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ABSTRACT

With the onset of the information explosion, the role of the special librarian began to change. While his service goals remained the same, new techniques had to be developed to cope with the flood of published literature. Both networking and information science represent predictable responses to this situation. Information science offers a new technique--the computer; a new method--management analysis; and a new approach to the problem of evaluation. Much research needs to be done on all aspects of the special librarian's role. In particular, the problem of evaluating information services on the user's terms needs to be thoroughly explored. (Author)

FOREWORD

The Special Libraries Association series of state-of-the-art reviews of research are intended to provide definitive statements on selected problems and issues of major importance to special libraries. It is hoped that these reviews will meet the important needs: 1) of assisting SLA to respond to the desires of special libraries and 2) by identifying significantly needed research to encourage further studies by students and librarians.

The initial series of three reviews--"The Changing Role of the Special Librarian in Industry, Business, and Government," by Janice M. Ladendorf (Graduate Student, Library School, University of Minnesota, Minneapolis, Minn.); "Paraprofessional and Non-professional Staff in Special Libraries," by Elin B. Christianson (Library Consultant, Hobart, Ind.); and "Continuing Education Needs of Special Librarians," by Lawrence A. Allen (Dean, College of Library Science, University of Kentucky, Lexington, Ky.)--were commissioned by the SLA Research Committee during 1972 and conducted with the cooperation and assistance of the American Society for Information Science/ERIC Clearinghouse on Library and Information Sciences. The Committee is now planning a second series of four reviews for publication in 1974.

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THE CHANGING ROLE OF THE SPECIAL LIBRARIAN IN INDUSTRY, BUSINESS, AND GOVERNMENT

JANICE M. LADENDORF

SLA STATE-OF-THE-ART
REVIEW NO. 1

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With the onset of the information explosion, the role of the special librarian began to change. While his service goals remained the same, new techniques had to be developed to cope with the flood of published literature. Both net orking and information science represent predictable responses to t is situation. Information science offers a new technique--the computer; a new method--management analysis; and a new approach to the problem of evaluation. Much research needs to be done on all aspects of the special librarian's role. In particular, the problem of eval ating information services on the user's terms needs to be throughly explored.

PREFACE

When I agreed to undertake this review, I was asked to look at the changing role of the special librarian, with particular emphasis on the impact of networks and information science. The review was to be done in two parts--1) summarizing existing research and 2) identifying needed research. Several difficulties immediately became apparent and were resolved with the aid of the Research Committee. First, I was able to locate almost no research which was directly pertinent to the assigned topics. Many opinions have been expressed on these subjects, but practically no scientifically controlled research has been done. Since there was essentially no research to review for part 2, I wrote a subjective essay to serve as explanatory background for the research recommendations to be made in part 2. This essay examined the assigned problem from the viewpoint of interpersonal and organizational communication research and theory. Therefore, I drew on these fields for material which I thought was applicable to library problems. My reasons for doing this are explained in some detail at the beginning of part 2. The literature search in this review covers material published through June 1972.

The second difficulty which appeared was a problem of definitions. To deal adequately with the assigned topics, I had to discover some way of distinguishing special librarianship both from other forms of librarianship and from information science. Since all are concerned with selecting, storing, retrieving, and disseminating information, this could not be done in terms of activities. Special librarians really do nothing which other librarians do not also do. In addition, many special librarians do some things which other special librarians do not do. This is why there seem to be as many definitions of special librarianship as there are special librarians. What special librarians do seem to have in common is a unique set of values. In contrast to other librarians, they seem to be more oriented towards service and innovation. In contrast to information scientists, they seem to be more concerned with the pragmatic aspects of helping people. By using this set of definitions, I could then treat networking and information science as sources of new techniques for innovative special librarians. In my opinion, what is changing today is not the goals of special librarianship, but the techniques which are necessary to reach those goals.

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1. BACKGROUND ESSAY

Special librarianship has been closely tied to the institutionalization of research and development. Special librarians are distinguished by an unusual dedication to service and an exceptional willingness to innovate. Under the pressures of the information explosion, they are searching for new techniques. A classic overload condition exists in libraries today for which there are five possible responses: 1) increasing error rates 2) queuing; 3) filtering; 4) adding more capacity, and 5) evolving new performance techniques, procedures, and standards. Libraries have already exhausted the first three possibilities, so they are being forced to turn to the fourth and fifth options. In library terms, the fourth option is networking, but organizational egocentricity has been a major stumbling block in the development of new co-operative arrangements. Librarians can exercise the fifth option by turning to the emerging discipline of information science for new techniques, it offers the computer; for new procedures, it offers cost and systems analyses which could both be used to improve library efficiency. Finally, for the evolution of new standards, information science offers a concern for evaluation. Two kinds of research have produced information which is useful in considering evaluation. The first of these is a series of studies on information flow in science and technology. The second is a series of studies on the problem of relevance. Techniques drawn from all of these areas are essential today for a special librarian in pursuit of better services for the clientele he serves.

Introduction

Change is the theme which runs through every facet of American society today. The transition from an industrial to be a post industrial civilization (1) is disrupting and then reshaping every basic societal institution. This wave of change is now submerging the library profession in a sea of seemingly insoluble problems. The same industrial and scientific revolution which created libraries as we know them today is now threatening their existence with an overwhelming flood of printed materials. Librarians are faced with two complex professional problems. One is to somehow get this mass of expanding material under bibliographic control. The other is to deal with new types of user demands. Library clients today want better and faster services, as well as more flexible and comprehensive ones. These demands arise out of their attempts to cope both with the accelerating rate of change and the results of the publications explosion. Special librarians are at the forefront of the revolution in processing and services. The clients we serve carry much of the responsibility for creating and expediting the innovations which are the basis of an industrialized civilization. Their need for extensive services and up-to-date information originally created the role of special librarianship and is now redefining its scope.

Role establishment is far from being a simple process. It depends on the goals, values, and attitudes of the people involved, as well as on certain technical capabilities and limitations. Essentially special librarianship arose out of the institutionalization of innovation. One hundred years ago the invention and exploitation of a technological innovation was essentially a haphazard process. Today it is a matter of regular policy within most corporations. Special libraries first came into their own early in the 20th century with the industrial invasion of the research game. After World War II, the government also discovered a need for organizing research and development. In both industry and government the existing state of the art must be well known before something new can be developed. To expedite innovation on a large scale, both bibliographic search and current awareness services must be available. To provide these necessary services, special librarians exploit both their own and other collections on behalf of their clients. The publications explosion has, of course, increased the difficulty of this job, adding much more bibliographic ground to be covered in order to provide the same level of service. Coping with this problem has placed an increasing strain on the professional skills of special librarians.

Role Definition

What others expect of you does affect your definition of a role--so does what you expect of yourself. A role is usually defined in terms of certain activities, as well as the knowledge of skills necessary to carry out those activities. A professional role, such as librarianship, is usually transmitted through a special education program. After graduation, a new librarian's expectations and knowledge will be further refined by on-the-job experience and contacts with other professionals. Unfortunately, what a dedicated librarian would like to be able to do and what he can do are two different things. The existing state of the art imposes one kind of constraint; budgetary limitations on staff and material impose another. Special librarians are fortunate in that they are usually able to do much more for their clients than can the typical college or public librarian. Coping with client demands generally represents a mutual educational process. People so often want the impossible, while remaining unaware of the library's true capabilities. As they are discovering these limitations, the librarian has to redefine their needs in terms of the available resources. Role definition, then, depends on interaction among the expectancies of the librarians, the organization for which he works, the other librarians he knows, and the clients he serves.

A professional role has two basic aspects. One is the establishment of appropriate goals, the other is finding the techniques necessary to reach those goals. New techniques first have to be developed and then disseminated through the library community. The available technology does, of course, affect the goals. Reaching a desirable goal may be technically impossible, but at the same time it may be

possible to attain various non-essential objectives. Today the fundamental goals of librarianship are the same as they always have been. We are still charged with the responsibility for collecting, storing, retrieving, and disseminating all published materials. What continues to change are the technical ar' used in reaching these goals. Unfortunately library science is far from being a theoretical science, based on controlled observation. It is simply a collection of techniques, based on the distilled experience of past generations. This experience has been unable to cope with the current crisis created by a sudden and unprecedented explosion in materials processing and service obligations. As yet our existing skills, unclarified by scientific research or analysis, are still unable to cope with the results of the publications explosion.

Within the library profession, special librarians do play a distinctive role. They are distinguished more by certain values than by any special skills. They are generally characterized by an intense devotion to the goal of better service, as well as by an exceptional willingness to innovate in pursuit of this goal. Admittedly, general techniques do have to be adapted in special libraries to deal with special types of materials, but these adaptations vary from library to library. What most special librarians seem to have in common is an attitude toward service that is relatively rare in the rest of the profession. For example, Bundy (2) found that special library administrators, as opposed to public or college library administrators, took pride in the range and quality of their services, rather than in the size and extent of their collections. This attitude reflects conditions in the special library setting. In the industrial environment, time is money and special library services must be designed to cut or replace patron effort. Few special librarians can afford to become buried in collection building at the expense of service. If they did, a cost conscious management would quickly remind them that they expect time saving services to personnel in return for their investment.

New Techniques

Today there are two developments which can provide some help to a special librarian in search of new techniques to provide better service for his clients. One is the gradual emergence of cooperative networks; the other, the new discipline of information science. Both are based on technological innovations. Networking on a large scale would hardly be possible if it were not for microform and photocopy reproduction techniques. Information science is, of course, deeply concerned with computer applications. The same industrial and scientific revolution which caused the publications explosion is now offering some potential cures. Unfortunately, there is always a time lag between the creation of an innovation and its wide scale application. Re-educating people is always a slow process; so is restructuring

organizational arrangements and retrieval systems. Simply stating that a possible answer to a problem exists is not enough. People have to be shown very clearly exactly how it applies in their specific situation.

Special librarians are more fortunate than most librarians in that they work in an atmosphere conducive to innovation. The relatively small size of their libraries and collections makes the introduction of changes far easier--redesigning a collection of 50,000 reports is much simpler than redesigning a collection of half a million books. Their devotion to service also leads special librarians to develop a keen awareness of possible innovations. Bundy (3) found that special library administrators were also distinguished by a better knowledge of information science and computer potentialities. Certainly the high overlap in membership between SLA and ASIS is another indication of this interest. To get the most service benefit out of their limited resources, special library administrators are forced to search constantly for improved techniques in materials processing and services. This search is all part of working a high pressure business or research environment.

Special library administrators may be unique in some respects, but they do have much in common with any type of manager. The basic managerial function is to exploit the available financial and human resources so as to best serve the goals of the organization. In special libraries, the optimal goal is to provide maximum services to users at minimum costs. This goal has now become increasingly difficult to achieve. In the last 20 years, funding for all types of libraries has remained relatively stable, while fixed costs for salaries and materials have risen rapidly. At the same time, the publications explosion has doubled or trebled the number of items which might be needed by the library's users. Every library tries to own the items in heaviest demand, but no library could possibly own all the items which might be needed. Somewhere in the range between the most used and the least used items, every library is forced to depend on other collections. The need to share resources is a fundamental facet of library operations. The publications explosion has simply made cooperation more and more essential. This pressure is resulting in the development of more formalized and sophisticated systems.

Overload Theory

Actually, cooperative networks are just one of several predictable responses to the current crisis. If library organizations are defined as communication systems, then what librarians face today is a classic problem in overload. This situation occurs when a system is faced with more messages than it can possibly handle with the existing equipment and procedures. Under such stress, a

system--whether it is a large organization or an individual animal--either solves the problem or it ceases to exist. Libraries are unquestionably communications-oriented institutions. Most of the messages they process revolve around citations to specific documents (4). They form the basis for ordering, cataloging, and circulation records. As has already been indicated, the publications explosion has greatly increased the number of items which must be ordered, processed, and retrieved by librarians. Under such overload conditions, there are only a limited number of actions which can be taken to resolve the crisis. By now, the library world has already fumbled into using most of the options.

Although overload theory is unfamiliar to most librarians, it has actually been a standard concept in social science for some time. It has been used both by scientists interested in communication and those interested in reactions to stress. Some of the basic laboratory experiments on individual response to overload were conducted by James Miller (5). The same basic theory has been applied by Richard Meier to communications-oriented organizations, including libraries (6), and by Karl Weick to the information problems of the working scientists (7). A review of this research indicates that there seem to be five basic stages in the resolution of an overload problem. The initial reaction to the stress induced by too many messages is a drop in performance level. Since a steady rise in the number of errors is rarely tolerable, the usual answer is to begin to queue the incoming messages. If this is still insufficient to solve the problem, then the next stage is to consider creating additional components to deal with the increased load. This step is usually accompanied by attempts to reduce the overload through filtration. Finally, if all else fails, new performance techniques, procedures, or standards may have to be developed.

Adaptations to Overload

When either an individual or a communications system is swamped with too many messages, attempts to process them become increasingly inefficient. Messages may be overlooked or incorrectly handled, leading to a rapid deterioration in performance quality. If continued, the resultant decline in efficiency could have a disastrous effect on the survival of the organism or organization involved. Overload conditions in libraries mean that client demands may get overlooked, important documents may not be ordered on time, and increasing numbers of documents may get lost in the system. If such errors increase beyond a tolerable rate, the library will become very unpopular with its clients and will eventually fail to obtain the funds needed for its continued support. Running an efficient operation may be a professional ideal, but it is an ideal based on the need for financial support. Providing acceptable levels of service is the only way by which any library can justify its existence.

Since an organization's performance level cannot usually be allowed to deteriorate, the easiest way to avoid excessive errors is to resort to queuing. Some messages, whether they are the last to arrive or the least important, can be held or stored until the capacity is available to process them. One of the best examples of this is the way in which queues will form in front of circulation or reference desks, as people fall into line to wait their turn for help. Like requests for service, documents received can also be held in order of arrival or processed according to some sort of priority system. To handle immediate demands, staff and equipment may also be switched from less urgent to more urgent jobs. Queuing is an excellent method of dealing with short term overload.

Almost all organizations experience some type of variation in workload. Messages--whether orders, documents, or service requests--can be held over from peak loads and dealt with in the lulls. However, if the overload problem is a serious one, the organization will eventually run out of time to catch up on the held over messages. In libraries, this will result in deteriorating quality of service and extensive backlogs of unprocessed documents. Even if the library still accepts and handles all user demands, the unavailable documents are bound to have an adverse affect on the services provided. This situation is, of course, exactly what is occurring in most libraries today.

When unprocessed messages begin to pile up at an alarming rate, the next obvious step is to increase the organizations's capacity to handle messages. Due to their peculiar nature, libraries find it singularly difficult to add more components to their operations. In a normal business, the typical response to increased demand is to raise the prices. Even if this is not done, the increased sales alone will eventually give the organization enough financial resources to expand its capacity. Libraries cannot operate this way. They offer services which usually must appear to be free to the public that utilizes them. To obtain the necessary funds for expansion, they must go to sources other than their actual clientele. This means that the process of obtaining such funds is usually slow, complicated, tedious, and may be almost impossible. In any case, the explosion in published documents has already far outrun the funds available to process, store, and retrieve them.

While searching for additional funds, most organizations also utilize filtering to cope with a long term overload problem. In queuing, messages were simply lined up according to some system and dealt with in turn; in filtering, certain categories of messages are either omitted or given less expensive treatment. Such differential processing cuts down both on overload and the costs involved in message handling. There are many examples of filtering in library operations. Different categories of documents may be cataloged or indexed to different depths. For example, some items

may be cataloged individually, others treated as part of a series. Books are a sample of the first category, periodicals of the second. Various types of documents may also be assigned different time limits for retention. On the service side, as the pressure on their facilities increases, most librarians will start placing limits on who may use them and to what extent. Generally speaking, the higher a person's status in the organization, the more library service he will receive. For example, in industry, a top manager will be entitled to much more than a part-time assistant in the laboratory. These kinds of limitations on service have a good deal to do with the failure or inefficient operation of many cooperative arrangements among libraries. Most librarians are forced to serve their own patrons first and other libraries last.

Networks

Unfortunately, librarians today are confronted with an overwhelming overload problem. None of the options which have been described so far seem to be able to solve their difficulties--neither queuing nor filtering is really an adequate answer for a large scale problem. As has already been discussed, librarians find it difficult to obtain the funds necessary for internal growth. The next obvious step for them to take is to add more capacity through external arrangements. Most managers are reluctant to utilize this option because it involves dependence on agencies outside of their administrative control. Librarians were forced into it long ago, since no library could possibly exist in isolation, without aid from other libraries or service centers. Such arrangements with other organizations can involve the provision of bibliographic data, as well as copies of individual documents. In both cases, the decision to depend on internal or external resources represents another example of filtering. One category of materials may be procured for the collection, another excluded from it. In the excluded categories, copies of individual items may then be procured from other resource collections, if they are requested by qualified patrons. In regard to bibliographic data, one category of materials may be indexed internally, another by bibliographies obtained from external sources. For example, most libraries catalog their book collections and buy indexes for their periodical collections.

A dependence on external resources has then been a characteristic of libraries for a long time. What is new today is the proliferation of various cooperative arrangements. There is unquestionably a trend towards the development of more centralized collections, which will then take on the responsibility for providing bibliographic data and document copies to outlying libraries. This is a predictable response to the publications explosion. As library collections come to represent smaller and smaller proportions of the available material, the obvious answer is centralized collections, which can compensate for the unavoidable lacks in local collections. More and more of these centralized collections will probably be stored on microforms and indexed by computers. Obviously such central storehouses of data and materials can give better service to other organizations if they have no local

clientele which has to be served first. Providing access to such collections is becoming an increasingly important responsibility for librarians, such as special librarians, who do serve local groups. They must know of their existence, be able to recommend their use in the appropriate circumstances, and maintain the forms which are necessary to obtain service from them.

Despite the obvious need for better sharing of resources through cooperative arrangements, the existing networks are far from satisfying the potential demand. There seems to be a number of factors, more human than technological in nature, which inhibit the development of networks. For example, organization egocentricity can have a very adverse affect on networking. First, most managers are reluctant to place any faith in outside agencies--obviously organizations which they do not control cannot possibly be as well run as their own. Second, most librarians are unwilling to give equal priority to requests received from outside organizations. Finally, members of any organization tend to believe that their arbitrary rules and procedures are somehow superior to those of any other organization (8). Unfortunately, before networking is possible, bibliographic records must be compatible. Often resolving conflicts among contending procedures is the most time consuming part of organizing a cooperative network.

What Information Science Has to Offer

As the previous discussion has indicated, librarians have been using the obvious options as responses to overload for a long time. Queuing, filtering, expanding capacity internally or externally--all were part of library processes well before the publications explosion. Since these actions can be exploited just so far, today they have undoubtedly failed as satisfactory solutions to the current crisis. The only remaining answer is the evolution of new performance techniques, procedures, and standards, which is where the new discipline of information science enters the picture. For new techniques, it offers various applications of the computer; for new or revised procedures, it offers management analysis; for new standards, it offers systems evaluation. To apply the computer effectively, information scientists have had to become concerned with management analysis and system evaluation. Their techniques and discoveries can be applied just as successfully in an unmechanized library as in a mechanized one.

Some of the problems facing librarians today can be solved by the application of two management analysis techniques: systems analysis and cost analysis. Library managers usually know what it is that needs to be done, but they rarely have enough information to determine the most efficient means of reaching their goals. Every organization needs a regular house-cleaning to prune its operations of unnecessary procedures. Out-moded routines or steps within a routine tend to appear in the best operated organizations. Systems analysis is a break down of each routine into its smallest parts, allowing the manager to determine what is really essential. Cost analysis, of course, is the

determination of the relative costs of each action, allowing the manager to go one step further and decide what is really worth doing. The lack of such analysis in most libraries decreases their efficiency and prevents the application of computers or data processing techniques. A detailed analysis of procedures must come first--until a human being has analyzed the job, no computer can be used effectively.

The value of this approach to management can be illustrated by two examples derived from networking. The first one is the filtering decision as to which classes of documents are to be drawn from internal resources. In establishing these categories, a library manager must consider a number of things, such as the relative costs involved in each method of procurement, what outside services are available and how dependable they are, the relative demand for the various classes of documents, and the tolerance of his clientele for delays in service. All of these factors should be analyzed in detail and put together in varying combinations to determine which mix would provide the best service at the least cost. Since this is rarely done, most libraries tend to add many unnecessary items to their collections.

The other example from networking relates to the instantaneous provision of document copies by means of expensive equipment. The establishment of such links between network units is a popular proposal today but, unfortunately, management analysis quickly shows some basic flaws in these visions of the future. Such linking is, of course, technologically feasible, but seems to lack economic justification. Therefore, before the equipment gets installed, consideration should be given to the fact that speed is not the only criterion of service quality. Time is of the essence only when the ability to predict user demands is lacking, and since libraries can usually provide most needed items from their own or other local collections, the low percentage of remaining items hardly justifies the building of expensive networks (9). The money involved could probably be much better spent on providing more extensive services to users. It could also be spent on improving the existing cooperative arrangements, which usually find that the postal or private delivery service provides a cheap and adequate means of copy transmission. Unfortunately, electronic gadgetry has a glamor and magic appeal that fighting administrative inertia and establishing bibliographic standards lack.

Evaluation

The introduction of new techniques and management analysis may be able to improve the internal efficiency of a library system, but this is relatively worthless without adequate systems evaluation. The point of attempting to improve efficiency is to be able to provide better service. However, what constitutes good service can only be determined through evaluation. One of the most critical parts of such evaluation is the definition of the characteristics, activities, and information needs of a service's total clientele--including both users and non-users. In pursuing this goal of efficiency and effectiveness, library science and information science have tended to follow

different paths. Librarians are generally concerned with physical documents and individual users. Their approach has been empirical. In contrast, information scientists have usually been concerned with information only in a very limited, defined sense. Their approach has generally been abstract and theoretical. They have been mostly concerned with citations and index tags as abstract bits of information. Librarians, on the other hand, have been much more concerned with getting the right documents into the hands of the right person. However, these different approaches should not be allowed to obscure the contributions which each field can make to the other. Hopefully, as librarians become more theoretical and information scientists more concerned with human problems, the gaps between them will narrow.

Until recently, librarians have designed their services by guesswork and failed to consider evaluation as an essential management tool. Today information science can make two major theoretical contributions as an aid to evaluation. The first is an extensive series of studies, which have established some of the basic characteristics of the process of information flow in science and technology and which were summarized for special librarians in 1969 (10). Although work has continued, the conclusions in this paper have not yet been outdated. Since then, four major pieces of research have appeared. First, Rosenbloom's research has supported Allen's definition of the basic differences between science and technology (11). Second, a pioneering study in the social sciences has appeared (12). Third, time scales and typical steps have been established for the dissemination of research results in many disciplines (13). Finally, some very promising studies on information seeking styles have been begun (14). While this research has exposed many of the limitations of libraries, it has also pointed the way to new types of services. For example, it has made painfully clear the reluctance of most people to turn to libraries as an information source for specific problems. However, it has also brought out the importance of the library role in continuing education.

Relevance and the User

Along with attempting to define the nature of information service clientele, information science has also carried out a series of comparative studies on various types of indexing systems. These studies have now established two indisputable facts. One is that all systems are inherently imperfect (15). If a perfect index system could be designed, there would be no need for special librarians. As it is, information retrieval systems share in the inadequacies of all

communication systems. Instead of conveying correct information, they tend to produce irrelevant and misleading information. Error always creeps into the communication process--all that can be done is to try to minimize it. This means that the librarian's role, as interpreter between user and system, is critically important. Human beings must be available, both to translate user demands and to explain the results obtained from the system. These studies of indexing systems characteristics have simply emphasized the importance of the immediate situation and the local librarian. We now know that a retrieval system can only be judged by how well it satisfies the needs of a particular situation. It is the local librarian who both knows this situation and is available to interpret the available systems for his clientele.

Librarians have always known how difficult it was to get the user and the right information together. Information scientists are now beginning to investigate the horrendous complexities of this almost impossible task. They are attempting to discover just how documents are judged to be relevant to a specific question. Research thus far has established two points. The less the judge knows about the subject and the characteristics of the inquirer, the more likely are irrelevant items judged to be relevant (16). This, of course, explains why computerized searches, obtained from a remote source, may contain so few citations which are judged as relevant by the user. In contrast, a good special librarian who knows his clientele well can judge relevance accurately in almost every instance. Cutting down on interaction, either with the user or the indexing system, is bound to inhibit search success. The results of these studies come as no surprise to any student of communication, who knows that the greater the distance between message source and receiver, the greater the possibility of error (17). This distance, of course, can be physical, psychological, or organizational in nature.

Conclusion

Nothing in life is perfect, neither the status of librarians nor the operation of indexing systems. Compensating for the lacks in formal systems is one of the major functions of a good special librarian. Confronted as they are by a serious overload problem, librarians can only try their best with the limited resources at hand. Today, to pursue the goal of better service in a rapidly changing world, special librarians need a whole new range of skills. They must be completely up to date with the scope and services of all available outside resources. They must be familiar with the functioning of computerized retrieval systems. They must be able to use management analysis to get the most out of their resources. Finally, they must know their clientele and

constantly evaluate every service they offer. As they acquire these necessary skills, special librarians are redefining their role in the modern world. Today they are more needed than ever, to help their users cope with an increasingly complex environment of information resources.

2. NEEDED RESEARCH

There is almost a complete lack of both scientific research and theory in librarianship. Therefore, the researcher who wants to formulate testable hypotheses is almost forced to turn to other fields. Communication and organizational theories can be fruitfully applied to libraries. Overload theory, used as a unifying theme in part 1, is a good example of this. Much of the research recommended in this paper represents classical studies in other fields. Such studies have just never been done in libraries. In regard to role definition, research needs to be done both on the way in which special librarians perceive themselves and on the way in which others perceive them. Network establishment represents a legal, administrative, and financial problem, not a research one. However, research could be done on the effect of attitudes and organizational egocentricity on networking. The application of computers, cost analysis, and systems analysis in libraries also does not represent a research problem. However, the rate of innovation dissemination in libraries could be studied. So could the reasons why special librarians are exceptionally open to innovation. Practically every aspect of evaluation needs to be researched. We need to further refine disciplinary distinctions in information flow and to develop some ideal prototypes for service evaluation. The situational determinants of indexing system choice need study, as do all aspects of the question negotiation process. We also need to do some controlled research on the success of machine versus human searching. Priority should be given, in my opinion, to research on role definition and all aspects of evaluation.

Introduction

An orientation toward research is one of the major lacks in library science as a scholarly discipline. It is a collection of practical arts, not a science. In this sense, the term library science is a misnomer. To be scientific, a discipline must conduct adequate research for the purpose of formulating general theories, and since good research is rare in librarianship, general theories are even rarer. Librarians may be prepared to deal with piles of documents and user demands, but they are not prepared to do research. Viable research problems may permeate the library environment, but few librarians recognize this fact. What usually passes for research in the library

field is hardly worthy of the name and, judged by the standards prevailing in other fields, is pathetic in nature. Non-librarians have generally done most of the good research which does exist. This sad situation became very apparent during the literature search for part 1 of this review. There was practically no research which seemed to apply to the assigned topic--the changing role of the special librarian, with particular emphasis on the impact of networks and information science. Regardless of the subject, an absence of relevant research is characteristic of the current situation in librarianship. There is an appalling lack of decent research which in turn prevents the formulation of any general theories.

The Relationship Between Research and Theory

Librarians as a professional group have been both uninterested in research and untrained in the necessary techniques. For example, a survey of the research literature on information flow (18), disclosed hundreds of user studies conducted by librarians which were so poorly designed that they produced no information of general value. They had two inherent limitations which are typical of the basic flaws in most library research. First, they studied only the library activities of those people who could already be classed as users. This meant that the library could not be compared to other information sources nor could users be compared to non-users. It was necessary to use other kinds of research to discover why library services are so rarely utilized in science and technology. The second major limitation of these studies was the lack of comparison among libraries. They were almost invariably limited to studying one specific situation. Such case studies cannot justifiably be called research, unless they express a concern for principles which could be applied in more than one situation. Such a concern is, of course, extremely rare in library research. Studies with such limitations in scope are almost bound to produce limited results. They may produce some helpful information for the management of the library studied, but they can hardly be utilized in general theory building.

The fatal flaw in most library research seems to be poor conceptualization of the problem to be studied. Such a lack of analytical thinking was certainly characteristic of most of the user studies conducted by librarians. Running around in circles counting things does not necessarily constitute research. If the researcher is unclear as to what he is attempting to discover, there is really no reason why the research should be done. For example,

research into the reference process seems to have consisted mainly of categorizing and counting reference questions by type and subject. This may have helped convince library administrators that reference librarians actually did something; however, it told us very little about how to evaluate, improve, or teach reference work. The researchers failed to relate inquirer characteristics with question characteristics, nor did they consider how the question changed in the negotiation process. They even overlooked determining the different time limits needed to answer different kinds of inquiries. They merely collected data in unstandardized categories for unstated purposes -- an activity which hardly constitutes research and does very little to advance our general understanding of the reference process. Collecting information for management is one thing; doing research for the purpose of establishing theories is another.

Poor, worthless, or trivial research does appear in every field. The problem in library science is that there is so much bad research and so little good research. To do quality research, a scientist must clearly define his problem and the purpose of his research, and he must apply good methodology to obtain valid data. Both features are essential if good results are to be obtained. If the problem is poorly defined, even the best methodology will not produce information of much value. On the other hand, good problem definition will accomplish very little if it is not supported by valid data. Library research usually fails on both counts. Although methodological considerations are outside of the scope of this paper, problem formulation is actually its major function. Librarians have generally failed to distinguish between studies which will provide useful management information and those which will lead to the development of general theories. Both kinds of studies are legitimate activities, but the two different goals demand different approaches. This lack of clarity in goal definition explains the general lack of scientific theories in librarianship.

The Lack of Theories in Librarianship

Theories based on good scientific research are practically non-existent in library science, but the field abounds with common sense theories which are based on tradition and practice, not on research. They simply represent adequate explanations, not scientific ones. To be scientific, a theory should possess three fundamental characteristics. It must be based on validated data, obtained through controlled observation. It must be logical and internally consistent -- when analysed, common sense theories usually turn out to have many inconsistent and improbable elements. Finally, a scientific theory must be able to make general and successful predictions about future events. As new data are discovered, a theory stands or falls,

according to how well it was able to predict or explain the new data. The superficiality of current library theories becomes quickly apparent to anyone attempting to design a worthwhile research study. This lack poses a real problem for the researcher. Without theory, he cannot clearly formulate his research problem, but it is poorly formulated problems which prevent the development of good, scientific theories. The only answer is to borrow from other disciplines. Redefining an old problem in a new way can provide some very valuable insights into its nature. Overload theory, which was used as a connecting theme in part 1, is an excellent example of this. Such borrowing permits clear problem definition and the formulation of testable hypotheses. If the research results support the theory, its principles will be further validated. If the results do not support the theory, doubt will be cast on its validity and some of its limitations will be exposed.

The library researcher who is looking for applicable theories has two obvious places to go: the interrelated fields of communication and organizational research. Librarians are prone to believe that because their problems occur in libraries, they are unique. This is a fallacy. A profit making business, a college, or a women's club may be very different, but they do have certain characteristics in common with all other organizations (19). Libraries too share in these characteristics. Most modern organizations are embedded in a web of complex communication systems. Communication breakdowns are regrettably common and can occur at any point within the organization as well as between the organization and the environment which supports it. Libraries certainly share these communication problems. Blocks between library and user are extremely common, as are communication breakdowns within the library. Getting a user's inquiry through the library's internal indexing systems to the relevant documents is a process which is fraught with error. Thus far, practically no research has been done on any of the communication problems of library organizations. In analyzing these problems, many applicable ideas can be drawn from organizational or communication theories. Miller lists some of the possibilities (20). Redding suggests others (21). Testing some of these ideas in the library environment would be a boon to librarians and social scientists alike.

In the course of preparing this paper on research problems in special librarianship, several difficulties appeared. The first was the lack of relevant research literature. The second was the fact that some of the assigned problems (e.g., the establishment of networks) did not turn out to be research problems. There were also information dissemination problems, such as the application of systems analysis in non-mechanized libraries. None of these problems involved research. The application and dissemination of already existing knowledge does not require scientific research or theory building. Finally,

there were some thorny theoretical problems which do need to be resolved through the application of well designed research programs. The most critical of these seem to lie within the area of library evaluation. Hopefully, the application of communication or organizational theories to each of these problems will suggest some fruitful routes for the necessary research to follow.

Role Definition

Now that some general comments have been made on the nature of theory and research design, the next step is to discuss specific problems. The first of these is role definition. Most professional groups want to establish the fact that only their special skills and values can make certain kinds of unique contributions to society. Special librarians share this desire, inasmuch as they are particularly concerned with distinguishing themselves from the rest of the library profession. This was the sole area in which one piece of applicable research actually was discovered. I had decided from my own experience that special librarians seemed to be distinguished by their attitudes towards service and innovation, and Bundy's research (22) supported this intuition. Her study was actually part of a series designed to compare administrators of different types of libraries. This comparison did establish an unusual dedication to service and an openness to innovation for special librarians. However, the sample was limited to the administrators of 150 special libraries with staffs of 10 or more. Considering the prevalence of one man special libraries, the same results might not have appeared with a broader or more varied sample. Certainly, similar comparisons among various types of librarians with few or no administrative responsibilities might also be very illuminating.

The most interesting aspect of role definition is not the way in which it is defined internally by a professional group; it is the different ways in which this same role is defined by those outside the group. Such contrasting definitions create a sense of psychological distance which can interfere with communication even more severly than physical distance does. Research tells us that differing definitions of job responsibilities can cause many major communication breakdowns in organizations (23). Investigating different role definitions could provide us with valuable insights as to how to improve and expand special library services. Too kinds of contrasting definitions may exist. One is vertical, between subordinate and supervisor; the other is horizontal, between the library and its clients. The library manager may be dedicated to service; but his staff, if he has any, might not share this dedication. Non-professional people may be especially lacking in this devotion and

they handle many routine contacts with patrons. Such a communications failure within the library may have a terrible effect on public relations. Each special librarian must also answer to a supervisor, who usually exercises major budgetary control over the library activities. The special librarian and his boss probably will define the librarian's role in the organization very differently and, unfortunately, any special librarian who fails to convey the nature and value of his work to higher authority is liable to end up without a job. The library's clientele may also perceive the special librarian's role very differently from the way he does. Note the many people who have suggested that libraries and librarians have a poor public image. Investigating differing role definitions might help establish the truth of this assertion. The most illuminating contrasts might be between the role conceptions of users and non-users. Defining the nature of such misunderstandings might provide some helpful clues as to how to remedy them.

Network Establishment

As the discussion in part 1 indicated, networks are here to stay and, as one of the few possible answers to the overload problem in libraries, they will probably continue to proliferate. There seem to be two opposing trends today in the library world -- one towards centralization and one towards decentralization. We may expect to see more central resource centers developing. At the same time, more local librarians will be needed to interface between their users and the complex web of regional and national arrangements. The end result will presumably be a more efficient deployment of resources, but this ideal will probably be a long time in arriving. Rather obviously, network establishment represents a management problem, not a research one. Network foundation must be based on financial resources, administrative arrangements between the cooperating organizations, and bibliographic standardization. All of these factors are essential; without them no network could operate successfully. Many individuals and groups must work to build this essential base. So far, many national plans have appeared and had little or no effect. When pressure groups in a geographic region or subject area demand, and are willing to work for, a network, then one may eventually get established.

The topic of networks does, however, suggest some research possibilities. Most librarians are in favor of networks, but few are willing to make the necessary administrative commitments of funds or staff. There seems to be a very interesting contrast here between what people say their attitude is and what they are willing to do in support of this attitude. Studying this contrast might throw some light on the relationship between attitude and activity,

which has caused problems in attitude-change research. If this anomaly does exist, then an investigation might provide some data on how much dissonance people are willing to ignore in their view of the world (24). Organizational egocentricity, as it affects networks, would be another worthwhile topic to investigate. Many breakdowns in network operation may occur because of reluctance to give any priority to requests which come from outside organizations. This attitude could explain why special libraries are so often called parasites, even though they are usually willing to pay the total costs for copy provision. Breakdowns could also be caused by a reluctance to accept standardized procedures different from the traditional ones of the organization (25). Finally, some comparisons could be made among different forms of network organization. Organizational theory suggests that the more organizational units a message must pass through, the greater will be the possibility of error and the longer will be the transmission time (26). Hence, too may units between the resource center and the local library or individual user may prevent the provision of a high level of service.

The Impact of Information Science

The third and last point of this paper is the impact of information science on library science a d, in dealing with it, an immediate difficulty appears. Since the two disciplines share the same general goals, it is difficult to differentiate between them. However, their approaches do seem to differ. Library science has tended to be pragmatic and humanistic, information science theoretical and abstract. So far, information scientists have been most concerned with juggling citations, mainly with the aid of their magic tool--the computer. The application of computers in libraries has long been a controversial topic. The computer advocates have been claiming for years that it is the answer to all our problems, but the appearance of such fallacious magic formulas is one of the predictable responses to organizational overload (27). To date, the computer has failed to solve all our difficulties. To use one effectively requires a sizable financial investment and a large data base which can be put to multiple uses, both requirements putting it well out of the range of feasibility for most libraries, including special libraries. Certain technical developments, such as time sharing, are, of course, now changing this situation. Computer application must also be preceded by extensive management analysis, and the necessary techniques have yet to be applied by most librarians.

In my opinion, there is no need to survey the effect of information science on special librarianship. I have identified three areas within information science that I thought were relevant to librarians:

1) technique--the computer, 2) procedural improvement through management analysis, 3) system and service evaluation. Computers have been extensively applied in resource centers which special librarians do use. In this sense they have affected special librarianship, but since they have been little used in libraries, the improvement and promotion should probably be left to other organizations. However, a very different situation exists for cost analysis and systems analysis, since they can be applied in an unmechanized setting. So far, they have been used mostly for sophisticated, computerized systems. Their failure to be applied in libraries is simply one reflection of the fact that most librarians seem to lack the most basic managerial skills. Like any other technique, these too can be over applied. Industry has probably already pushed them beyond the point of no return; however, they have not yet been applied in most libraries and their use could lead to considerable savings and improvements in efficiency.

The dissemination of knowledge about these techniques does represent a practical problem, not a research one. It would be much better to spend money on this problem than to conduct a survey to discover facts which are already generally accepted. To spread an innovative technique successfully, two conditions are necessary. It must be discussed in an understandable medium, and it must be shown to be directly applicable (28). Unfortunately, much of the value of information science has been lost for librarians because it has been buried in mathematical jargon. SLA could well sponsor the preparation of how-to-do-it manuals on these techniques, based on examples drawn from special library practice, adapting them for easy acceptance by special library management. While spreading them does not represent a research problem, another aspect of dissemination might. Special librarians seem to be unusually innovative. This may be the result of the organizational climate (29) in which they work or of those personality factors which draw people into special librarianship. Some research on this could be very helpful to social scientists who are interested in the problem of technology transfer.

The topic of evaluation, in my opinion, represents the most critical question facing librarianship today. The other research possibilities which have been discussed represent interesting, useful programs, but evaluation is the key problem. We have now reached a point where it is possible to measure the internal efficiency of library operations with a fair degree of success. The fact that librarians rarely do evaluate does not mean that the methods do not exist. There are also many management techniques, such as cost and systems analysis, which can greatly improve this

efficiency. However, when it comes to measuring external effectiveness, there is no such method. We have yet to bring the user into the evaluation process. Special librarians may be devoted to providing better service, but we have no idea of what constitutes ideal, good, or better service. We can devise many kinds of index systems and services, but we do not know which kind would best suit which clientele. Some general research has affected our concept of the library role, but no real knowledge exists on the question of evaluation. All that we have is the same primitive unscientific techniques which special librarians already use (30). Until we can find some way to measure the value of information, support for library services will continue to be based on emotion, rather than fact. Currently some managers believe library services are a good thing and some do not, and until we obtain some solid facts, the unconvinced will continue to threaten the existence of special libraries.

Information Flow Research

Some excellent research has been done on the process of information flow in science and technology (31). This research has made two facts about the role of information services quite clear. First, we live in an information rich environment. In this environment, libraries are about the least popular information source. They tend to be both physically and psychologically remote from their users. Also, locating documents through the library's internal indexing systems and geographical arrangements represents a major exercise in problem solving. Given these facts, it is no wonder that the library or information services are the court of last resort when specific information is needed. The most popular information resource is naturally the knowledge stored within the individual scientist's or engineer's head and office. When he needs information, he first refers to his own memory and files. If this is not sufficient, then he turns to his colleagues in nearby offices. Obviously then, what a special librarian should do is concentrate his efforts on getting library documents into this working environment. Keeping the knowledge in people's heads up to date is the most valuable service he can offer. By emphasizing continuing education, with search services as a back-up when needed, he can offer a more realistic mix of services.

One other basic fact emerges from the research literature on information flow. This is that the library does not have all the answers. There is a good deal of fugitive literature, such as conference papers, which never gets under bibliographic control. Information on some subjects, such as experimental techniques, travels partly by word of mouth. Depending on the discipline, there is also an 18 month to 3 year delay before a report on completed

research will appear in the literature. Part of a special librarian's job is to be able to recommend other information sources when they are appropriate. In my experience, being honest about your limitations only improves your relationship with your clients. The emphasis in service should always be on quality, not quantity. Librarians are professionally qualified to build elaborate indexes and do complete literature searches. They naturally want to use these skills to the utmost, whether or not they are actually necessary. They have an unfortunate tendency to swamp people in too much material, just as engineers have a smillar tendency to overelaborate the gadgets they build. Such overelaboration leads to more, rather than less, inefficiency. Locating relevant documents is important, but even more important is providing the right number of documents at the right depth for each particular patron.

Within the general area of information flow, there is still much research to be done. We still need to define many of the disciplinary variations from the general patterns which have been discovered. It is also about time we started to use the existing knowledge to develop methods for predicting user demands on libraries. Being able to anticipate demand, rather than merely responding to it, would be a great advantage for library administrators. We need to be able to predict the optimum mix of services and the literature saturation point for any given audience group. There are always bound to be people who will not or cannot read, along with many who simply prefer oral to printed sources, and even the most enthusiastic user will have only a limited amount of time available for reading. For each client group, we need to be able to predict the percentage of people who would use the library under ideal conditions. We also need to be able to specify their level of demand, both for types of documents and services. Establishing a series of ideal prototypes would give librarians some realistic service goals to aim for, as well as establishing a means of measuring their progress towards these goals. It would also point up the gaps in existing research.

Relevance and the User

Like the literature on information flow, another general area of research has also modified our conception of the librarian's role, The discovery that all indexing systems are inherently imperfect has settled a long standing dispute. Librarians have been quarreling for years over which type was best, but we now know that they are all equally inefficient (32). This means that the simplest possible system is always the best. It will be just as efficient and will be the least expensive to construct. Unfortunately, this is bound to

be rather a blow to those librarians who enjoy building elaborate and complicated systems. Interpretation between user and system requires just as much professional talent and it is probably more important. However, the fact that all systems are as effective in absolute terms does not mean that their suitability does not vary with the circumstances. A series of studies does need to be done on how situational factors affect the choice of indexing systems, since the various characteristics of the documents to be indexed, the clientele to be served, and type of library probably all affect this choice. If we knew what choices experienced librarians had made, then it would be much easier to prescribe the choices which ought to be made under similar circumstances. Since special librarians build so many specialized indexes, special libraries would undoubtedly be an excellent place to begin these studies.

As librarians become more important as interpreters, studying the question negotiation process becomes increasingly critical. All we presently know about it is that the question usually becomes more complex as it is translated (33). We need to do many more studies of this form of interpersonal communication, with particular emphasis on the non-verbal elements. There has been a great deal of discussion about the possibilities of direct user-computer interaction. Such suggestions are, in my opinion, based on an overestimation of machine capabilities and an underestimation of the complexities of the negotiation process. We need to run some controlled studies comparing the results of human versus machine searches. If the user is allowed to determine relevance, I suspect human beings will produce much better results. No machine could possibly evaluate an inquirer as an experienced librarian can. No machine can adapt to the educational level and purpose of each inquirer as a human being is able to do, because he grows up in a human society, any person can interpret meaning in relationship to social context and cultural values. These factors have yet to be incorporated into machine languages. If there is a literature saturation point beyond which people will not read, there is also a citation saturation point. Beyond this, too much irrelevant or useless material will simply deter a user from making any use at all of the search results.

Conclusion

As this paper indicates, research could produce some invaluable knowledge for special librarians. There is nothing so practical as a good theory and nothing more difficult to develop. Usually today's scientific theory becomes tomorrow's common sense. Most special librarians have a pragmatic attitude toward library traditions. If something works, they use it; if it does not work, they throw it out and look for something better. However, if we knew why one thing worked and another did not,

we might be able to discover something even better yet. This is where research enters the picture. The author's interest in research developed out of her search for ways to design better library services. The strength of SLA has always lain in its educational programs and the willingness of its members to help one another. Each year many educational programs are organized by the Chapters and for the Annual Conference; however, sharing principles is much easier than sharing a mass of practical details, which may or may not be relevant in another situation. Librarians have always tended to respond to each crisis as it arose. Research might at least give us the ability to predict from where the next crisis is coming. "Putting Knowledge to Work" is SLA's motto. It is about time that we started to create some scientific knowledge in our own discipline, which special librarians could put to good use in their libraries.

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OUTLINE OF RECOMMENDATIONS

NON-RESEARCH RECOMMENDATIONS

1. The Association should carefully review its goals to determine if it is either interested in doing high quality research, or competent to do it. Any other type is, of course, a waste of time and effort. However, the Association may wish to encourage certain kinds of research in cooperation with library schools or to advocate support for the most needed research before the appropriate agencies.

2. The Association especially at the Chapter and Division level, already seems to be deeply involved in the problems of establishing and improving cooperative arrangements (networks). As I have already indicated, these are not research problems. They demand political and organizational action from dedicated pressure groups. This type of action already seems to be taking place and I doubt if it needs any special encouragement. However, if the research suggested in Research Recommendations no.3 and 4 were carried out, this group action might be better directed.

3. The Association should sponsor the publication of practical manuals on cost and systems analysis.

4. Managerial skills, of all kinds, should be recommended as a topic for educational programs at all levels and for inclusion in library school curriculums.

5. There is no need to leap on the computer bandwagon. The application, development and promotion of computers is already being adequately handled elsewhere.

RESEARCH RECOMMENDATIONS

1. Bundy's research should be extended to discover if the results will hold with a larger and more varied sample.

2. Research should be done on contrasting definitions of the special librarian's role held by:

   a. The library manager vs. his subordinates
   b. The special librarian vs. his supervisor
   c. The special librarians vs. his clientele, with particular emphasis on contrasts between users and non-users.

3, Research should be done to discover the range of difference between librarians' attitudes towards networks and the degree to which they are willing to support them.

4. Research should be done on the extent to which two factors interfere with network operation. These factors are organizational egocentricity and the number of units between request and copy sources.

5. Research should be done to discover if special librarians are really as innovative as they seem. A historical survey could be done to determine if they have been responsible for more than their share of innovations. Another study could be done on the rate of dissemination of an innovation, comparing special libraries to other types.

6. Research should be done to discover the source of the service orientation and open-mindedness of special librarians. Are they this way because of the organizational climate in which they work or because of the personality factors which attract people to special librarianship?

7. The research on information flow should be extended to further refine disciplinary distrinctions.

8. An attempt should be made to develop some ideal prototypes for service evaluation. Some preliminary ones could be developed for various kinds of special libraries. This might be an excellent task for the Divisions.

9. The situational determinants which control the choice of indexing system type should be studied.

10. All aspects of the question negotiation process should be thoroughly investigated, with special emphasis on non-verbal elements.

11. A controlled study should be made of human vs. machine searches with the user as the judge of relevance.

Any attempt to establish priorities among these research programs would represent personal preferences. However, I do consider evaluation to be the most critical area for research. My own first choices are 2c, 8, 10-11.

BIOGRAPHICAL NOTE

Janice Ladendorf received the BA degree magna cum laude from the University of Minnesota and received the MA from the University of Minnesota Library School. She was hired in 1964 by the North Star Research and Development Institute to provide special library services for their research staff. Ms. Ladendorf began work on the Ph.D. in 1970 specializing in human communications problems at the University of Minnesota.