figure C-1 provides a listing of these events, and Figure C-2 provides a schematic of their inter-relationships.

Phase 2 Events. Figures C-3, C-4, C-5, and C-6 provide listings of these events, and Figure C-7 provides a schematic of their inter-relationships. The activities in Phase 2 will involve the following technical steps for each of the three functional modules:

(1) Review of system specifications
(2) Programming and de-bugging
(3) Procedural development and training
(4) Acquisition of terminal equipment (where necessary)
(5) Test
(6) Evaluation
(7) Modification

The following paragraphs discuss each of these in more detail.

The initial task will be the preparation of a set of detailed specifications based on the information provided by SILC feasibility study report with the guidance of the advisory group representing the libraries and consortium in the pilot-test group for SILC. Plans, procedures and evaluation guidelines must be developed for the operation of the pilot-test to demonstrate the validity of the system design and to refine specifications and procedures in the light of practical experience. Computer programs, terminal equipment, and time-sharing services must be procured for the pilot project. All personnel involved must be trained in the operation of the system during the project.

Once the TSS has been chosen, system specifications must be reviewed with respect to:

(a) system loads and timing for total traffic, peak loads, peak periods and times, peak load response ratio, average and peak core requirements, CPU time estimates, etc.

(b) file sizes and timing for file access and file processing.

(c) operation under degraded status, degraded operations, and downtime of the TSS service

(d) printing requirements for high-speed printers and on-line and off-line terminals.

(e) terminal requirements, availability, and reliability

(f) data transmission and scheduling--how the data will enter and leave the TSS and SILC systems and when these actions will occur--What priorities does the TSS service assign when conflicts occur?

(g) message types, formats, logging, routing, and scheduling--What forms will messages take? How will each type be logged and routed through the system? How will invalid messages be treated? What messages have priorities and how will each be handled?

(h) system configuration--What is the line configuration? What types of lines will be used and what are their rates? Where will the terminals be and how many terminals will there be?

(i) system monitoring and controls--How do the TSS programs operate? What file management controls and processing steps are required? How is the user ID assigned and how does it function in relation to access methods, etc.? What audit trails must be devised? What SILC system programs are required and how will they interface with the TSS programs?

(j) system timing, line and task contention, intercept routines--how will system processing be timed? How are charges computed? How will the TSS resolve conflicts in lines and tasks? How will the SILC manager's terminals interface with the TSS for system messages and intercepts?

(k) backup, file reconstruction, restart and recovery--What file protection and backup does the TSS provide? What protection and backup must SILC program? What procedures will the TSS use to restart and recover when the system goes down?

(l) requirements superimposed by existing networks--Do existing library networks and consortia have any special requirements affecting the design of the SILC or TSS programs? Are there any conflicts between networks, consortia or SILC users?

(m) interfaces for new services--What provisions should be made for future services and additional institutions? What are the maximum limits on lines, terminals, program sizes, file sizes, I/O units, etc.?

Programming and program testing covers the following:

(1) File Organization. Planning the file organization includes such tasks as: (a) establishing the file specifications; (b) determining file type and access method; (c) deciding on addressing techniques and algorithms; (d) defining file update and maintenance procedures; (e) devising file security measures; (f) indicating file overflow procedures; and (g) creating the files.

(2) Programming Specifications. Once system specifications and design are known, the programmer can set up specifications for the programs. The specifications cover a number of activities including:

(a) establishing program design--How much modularization is desirable? In what order will the programs be written? How can economies be realized without loss of service?

(b) choosing the language or languages in which the programs will be written.

(c) formulating the program philosophy--What will each program do and how? How will the programs interface with the TSS?

(d) evaluating and selecting programs from available software--What commercial programs and utilities could be used within SILC? Will any changes be required?

(e) selecting TSS software--Will any changes in TSS software programs be needed to accommodate SILC requirements? Will the TSS service make the changes, if any?

(f) defining automatic coding requirements--What codes must be added to records for control, audit trails, or backup (e.g., batch numbers, dates, transaction codes, status indicators, etc.)?

(g) planning for program modifications--How will projected enhancements be incorporated? How can the programs be written for easy and economical changes when required during development, testing and operation? What debugging and trace routines should be written?

(h) establishing system program specifications--What SILC monitoring and supervisory programs are needed? What TSS system programs will be used? What functions should be included in the monitoring and supervisory programs? What functions should be written as separate programs or subroutines? How will SILC storage be allocated for tables, indices, programs, files, etc.?

(i) selecting and/or specifying test programs--Can available programs be used to test the system? What changes in programs or special single-thread and multi-thread programs will be needed for pre-installation testing and field testing prior to achieving system operational status?

(j) formulating backup and recovery program specifications and procedures.

(k) specifying program security measures.

(l) defining user program specifications--What edit programs are needed? Will TSS edit programs suffice? What other programs or routines will participating libraries use?

(m) planning training program specifications--What programs will be required to train the staff of test installations and new participants? What training aids will be used to train new staff after operational status is achieved?

(n) estimating program sizes--How much core and storage will each program require?

(o) scheduling system testing and review--Whose equipment will be used for testing batch operations? What hours are available? How many hours of test will be needed and when?

(3) Programming, coding, and implementing the SILC system should proceed in the following order:

(a) adapt or code system programs, test and debug.

(b) code monitoring programs, test and debug.

(c) code user programs, test and debug.

(d) perform program simulation.

(e) select utilities.

(f) select and/or code test programs, debug.

(g) code update and maintenance programs, debug.

(h) create training programs and test data for single- and multi-thread procedures for the first installations, later installations and operational status staff turnover.

(i) incorporate in all programs the features needed to expand the system from test installations to full operational status. How many lines and terminals can be added without changing programs?

(j) field test and debug the programs in batch mode with test data.

(k) field test and debug the programs on-line using test data.

(l) test and debug all programs in batch mode with actual data.

(m) test and debug all programs on-line using actual data.

(n) make any required modifications and additions, test and debug.

Three major categories of tasks are included in the pilot-test itself. The basic Phase 2 pilot-test procedures will be followed every time a new library is added to SILC, even after full operational status is achieved. The three major categories are pre-installation planning, system testing, and the test installations.

(1) Pre-Installation Planning. A number of decisions must be made and actions taken before the first field tests are conducted, such as:

(a) system modifications for testing--what changes to the full system must be made during testing? How and when will these changes be made and when will the system be restored to its designed status?

(b) defining pilot operations--who will perform the pilot tests? What procedures will be followed?

(c) specifying cut-over procedures and programs--When and how will cut-over from old systems for inter-library lending to SILC occur?

(d) selecting parallel operations--How long should libraries continue their manual system after they join SILC? What manual and SILC procedures should run in parallel?

(e) scheduling implementation--When will each pre-installation task be performed? How long does each task take? When will each library be added to SILC?

(f) defining training procedures--Who will conduct the training? How much training is necessary at each installation? How will new personnel be trained after installation of SILC?

(g) setting up expansion procedures--How will new libraries be added to SILC?

(h) establishing single and multi-thread test procedures for batch and teleprocessing operations.

(2) System Testing. System testing will be conducted in the following sequence:

(a) simulation tests

(b) program interfaces.

(c) validity and security checking.

(d) backup programs and procedures.

(e) file update and maintenance programs and procedures.

(f) internal or "in-house" checking of the total integrated system.

(g) field testing--batch mode.

(h) field testing--teleprocessing mode--single-thread.

(i) field testing--teleprocessing mode--multi-thread.

(3) Pilot-Test Installations. The procedures to be followed and the tasks to be performed during pilot-test of SILC will have been defined and scheduled during pre-installation planning. Of course, some adjustments to plans will have to be made in view of unanticipated situation. Special attention should be given to the following events or activities:

(a) user education and training.

(b) first installation--batch operations.

(c) other test installations--batch operations.

(d) teleprocessing operations.

(e) cut-over operations.

(f) parallel operations.

(g) analysis of error statistics and problems.

What errors are occurring frequently? Which errors are causing the system to fail or degrade? Which errors are due to system faults and which to lack of training and experience? What human factors were overlooked in the design and/or implementation of SILC? What corrections can be made to training procedures, user manuals, operating procedures, and the system?

(h) field modifications.

(i) traffic analysis--Using the System Log and the System Summary Log, what is the traffic? What trends are discernible?

(j) analysis of system resource utilization--Are all of SILC's resources being used effectively?

(k) saturation and reliability analysis--Are teletype terminals sufficient in number to carry projected loads? Do the users have ready access to the system? Are response time and turnaround requirements being met? What terminal, line and other hardware maintenance problems are arising? How much downtime is occurring within SILC and at each library?

(l) reviewing SILC's operations with the TSS operators and managers--Is SILC functioning smoothly from the TSS operator's viewpoint? Are communications between SILC and the TSS adequate and efficient? What factors need attention from the TSS management's viewpoint?

(m) status meeting--ARL and SILC will meet to review SILC's functions, operations and procedures before expanding services or adding the remaining ARL libraries.

SILC, as far as Phase 2 is concerned, will be able to move into full operational status when all statistical and accounting message switching and referral, and maintenance and system functions are working efficiently. Maintaining the system and adding consortia of libraries are the two areas of subsequent work to make SILC fully operational. Maintenance starts with the first program and continues as long as the system is in operation. Libraries could be added by consortia as soon as the pilot-test installations are operating effectively.

(1) Maintenance. Maintenance pertains to the programs, and the TSS system as a whole, including the monitoring, statistical and backup functions. Maintenance procedures should be reviewed periodically and a thorough review scheduled just before adding a new group of libraries or new services.

(2) Add Remaining Consortia. Many of the same steps followed while installing SILC in the pilot-test institutions are followed each time a library or group of libraries is added to SILC. Expansion procedures include:

(a) contract negotiations with the new libraries

(b) user training

(c) practice problems using test data files

(d) defining some standard procedure for handling unusual conditions

(e) user review of the system

Phase 3 Events. The purpose of Phase 3 is to study and develop the communications facilities and programming requirements for tie-in between SILC, with its account and message switching functions, to on-line data bases (OLDB). To establish the requirements for the network, some of the more important questions which must be answered are:

(1) What is the amount and time distribution of the message traffic?

(2) How many On-Line Data Bases are there and what are their distances from the TSS?

(3) What level of errors can be tolerated?

(4) What types of systems and communications facilities exist at the various OLDB's? At the TSS?

(5) Is it feasible to employ the communications facilities or communications network of the TSS to communicate with the OLDB's

(6) What software development will be required for the TSS and the various OLDB's if various communications network approaches are selected?

(7) How much time will be involved for the design and implementation?

(8) Finally, how much will the several approaches cost and are they economically feasible?

It is suggested that the Phase 3 effort be divided into the following steps:

(1) An analysis of the system requirements.

(2) An evaluation of alternative network configurations.

(3) Selection of a network configuration.

(4) Preparation of specifications for the network and the software required at the TSS and the OLDB's.

(5) Design of the software.

(6) Testing of the system.

The criteria which should be used in the evaluation of the alternative network configurations include the following:

(1) Availability of the Network (Operational Date).

(2) Performance (Error rate).

(3) Reliability (Backup).

(4) Expansion Capability.

(5) Software Requirements.

(6) Cost.

Having evaluated the alternative network configurations, the selection of a final network configuration will undoubtedly require certain compromises. Because of the proposed communications networks which are scheduled to become operational within a few years, it is very possible that some interim solution may be decided upon. However, once the network configuration or combination of configurations has been selected, the detailed effort to specify protocols and coding can proceed.

The specifications for the network include the definition of the protocols which are to be employed, coding for transmission, and error recovery. From these specifications, the specifications for the software required at the TSS and the OLDB's can be developed.

It is desirable to establish at least two levels of protocols. The first is the data-link protocol which is used to effect data transmission, error detection, retransmission, etc. The second is a higher level protocol which may be used to effect the transmission of messages, files, etc. If a packet-switching type of network is employed, the data-link protocol will probably not be required since the network itself will take over this function. Some type of interface protocol will then be required to interface the TSS and the OLDB's to the packet-switching network.

Whatever communications protocols are chosen, they should be designed to permit error recovery. For the packet-switching type of network, recovery from data transmission errors should be taken care of by the network itself. Even so, it would be desirable for the higher-level protocol to include an error recovery capability to facilitate recovery from computer system failures and similar events.

The error control scheme and the associated communications protocols should, if possible, be designed for eventual compatibility with either a packet-switching type of network or with the more conventional dial and leased-line networks.

ESTIMATED SCHEDULE AND COST

The following Figures C-1 to C-8 provide a tentative schedule for the subsequent Phases 2 and 3 in development of SILC and Figure C-9 provides a cost estimate. The schedule and cost estimate cover the list of tasks identified earlier

in this section. The schedule and cost estimate are based on our "best guess" of the time and effort required to implement the system described in Section 2 of this report and cannot be considered firm until evaluation of formal proposals from potential contractors. The cost estimate includes the cost of programming for SILC, although this could be done by a number of different organizations in order to arrive at an estimate that includes the total development cost.

FIGURE C-1

Activities Related to SILC Management

1. Evaluation of the results of Phase 1
2. Discussion with, evaluation of, and choice of one from the set of potential SILC managers
3. Choice of Phase 2 pilot-test environment
4. Acquisition of key staff by manager for management of development
5. Preparation of proposal for funding of Phase 2, Development and Pilot Test
6. Evaluation of proposal by funding agencies
7. Administrative processing by funding agency
8. Monitoring of Phase 2 development and pilot-test

8A. Phase 2 development and pilot test (see Figure 3-3)

9. Evaluation of Phase 2 results
10. Initiation of program for communication to the library community
11. Hire director of training program
12. Development and production of training materials
13. Development and production of operations manual
14. Initiation of training program for library community
15. Development of standard contracts with library groups, networks, and consortia
16. Monitoring of operation of SILC (accounting, message-switching, and referral)
17. Preparation of proposal for funding of Phase 3, Research and Development of Tie-in to On-line Data Bases

Figure C-1 (continued)

18. Discussion with potential sub-contractor for Phase 3
19. Development of Proposal for funding of Phase 3
20. Evaluation of Proposal by funding agency
21. Administrative processing by funding agency
22. Monitoring of Phase 3
23. Evaluation of Phase 3

FIGURE C-2

Management Events (Associated with Completion of Activities)

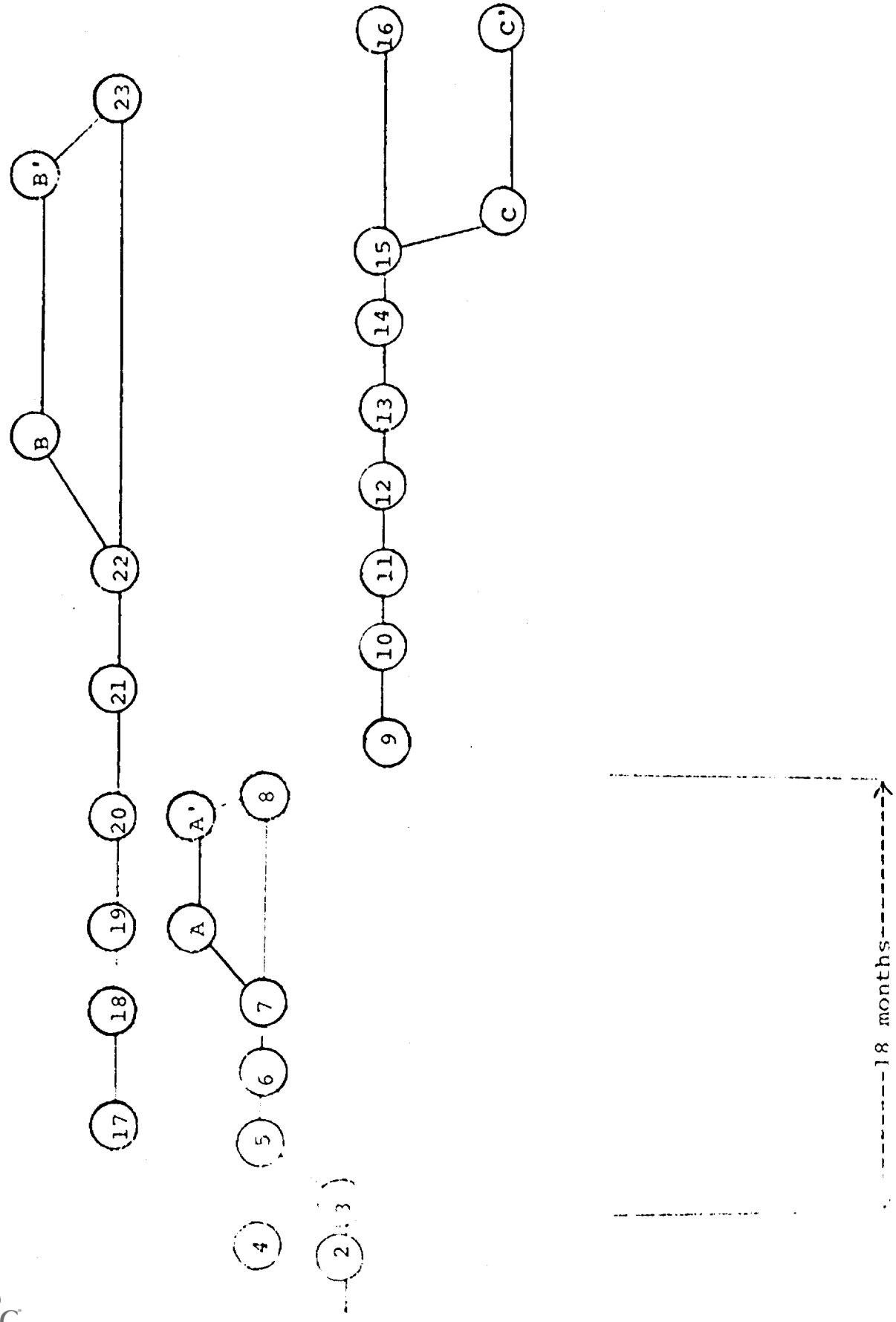


FIGURE C-3

Activities Related to Phase 2 (Management)

1. Development of specifications for system development contractor
2. Development of RFP for system development contractor
3. Identification of potential system development contractors
4. Submission of RFP to potential system development contractors
5. Preparation of proposals by potential system development contractors
6. Evaluation of proposal from potential system development contractors
7. Contract negotiation with potential or chosen system development contractor
8. Development of formal specification for inclusion in RFPs to potential Time-Sharing system contractors
9. Submission of RFP to potential TSS contractors
10. Preparation of proposals by potential TSS contractors
11. Evaluation of proposals from potential TSS contractors
12. Contract negotiation with potential or chosen TSS contractor
13. Development of TSS programs
14. Development of pilot-test evaluation criteria
15. Development of pilot-test operations manual
16. Development of pilot-test training procedures
17. Installation of terminals (where necessary)
18. Distribution of manuals, training material, forms, etc.

FIGURE C-4

Activities Related to Phase 2-A

1. Identification of major net lenders in pilot-test consortium (PTC)
2. Identification and analysis of their accounting requirements and existing procedures
3. Detailed specification of statistical and accounting function of SILC pilot-test
4. Programming of statistical and accounting function of SILC pilot-test
5. Development of procedure manual for SILC pilot-test (accounting and statistical functions)
6. Specification of evaluation criteria for evaluation of SILC operation on accounting and statistical function
7. Check-out and de-bugging of program and procedures for pilot-test of SILC accounting and statistical functions
8. Training of operating staff in major net lenders in
9. Pilot-test operation of statistical and accounting functions
10. Evaluation of Phase 2-A
11. Decision concerning extension of statistical and accounting functions as an operational service to PTC and to other libraries or library groups

FIGURE C-5

Activities Related to Phase 2-B

1. Identification of entire set of participating libraries in PTC
2. Identification of PTC lending policies
3. Detailed specification of message switching functions of pilot-test
4. Programming of message switching functions of pilot-test
5. Establishing identifying codes for PTC libraries
6. Development of procedure manual for message switching in pilot-test
7. Specification of evaluation criteria for evaluation of SILC operation in message switching
8. Training of operating staff in PTC libraries
9. Pilot-test of message switching function of SILC
10. Evaluation of Phase 2-B pilot-test of SILC
11. Decision concerning extension of message switching functions as an operational service to PTC libraries and to other libraries or library groups

FIGURE C-6

Activities Related to Phase 2-C

1. Identification of PTC referral protocols
2. Detailed specification of referral function of pilot-test
3. Programming of referral functions of pilot-test
4. Development of procedure manual for referral in pilot-test
5. Specification of evaluation criteria for evaluation of referral
6. Training of operating staff in PTC libraries
7. Pilot-test of referral functions of SILC
8. Evaluation of Phase 2-C pilot-test of SILC
9. Decision concerning extension of referral functions of SILC as an operational service to PTC libraries and to other libraries or library groups

FIGURE C-7

Estimated Phase 2 Schedule

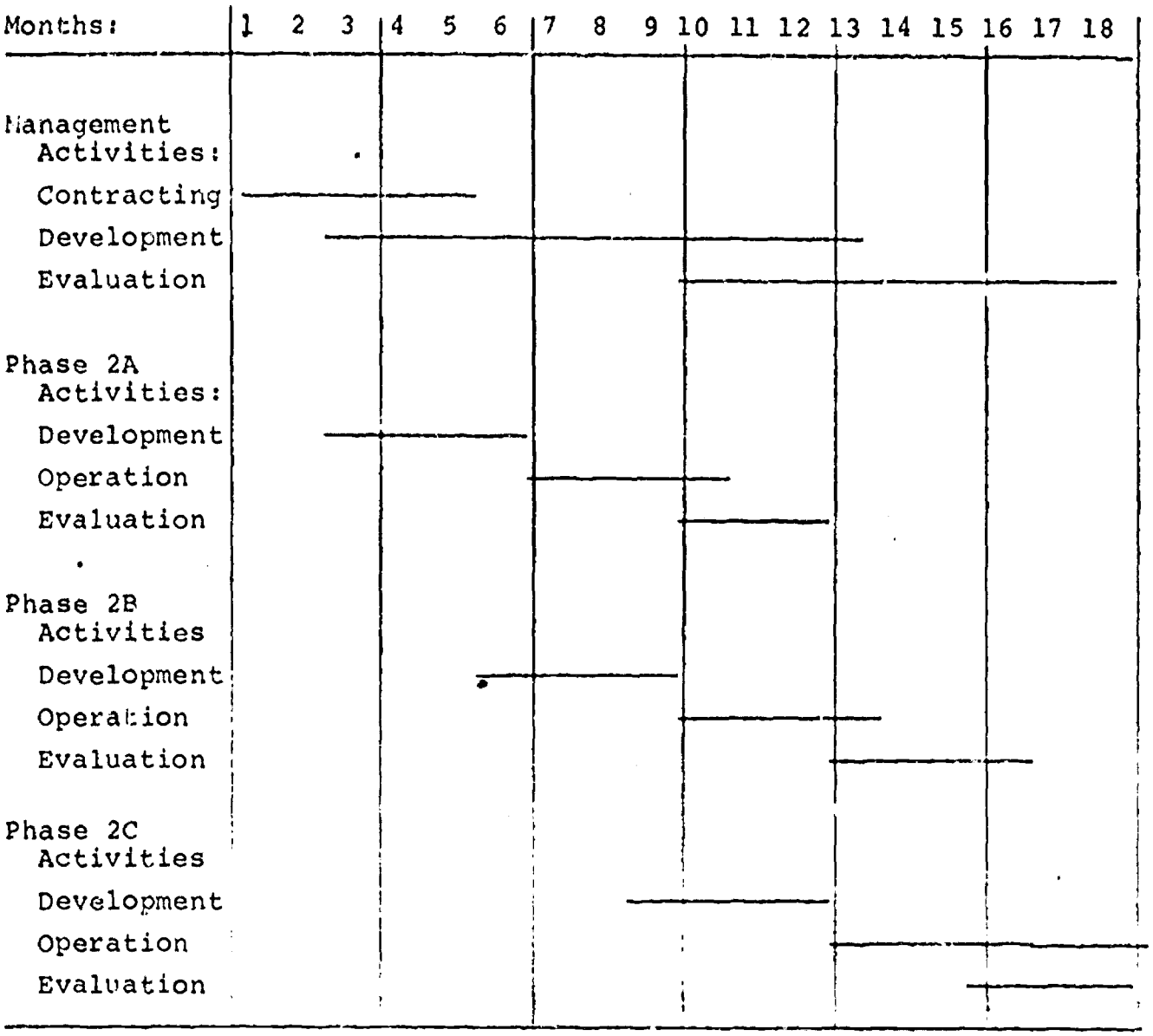


FIGURE C-8

Activities Related to Phase 3

1. Identification of present and likely future on-line data bases
2. Characterization of the operational features of each
3. Evaluation of expected traffic loan on each data base
4. Evaluation of effects of likely error rates in communication
5. Evaluation of alternative network configurations for tie-in to SILC
6. Definition of network protocols
7. Definition of error recovery procedures
8. Evaluation of geographic distribution of data bases
9. Definition of alternative network configurations
10. Definition of SILC-network tie-in
11. Definition of alternative communication facilities
12. Definition of requirements for software development

The following Phase 3 schedule is presented assuming that the design of the communications network to link the TSS with the OLDB's is started about September 1974

September 1974----------Start Design

3 months

January 1975----------Complete study of TSS and OLDB facilities and the TSS communications network.

3 months

April 1975----------Complete Initial System Design and the software specifications for TSS and OLDB's

9 months

January 1976----------Complete software for the TSS and the initial OLDB's and perform initial testing.

6 months

June 1976----------Complete testing of the TSS and initial OLDB's

12 months

June 1977----------Complete phase-in of remaining OLDB's

FIGURE C-9

Phase 2 Cost Estimate

Task		Amount
Administration (SILC Manager)		$150,000
Programming		150,000
Pilot-test (SILC Manager)		
Planning	10,000	
Procedures development	15,000	
Training	45,000	
Test & evaluation	20,000	
		90,000
Time-sharing system costs		30,000
Participating library costs		
Terminals (15 for 12 mos. @ $100/mo.)	18,000	
Phase 2A Personnel (1 Library, 6 mos.)	10,000	
Phase 2B Personnel (15 Libr'y, 6 mos.)	50,000	
Phase 2C Personnel (15 Libr'y, 6 mos.)	50,000	
		128,000
Travel and other expenses		30,000
		$578,000

APPENDIX D

DRAFT PROCEDURE MANUAL

Marion Rice

Sarah K. Thomson

PREFACE

This prototype edition of the SILC Procedure Manual has as its purpose the delineation of basic processes required of inter-library loan librarians in the interface with the SILC system. Since this version is an outgrowth of the feasibility study, and many basic decisions must be reserved for the implementation phase, many of the routines outlined are deliberately generalized, and others are hypothetical. For example: the dial up protocol will vary depending upon the time-sharing system to whom the contract is awarded, but a hypothetical example has been included.

Every attempt has been made to keep the routines as simple as possible, and to have them consistent wherever possible with current practice, especially as set forth in the ALA Interlibrary Loan Procedure Manual, Warren Bird's Teletypewriter Exchange System for Interlibrary Communication, and KCMRML's Procedure (1-6). We are indebted to the ALA Publishing Department, Rights and Permissions section, to Warren Bird, and to Vern Pings for permission to adapt sections of their publications for use in this Manual. Where it has been necessary to depart from these established practices because of the requirements of the SILC system, these departures have been clearly emphasized.

Major changes involve:

(1) dial up procedure

(2) format of identification and other portions of record

(3) error recovery procedure

(4) potential for libraries using the computer's output capability to simplify, if they wish to do so, their own internal record keeping

In selecting the recommended option from the available alternatives, consideration has been given to the optimum trade-off between input costs and the additional benefits that the computer can provide.

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SILC FEATURES AND FUNCTIONS

The System for Interlibrary Communication (SILC) uses a national computer time-sharing system for message switching, automatic referral, and accounting for the transactions involved in inter-library loan (and other inter-library communication).

SILC will facilitate the communication of inter-library loan requests and related messages, monitor the traffic in order to produce statistical reports and centralized clearing-house accounting for fees, and eventually to provide access to on-line data bases.

SILC will permit users to submit requests by teletype terminal to the SILC system at any time, The computer network will then process and store the requests and forward them to the lending libraries designated by the borrowers. Lending libraries would receive these requests and send their responses to the computer by teletype terminal. SILC would transfer the responses to borrowing libraries and maintain all statistical and accounting records automatically.

In addition to facilitating communication of inter-library loan requests, the system embodies the following features:

(1) Automatic logging and analysis of logging and analysis of traffic and loads.

(2) Automatic statistical summary, accounting, and billing. Each participant would receive at stated intervals reports which could cover data on services used and provided, charges such as net borrowing fee or net lending credit, copying fees, and reference fees for bibliographic center referrals.

(3) Automatic referral to alternative libraries either as designated by the ILL request or as determined through controlled reference points in regional networks.

(4) Automatic checking of completeness of the formatted portion with its coding, and of the text portion for inclusion of all appropriate bibliographic elements. Incomplete requests will be rerouted to the borrowing library for correction, thus reducing the load on the lending library, and putting the obligation for completeness on the borrowing library.

(5) Referral of qualified incomplete requests to state, regional, or national bibliographic centers.

These functions are illustrated in Figure D-1.

FIGURE D-1

Schematic of SILC Services

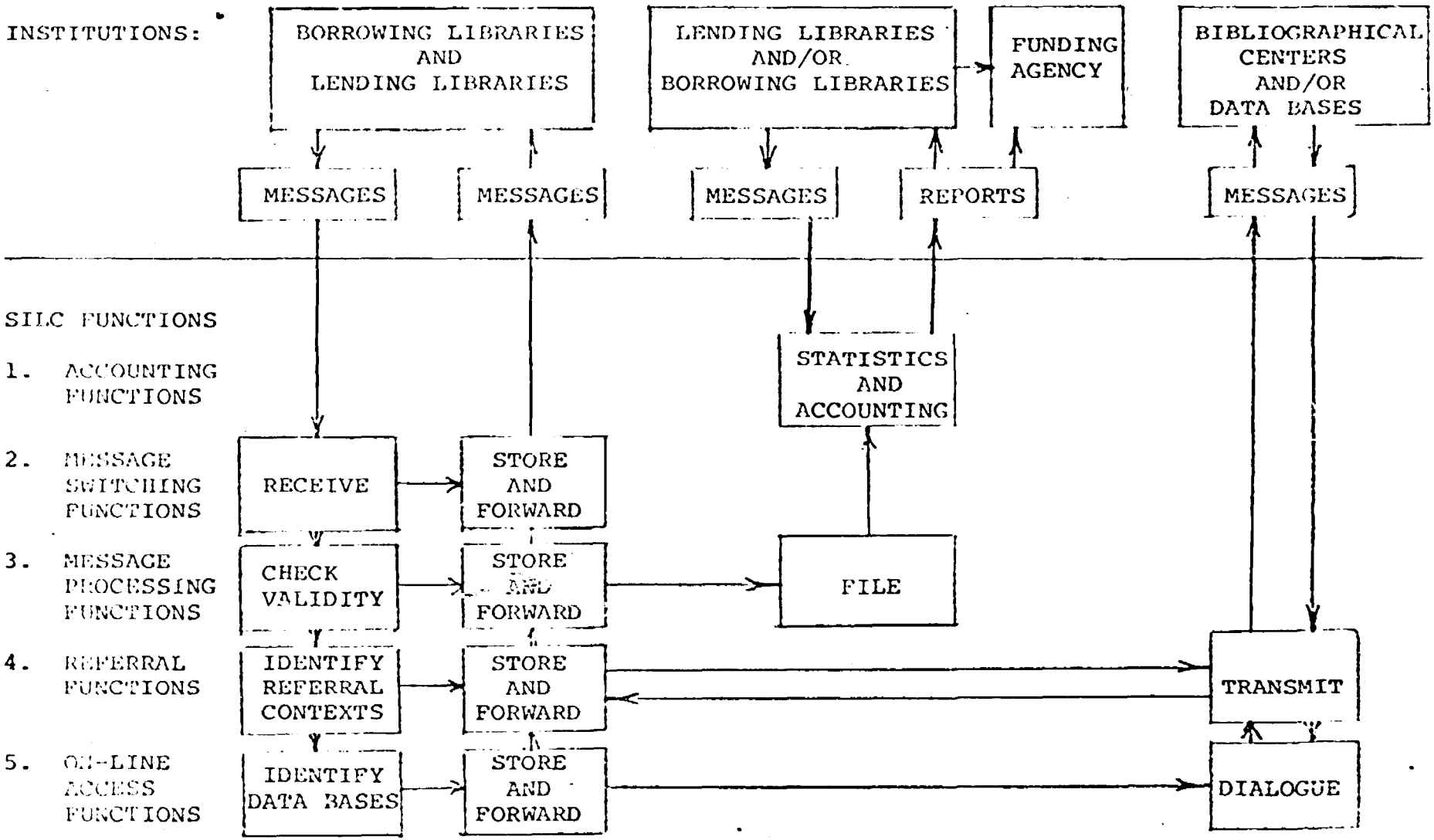


FIGURE D-1 (continued)

LIBRARY AS A BORROWER

SENDS	RECEIVES
Original Requests	Request Filled Notices
Corrections to Requests	Not Available Notices
Acknowledgments of Loans	Invalid Request Notices
Renewal Requests	Bibliographic Corrections
Acknowledgments of Renewals	Referral Notices
Loan Return Notices	Overdue Notices
Tracer Requests	Acknowledgments of Returns
	Tracer Requests

LIBRARY AS A LENDER

SENDS	RECEIVES
Request Filled Notices	Original Requests
Not Available Notices	Corrections to Requests
Bibliographic Corrections	Acknowledgments of Loan Receipts
Acknowledgments of Returns	Renewal Requests
Tracer Requests	Acknowledgments of Renewals
	Loan Return Notices
	Tracer Requests

BIBLIOGRAPHIC CENTER

SENDS	RECEIVES
Location Notices	Search Unfilled Requests
Bibliographic Corrections	
Not Available Notices	

BORROWING LIBRARY:

TRANSMITTING REQUESTS FOR

LOANS OR PHOTOCOPIES

The borrowing library transmits its requests for a loan or a photocopy via a terminal to SILC for processing by the computer.

Each request consists of two parts: a formatted part and a text (bibliographic) section. The formatted section, shown in Figure D-2, will identify the SILC record in approximately 60 characters or two lines:

First Line:

Format Type Code. This code will identify variations in format and function for the SILC system. At present, there is one format--the one described here, so the system assumes Format number 1. Tentatively (preliminary draft only) some of the SILC functions described by this code might be N: new request, C: correction to a request, K: cancel request, P: post to request, Z: format variation.

Message Date and Time. Generated by the computer and added.

Request Code Number. This number is used to identify the code in all subsequent processing and to associate messages that refer to the same request. The number is assigned by the library, using whatever sequencing or other coding may be appropriate to its needs, provided that unique numbers are assigned to each request. (The SILC system will augment the library assigned number with an added, error-checking digit to ensure that messages referring to a request are properly identified). Type this 6-character code.

FIGURE D-2
FORMATTED SECTION OF MESSAGES

KEYING (TOTAL CHARACTERS: 43)											
	FORMAT TYPE	DATE & TIME	REQUEST CODE #	REQUEST DATE	BORROWING LIBRARY	CONSORTIUM CODE #	LENDING LIBRARY	MESSAGE TYPE	MATERIAL FORMAT	DEWEY EQUIV.	CONTINUATION INDICATOR
SAMPLE	N	ADDED BY SYSTEM	104617	30/11/73	ADDED BY SYSTEM	201	N:JP or NjP or 2865	ILLRQ	1	410	X
# CHAR.	1		6	8		3	15	5	1	3	1

DISK AND TAPE RECORD (TOTAL CHARACTERS: 47)											
	FORMAT TYPE	DATE & TIME	REQUEST CODE #	REQUEST DATE	BORROWING LIBRARY	CONSORTIUM CODE #	LENDING LIBRARY	MESSAGE TYPE	MATERIAL FORMAT	DEWEY EQUIV.	CONTINUATION INDICATOR
SAMPLE	N	301173153045	1046176	301173	1463	201	2865	ILLRQ	1	410	X
# CHAR.	1	12	7	6	4	3	4	5	1	3	1

PRINT OUT (TOTAL CHARACTERS: 77)											
	FORMAT TYPE	DATE & TIME	REQUEST CODE #	REQUEST DATE	BORROWING LIBRARY	CONSORTIUM CODE #	LENDING LIBRARY	MESSAGE TYPE	MATERIAL FORMAT	DEWEY EQUIV.	CONTINUATION INDICATOR
SAMPLE	N	30/11/73 15:30:45	104617-6	30/11/73	N:JP:A:RB or NjParB or 1463	201	N:JP or NjP or 2865	ILLRQ	1	410	X
# CHAR.	1	17	8	8	15	3	15	5	1	3	1

(Request Date). Added to subsequent reports and messages, to identify original request date. Type 6 characters.

Borrowing Library Code. Commonly used codes from the National Union Catalog's Symbols of American Libraries will be used, with a colon added before each lower case letter if the terminal has only upper case font. For example: NjParB would be transmitted as N:JP:A:RB. Type this code. It may contain up to 15 characters. If the terminal being used has upper and lower case letters, the colons would be unnecessary. A four-digit library code developed for SILC internal use will be distributed to participating libraries and may be used instead of the NUC code at the library's discretion. Note that it will no longer be necessary to key in the names and addresses of the borrowing and lending libraries. These will be stored in the computer and automatically added as part of out-put. A library will not have to enter its own code in messages, since the computer can supply the code from the library's ID in the sign-on procedure.

Consortium Code. The borrowing library will identify from a code list of participating consortia, the one within which this requisition is to be handled. Type 3 characters.

Lending Library Code. From Symbols of American Libraries, arranged as above, or the SILC 4-digit code. Since referral may necessitate that the borrowing library specify several possible lending libraries, in case the item is not available

in the first library tried, this field may be a repeating one. The second and later library codes will be entered as "special data items" (q.v.). This code may contain 15 characters and must be typed in all messages.
When a consortium has a locator service or affiliated bibliographic center, requests can be routed for location searching by placing, in the lending library position, the code: "NOLOCATIONFOUND".

Second Line:

Message Type. Type this 1 to 5 character code. (In this draft manual, it is not possible to state what these codes may be, although the present teletype codes might be used. In the final operations manual, a table of "Message Type Codes" would be inserted at this point. To illustrate it, the following is a list of representative codes:

CODE	MESSAGE TYPE
ILLRQ	ILL Request
UC	Union Catalog
RENAP	Renewal Approval
ILLRQ	Renewal Request
REFPQ	Reference Question
REFRP	Reference Response
ILMSG	ILL Plain text message
MSG	Other plain text messages
QUERY	Query
RETRN	Returning material
NOSEN	Material not available
SENT	Material sent

Material Format. 1 serial; 2 monograph; 3 doctoral thesis; 4 master's thesis; 5 technical report; 6 government documents etc. Type 1 character. This code will be used to sort messages by format.

Dewey Equivalent. The first three numbers of the Dewey Decimal Classification will enable SILC to perform some rudimentary subject analysis on the types of requests being made through ILL. Tables will be provided giving the Dewey equivalent of LC classification categories.

Continuation Indicator. When an "X" is typed in the last position of the formatted section of a message, it is an indication that there are some special data items to follow. Special data items include codes for referral libraries, a due date, photocopy charges, etc.

FIGURE D-3

FORMATTED SECTION: (example)

```
N 104617  201  N:JP
ILLRQ  1  410  X
*NNC   *NIC
```

This formatted section indicates that this message is a new request (N), number 104617, consortia code 201, to be sent to library NjP(N:JP). This request for an ILL (ILLRQ) is for a monograph (1), Dewey classification 410. The X indicates special data fields contain additional lending library codes for referral should library NjP not have the material.

The bibliographic or text section of the message is entered after the special data fields and will follow present practice as outlined in Bird and elsewhere excepting that the end of a message will be marked by "EOM" (End of Message). Note: It is not necessary to follow a specific format when inputting requests, since the computer will format requests when printing them out. Line feeds and indentations are included in the following description to make the printout of the input easy to read and work with in the sending library.

FIGURE D-4

BIBLIOGRAPHIC PORTION OF MESSAGE

REQUEST FOR JOURNAL ARTICLE

EXAMPLE 1

SAMUEL M. ATKINSON RESIDENT OB-GYN

NEW ZEALAND MEDICAL JOURNAL 59: (DEC) 1960
LILEY, A. W.: TECHNIQUES AND COMPLICATIONS OF
AMNIOCENTESIS 581-586
VER: CIM 2:A-844, 1961
AUTHR: M. A. BROWN

REMARKS: WE LACK THIS VOLUME.

EOM

EXAMPLE 2

DR. EDWARD Y. LIU INTERN OB-GYN

OBSTETRICS AND GYNECOLOGY 13: (MAY) 1959
TAYLOR, F.S.: PREMATURE INFANT DEATHS, PG. 555-560.
VER.: INDEX CAT. (S.4) 6:740, 1950
AUTHR.: E. KEEFER

REMARKS: VOLUME NOT IN AREA.

EOM

JOURNAL ARTICLES AND OTHER SERIALS

(1) Give the name, position, and department of the individual patron who has initiated the request. (If desired for listings used within the borrowing library.)

(2) Transmit one extra line feed.

(3) Give Title, Volume and Date of Journal. If more than one line is needed, indent the next line by three spaces.

(4) Give the Author (last name first) and Title (first three or four identifying words if very long, followed by ellipsis) of the article, followed by complete pagination. Indent additional lines if required.

(5) Send VER: add the verification of the reference, using standard form and abbreviation. If unable to verify and the source of the reference is known send SOURCE: and provide same.

(6) Send AUTHR: add the name of the Librarian who has authorized the request. Do not give the terminal operator's name, or the ILL clerk's name.

(7) Send three extra line feeds.

(8) REMARKS: Send here any specific remarks, comments or questions relating to this request, such as "Unable to verify", "Copy lost", etc. As many lines as are desired may be used, because the form can be folded under at this point for filing, and all essential information is still readily available above the fold.

(9) EOM

(1) Give the name, position, and department of the of the individual patron who has initiated the request.

(2) Transmit one extra line feed.

(3) Give Author of book, last name first.

(4) Give the Title of the book, followed by statements for edition, place of publication, and the date of publication.

(5) Continue as in routine for periodical articles, as described in Statements (5) through (9).

FIGURE D-5

BIBLIOGRAPHIC PORTION OF MESSAGE

REQUEST FOR NON-SERIAL

EXAMPLE 1

JOHN PORTER RESIDENT SURGERY

EUSTERMAN, GEORGE BYSSHE
THE STOMACH AND DUODENUM. W.B.SAUNDERS CO., PHILA., 1936.
VER: U.S.SG (S.4) 5:664, 1940
AUTHR: M.A. BROWN

EOM

EXAMPLE 2

DR. EDWARD Y. LIU INTERN OB-GYN

EUSTERMAN, GEORGE BYSSHE
THE STOMACH AND DUODENUM. SAUNDERS, PHILA., 1936
VER.: CIM 2: A-844, 1961
AUTHR.: E. KEEFER

REMARKS: MONOGRAPH NOT OWNED

EOM

In sending an ILL request via the terminal, follow the procedure shown in Figure D-6.

First, using the reader's request slip, verify the bibliographic citation, correct and complete it, locate the libraries owning the item, and include exact citation to the bibliographic source where the citation was verified and located.

Without connecting with the computer, prepare the paper tape or data cassette for transmission. Then sign-on to the computer and call up the tape input program. Transmit the tape. Call up and utilize the edit capabilities for which the computer will be programmed, to correct spelling, make additions and deletions and remedy any errors which the computer program detects. When all the data is correct, file it permanently and sign off.

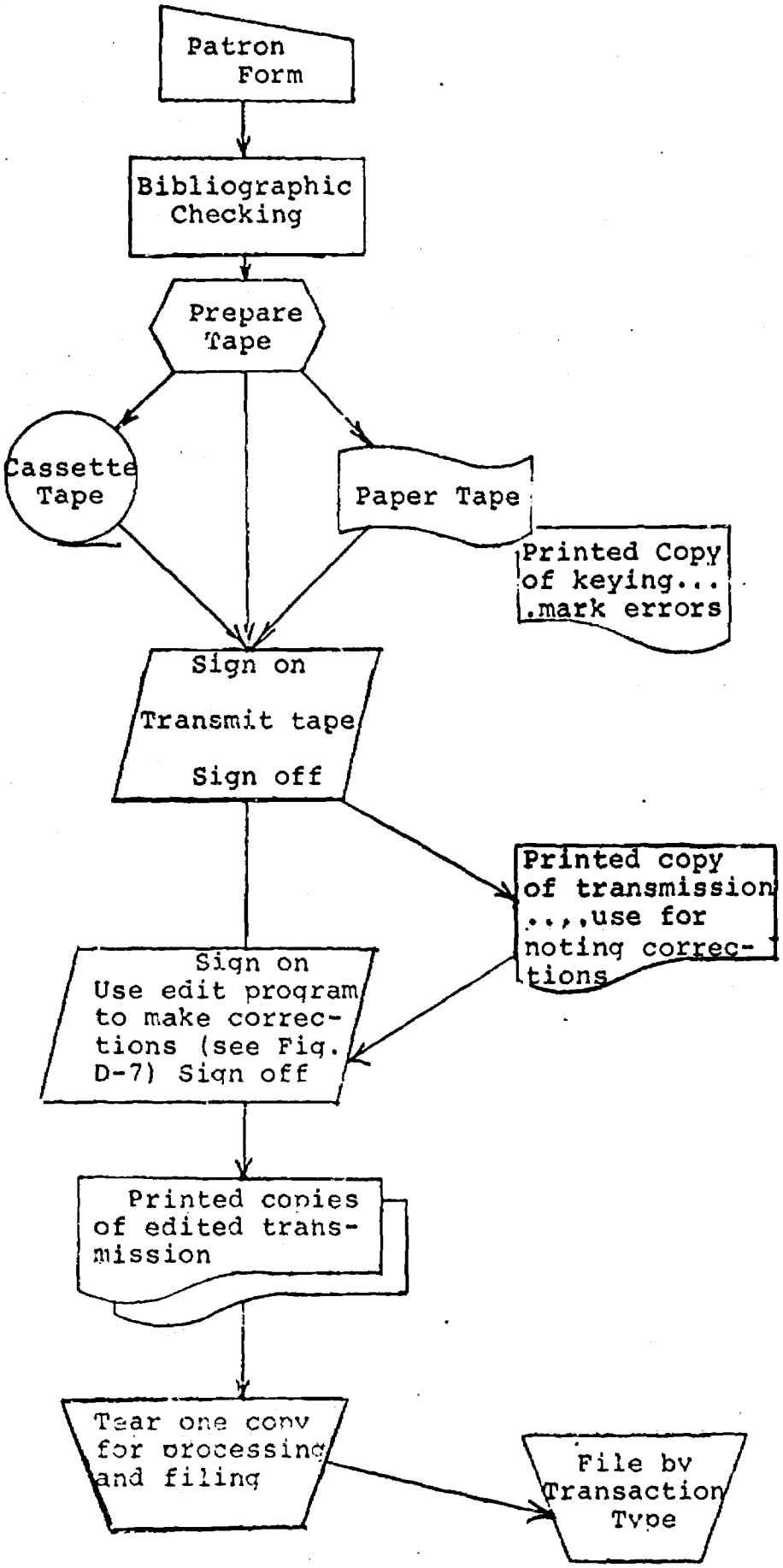
The computer will be programmed to add extra line feeds where needed to increase clarity and provide an 8" x 5" form for easy handling in the lending library. Since the computer will sort the messages before transmission to the lending library, it will not be necessary for the borrowing library to put them in order.

The above is a general outline of how to prepare, transmit, and edit a tape containing ILL messages and requests. In the following sections, each step of the procedure is described in more detail by means of an illustrative example.

Sign on, according to the following procedure: Dial the TSS phone number. After the connect tone is heard, secure the headset.

FIGURE D-6

TRANSMITTING REQUESTS



TSS prints on terminal	TSS READY	
Library keys	SILC 1463	system and library ID
TSS prints	PASSWORD	
Library keys	[redacted]	Library types in the password after the system has blanked out an area so the password can not be read by others
TSS prints	READY 30/11/73 15:29:55	
Library keys	PT INPUT	call paper tape input program
TSS prints time	15:30:27	
Library sends tape	N 104617 201 N:JP ILLRQ 1 410 X *NCC *NIC	

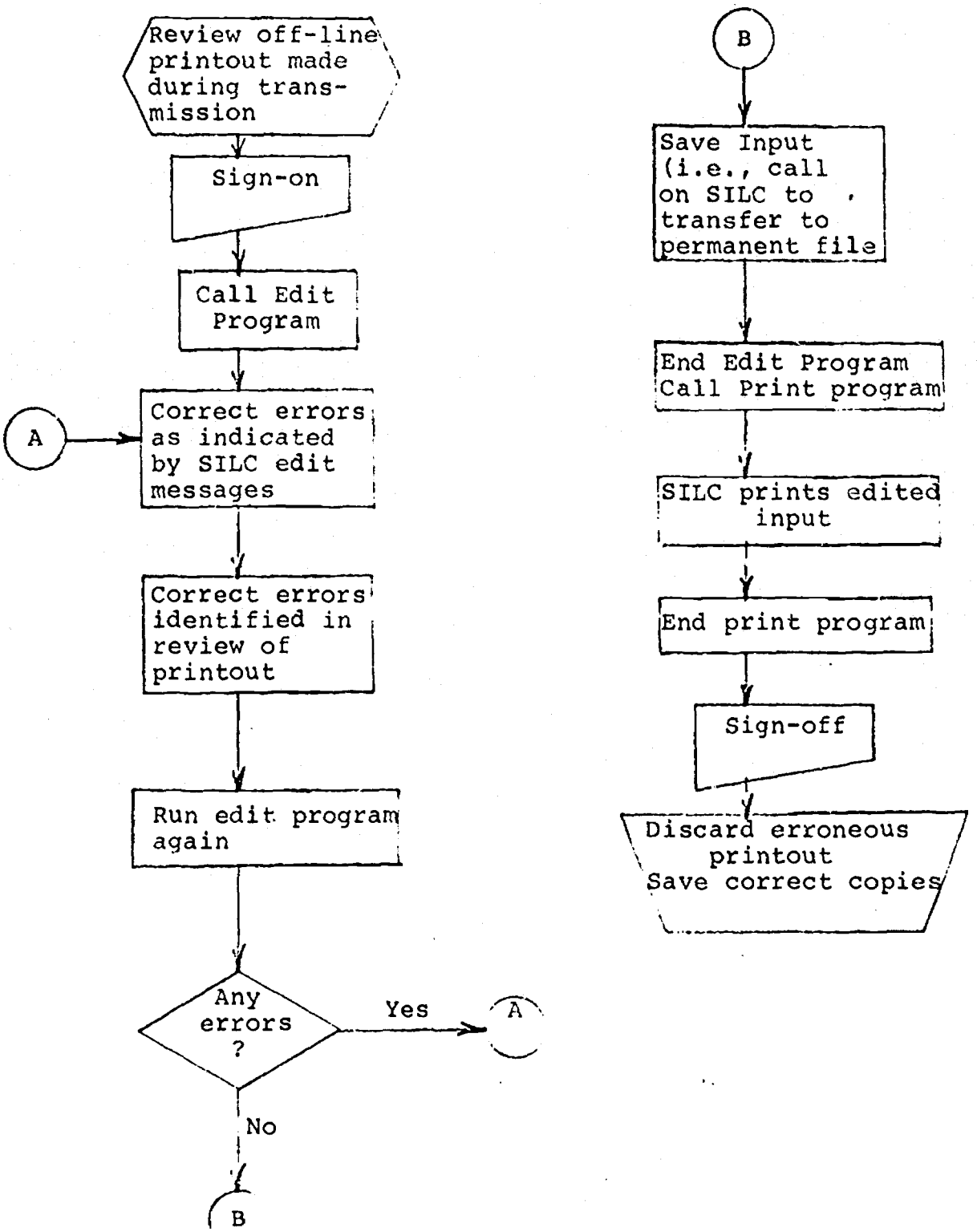
Transmit the tape.
Either on the tape or by keying in, enter "END" (this tells the computer that the transmission is complete).

Library keys	END	
TSS prints time	15:55:18	
Library keys	EDIT INPUT	Edit program is called to edit Input file.

Using the edit program (see Figure D-7), the library may correct all errors which occurred on the tape, and make deletions and additions of characters, lines, and messages. Also, the SILC edit program will be checking the data for valid codes and the correct number of characters in certain fields. It will also translate certain fields and complete the records by adding date, time, library codes, check digits, etc. The edit program will then print out any error messages for items which must be corrected

FIGURE D-7

Summary of Editing Procedures



before SILC can process the messages. The terminal operator will make the necessary corrections and then edit the file again to make sure no further errors have been made.

When all errors detectable by the terminal operator or the SILC edit program are eliminated, the messages are "saved" in a "permanent file" and the edit program ended.

TSS prints	NO CHECK DIGIT REQ. NO. 1043	Check digit must be entered in every request number except a new request.
Library keys	1043-6	
Library keys	END	This is the end of one edit program
TSS prints	15:58:16	
Library keys	EDIT INPUT	Edit the file again to catch any new errors.
TSS prints	NO ERRORS	
Library keys	SAVE	File messages in permanent file
Library keys	END	End edit program

To get a print out of the corrected messages, the operator calls for the print program and lists the entire input file. Check digits will be included in this printout.

TSS prints	15:59:45	
Library keys	PRINT INPUT	The print program is called to print out the Input File
TSS prints	N 104617 201 N: JU ...	The file is printed out on the terminal
Library keys	END	End the print program

Since the library will receive in this way an original and carbon, the printed copies created while keying the tape may be discarded. The library will have on hand two complete, clean, correct copies.

Unless the library wants to interrogate SILC files on some other requests, this terminal session is complete so the operator would sign off as follows:

TSS prints	16:01:23	
Library keys	OFF	Sign off
TSS prints	21.502CPU,0.35 CONNECT HRS SIGNED OFF AT 16:02:05	TSS acknowledges sign-off and gives the number of CPU seconds and the connect time consumed during the session.

SILC PROCESSING OF REQUESTS AND OTHER MESSAGES

Requests transmitted to the SILC system are handled as indicated in Figure D-6 above.

The SILC computer will be programmed to examine the request, check the validity of the borrowing library in the protocol tables of the consortium indicated, and perform automatic error checking for presence of necessary types of bibliographic elements. It will add complete names and addresses of the borrowing and lending libraries, and the name of the consortium. Extra line feeds and appropriate spacing will create a copy that can be read and processed without decoding. Spacing will automatically create a shipping label for use in the lending library.

The SILC computer automatically batches all messages ready to transmit to the lending library, grouping the messages as the lending library has indicated it prefers. In most cases, all requests to borrow will be sent first, in alphabetical order by main entry. However, in the case of some libraries like NYPL or UC where a published catalog enables the borrowing library to include the call number in the original request, thus saving lookup time in the lending library, the computer will transmit requests containing the call number arranged in call number sequence.

LENDING LIBRARY PROCEDURES

The lending library can at its convenience call for all requests and messages that the SILC system has received for it. The receiving procedure is outlined in Figure D-8.

Lending Library Interactions with SILC

Prepare terminal paper (and tape if desired) for receiving messages.

Sign-on and call for messages.

Print/out (and tape) all messages. Messages are pre-sorted in previously agreed upon order (e.g. requests first with monographs, serials, reports, and theses separated, then other messages).

Sign off.

The lending library reacts to the request as indicated in Figure D-9. It sends to SILC its reply as to whether or not it can supply the material, and in what format (original, hard copy, microform, etc.). These replies will be formatted as indicated in Figure D-2 above; repetition of the bibliographic information will not be necessary; the computer will add it, based on the request number. If the lending library corrects or amends the bibliographic information, the computer will post this information to its bibliographic portion, and include it with future transmissions.

The formatted portion of a reply would include:

Format Type
Message Date and Time (supplied by system--not keyed)
Request Date
Borrowing Library Code
Lending Library Code (supplied by system--not keyed)
Request Code Number
Consortium Code

FIGURE D-8

PROCEDURE FOR RECEIVING

MESSAGES OR REQUESTS

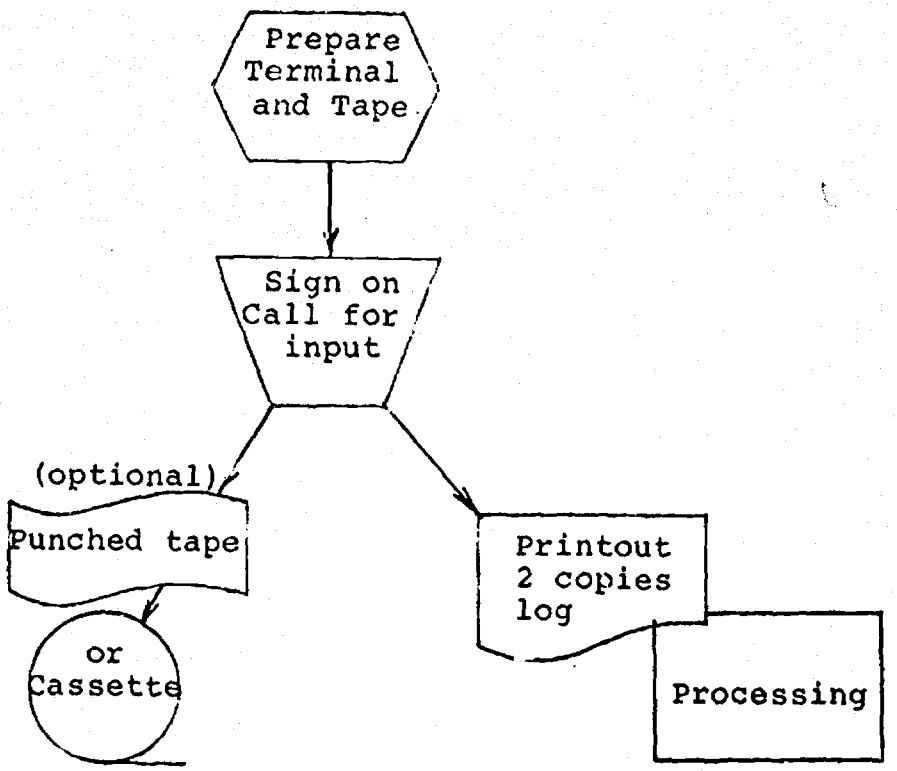
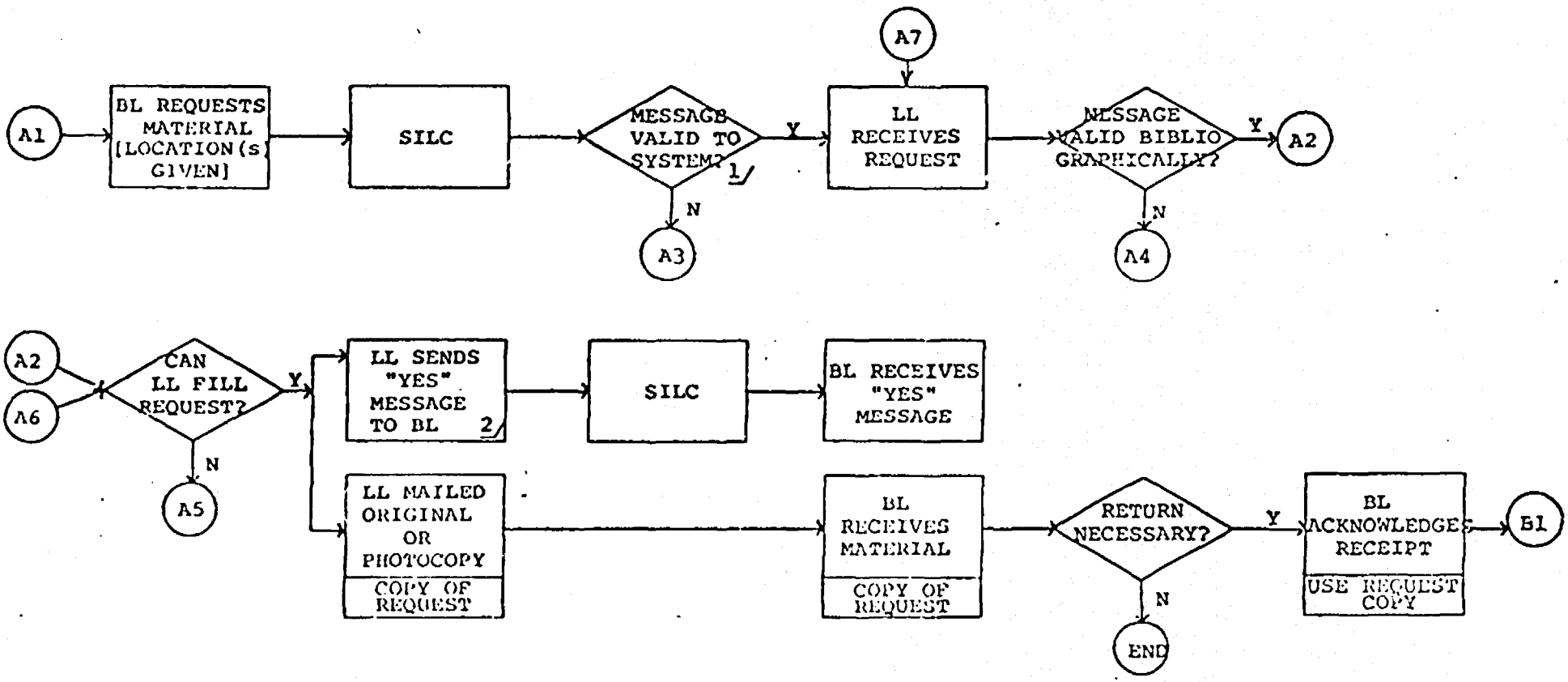


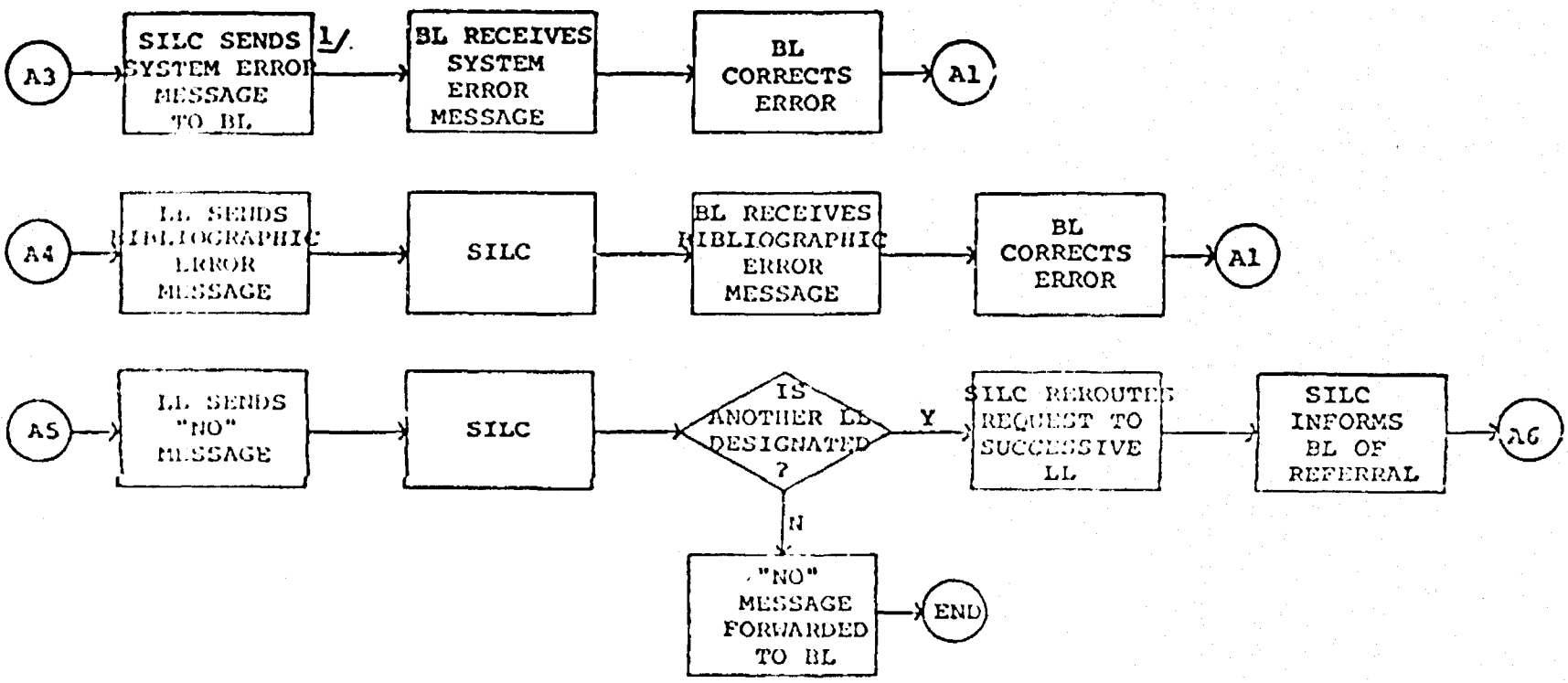
FIGURE D-9

A. REQUESTS TO DESIGNATED LOCATIONS (BL: Borrowing Library; LL: Lending Library)



- Continued on Next Page -

FIGURE D-9 (continued)



1/ SILC will perform automatic error checking for presence of necessary types of bibliographic elements in the request, as well as for errors of concern only to the system.

2/ "Yes" message will include form of material being sent (e.g., book, film, microform, photocopy), date due, special instructions, etc.

Message type: SENT (or NOSEN)
Material format
Message:
Positive: Lending original, due 4 weeks.
Sending photocopy, charges $5.20.
Negative: Non-circulating.
Not on shelf.
etc.

When the computer sends the reply to the borrowing library, it will include all bibliographic information, date and time, and sending library code so that additional lookup will not be necessary, and will include a formatted shipping label for return of returnable items.

RENEWALS

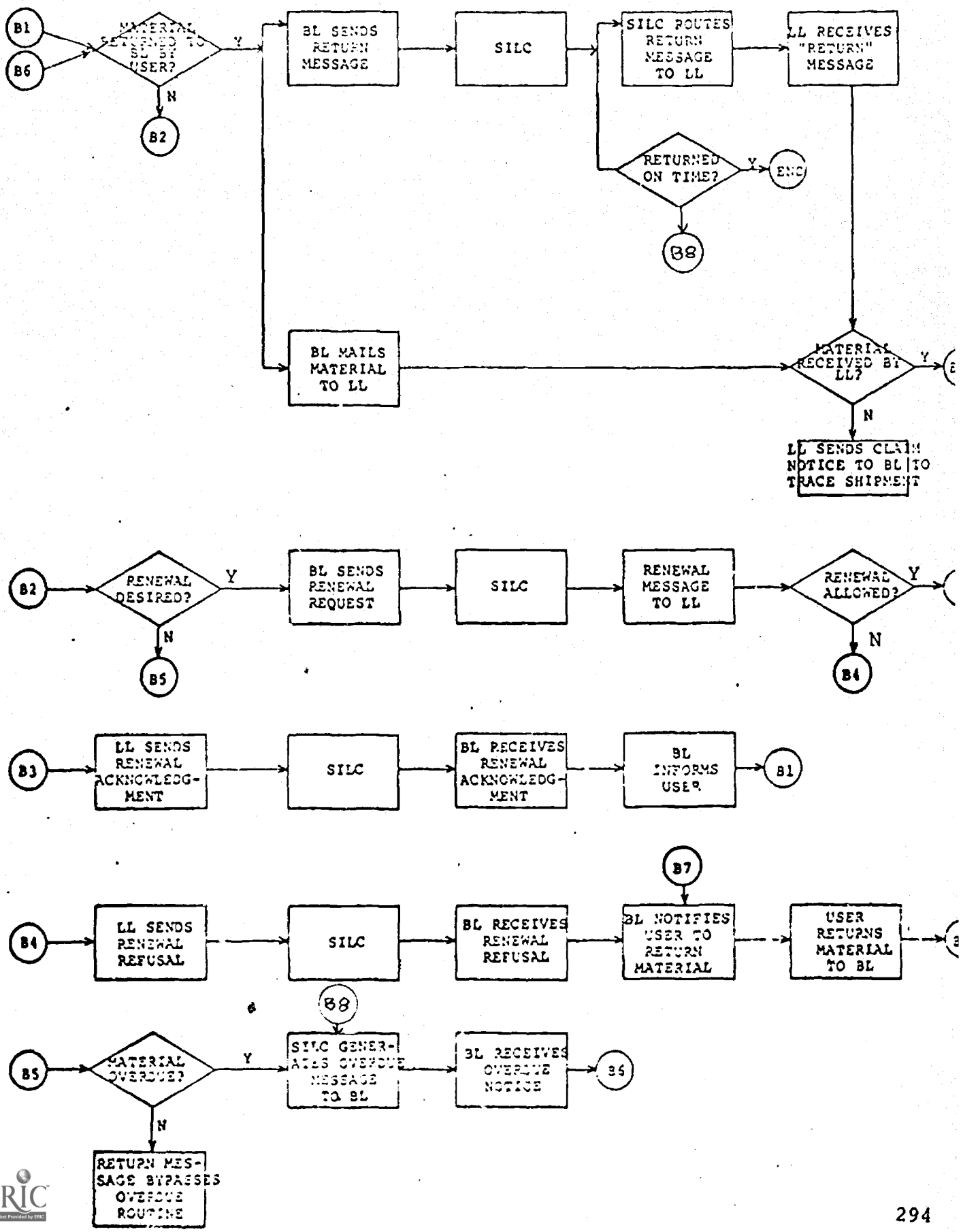
Renewals may be requested through the SILC computer unless the lending library's protocol does not permit renewals. Requests follow standard formatted portion outlined above, except the message type is ILLRN. The lending library will reply with message type RENAP indicating agreement and new date due, or denial. The renewal routine is outlined in Figure D-10.

RETURNS

When the borrowing library returns the material to the lending library, it transmits a return message by terminal through SILC. The message type is RETRN. The message: returned, date. This routine is diagrammed in Figure D-10 also.

FIGURE D-10

B. RETURNS, RENEWALS, OVERDUES



SILC/BIBLIOGRAPHIC CENTER INTERACTION

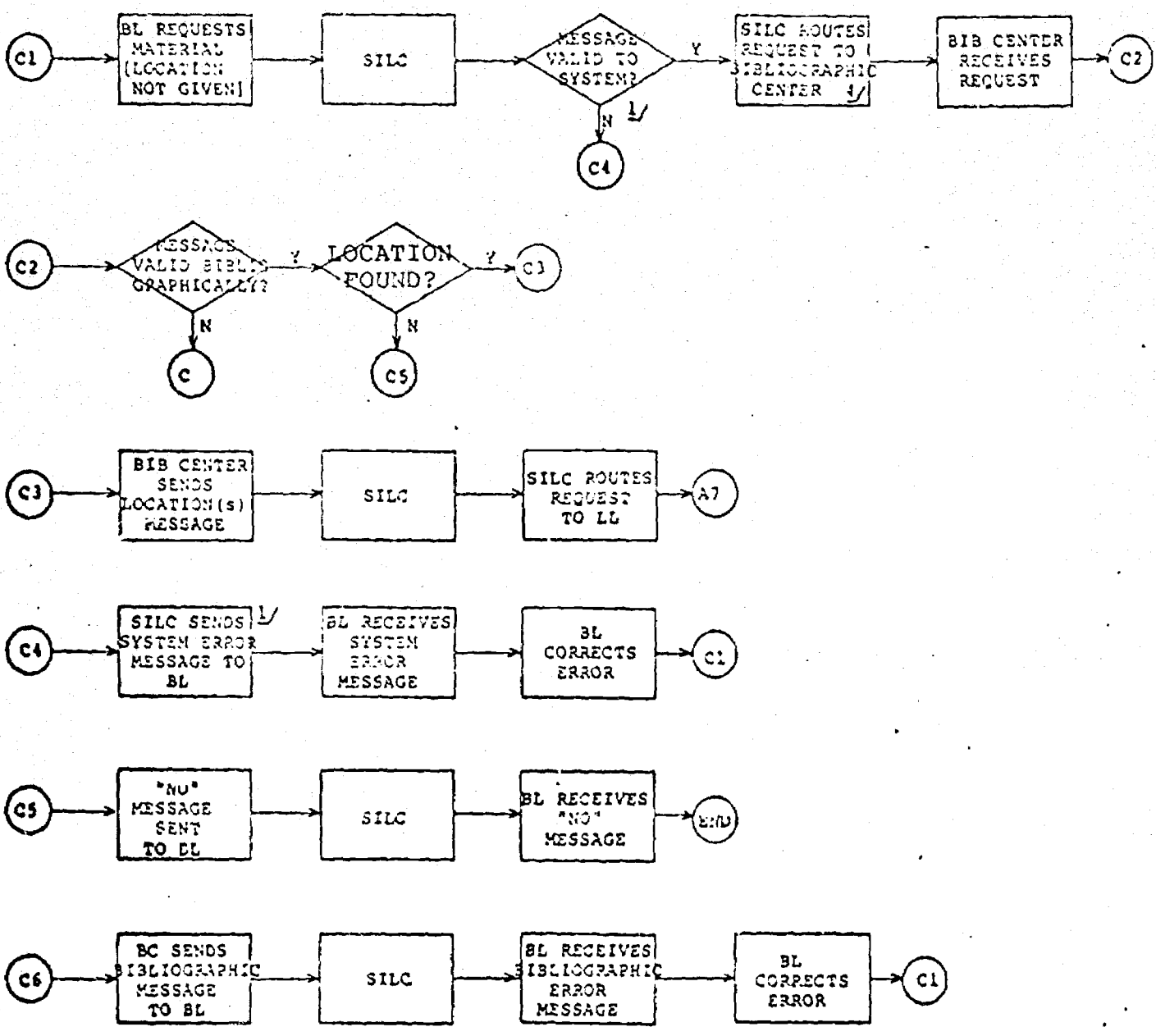
If the borrowing library is unable to find a location for an item after exhausting its bibliographic resources, it shall enter the code: "NOLOCATIONFOUND" in the Lending Library position. The SILC computer will route these requests according to the protocol table of the consortium to which the borrowing library belongs for location and rerouting. Each consortium will detail its own procedure to its own members. For the purposes of this manual a "bibliographic center" is any designated service for searching union catalogs, directories, or locations, whether manual or automated. Location service will normally be charged for, according to the schedule determined by the consortium.

If the borrowing library, after making every effort, including obtaining as much information as possible from the reader, cannot verify or complete its bibliographic citation, it will send a message giving the code: "UNABLETOVERIFY". The consortium will establish routines for routing these requests. Bibliographic searching will usually be charged for according to schedules established by the consortia.

The handling of these types of requests is shown in Figure D-11.

FIGURE D-11

C. REQUEST TO UNKNOWN LOCATIONS



1/ "Bibliographic center" is used in the sense of any service for searching union catalogs, directories, or locations, whether manual or automated.

SILC REFERRALS

If the first lending library listed in the requests is unable to supply the item, SILC will automatically try the second library listed, and inform the borrowing library that the report from the first lending library was negative. This process will continue until all libraries have been tried, or until the item is obtained, or the borrowing library cancels the request. But in any case SILC keeps the borrowing library constantly appraised of the state of the request.

If the borrowing library is able to find only one location for a title, and it wants the search to go beyond that one library if it is unable to supply the item, the borrowing library should insert as the second lending library code: "BIBLIOCENTER." The request would then be rerouted by the SILC computer to the institution designated by the consortium for searching locations.

If a borrowing library does not wish automatic referral or search beyond the library(ies) it indicates, it may omit further codes from the request.

When a negative response to a request is received by the borrowing library, the borrower must then decide whether or not to refer the request. If a referral is desired, the borrowing library could either trigger a referral of the initial request to another library or enter a new request. A new request must be entered if significant changes have been made in the record. If the record is still incomplete, it should be sent to a Bibliographic Center. These procedures are displayed in Figure D-12.

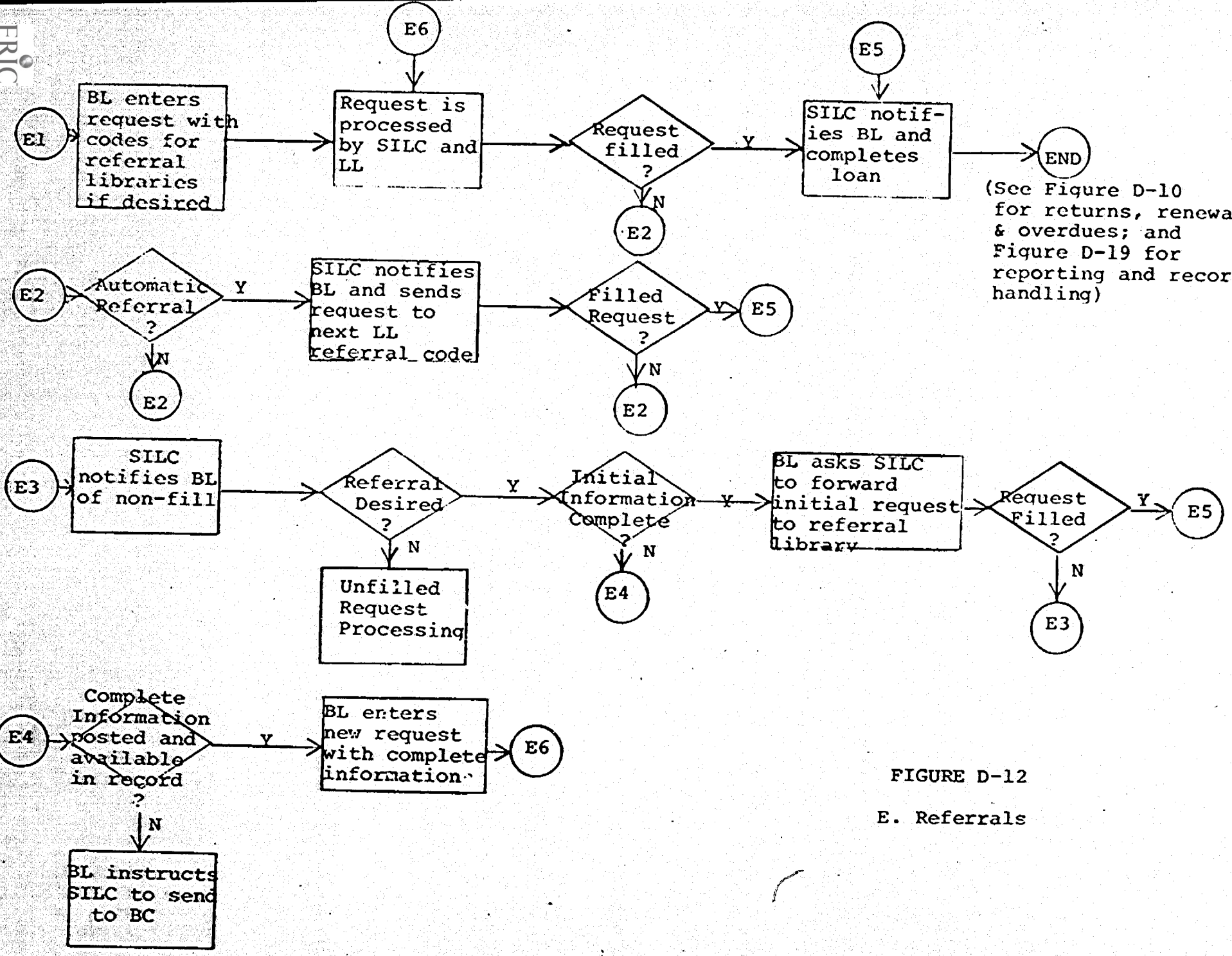


FIGURE D-12

E. Referrals

QUERIES TO SILC FROM PARTICIPATING LIBRARIES ON OUTSTANDING REQUESTS

Libraries can obtain a variety of reports on the status of their requests from the SILC computer whenever desired. Some of these reports include:

(1) Outstanding requests to borrow from other libraries

(2) Outstanding requests by request number

(3) Outstanding requests by date and lending library

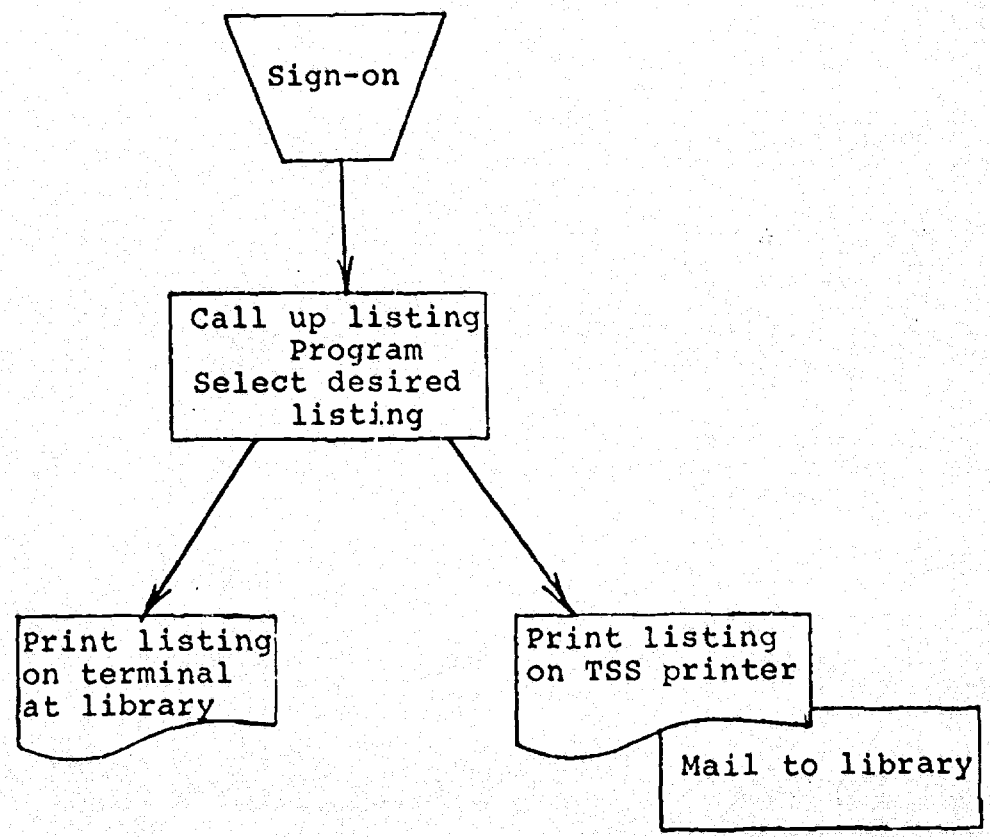
(4) Outstanding loans by borrowing library

These reports may be requested at any time by any participating library or consortium. (Charges for processing the lists would be absorbed by the requestor).

After preparing the terminal and signing on, the requestor would call for a special program which prompts the requestor to select the listing he wants from a group of pre-formatted reports. After selecting the appropriate listing, certain other information would be entered in response to prompting from the listing program (ID, dates and other parameters). The listing would then be prepared by SILC and printed on the terminal. The length of time required could be from less than one minute to several minutes depending on the length of the listing and the speed of the terminal. This routine is shown in Figure D-13.

FIGURE D-13

Library-initiated Reports



MISCELLANEOUS QUERIES

There will be a variety of other types of questions that participating libraries will wish to address to the SILC system and SILC management regarding requests. Queries will be transmitted to the computer in interactive mode; i.e., the computer will tell the querying library how to ask its question.

Prepare the terminal and sign-on. Call the Query Program.

The Query program will prompt the operator with questions to which the library responds, entering the query by selecting appropriate answers and keying in identifying request number, date, etc. The SILC system will respond with formatted replies.

The library then signs off. (Charges for queries will be absorbed by the library entering the query).

This procedure is diagrammed in Figure D-14.

RECOVERY PROCEDURES: WHAT TO DO WHEN THE MACHINE DOESN'T WORK

Terminal Down

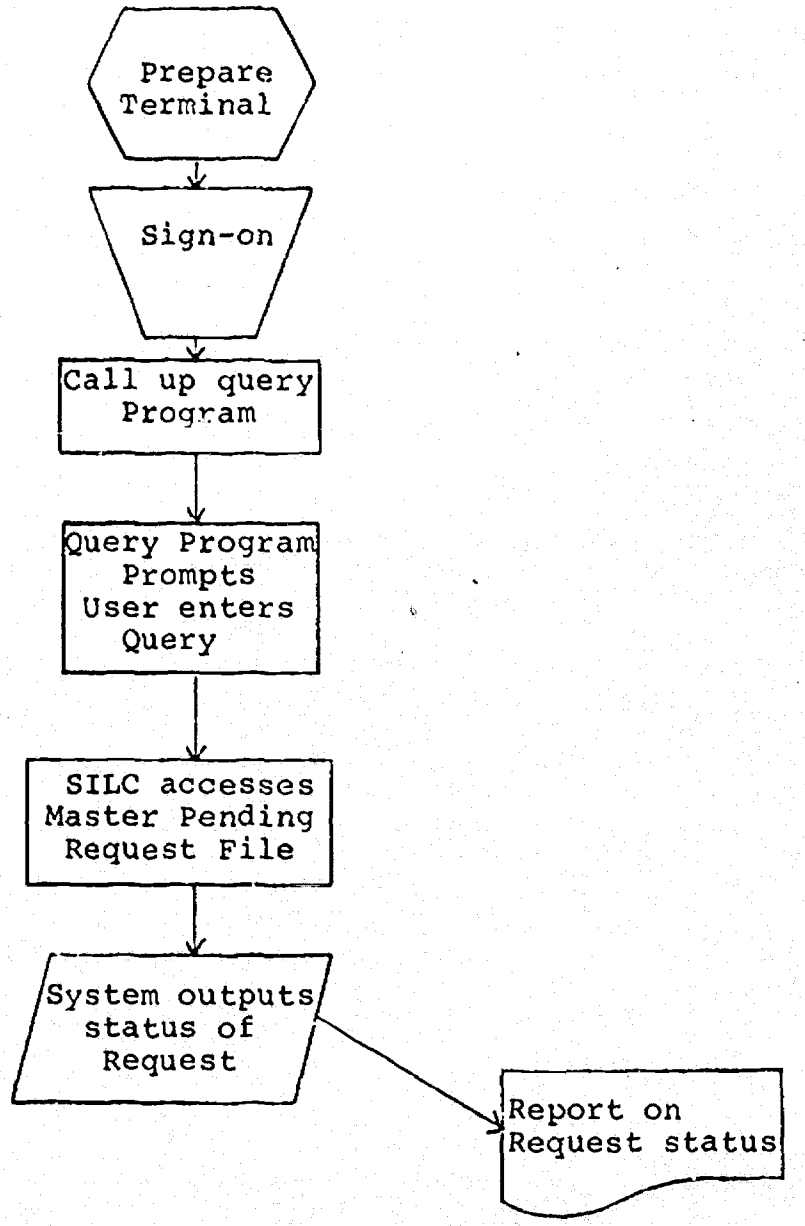
If the library is on-line when the problem occurs, check the line--If there is a connect tone the line and computer are O.K. and the problem is in the terminal. If there is no connect tone or the line has reverted to a dial tone, the line or computer is down.

Other terminal problems are usually obvious: e.g., paper jammed, broken part, out of tape or paper, etc.

To recover, correct the terminal problem and retransmit all data from the time of sign-on to the terminal problem.

FIGURE D-14

Special Queries



Line or Computer Down (or Power Failure)

Check the terminal and coupler connection. Re-dial the number--if the connect tone is re-established re-transmit all data from sign-on to line, coupler, or terminal problem.

If the line is not re-established, call the SILC Manager by phone or teletype to report the problem or get information on when the system will be in operation. When the system is in full operation again, re-transmit all data processed during the interrupted session.

These procedures are diagrammed in Figure D-15.

OVERDUES

The Master Pending Request File will be searched at pre-scheduled times (probably weekly) for all overdues and SILC will prepare overdue messages for each overdue item. The messages will be placed in the proper "mailboxes" and will be received along with all other SILC messages and requests when a library signs on for its messages. See Figure D-16.

SILC ACCOUNTING REPORTS TO LIBRARIES AND CONSORTIA

Each month the TSS will run the statement programs and issue statements for each participating library and/or consortium. Statements will follow a previously agreed upon format and will be addressed to the designated libraries and consortia. All statements will be printed on the TSS high-speed printers and then mailed or delivered by some faster means to the SILC management.

FIGURE D-15

Recovery Procedures

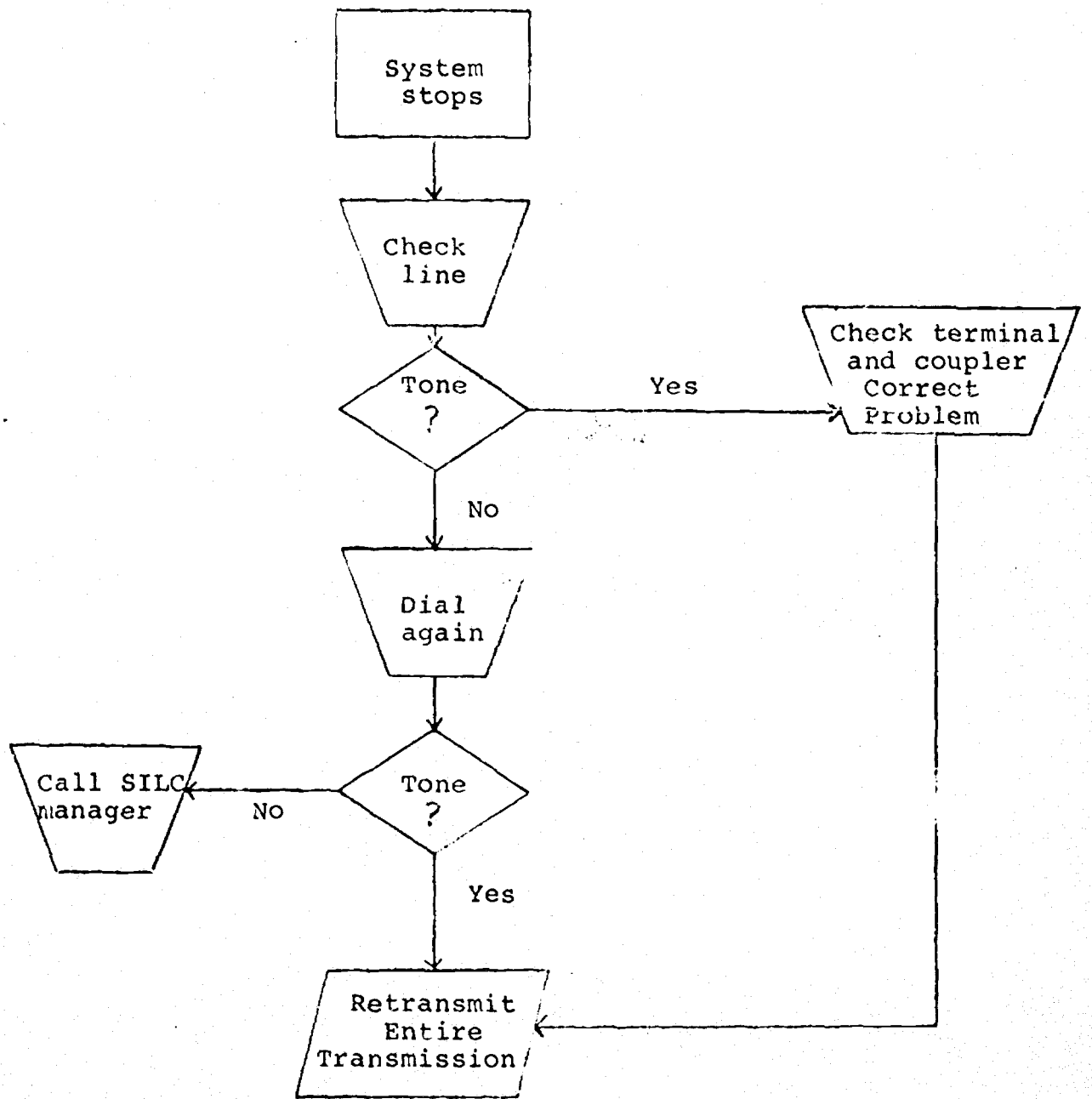
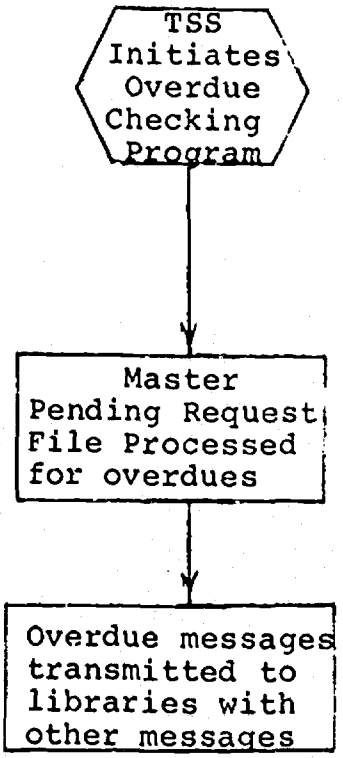


FIGURE D-16

Overdues



The SILC management will mail the statements to the addressees and be responsible for all bookkeeping and for making any necessary adjustments. All questions regarding statements should be mailed or phoned to the SILC management. Where payments or credits for photocopies or other charges are involved, SILC management will expedite the transfer of funds, enter all necessary accounting data into the SILC system and maintain full accounting controls. See Figure D-17.

Analytical Reports

Most of the analytical and accounting report programs will be pre-scheduled for monthly, quarterly or annual runs. The TSS would initiate all pre-scheduled reports. Some reports might be on a "demand basis" only and would have to be initiated by the SILC management. Conceivably any report could be prepared "on demand" should the SILC management find it necessary to do so.

All analytical and accounting reports will be printed on the high-speed printers in the TSS facilities and delivered to SILC management for analysis and/or distribution to the membership.

Analytical reports include:

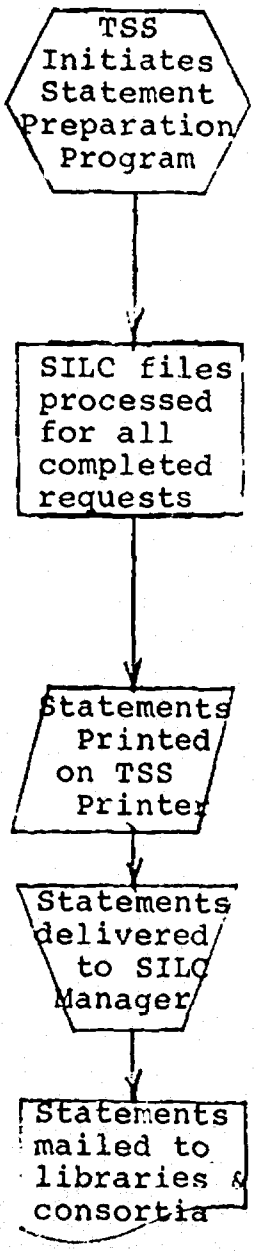
Transactions by Consortium and/or Library

Transactions by Subject Class

Accounting reports include all necessary journals, ledgers, and registers as well as an Income Statement, Trial Balance, Delinquency Notices, etc.

FIGURE D-17

SILC Accounting Reports



SILC routines for handling analytical and accounting report generation are described in Figures D-18 and D-19. A sample statement follows (Figure D-20).

FIGURE D-18

SILC Analytical Reports

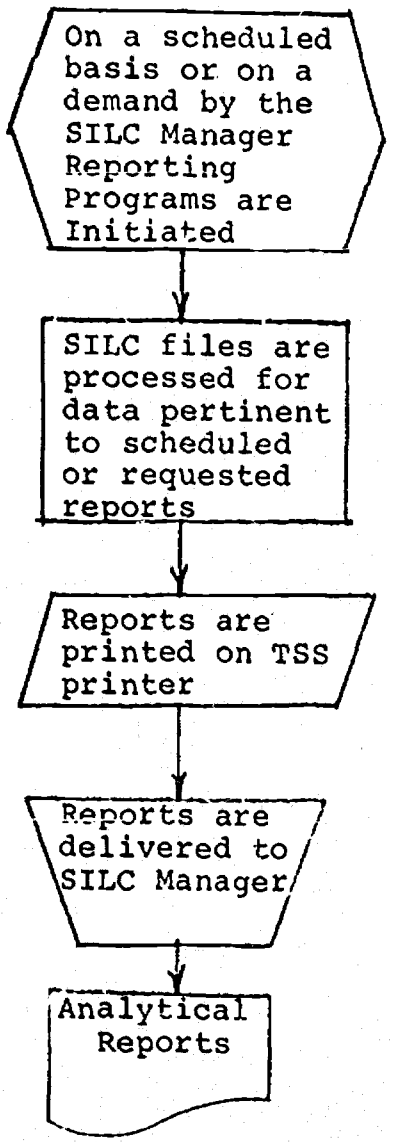
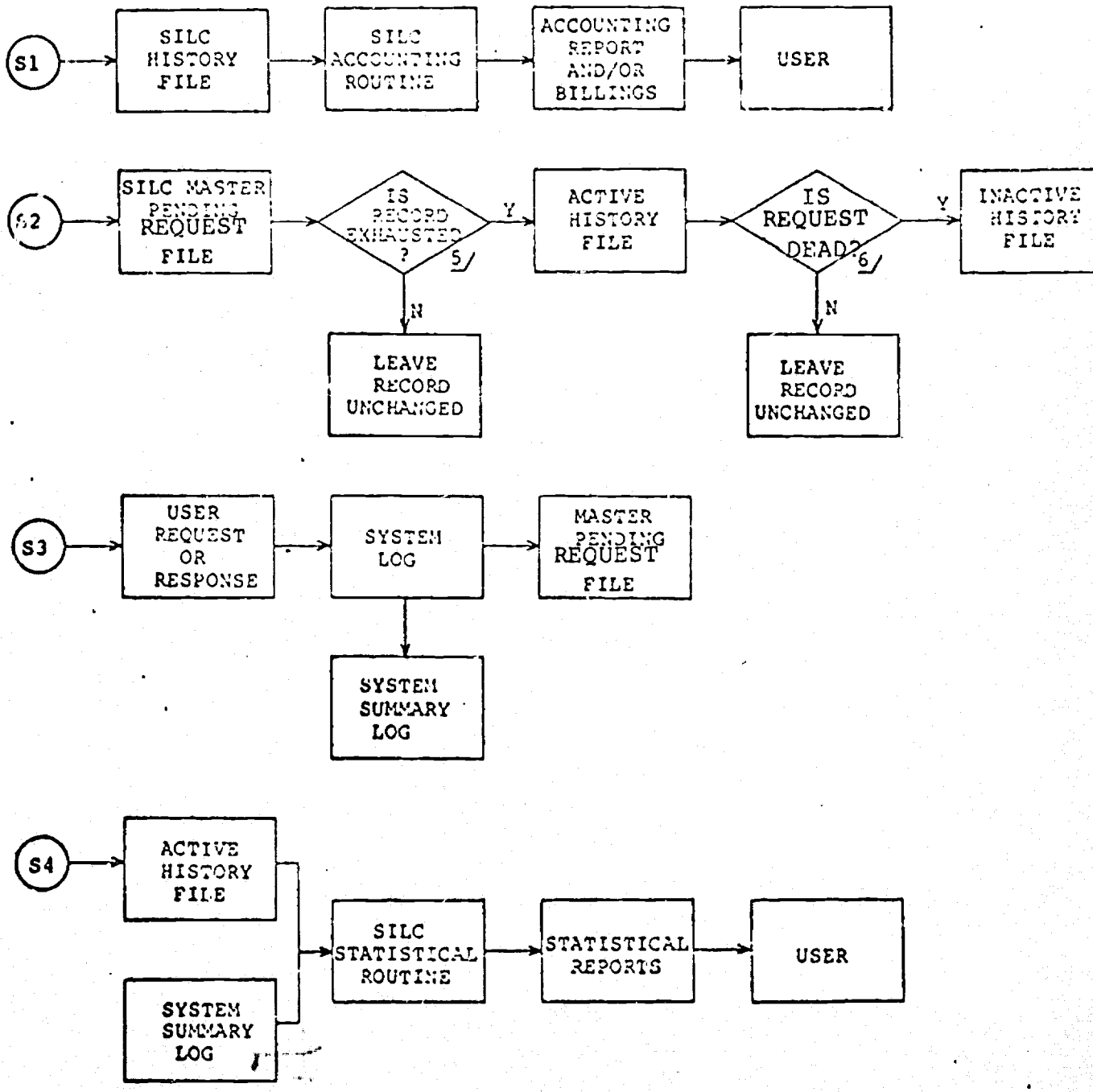


FIGURE D-19

SYSTEM RECORD HANDLING



5/ Record exhausted = request has been filled or request has no further lending libraries designated.

6/ Record dead = request has been filled, material returned, statistical and accounting routines completed.

FIGURE D-20

STATEMENT FORMAT (Libraries)

TO: Alpha University Library
Attention: ILL Accounting
Address

Statement of SILC Transactions

For: Month, Year

Consortium A

Service	Borrowing		Lending		Referrals	Net Charge
	Requests	Filled	Requests	Filled		
Lending	53 132.50	43 107.50	647 1,617.50	531 1,327.50	30 75.00	$2,780.00CR
Bibliographic			141 474.00			474.00CR
Copying	25 2.50		525 52.50			50.00CR
Special Service Charges						- 97.00

Other:

Replacement for lost book, request No. 100386,
Pay to: University Omega - 37.00

(Charges and credits for other consortia and libraries)

Total Net Charges	$3,170.00 CR
Balance Forward	468.50 CR
Payments Made	-
New Net Total	$3,638.50 CR