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The project set out to establish an operational film scheduling network to improve service to New York State teachers using 16mm educational films. The Network is designed to serve local libraries located in Boards of Cooperative Educational Services (BOCES), regional libraries, and a statewide Syracuse University Film Rental Library (SUFRL). The system proposes to refer films which are unavailable for scheduling in local libraries to a central back-up library and to revise computer programs to meet the specific needs of member libraries. In developing an operational model, the project collects data on the operation and inventory activities of BOCES and other New York film libraries and develops standard coding systems for film identification and user identification within the Network. A computerized materials network is workable and will soon become a necessity, but will not reduce operating costs. The formation of a research team to study reports, standardization of codes for member libraries within any computerized system, and the adoption of a management information system are recommended. (TD)

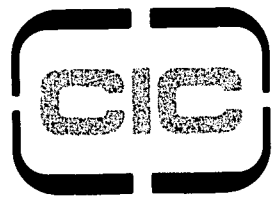
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A PROTOTYPE SYSTEM FOR A COMPUTER-BASED

STATEWIDE FILM LIBRARY NETWORK:

A MODEL FOR OPERATION

September, 1968



CENTER FOR INSTRUCTIONAL COMMUNICATIONS - SYRACUSE UNIVERSITY

FINAL REPORT

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**U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Office of Education
Bureau of Research**

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Charles M. Bidwell

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This report is dedicated to the memory of:

EUGENE K. OXHANDLER
Associate Director for Academic Affairs
1960-1967
Project Director
1965-1967

**It was Dr. Oxhandler's genius that initiated this research,
guided its proposals and kindled its vision in the minds of
all who served on the project staff.**

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CHAPTER 1

1. INTRODUCTION

The research activities reported in this document resulted from two federal grants supporting the computer simulation of a statewide film library network. The first grant from the U. S. Office of Education in 1965 endorsed a proposal subtitled "A Feasibility Study for Actual Operation" which was found to be favorable toward further investigation and led to a second proposal subtitled "A Model for Operation" which was funded again by the U. S. Office of Education in the main and the New York State Department of Education, Bureau of Classroom Communications in part. This report deals mainly with the establishment of an operational model of a statewide film library network and in so doing it incorporates some of the findings of the earlier work.

1.1 THE PROBLEM

Simply stated, the immediate problem of this recent research project was to establish a computer based film library network along the lines indicated by the earlier feasibility study. In conjunction with the establishment of such a service two other areas of investigation and development were incorporated into this problem; they were the collection of more data on the operations of the specific libraries intending to join such a network and the creation of new computer programs along with the revision of former programs to meet the specific needs of these member libraries.

Generally stated, our problem was to improve the communications between member libraries (concerning film availability) and their customers and between member libraries and the central resource (rental) film library. The earlier study addressed the problem of increasing utilization of 16 mm educational motion picture films in the schools of the state. It posited several factors as contributing to the failure of utilization of film to match the expansion of expenditures for materials and equipment as shown by recent studies (References (2, 5, 6, 7, 8)). These factors were:

- A. A lack of adequate means for collecting and analyzing data as an aid to long-range planning for film services, which led to:
 - 1) unimaginative and unscientific acquisition procedures by film library directors, and

2) a limited selection of film titles available to the classroom teacher.

B. A lack of standardized procedures for purchasing, maintaining, scheduling, confirming and delivering films, which led to:

1) delays between the request for a film and the confirmation or denial of that request, and

2) extensive variations between the time period requested for use of the film and the time period allowed, or the time of actual delivery. Under some film library services, established to suit administration needs, many teachers must presently order everything "available" many months (often more than a year) in advance to get something close to what they want when they want it.

Economic and logistic explanations were then offered in the final report (4) for these conditions.

The present study also concerned itself with providing means for collecting and analyzing data as an aid to long-range planning for film service and for suggesting standardized procedures within film library systems.

1.2 OBJECTIVES

The guiding objective of this project was to carry forward the feasibility study's recommendations into an operational model of a computer-based statewide film library network. To accomplish this goal the following sub-objectives were postulated:

A. To collect additional data on the operation and inventory activity of BOCES* and other film libraries in New York State.

Film titles and numbers of prints along with their related circulation activity through the 1967-1968 school year were accurately recorded for two BOCES film libraries (one for Erie County Supervisory District #1 and one for Westchester

* Interested school districts, in New York State, may unite and receive state aid to form a Board of Cooperative Educational Service. Such a Board, commonly called a BOCES, furnishes member districts with services they are unable to provide for themselves. One such service is frequently a film library. In general, BOCES areas correspond roughly to county boundaries.

County, Supervisory District #1). Similar data for the 1966-1967 school year was obtained and analyzed for White Plains (N. Y.) Public School Board's film library, and the BOCES film libraries for Cortland County, Erie #1, and Westchester #1.

Together with similar data collected in the feasibility study, these reports gave the film library directors a means of detecting usage patterns enabling them to better forecast future demands and prepare long-range plans for film service.

B. To develop alternate operational models for participation within the computer-based network.

As the data was collected and analyzed, two main modes of communication between customers and the libraries merged. The chief mode was a batched order of advance written requests which could be confirmed a day later, and the other was an individual order or an immediate oral request which should be answered a moment later. To accommodate both modes, two variations of the main operational model were programmed and put into service.

C. To develop standard coding systems for film identification and user identification within the network.

The codes selected had to be as compatible with existing codes as possible to ensure their wide acceptance and ease of adoption. No code for film identification existed before the Standards for Cataloging, Coding and Scheduling Educational Media (1) was published, and so a very simple accession order number was assigned to each unique title as it was added to the files of the network. The user or customer identification number is based on that used by the Bureau of Statistical Services of the Department of Education for New York State which has twelve digits for locating county, municipality, district, and school. For our purposes, only district and school identifiers (with allowance for teacher identifier if desired) were used to indicate the school requesting the film. The Standards provide other coding guides such as for short title derivation, grade or maturity level indication, media identification, etc., which might have been incorporated in an expanded version of the identification of the materials within the network.

- D. To prepare a procedural manual for use by staff members of new or existing materials libraries, who wish to organize their procedures along lines that would be compatible with the new system.**

Since the service being established was seeking not only volunteer participation but also financial commitment on the part of the participating film libraries, the system had to be developed initially along the lines of operation being followed by these libraries, each had to have specific computer programming adaptations to suit its services. However, in spite of this seemingly tailor-made approach, certain procedures were shown to be more advantageous than others within the network service and these have been stated in the User's Manual which forms Appendix A.

Although this User's Manual is specifically aimed at the Network, it does suggest routines and elements of information that, if followed, could lead to compatibility among libraries of the state. Uniform procedures make annual reports easier to prepare and easier to interpret for others, they make exchange of materials and information between libraries easier and they make adoption of any large-scale cooperative network service easier than if every library followed its own individual recording and operating procedures.

- E. To develop a computer program for handling film scheduling between local libraries, regional libraries and a central backup library, as well as among various combinations of these libraries.**

This very complex and ideal program has only been approached in actual established operation, although its creation was a goal always borne in mind. The three-tiered program to allow requests that could not be met at the local level to be automatically checked against the holdings of a regional (state college) library and finally of a central (rental) library was only approximated. The limited fulfillment of this objective was a two-tiered program of local to central referrals of requests. Apart from the time limitation which prevented the establishment of an operating regional center, there was a policy limitation on the part of the local libraries; they were reluctant to share their materials with other libraries and this prevented any scheduling between local libraries.

Despite these limitations, a two-tiered program was established and in fact this program, in operation, was the most impressive aspect of the whole network when demonstrated to visitors.

How these objectives were met is discussed next under METHODS.

CHAPTER 2

2. METHODS

Since the project's purpose was to establish an operational information system, the methods may be grossly grouped into those related to the collection of data and subsequent inventory control and those related to the operation of the Network and the fulfillment of the objectives. The description of the methods employed (or considered and rejected) will reveal the interrelations which must exist between the human support services and the automated aspects of the Network.

The equipment used for central control processing was IBM's 360 Computer, Model 50 with a 2314 disk unit and 6 tape drives. Local library communications were transmitted and received via Model 33 ASR Teletypewriters on TWX service. Signals between the teletype terminal and the computer were translated by an IBM 2701 Data Adapter Unit.

Data collection and inventory control will be discussed first because they precede operation.

2.1 DATA COLLECTION PHASE

Historical Records

The first film distribution studies done in 1965-66 involved those film libraries who contributed their booking records and inventory records for the entire prior school year (1964-65). In return for providing data for simulation and feasibility studies by the first research team, the resultant tabulations provided the libraries with detailed statistical reports of their film distribution.

The second film distribution studies were concentrated on those libraries who participated in the Network's operational phase. Again, historical records for the entire prior school year of 1966-67 were collected and processed to provide statistical reports. Due to the lack of time and, in some cases, incomplete booking records not all libraries received statistical reports.

The methods which were considered for capturing the data were mark sense sheets, manually punched tabulating cards and computer produced forms.

MARK SENSE SHEETS

Although the initial film distribution study done in 1965-66 used mark sense sheets for capturing booking records this method was abandoned for several reasons.

One deciding factor was the loss of the mark sense reader which had the adaptations necessary to output several punched tabulating cards from a single mark sense sheet.

Another deciding factor was the abandonment of exact day accuracy by the research team in the reporting of booking records. The usage of a film during every week of the school year seemed detailed enough for the purposes of studying and reporting film distribution.

The final deciding factor was the opportunity to eliminate steps and reduce errors by reporting booking records directly on tabulating cards. The two approaches to this method are outlined below.

MANUALLY PUNCHED TABULATING CARDS

International Business Machines produce a portable punch for its many forms of Port-a-punch tabulating cards. This would allow an investigator from the film distribution study to go directly to the records of a film library and produce the data deck of cards needed for statistical analysis by the computer. With limited training a clerk in each individual film library could collect the booking records and thus free the investigator from travel and reduce data collection time.

There were however, two serious drawbacks to the port-a-punch cards. First, there were only forty (40) columns available in these special tabulating cards and we wished to record booking activity for each film over forty-two weeks of the regular school year. Also we would have preferred to have the title and print number of the films printed on the cards (a card for each print held by the specific library) and there seemed to be no way to have a machine place these titles on the cards without also punching holes and further reducing the area for recording film bookings.

Second, the holes produced in the Port-a-punch tabulating cards were wider than those on standard punched cards and placed in alternate columns. This required equipment modifications to allow these cards to be converted to a standard deck of tabulating cards capable of being read directly into the computer. Under closer study this method was abandoned for one of our own creation.

COMPUTER-PRODUCED FORMS

Two programs were designed and written for the IBM 7074 to assist in the data collection. The first program took input cards, one for each film title, with the number of prints of each title held by a specific library punched in a column assigned to that library and instructed the computer to reproduce a deck of cards, one for each print, containing the current inventory of a specific film library. The output deck had a card for each print with the title and print number printed on the card in the columns beyond 42 (see Appendix B1).

The second program instructed the computer to print out a grid beside each title/print under the weeks of the school year (see Appendix B2). This accompanied the inventory deck in order to

assist the keypunch operator in transferring booking information from the library's record forms to the inventory deck.

Under test this method has proved to be simple for use by staff members of any film library either with or without the services of a keypunch operator. Once the booking information has been transferred to the printout grid, any keypunch operator can punch it into the first forty-two columns of each tabulating card of the inventory deck for that library, and then the deck becomes the data deck ready for reading into the computer.

Current Records¹

Ideally, the operation of the network should have been initiated during the summer months so that no backlog of film requests and bookings would have existed when school opened in September. Unfortunately, the grant was not processed and received until December, so that a half-year backlog of manually made bookings had to be captured by the computer before the network could automatically handle the scheduling of current film orders.

TWO FORMATS ACCEPTED

To capture these manually made bookings the calendar records for each film were translated into punched paper tape format on the teletypewriter in one instance, and the punched tabulating cards available for each film order were used in the other instance.

Each format necessitated different handling:

- A. Records that were not machine readable (usually standard booking forms adapted by the local library) had to be transformed into a machine readable format. This was accomplished by producing a paper tape from a TWX machine that included the necessary information; the tape was then transmitted to the computer as in Network operation.
- B. Records that were available on machine-readable cards were usually found in libraries that had a data processing system. These, of course, like the tape had to be interpreted and translated into Network formats by a computer conversion program.

It should be mentioned that most film libraries accept requests and fill orders at least two months in advance. Consequently, in order to begin operation on the first of February, for instance, all the manually booked orders whose use days ran to the end of March had to be recorded within the computer's disk files to avoid duplicate bookings on the same print at the same time. All those whose use days fell prior to February, in this instance, could be considered completed records and could be entered as time allowed, since they were only for statistical rather than operational purposes.

¹ Current records are bookings for the current school year.

A word of caution is needed regarding the delaying of processing of these "completed" records. If program changes should alter the format for acceptable input during operation, attempts to enter this information later will necessitate either a conversion of these records to suit the revised input format or the creation of a conversion program to alter the information prior to acceptance into the computer's disk files.

Generally speaking the punched paper tape format was the chief input format during the establishment of operational scheduling services - the Network's primary function.

General Library Data

Each participating film library was required to supply the following information in detail for the school year 1967-68:

- A. a listing of all titles currently held in the inventory for circulation to all schools (films and other materials that circulated under restrictions were to be handled manually as usual by the library staff). The current film library catalog could be substituted if it was up-to-date.
- B. the latest number of duplicate copies of each film in the inventory listing, or if applicable, in the film library catalog.

E.g.	HEN HOP	[one print]
	FARM BABIES (2)	[two prints]
	CRITIC	[one print].
- C. a calendar of school days; specifically this should indicate all days where either a delivery or a pick-up of films is possible even if students may not be in classes all day.
- D. the delivery and pick-up schedules associated with the schools so serviced.
- E. a list of all schools serviced and their mailing addresses for receiving back-up service from the central film source when the local film library cannot provide a film to meet the teacher's request.
- F. rental fee associated with each title held within the inventory for circulation; this applied to the central back-up library only, but could have applied to local libraries who were willing to share their holdings.

With the collection of data completed it remained necessary to establish and maintain inventory control for the computer's files.

2.2 INVENTORY CONTROL PHASE

The success of an information processing system such as the Film Library Network depends heavily on the ability to maintain accurate and current information files. It requires a constant awareness on the part of those responsible for data input, that at no time can the demands of the computer programs be overlooked.

These computer programs maintain strict adherence to input restrictions (parameters) immediately rejecting input errors. Needless to say this is one area where expediency, though important, must give way to accuracy and consistency.

One area that demanded research for verification was that of the film title. Titles for identical films often appeared in different wordings in the various library catalogs and inventory listings. To remove duplicate entries, reference to the Library of Congress' National Union Catalog - Motion Pictures and Filmstrips and National Information Center for Educational Media's Catalog of 16 mm Educational Films as well as producers' catalogs was necessary.

In some cases identical titles remained as separate entries because the libraries made errors in identifying the producer as in using IFB (International Film Bureau) instead of IFF (International Film Foundation). Constant reference to the above sources had to be made to eliminate such duplication and to obtain proper film back-up.

For the entire six-month-operational-phase the inventory control was maintained by the project staff. Toward the end of the period, however, the local libraries were trained and computer programs were implemented which allowed local changes such as: print or title removal (for repair or loss), and print or title insertion (following purchase, recovery, or return from repair). Such inventory corrections were made via the teletypewriter directly into the computer files for the specific library calling in the change. Changes to alter all reference to a particular item (no matter what library held it) were made only by project staff members. Such universal changes were all made to the master title inventory which was maintained as a deck of punched tabulating cards which was periodically used to update the computer's master title file. The master title file acted as a brief union catalog and indicated cross-reference possibilities for back-up sources.

Updating master and local inventory files within the computer required that each revision be compatible with the program's acceptable input format; be consistent and complete in content with existing entries; and be checked upon completion of input to detect any inaccuracy between intended and actual outcome of change to the inventory record. Following master revisions the local libraries were informed of changes that related to their inventories.

One of the benefits of the Network operation is the provision of statistical reports. The accuracy of these reports is dependent on the accuracy of the film inventories. Many errors in the records and catalogs of the local libraries were detected and corrected as a direct result of the reference searching of those responsible for inventory control.

2.3 OPERATIONAL PHASE

Collecting and maintaining data is but a part of the total method employed. The complete picture must include the techniques and technology involved in the undertaking. Therefore, the following statements will delineate the necessary strategies.

Travel

The local libraries serviced by this network were located several miles from Syracuse University. Consequently, traveling to these areas was an important part of the program. The majority of time consumed for this purpose was at the initial stages of their involvement. At this time the teletypewriter terminal was installed and instruction was given on its proper use. [Certain patterns of input must be used to accommodate different output demands. Thus, a request for film confirmation will differ from a request for removing a title.] Also, at this time some of the records needed for input were collected.

In addition to the terminal instruction, consultation was provided for adapting the Network to the local system of film service. A certain amount of resistance to change will undoubtedly be manifested by the local staff and, therefore, a cautious approach is imperative. It may even be necessary to trade-off effectiveness for stability, in a sociological sense. Unlearning old habits may pose a serious threat to the need for unity.

Finally, the need to make periodic visits is important. Necessary changes in prior instruction; difficulty in assimilating the Network routine into the local system are just two of several reasons why return visits must be considered.

Programming

A considerable amount of time was consumed writing and rewriting computer programs for the following reasons:

- A. Changes in specifications to accommodate new demands from local libraries which occurred after the operational stage began in turn required new computer programs.
- B. Although many adequate programs had been written during the simulation stage, these were designed for the IBM 7074 which is no longer available. The installation of an IBM 360 (Model 50) required that a large percentage of these programs be rewritten.
- C. The operational stage revealed, in certain instances, techniques which fell short of desirable goals. Modifications were made which frequently involved writing new programs or program changes.

- D. Changes in storage location for the purpose of optimizing service required the generation of new programs.

Back-up Service

The central library required special treatment for the following reasons:

- A. Deletions and additions of films to this library required changes in other vital information which was not the case with local libraries.
- B. Updating of information was far more frequent with this library due to frequent changes in inventory.
- C. Requests for back-up films were conducted by phone at a time not always convenient to both parties. Requests from local libraries was in the form of a systems number which the back-up library did not recognize. Consequently, it was necessary to translate this information into a title form.
- D. Some responsibility was assumed by the Network for encouraging local libraries to return films on time to the back-up library by transmitting reminder messages over the teletypewriter.

Naturally, most of the procedures associated with the specific objectives have been treated under the tasks of data collection and operation of the Network, especially objectives A, B, and E, (see Chapter 1, 1.2).

However, there were two objectives, C and D (see Chapter 1, 1.2), which were reached by procedures not covered in the descriptions above. These were to develop standard coding systems for film and user identification and to prepare a procedural manual for participating libraries.

There were no standards for film identification numbers. Numbers must be used for economy in transmission, but to avoid errors caused by transposing digits while typing - a check digit was provided. This was calculated by the computer, added to the sequential accession number it assigned to each title, then added to the master title inventory list. This system was set up to allow for 64,000 titles. In the following formula, digit A is to be used for expansion. It will always contain a '0' until the system film inventory goes beyond 9,999 titles.

$$\text{E.g. } 10 - [2 \text{ (A + C + E) - (B + D)]$$

last digit	last digit
of sum	of sum

Using 4326 as a sequential accession number -

A	B	C	D	E
0	4	3	2	6

$$10 - [2 (0 + 3 + 6) - (4 + 2)] =$$

$$10 - [2 (9) - (6)] =$$

$$10 - [18 - 6] = \quad \text{NOTE: Use last digits of sums.}$$

$$10 - [8 - 6] =$$

$$10 - 2 = 8$$

CHECK DIGIT = 8

SYSTEM IDENTIFICATION NUMBER = 43268.

If the teletypist, in sending in the request typed 42368 (transposing digits) - the computer program would not make a booking for film 04236 (The Critic) since its check digit by the above formula would be 1, instead the program would reject the request by issuing a check digit error message. This illustrates how mistakes in booking were avoided when titles were not used. Titles were held in computer storage for reports but were never involved in processing requests.

Dates were simply coded by month and day, as 117 was January 17th and 1117 was November 17th. The year was not necessary since no requests were accepted for more than four months in advance although a twelve month advance limit could still operate without a year digit since yesterday's date would then belong to next year's calendar within the computer's files.

Customers (schools, usually) were identified by district, building and check digit codes. The only reference available was the coding system used by the New York State Education Department's Bureau of Statistical Services which used twelve digits and provided no check digit to eliminate transpositional errors. Some libraries had number coded their schools on district-building basis and only needed our check digit to allow 04-01-5 to identify Croton-Harmon High School if it was the Westchester County Film Library calling (Library identification code 004). The same customer identification code was used under other libraries but the calling library's identification code summoned up the corresponding customer files for that specific library.

Manuals for employing the codes, placing booking requests and carrying on other transactions within the network's operating system were drafted by the staff and given to the libraries. As program changes made revision of the teletypewriter input formats necessary these were either made by replacement pages sent by mail or follow-up visits which allowed the staff to explain and demonstrate the new procedures as well as make the corrections to the manual. The complete manual as it finally emerged forms Appendix A of this report.

CHAPTER 3

3. RESULTS

Succinctly stated, the results were that data was collected, programs were implemented and services were established. Information relating to the inventory of the network, the services established by computer programs and the statistics gathered from the operational period will again be given in approximate chronological order.

3.1 INVENTORY DATA

The holdings of the three local libraries combined with the holdings of the central back-up library gave the Network a total master inventory of 6,897 unique titles, even though collectively these libraries held 9,050 titles. Hence, 2153 titles or approximately 23% of the total holdings consisted of titles that were held by more than one library. This overlapping of titles would allow sharing and back-up service.

The study of film inventories made in 1964-1965 showed that the overlap between the local libraries and the central library was 60%. The current study revealed an increase in this overlap (slightly above 70% in the case of the largest local library) which allowed more films to be back-stopped centrally. (see Table 1).

Table 1
Growth of Film Inventories

Library	1965 Titles (Prints)	1968 Titles (Prints)
Westchester	466 (486)	942 (980)
Suffolk	627 (863)	749 (972)
Erie	1424 (1603)	2137 (2883)
Syracuse	4122 (7731)	5222 (9527)

3.2 SERVICES ESTABLISHED

By the end of the school year the following computer services were operational.

Booking

- A. Recording all requests received by teletypewriter and the results of the requests (booked, booked by sharing, referred, and denied).
- B. Processing all requests to determine availability of material.
- C. Scheduling materials for delivery to users for specific periods and reserving time for return and inspection of material.
- D. Referring those unbooked requests for films which are back-stopped at the central library, by printing out the film titles and corresponding customer numbers for manually scheduling at the central library.

Cancelling requests for materials previously scheduled to comply with customer rejections or to meet the situations where a film was lost or damaged and the requests could no longer be honored.

Entering titles into the local library's inventory and computer files to reflect purchases.

Removing titles from the local library's inventory and computer files to reflect permanent removal of title from collection.

Adding records of copies or prints of materials to reflect duplicate purchasing.

Deleting records of copies, as when a print is removed temporarily for repairs and no bookings can be scheduled for these copies.

Preparing delivery lists which for a specific date will display the materials, by inventory number, under the customer (school building) to receive them for the use period being served by this specific delivery date.

Displaying, upon request, either the dates for which an item is booked and the customer to receive it, or the open ranges of use periods available in which an item may be booked.

3.3 ACCOMPLISHMENTS

Procedures for data collection and operation of network transactions were developed using machine-readable-tabulating cards and teletype-punched-paper tapes.

The chief results were that reliable records were collected and processed. The results were reported, thereby establishing and demonstrating an operational network.

Almost 23% of all the titles were held by more than one library and generally 60% of the locally-held titles were also held by the central library. These common titles were the basis for the back-up service that was established.

The services actually established on a daily basis via telecommunications between the local library and the central computer records included:

- recording all requests,
- scheduling films for delivery,
- cancelling requests,
- entering and removing titles or prints,
- preparing delivery lists, and
- displaying available dates for specific titles.

Other accomplishments included standardization of codes, automation of usage reports and development of the basis for a generalized information network. Staff requirements, costs to anticipate, usage statistics and general operational findings were also reported.

3.4 STAFF REQUIREMENTS

Director - This person (by regulation a faculty advisor) had to be assigned to provide part-time guidance and support. In an operating situation this position would become full-time and incorporate the responsibilities of the principal investigator.

Principal Investigator - This person had complete responsibility for supervision and administration of the research.

Systems Analyst - This person's time (50%) was devoted to the research both in the design stage and in the developmental stage since revisions and alterations to the operation of the Network demanded his view of the whole system and the interrelation of the parts. This position, in an operational situation could be incorporated in the chief programmer or be a consultant position.

Operations Manager - This person was responsible for acting as liaison between project staff and personnel at the libraries; data collecting, staff-training, and handling business affairs. This position would remain unchanged in any future operation.

Data Manager - This person was responsible for data collection and data computer preparation. This position would be needed in any future operation which added any new libraries to the system.

Chief Programmer - This person was directly responsible for the writing and coordinating of all computer programs both for operational and for record-keeping functions. During the developmental stage there was also a team of part-time assistant programmers assigned to specific programming tasks; one of these positions might be needed to accompany the chief programmer in an operational situation.

Documentor - This person was given the sole responsibility of documenting the Network's operations. A constant documentation of programs, systems and the changes relative to them is not only valuable to the development of any system, but also to the Network staff as a means of coordinating their efforts and of keeping them informed of constant changes. This position could be incorporated into that of the chief programmer in an operational situation, and would be important in preserving records for any future development.

3.5 COSTS TO ANTICIPATE

Although the original proposal had a budget - its figures are now meaningless because of changes in staff, procedures and equipment as they came to be used in the actual development and operation of the Network. More valuable to future developers is the following estimate of expenses to be considered. They reflect the estimated costs for one year's operation.

A. Operating costs for 10 libraries

Personnel:

Programmer/Analyst	\$10,000	
Operations Mgr./Admin. Ass't.	8,000	
Secretary, half-time	<u>2,500</u>	\$20,500

Hardware:

Computer time	\$25,000	
Teletype equipment (Data Set & Monitor)	2,700	
IBM Type 2 Adapter (Teletype to computer interface)	1,800	
Telephone line service (WATS)	6,500	
IBM 2701 Data Adapter	6,400	
IBM Auto-call	<u>400</u>	\$42,800

Office:

Supplies, typewriter	\$ 2,000	
Keypunch and cards	800	
Telephone, postage	<u>200</u>	\$ 3,000 +

Travel:

Minimum - four visits each library	<u>\$ 3,600 +</u>	\$ 3,600 +
	Minimum Total	<u>\$69,900 **</u>

B. Future costs if additional development is needed

Personnel (In addition to above mentioned personnel):

Dir./Developer	\$14,000
Systems Analyst	12,000
Chief Programmer	11,000
Programmer	9,000

Plus:

1 additional person each 1000 new titles during Data Collection Phase for new libraries (or 1/2 man month per 1000 titles); plus an additional man month per 4000 bookings if libraries require collection of previous year's booking data (not in computer processable form) for statistical purposes.

** This figure does not include any overhead or fringe benefits for employees, nor does it include the cost of the teletypewriter which would be approximately \$1200 for each local library which does not already have one.

3.6 USAGE STATISTICS

Although only one local library became fully involved, the findings regarding its booking activity can be compared with similar findings for the same library in the earlier study.

The average number of bookings per print held in the inventory increased from 11.76 to 13.90 over the three-year period. This is a considerably high usage rate when compared with the average of 6.4 bookings per print achieved by the central back-up library which must allow for slower turn-around-time due to mailing times for delivery and return of films.

The main feature of the network that enthused the member libraries was the back-up capabilities of the central library. Of the 32,537 bookings made on the 1,603 heavily demanded prints (more than 11 bookings per print was defined as heavy demand), 25,324 or 77% of those bookings were made on films that were back-stopped by the central library. Likewise, about 75% of the seasonal bookings were made on films which were also back-stopped by the central library.

During the months of April and May 1968, the approximate statistics on back-up bookings for one local library were as follows:

37	Request Normal Booking tapes processed,
8600	Transactions entered into the computer,
1000	Referral requests for back-up films,
440	Referral requests booked by the central back-up library,
560	Referral requests not available.

Therefore, referral requests to the central back-up library amounted to 11 1/2% of total transactions, 44% of these were booked by the back-up library; and the remainder, or 56% were not available. The low percentage of back-up bookings available from the central back-up library indicated that most films are solidly booked for the year by May.

Seasonal films were defined as those titles which were booked only during a limited period of the school year, specifically, if a film showed 90% of its booking activity within a five-month period or less (and had more than six bookings total) it was defined as a seasonal title. In 1965 the Erie Library had 401 seasonal titles with 5,381 bookings. In 1968 they had 501 seasonal titles with 7,185 bookings. Most of these seasonal titles reflect topics directly associated with the seasons of the climate, holiday seasons, and calendar events such as birthdays and historical anniversaries. Others, however, must follow some curricular calendar for here are some examples of title topics heavily used in a specific month:

September	- Safety, Our Earth
October	- Rocks, Maps, Vikings, Prehistoric Life
November	- Navaho, Courtesy, Holy-land
December	- Ancient Rome, Medieval Times

January - Cotton, Colonial Life
 February - Napoleon, Mailman
 March - New England, Western Europe
 April - Civil War, Human Growth, Germany, Rabbit
 May - World War, Far East
 June - Water, Circus

Beyond heavy usage seasonal films, there were films which were heavily used over the whole year such as:

World is Born - 116 bookings
 How to Catch a Cold - 92 "
 Johnny Appleseed - 90 "
 Seasons of the Year - 89 "
 Telling Time by Clock - 81 "
 Birds in Winter - 81 "
 Alaskan Eskimo - 81 "
 Hansel & Gretel - 80 "
 Trip to the Moon - 80 "
 Age of Discovery - 79 "

Looking at the year's usage totals by both weeks and months, March volumes of bookings were the highest with 5800, with May's totals next highest at 4600 (see Table 2).

The most significant finding in the usage statistics (Table 2) is that the total volume of bookings at the Erie Library has more than doubled over a three-year period going from approximately 19,100 bookings in 1964-65 to approximately 39,600 bookings in 1967-68.

TABLE 2

COMPARISON OF RANKED USAGE BY MONTH BETWEEN FORMER AND CURRENT STUDIES

1964-65		1967-68	
(BOOKINGS BY HUNDREDS)	MONTH	(BOOKINGS BY HUNDREDS)	MONTH
25	March	58	March
24	Oct.	46	May
23	May	44	Jan.
22	Jan.	43	Nov.
21	Feb.	42	Feb.
20	Nov.	40	Dec.
16	Dec.	38	Oct.
15	April	33	April
15	June	30	June
10	Sept.	22	Sept.
<u>191</u> TOTAL		<u>396</u> TOTAL	

3.7 OPERATIONAL FINDINGS

By far the most significant results to report are the details of operation that finally emerged as the services of the Network were developed and established. These are most meaningfully presented and understood in the context in which they are applied. This presentation is contained in the User's Manual to be found in Appendix A.

CHAPTER 4

4. DISCUSSION

This chapter will present comments on the findings reported in the preceding chapter following this order: inventory findings, services and costs, usage statistics, operational findings, and problems encountered.

4.1 INVENTORY FINDINGS

The previous survey revealed that about half of the titles in any local library were unique to that library when compared with any other local library. This led to the conclusion that greater variety could easily be offered if local libraries could establish some sharing arrangement. This has been tried informally but has generally been avoided for political and logistic reasons.

The present survey shows once again that the majority of titles held by any local library were also held by the central library. See Table 3 below:

TABLE 3

NUMBER OF TITLES COMMON TO BOTH LOCAL AND CENTRAL LIBRARIES

LOCAL LIBRARY	LOCAL TITLES	LOCAL TITLES DUPLICATED IN CENTRAL LIBRARY	BACK-UP SERVICE POTENTIAL
WESTCHESTER	942	555	59%
SUFFOLK	749	479	64%
ERIE	2137	1384	65%

This made back-stopping at the central library feasible when the local library did not have a title available as requested. In some cases, when the back-up service was used, the teachers even received updated versions of the films requested.

Many small libraries are forced to re-use films until they literally fall to pieces, and their teachers are forced to use out-dated films because they have no other alternative than to use what is held in the inventory. The central library through its rental charges can and must maintain a current inventory in excellent repair to hold its customers. Drawing upon the resources of a rental library for back-up services ensures a quality alternative source and must be less expensive than purchasing a duplicate print when the additional copy is only used a few times.

4.2 SERVICES AND COSTS

The services and computer programs were all designed to meet the needs of the libraries involved. Studies of both the central and local operations were made and their information requirements were built into every service established. Since all libraries were volunteers we could not force any administrative or procedural changes; instead we had to design each program so that a tailored version could be called into operation to match the library calling the network's central computer. Our only requirement was that both customers (schools) and materials (film titles) be identified by numbers. This caused no problem in any library since most already used numerical identifiers to some extent and the largest library was waiting for a numbering system to be developed.

The comment that not all these services were established until the end of the school year points to one of the major limitations of this study. IT WAS BEGUN TOO LATE. The funding for the project was received in December 1966 and from then on there were several delays in equipment delivery. Then programs had to be rewritten or written to suit the new computer. Tests were run in the fall and the backlog of teacher orders had to be entered into the computer files before the first local library could begin to allow the computer to schedule its requests. This was in February. Ideally, the services should have been tested in the spring so that the summer could have been used for revision, inventory changes, and entering fall requests in preparation for full service operation in all libraries when school began in September.

Costs for this project are only a rough guide for any future development. Computer costs are expected to decrease and a more economical telecommunication system could be employed. This project used the TWX SERVICE. Depending on the length of the average call from the local library and the call-in arrangement, (DATA-PHONE) or some version of wide-area-telephone service (WATS) or tie-lines could be used.

Under travel expenses it was generally found that for one person traveling a great distance, airplane travel was more economical than automobile travel in time as well as accommodations; whereas, for three or more travelers automobile travel was preferred. Also, commuting within a 50 mile distance was preferred to staying overnight especially for more than one traveler.

4.3 USAGE STATISTICS

The earlier study revealed much the same monthly demand patterns for the school year. While December is always expected to be low because of the reduced number of school days and the special activities planned in elementary schools; the other low-film-usage-months could be raised. A teacher survey revealed that teachers would use films more evenly (in September and January for introduction and motivation, in June for review) if given unrestricted choice; but the reason for their not doing so in actual practice has yet to be investigated.

Seasonality of certain unseasonal topics seems to follow the syllabus and results in heavy demand for limited periods with many teachers either having their requests for these materials denied or delayed. If the teachers could juggle some topics to other calendar arrangements their chances of receiving materials would increase. Materials on truly seasonal topics can never be supplied in sufficient quantity by local or central libraries.

There are two possible solutions to this problem. One is for the districts to rotate the seasonal material amongst all the schools (circuit booking) without going through normal delivery procedure. The second solution would be for districts to purchase less expensive materials such as film-strips or film loops in cartridges, and supply each school with a set. Possibly four variations of the set could be used and these rotated each year to provide different titles on the same topic every year with a repeat occurring only every fourth year so that students would not be exposed to the same materials every year.

4.4 OPERATIONAL FINDINGS

The major finding was that computerized booking, involving BOCES film holdings, delivery schedules, holiday and examination schedules, terminals, phone lines, computer programs, and most importantly people, could work despite some unforeseeable obstacles which are discussed below:

- A. Originally the input film request format contained 39 characters of information. In practice this took too long to type and to transmit to the computer. This format had to be completely altered to one containing an average of 16 characters per film request.
- B. Each local library had its own peculiarities which meant providing for alternate types of input and processing within our programs. This point must be considered whenever a new local library is about to enter into the system. Some of these deviations were:
 - 1) One library, when doing manual bookings, noted on the booking records when additional requests came in for the same film, from the same school, at the same time; and then shipped the film with a note indicating that additional teachers in the building also were to have this film. The computer booking program had to be altered to record and signal such shared usage bookings and deliveries.

2) Another library used its own catalog number for identifying films which was not the same as the Network's film number. Therefore, a cross-reference table had to be incorporated into the computer program to equate the two numbers.

C. During the developmental phase, error-correction procedures were very time consuming and costly on the part of both local library and central control staffs. Each error in teletype input had to be re-entered as soon as possible. Check digits prevented most transpositional digit errors. However, if a format error occurred in the school number all the film requests from that school, that could be booked, were booked under the last valid school number. Such errors sometimes were difficult to find either centrally or locally. The system functioned best when all the error-corrections were entered in on the day they occurred. If these errors were not detected early enough to be corrected the same day a backlog of error-corrections accumulated.

The next finding was in the area of back-up service. During the period of booking back-up film for the local library at the central library, beginning the middle of March until the end of the semester (in the middle of June), there were:

1058 requests for back-up film;
584 requests were booked;
474 requests were not booked.

The 584 requests that were booked represented 55% of the total requests and involved 235 unique film titles or about 2.5 requests per film title on the average. These results tend to indicate that a back-up source would be a good supplement for a local film library. Teachers could get better service without the local library having to make a capital investment in additional film, particularly if the number of overload bookings for a film were too low to warrant a film purchase.

The final finding involved computer down-time or non-operating problems at the Syracuse University Computing Center where the computer programs were run. When the computer went down all booking requests were delayed until the computer was back in operation. At times the down-time lasted as much as 3-4 days. Since the project staff did not have full control of the computer, little could be done about the situation. Were the computer based in an operational setting run by the State or a local library, this problem could be eased (but not completely solved unless a back-up computer were made available in case the primary computer went down). This is a general problem in all networks, but it becomes more critical in a pseudo-real-time operation like this one where the turn-around time should be a matter of seconds instead of hours or days.

4.5 PROBLEMS ENCOUNTERED

Funding

Grants for a study as complex and unique as this cannot be given on a one-year basis with any assurance of reaching the objectives.

Target dates for real-time systems are usually off by one-hundred percent or more. The deadlines were off at least by this factor due to the change in computers, the delay in delivery of the IBM 2701 Data Adapter Unit, the re-writing of programs to meet the demands of the new hardware, and the re-training of staff.

Under these unforeseen circumstances a six-month, no cost, extension was granted. This was necessary to achieve many of the objectives in the proposal. Funding for long-range projects such as this one should be awarded for a two or three-year period to make maximum use of staff experience, to insure continuity of the research, and to avoid the redundant collection of data.

Endorsement

Institutions to be involved in the Network were not partners in the planning of the system; they were correspondents rather than clients. This engendered the prevailing posture that if the Network functioned more economically than a manual system it would be supported, and if it did not prove to be economical it would not be supported. No library providing a service could be expected to abandon its procedures for new ones without some guarantee that the new system would continue beyond the research and development stage.

Political endorsement, accompanied with financial and personnel help, should be given by the State Education Department.

Service Safeguards

Before a new system involving computer programs and telecommunications replaces an existing one, there should be a period of time that the two systems are operated in parallel to insure that the new one functions properly. The parallel period should not come before all known errors are removed from individual computer programs even if deadlines should fall by the wayside. The materials scheduling system was paralleled too soon and consequently many unnecessary corrections had to be made to large volumes of data to keep the two systems compatible during this period. The university computer on this project was used mainly to run research and student jobs, consequently strict time scheduling was not an important factor. It was very difficult to schedule exact times for the materials network under such an operation. Even when schedules were fixed, frequent disruptions in service occurred due to computer modifications and computer down-time.

Once a service becomes operational it should be moved to a service computer with back-stopping facilities to eliminate disruptions in service. Non-operating periods in the operational phase of this project caused backlogs of requests at the local level and consequent delays in confirmations to schools. A service computer should be available for any operational testing of information networks.

CHAPTER 5

5. CONCLUSIONS & RECOMMENDATIONS

CONCLUSIONS

This project set out to establish an operational film scheduling network among film libraries within New York State. Although the conclusions and recommendations are based upon experience involving only requests for 16 mm film it should be understood that any other scheduled materials could be handled almost identically with the procedures for processing film requests. Therefore, references will be made below to a materials scheduling network rather than to the narrower, though actually demonstrated, film library network.

1) A Computerized Materials Scheduling Network is Workable.

The performance of the operational programs for data capture, booking, file maintenance, analysis, and shipping lists developed in this operational phase, demonstrated conclusively that most of the major technical problems inherent in a computerized telecommunications network have been solved.

2) A Computerized Materials Scheduling Network Will Be A Necessity Within The Next Few Years.

As indicated earlier the largest library in this study had doubled its bookings over the past three years (up to 40,000). The back-up library at Syracuse had increased its bookings 26% (up to 62,200) over the same period of time. This is indicative of a rapid rise in film usage throughout the State. As volumes of bookings increase additional personnel will be needed to make the bookings. More important it will become increasingly more difficult to obtain even limited statistics manually for operation, planning and control, both by the local libraries and by the State. When other media are also considered this situation will become even worse. The best solution to these problems would be to set up a computerized materials scheduling network.

3) A Computerized Materials Scheduling Network Will Not Reduce Operating Costs.

Computerization will not save money because of the expense involved in computer personnel salaries, line charges, teletype-rental charges, and computer time. It is estimated that charges would range from \$3,700 - \$9,700 per library annually depending on the number of prints and the average daily attendance. If a local library had its own teletype, its cost would be reduced approximately \$1200 from the above figures. The charges first quoted do not include the cost of back-up film. For the largest library an estimated one year's back-up rental fees (based on three-months data) would be \$9,000 excluding volume discounts (this library had over 2000 films and about 40,000 bookings per year).

RECOMMENDATIONS

Up until the conclusion of the current operational phase of this study -- objectives and direction were supplied mainly by the Syracuse University research team; however, state and local direction and participation will be necessary in order to make a materials network a reality. With the above in mind, the following recommendations are made:

- 1) A study team (composed of a Systems Analyst, State personnel, local library personnel, and on a consultant level members of the Syracuse University research team) should be set up to clarify existing objectives, state new objectives, plan, and implement the computerized materials scheduling network.

The following documents should be read by members of the study team as aids to their planning:

- a. Final Report - A Computer Simulation of a Statewide Film Library Network: A Feasibility Study for Actual Operation.
 - b. Final Report - A Prototype System for a Computer Based Statewide Film Library Network: A Model for Operation.
 - (With accompanying Documentation:
 - Doc. #SD-003-0 Specifications - Files,
 - Doc. #SD-004-0 Specifications - I/O,
 - Doc. #SD-005-0 Systems Writeup,
 - Doc. #SD-006-0 Code Book).
 - c. Doctoral Thesis - By Fred L. Christen (Nov. 1966, Syracuse University) An Analysis of Film Usage Patterns and Trends Among Selected Film Libraries in New York State (3).
 - d. Coding Standards - By Charles M. Bidwell & Ford L. Lemler - Standards for Cataloging, Coding and Scheduling of Educational Media.
- 2) Standardization of codes should be considered for each of these data elements: titles, districts, schools, teachers, producers, and media. Standardized procedures or guidelines should be considered for materials ordering, scheduling, delivery and pickup routines, holidays, record-keeping, inspection and repair, as well as preview evaluation, selection, and purchase of materials for collections. Standardized forms could be produced and provided more economically than under the present individualized method.

- 3) The practicality of establishing a management information system for an expanded materials scheduling network should be studied. A management information system is a coordinated communications process of recording, processing, maintaining, and querying data. It provides feed-back to operations and management personnel whenever a predetermined exception occurs which requires higher-level decision making. Such a system would serve to aid the operation, control, and planning necessary in the materials scheduling network. The existing computer programs form a basis for such a system, however, some modifications and additions would have to be made to them (at a cost of 3-4 man years). Programming is currently in progress in this area under another contract at the Syracuse University Computing Center under the direction of Dominick Auricchio.

- 4) Temporary subsidies as enticements to join the Network should be avoided, because once the local library plans its expenditures with the subsidy included, it will balk when the subsidy is removed.

- 5) Funding for such a network should be obtained for a two or three-year period at least to allow a firm establishment of the system and to provide adequate safeguarding of service during the establishment of operations.

CHAPTER 6

6. SUMMARY

PURPOSE

The purpose of this project was to develop an operational, telecommunications-oriented, materials scheduling network for local libraries with back-stopping capabilities at a central library. Specific libraries were to be entered into the system and the collection and analysis of data was to be undertaken.

The primary concern of both local library and project staff was to provide improved film service to teachers. As a result, one of the chief objectives was to develop programs to refer films, which were unavailable for scheduling in local libraries, to a central back-up library.

CONCLUSIONS AND RECOMMENDATIONS

Three conclusions were arrived at regarding the computerized materials scheduling network. Such A NETWORK IS OPERABLE; such A NETWORK WILL BE A NECESSITY WITHIN THE NEXT FEW YEARS; and such A NETWORK WILL NOT REDUCE OPERATING COSTS.

Beyond these conclusions there were five recommendations:

- 1) A research team should be appointed to study the reports of this project in order to clarify objectives, plan development, and implement operation of a computerized materials scheduling network.
- 2) Standardization of codes, procedures, and forms should be seriously considered for all member libraries within any computerized materials scheduling network that is established.
- 3) A management information system should be considered for aiding in the planning, operation and control of any future materials scheduling network.
- 4) Temporary subsidies as enticements to libraries to join a network should be avoided.
- 5) Financing the development and establishment of such a network should cover a two or three-year period to be most effective and to ensure the greatest return for investment in time, materials and personnel.

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