A MATHEMATICAL DESIGN FOR EXPERIMENTAL EVALUATION OF I. L. L. OPERATIONS*

By T. K. S. IYENGAR

(Librarian, Indian Institute of Science, Bangalore-12)

ABSTRACT

This is an attempt to set up an Experimental design for evaluation of Inter-library loan operations. The study is based on Local situation at I. I. Sc., and Bangalore Libraries and interpreted in a general way applicable for the Special and academic libraries in different regions in India.

The three Union Catalogues of Serials published by the Regional Centre of Insdoc at Bangalore, give evidence of the coverage, potentiality and resources in terms of scientific periodicals available in Mysore State especially in Bangalore area and with particular reference to the Indian Institute of Science Library. In the present day Library operations, no library can claim to be self-sufficient or can subscribe to all periodicals covering the demand of its clientele. Library co-operation, of late, is becoming one of the main activities of academic and scientific libraries.

Some time ago, a meeting was initiated by the author and local librarians at Bangalore met at the Bangalore University Library to discuss matters pertaining to inter-library loan operations among the academic and scientific libraries in Bangalore area. Of course, any implementation of the operation concerning inter-library loan activity depends on the framework of rules established by each library or Institution.

In the initial meeting, an impact was made on the importance of inter-library loan facilities and library co-operation. A suggestion was

---

* Some aspects of this paper were evolved out of a course "GLS-Research Methods", which the author took as a part of doctoral work at the University of Chicago.

also made that each library should look into its own inter-library loan policy and come up with more flexible arrangements towards achieving efficiency in library co-operation.

The type of materials and the content to which such material can be lent among each library will depend of course on the revised inter-library loan policies of respective institutions and also it very much depends on the uniform policy that the Libraries will come up with in the Bangalore region.

The article which I am presenting here will confine only to the design aspect of inter-library loan pattern in the Bangalore area with reference to I. I. Sc. Library that may be applicable to other areas as well.

Type of variables available

Books

Periodicals

Photocopies

Microfilms

Faculty

Grad. Student

Others (Research, workers, Scientists, Administrators, etc.)

Due Date

Request Date

Department

Subject

N. A. L. Library

Bangalore Univ. Library and other academic Libraries in Bangalore

Major University or Technical Libraries outside Bangalore.

INSDOC main/regional Centres.

The I. L. L. operation could be evaluated in various phases taking into consideration different variables in correlation to others. Let us pick 2 variables in the area of requesters and 3 in the type of material.

Books (N_1), Periodicals (N_2) and Faculty (F), Student (S) and others (such as Research workers, Scientists Administrators, etc.) There is variation between Academic libraries and Industrial Libraries in terms of type of material requested (Books/Periodicals). F, S, and O' are variables representing the 3 types of requesters. Let us represent this by 'y' which is an independent variable standing for the type of requesters in the Indian Institute of Science Library in terms of their request for Books or Periodical articles which also is an independent variable. Let us call it 'x'.

Now, the relation 'x' to 'y' in a tabular representation will be:

		Type of Material x	
		Books	Periodical Articles
y *Type of Requester*	$F \begin{cases} R_1 \\ R_2 \end{cases}$		
	$S \begin{cases} R_1 \\ R_2 \end{cases}$		
	$O^t \begin{cases} R_1 \\ R_2 \end{cases}$		
Total Cases		N_1	N_2

R_1 – In Libraries of Bangalore

R_2 – In I.I.Sc. Library.

Since this experimental design is for evaluation purpose, we have to study the availability of material in two major sources. (Major Academic and Technical Libraries/INSDOC Centres, Tata Institute of Fundamental Research and National Aeronautical Laboratory, etc.). Therefore, for this purpose let us introduce a test variable and call it 't'. In terms of two major sources, let us dichotomize t into $\begin{cases} t_1 \\ t_2 \end{cases}$.

Statistically speaking t_1 and t_2 are partial conditional relations.

t_1 – Availability in I.I.Sc. Library

t_2 – Availability in Bangalore Libraries.

By tabular representation we have the relation of independent variable 'x' to test variable 't' as follows :

		x	
		Books	Periodical Articles
t	I. I. Sc. Library	a	a_1
	Bangalore Academic/ Industrial Libraries	b	b_1
	Total Cases	N_1	N_2

Correlation of xt is given by the cross-product, which can be obtained as follows :

$$xt = \frac{ab_1 - a_1 b}{aa_1 \; bb_1} = \text{point correlation}$$

Now, the relation between type of material borrowed (x) and whether the faculty is from I.I.Sc. Library (R_1) or Scientists from other Libraries (R_2) could be calculated in the following way.

t_1 (I. I. Sc. Library)

		Books	Periodical Articles
y	I. I. Sc. Faculty		
	Scientists outside I. I. Sc.		

Pratial conditional relations $xy : t_1$

t_2 (Bangalore Libraries)

		Books	Periodical Articles
y	I. I. Sc. Faculty		
	Scientists outside I. I. Sc.		

Partial conditional relations $xy : t_2$

These partial conditional relations are with respect to the Faculty of either I. I. Sc. or other Scientists. Similarly, we can obtain p. c. relations with respect to other requesters (namely, students and others).

Also, relation *ty* could be calculated for each case *F, S* & O respectively————(2).

Now, the p. c. relations of variables as related to original variables could be expressed by a general formula.

$$(xy) = (xy : t_1) + (xy : t_2) + (xt)\ (ty)$$

In controlled experiment, the two matched terms should be alike.

$xt \rightarrow 0$ and $ty \rightarrow 0$

The formula : $xy = (xy : t_1)\ (xy : t_2)$

The other case is such when the partial relations $\rightarrow 0$. i. e. t_1 & $t_2 \rightarrow 0$

The formula will be $(xy) = (xt)\ (ty)$.

But for our purpose t_1 & t_2 does exist.

That is the type of meterial borrowed (Periodical Articles or Books) through the I. I. Sc. or other Libraries in Bangalore System should be the base for sample for systems analysis.

There are several variables that are to be taken individually and the sample for Systems should have at least records for a period of one year. This is only a design to select sample and variables for any library that would like to evaluate their I. L. L. System with a pattern similar to Bangalore Academic/Technical Libraries.

PLAN FOR FILE ORGANIZATION IN I. I. SC. SYSTEM

a. *Requests* :

- →Loan
- →Photocopy or Microfilm — Alphabetical
- →I. I. Sc. Library
- →INSDOC Centres — Date

Variables : Type (Book *or* Photocopy *or* Microfilm).
Libraries (other *or* I. I. Sc. *or* Bangalore Libraries.

b. Receipt : → Borrower | Alphabetical

Variables : Type (Faculty, Student, others).

c. Arrival : Bangalore or outside Bangalore.

List by date requested and date received.

Variables : 2 (Bangalore, outside Bangalore).

d. Mechanics : (Follow → Flow chart skeleton)

when material arrives, list by – due date – name – department – short title.

e. Bus. Operations :

Variables : Charge to Departments.

I. L. L. Grant of I. I. Sc. Lib. Budget.

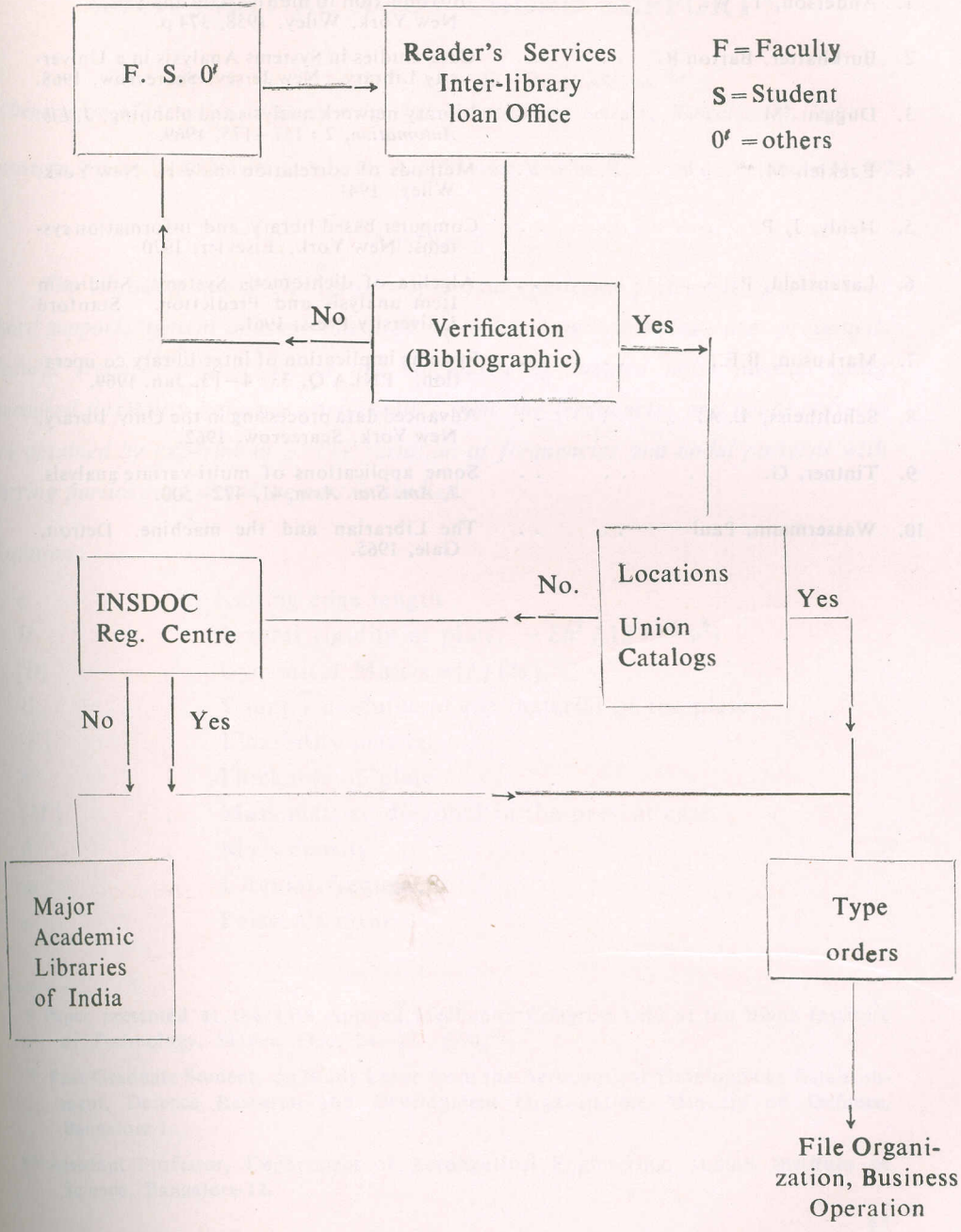
f. Completed Files : (*Retrospective*)

Requests arranged by borrower and kept for one year. I. L. L. files arranged by title or author and by department, kept for two years.

CLERICAL OPERATIONS IN I. I. SC. SYSTEM

1. Type I. L. L. requests
2. Through Insdoc Regional Centres
3. Processsing of incoming books (records of postage, etc.)
4. Processing incoming Insdoc's processed material.
5. Returning books (packing and sending of forms and postage etc.)
6. Payments (Departmental budgets/I. L. L. operational grant of I. I. Sc. Library).
7. Statistics
8. Files
9. Orders for Photocopying material on loan.
10. Order supplies.
11. Overdues.

I. I. Sc. Library Interlibrary Loan Flow Pattern



REFERENCES

1. Anderson, T. W., ... Introduction to multivariate analysis, New York, Wiley, 1958, 374 p.
2. Burkhatter, Barton R. . . . . Case studies in Systems Analysis in a University Library, New Jersey, Scarecrow, 1968.
3. Duggan. M. . . . . Library network analysis and planning, *J. Lib. Automation*, 2 : 157—175, 1969.
4. Ezeklel, M. . . . . Methods of correlation analysis, New York, Wiley, 1941.
5. Henly, J. P. . . . . Computer based library and information systems, New York, Elsevier, 1970
6. Lazansfeld, P. . . . . Algebra of dichtomous Systems, Studies in Item analysis and Prediction. Stanford University Press, 1961.
7. Markuson, B.E., ... Systems implication of inter-library co-operation. PNLA Q, 33 : 4—13, Jan. 1969.
8. Schultheiss, L. A. . . . . Advanced data processing in the Univ. library, New York, Scarecrow, 1962.
9. Tintner, G. . . . . Some applications of multi-variate analysis. *J, Am. Stat. Assn.* 41, 472—500.
10. Wassermann, Paul . . . . The Librarian and the machine. Detroit, Gale, 1965.