

Information Science and Library Education

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Content

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|---|--|
| I. Introduction | on library education |
| II. Development of information science | W. Current problems of library education |
| III. Relevance of information science to library science and its impact | V. New direction of library education |
| | IV. Conclusion |

I. Introduction

What kind of education is required to prepare the new leaders in the field of librarianship and information industry? And how and where should the library profession move to improve the education of its students? How and where should the curriculum be enriched to improve library education? What kinds of new courses and education facilities are required for future improvement? The answers to these key questions can come only after a closer look at what is happening in library and information profession, what are the current situations or problems in library education, and what the potential implications are for the future.

It seems clear that librarianship today is a profession in a state of transition. In other words, librarianship today is drawn into the vortex of transition from a pre-scientific to a more scientific discipline. Librarianship today moves to become more analytic, more scientific and research-oriented using new conceptual tools and techniques of logic, mathematics, information theory, and systems analysis. Moreover,

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the contemporary librarianship is trying to see its own subject content more clearly and firmly, and apply various tools of analysis to its own subject and problems. Therefore, the major content of the contemporary librarianship is the problem of information identification, storage and transfer. In other words, the contemporary librarianship fundamentally involves such problems as the nature of knowledge and the notion of information need, the nature of information and how it can be represented, identified, and communicated, the structure of language and how it might be analyzed formally, etc.

The major forces that are both accommodating and effecting the above-mentioned transition in the field of librarianship and information industry are the computer and information science. Thus, in this paper we will consider the information science and its great impact, present and potential, on library education.

Information science, as a still emerging science, has generated a diversity of opinion concerning its nature and definitions, and concerning curricular programs in the field. In addition, both inside and outside the library profession, questions about the contribution of library science to this emerging discipline has raised arguments concerning the relationship between these two fields.

While some library educators regard information science as an integral part of library science on the ground that "library science is an all-inclusive, or parent, term that encompasses all knowledge concerned with creation, recording, transmission, storage, retrieval and use of information",⁽¹⁾ others insist that librarianship is only applied information science.⁽²⁾ Furthermore, an extreme position states that a library-centered definition of information science is an effort to acknowledge the importance to the librarianship of a crucial concept or entity as well as the power-politic desire of claiming ownership of

(1) Corrigan, Philip K. *A model system of bibliographic organization for library science* College of Librarianship, Aberystwyth, Wales, 1968, pp.1-48.

(2) Borke, Harold "Information science: what is it?" *American Documentation*, 19:1 (Jan. 1968), p.3.

it. (3) Jesse Shera indicates that the debate which "for so many years characterized... definitions of information science, and particularly... its relations to librarianship, now seems to be yielding to a less argumentative point of view. A true consensus has not yet been reached, but an atmosphere of agreement is being achieved in which polemics are being replaced by at least a measure of objectivity, and in which information scientists and librarians are able to communicate." (4) However, literature shows that the discussion still continues, and the widening use of the newer term *informatics* is adding to the confusion.

In this paper, an attempt will be made to describe the nature of information science in terms of its need and scope, and its relevance to library education. This paper, however, does not provide any positive answers: rather, it provides a focus for the discussion about the impact of information science on library education, and new directions which library education should follow in the future.

II. Development of information science

Information science was developed as a consequence of the postwar proliferation of scientific activity. William Goffman traces the origin of information science directly to the war, during which the efficient and knowledgeable handling of masses of information was necessary. (5) A more direct impulse, he points out, is that the advent of computing machines accompanied a coding problem in linguistics, mathematics, logic, indexing, etc. Thus, this activity, which came to be called at various times, without differentiation, documentation, information retrieval, and finally information science, constituted a parade of

(3) Slamecka, Vladimir "Graduate programs in information science at Georgia Institute of Technology," *Special Libraries*, 59:4 (April 1968), p. 246.

(4) Shera, Jesse H. and Anne S. McFarland "Professional aspects of information science," in C. A. Cuadra (ed.) *Annual review of information science and technology*, vol. 4, 1968, p. 439.

(5) Goffman, William "Information science: discipline or disappearance," *ASLIB Proceedings*, 22:12 (Dec. 1970), p. 589.

clever schemes each of which was proclaimed by its inventor as the answer to the problem.

Glynn Harmon holds a view that information science emerged as one of a modern generation of communication or behavioral disciplines which emerged almost simultaneously about the time of world war II; it directly or indirectly incorporated or paralleled several prevailing objectives and concepts of the communication and behavioral sciences and other contributory disciplines.⁽⁶⁾ He seems to identify information science as a behavioral science which emerged as an integrative discipline to facilitate the coordination and use of science.

More detailed and tangible reasons for the emergence of information science are given by Harold Barko. According to him, information science set its goal at the provision of a body of information that will lead to improvements in the various institutions and procedures dedicated to the accumulation and transmission of knowledge. There are in existence a number of such institutions and related media such as books, schools, libraries, films and television, journals and conferences. However, he insists that these institutions are not sufficient to meet the communication needs of today's society.⁽⁷⁾

On the other hand, information science is interpreted by different scholars in different context. It is, however, clear that the emergence of information science can be attributed to the scientific revolution, information explosion, and critical communication problems arising in the scientific community due to the information explosion. Similarly, there are variety of ways to define the term information science, partly because of its inter-disciplinary character. Information science has developed as a science derived from and related to mathematics,

(6) Harmon, Glynn "Information science as an integrative discipline", *Proceedings of the American society for information science*, vol.6, 1969, p.459.

(7) Barko, Harold "On the evolution of information science", *Journal of the American society for information science*, 22:4 (July-August 1971), p.235.

(7) Barko, Harold op.cit. p.4.

logic, linguistics, psychology, computer technology, library science, management, and other similar fields, and information science cannot be directly ascribed to any one single development in science.

Robert S. Taylor provides three unique definitions concerning this field: information science, information engineering or technology, and information services. "Information science is concerned with the education of persons who will undertake fundamental investigations directed toward the phenomena of message generation, storage, organization, structure, filters, and transfer. Information engineering or technology is directed toward the design and testing of devices and systems useful for the solution of actual problems in operating environments. Information services is directed toward the training of persons for service functions in information centers and other knowledge dissemination systems. Accordingly, information science is concept-oriented, information engineering or technology is operations-and problem-oriented, and information services is service-oriented."⁽⁸⁾ However, these have points in common as well as some differences in emphasis. Although these give us the clear idea about the major fields of study into which graduate work can be divided, these definitions not only have ambiguous points, but also have overlapping areas among them. The definition that derives from a synthesis of these ideas may be that "information science is a science which investigates the properties and behavior of information, the forces governing the flow of information, and the means of processing information for optimum accessibility and usability." Information science is thus concerned with knowledge relating to the origination, collection, organization, storage, retrieval, interpretation, transmission, and utilization of information.

Another definition is given by Robert Hayes. He maintains that

(8) Taylor, Robert S. "Professional aspects of information science and technology", in C. A. Cuadra (ed.) *Annual review of information science and technology*, vol. 1, 1966, pp.17-19.
 "A structure for change in education and research in the information/communication field", in J. H. Wilson (ed.) *Proceedings of the American society for information science*, vol. 9, 1972, pp.152-3.

information science deals with *information* and therefore, it is important to have a precise and operational definition of *information*. To him, "*information* is the data produced as a result of a process upon data: the processes include data transmission, selection, organization and analysis." An important point about this definition is that information cannot exist independently of the processes which produce it. That means that information can be studied only in the context of specific information systems. He defines information science in terms of this relationship; "information science is the study of information-producing processes in any information system in which they may occur."⁽⁹⁾ However, he also implies that information science cannot exist as a separate discipline. This means that while information science may in principle be concerned with pure analysis of processes in reality it can not be separated from the methodology of specific disciplines. Therefore, he suggests it is more appropriate to talk in terms of information science in genetics, or information science in social theory or information science in documentation than to talk of information science in isolation.

Thus, the fundamental problem of the definition of information science epitomizes the field. All definitions are slippery concepts and loaded with connotations and implications. They are viewed in terms of the specifics of individual situations, bound to be either too general or too specific. A. G. Hoshovsky and R. J. Massey explain the difficulty of defining the term information science, saying that "a definition of the field framed in terms of inputs must of necessity become progressively more inadequate as the advance of science and technology changes the content of what information scientists should properly do to produce the results information science should produce."⁽¹⁰⁾

The emergence of information science is probably too recent to per-

(9) Hayes, Robert M. "Education in information science", *American Documentation*, 20 : 10 (Oct. 1969), pp. 332-3.

and Joseph Becker *Handbook of data processing for libraries*, New York, Becker & Hayes, 1970, pp. 745-759.

(10) Hoshovsky, A. G. and Robert J. Massey "Information science: its end, means, and opportunities", *Proceedings of the American society for information science*, vol. 5, 1968, p. 47.

mit its definite definition. Furthermore, the interdisciplinary character of information science not only makes it difficult to organize a formal structure for the discipline but also to delineate its boundaries. However, it seems to me that information science may be defined as a science which investigates the properties, structure and behavior of information and communication as well as theory and methods for organization, transfer, storage, retrieval, evaluation and dissemination of information, and the processes, activities and system which convey information from source to user.

III. Relevance of information science to library science and its impact on library education

As its literature shows, information science has a broad meaning, encompassing the foundations not only of libraries but of business information systems, technical information systems, communication systems and networks, socio-economic data banks, and military command and control systems as well. However, there are many common areas which information science interacts with librarianship. Accordingly, information science is closely related to librarianship in the more or less mechanical processes of information handling. Furthermore, the major subject content of contemporary librarianship can be characterized as the general problem of information identification, organization, storage, retrieval, and transfer. Libraries exist solely for the information functions they serve. The information processes and activities they use, e. g. cataloging and indexing, are relatively well formalized, and therefore, provide ideal subjects for study by information science. On the other hand, "information science offers a much broader view of librarianship."⁽¹¹⁾ Therefore, there has been a corresponding interests in libraries to utilize the insights which

(11) Taylor, Robert S. "The interfaces between librarianship and information science". *Special Libraries*, 58 : 1 (Jan. 1967), p. 47.

information science could provide. The extent of interest, on both sides, has been so great that some have identified information science with library science.

According to Borko, information science is investigative rather than operational; and it is distinct from documentation, which is an application of the findings of the information scientists to actual situation.

⁽¹²⁾ Shera takes the similar view that information science provides the intellectual and theoretical base for the librarian's operations and therefore, the two fields are halves of whole. ⁽¹³⁾ Goffman insists that information science provides not only the theoretical foundation for librarianship but also a means of attaining the academic respectability which library science lacks. ⁽¹⁴⁾ On the other hand, Taylor insists that the major effect of information science on librarianship be strategic rather than substantive. ⁽¹⁵⁾

Consequently, information science curricula were most likely to be found in schools of library science, and information science became an integral part of library education and an increasingly important part of the librarian's professional and operational responsibility. There are some good reasons for this. First of all, librarians today are called upon to set up systems which are to achieve certain objectives at a certain cost, to evaluate their own operations, and to suggest and justify changes relative to new technologies. Information science provides a core concept of systems planning, systems analysis or systems designing for such purpose. As a matter of fact, librarianship cannot remain isolated from the scientific and technological revolution progressing around it. Rather, the past decade has witnessed impressive efforts to define, formalize, systematize and even automate both the clerical and intellectual processes involved in library practice. ⁽¹⁶⁾

(12) Borko, Harold op. cit., p.3.

(13) Shera, Jesse H. and Anne S. McFarland op. cit., p.441.

(14) Goffman, William op. cit., p.590.

(15) Taylor, Robert S. op. cit., p.47.

(16) Hayes, Robert M. op. cit., pp.723-70.

There has also been an increase in library-related research, and practically all of this research requires a knowledge of methods for obtaining, analyzing, processing, and evaluating data as well as to judge how and when computers can aid these processes. Information science is concerned with the search for optimal tactics and strategies for identifying, searching, clustering, retrieving, disseminating information. In other words, information science basically concerns the fundamental commodity of information, its meaning and measures, and it concerns automated information and communication systems and their analysis and evaluation. Furthermore, information science also encompasses all the related conceptual tools and techniques of computer science, cybernetics, and information theory. Therefore, information science comprises the set of research and development techniques necessary to support the profession of librarianship.

More specially, Hayes defines seven general areas of library education in need of improved methodologies. ⁽¹⁷⁾

- (1) user study: methods for defining the purposes of the user and for specifying the services to him.
- (2) vocabulary development: methods for defining, structuring, and improving or updating the vocabulary.
- (3) technical details of internal system processes: methods for designing the formats of input records, file items, and output reports and for programming and flowcharting of operations.
- (4) file organization: methods for defining the physical structure of file.
- (5) intellectual problems in judgement of relevancy and screening of material: methods for determining the criteria or heuristics for matching patterns.
- (6) component and systems evaluation: criteria for measuring per-

(17) Hayes, Robert M. *ibid.*, pp.589--70.

formance and cost.

- (7) organizational relationships: methods for determining the optimum relationship between library and user, or library and management.

Accordingly, a number of the fundamental concepts which cut across library school curricula can be grouped in the following broad categories:

(a) the processes involved in communication, the nature and behavior of information, the theory of document organization and data organization, patterns of information transfer and existing formal and informal information systems in the broad sense of the word, methods of research, and problems of computer manipulation of texts for such purposes as indexing, abstracting, translation, and querying;

(b) the general concept of systems, their behavior, design, and operation, the study of systems in terms of their efficiency and their value to the users, consideration of which leads to the analysis of needs and situations prior to action and the clear-cut definitions of objectives;

(c) the relevance and potential of computers in the field, as well as their limitations, consideration of which leads to informed judgements concerning the application of computers to a variety of situations.

There can be no doubt that the understanding of a fundamental tool or principle of librarianship is enhanced if it is supported by an understanding of the methodologies involved. The research methods of information science are indispensable to the progress and evolution of librarianship and therefore, the concepts and methodologies of information science should be introduced into library education. As a natural process, library schools response to the emergence of information science and the changing technological environment by incorporating information science courses into library education programs, and designing separate degree programs in information science.

It is worth to note that the name of School of Library Science, Syracuse University was changed to the School of Information Studies on July, 1974 in order to better identify the broader program and direction of growth. It is my personal opinion that it made long strides in the history of library education, and it is one of major impact of the emergence of information science on library education. As a matter of fact, the term librarianship or library science is a relic of the times when libraries played the most important role in the information process. Furthermore, the term librarianship or library science is static and inactive because of its institutional bound and implication. In addition, we don't have any reason or justification we have to be excessively attached to the term librarianship or library science. Rather, we need a newer term which can be better reflect the broader spectrum of the information processes in our society. From this point of view, this is not only great progress in library education, but also opportune.

It is natural that libraries take their rightful place in the information field and in a sense, librarians are information specialists—they deal with information or recorded knowledge in all of its forms. Librarians, more than other professionals, are familiar with the problems encountered in the acquisition, processing, storage, retrieval, and dissemination of recorded knowledge. Therefore, it is imperative that librarians make a conscious effort to understand the nature of information, the processes by which it is generated, the extent to which it can be provided by libraries, and the extent to which it has been formalized and can be provided by computer.

From this point of view, information science has a considerable relevance to library education, and its impact on library science together with computer is so great that library education cannot be improved unless information science courses incorporate into library education programs. Rather, the crucial issue is how it should be

taught and by whom. It is not enough to append a few courses to the existing curricula of library schools. Furthermore, it is not enough to change merely the name of school. The new point of view and research findings of information science are relevant to all courses and should be fully integrated into the curriculum. In addition, another important issue is how computer technology and techniques for intellectual access should be taught and by whom in order to prepare the students of library schools for the extended mechanization of library in the future. And also, what topics need to be mastered, and what level of depth and detail is the most important issue which library educators have to solve. Furthermore, library schools have their students for only a few years. Thus, it is not practical to require all of the course work that it would be good for the students of library schools to have. Therefore, what the relative priorities are is the crucial issue which library schools have to decide or solve.

II. Current problems of library education

The rapid increase in the amount of information to be processed and stored, the growing dependence of modern society on relevant information, the larger costs for materials and services, the emergence of new kinds of technologies, and of new types of materials, and the widespread dissatisfactions with current information-access capabilities and processes lead to the crucial issue that better information-access mechanisms should be developed, and such improved access systems may be economically and intellectually important to society. However, such improved information-access mechanisms cannot be developed without the improvement of library education.

In order to improve library education, current situation or problems should be assessed and understood before specific recommendations are made for future improvement. Therefore, the current problems or

deficiencies of the existing library education programs which we can see in the recent literature bearing on topics related to future needs and means for improving library education will be randomly listed as follows:

(a) The course of study is limited by the need for students to find jobs and courses are pitched only at the skill level, thus restricting vision and mobility in the larger information context.

(b) Within the academic setting, the department of library science is frequently marginal. Consequently this results in a lack of political power within its parent institution. In a way this reflects the low expectations of the profession as a whole.

(c) Faculties are frequently poorly prepared to meet the needs of a high technology in information industry. Furthermore, they are frequently weak to meet the need for professionals who are sensitive to the information needs of the users and are able to negotiate substantively and empathetically with individuals in their own domains and contexts.

(d) Library education programs are geared mainly to present needs and those of the next few years rather than to the long-range future.

(e) The methods and materials of instruction employed in library education in general are traditional, antiquated or obsolescent.

(f) Serious differences of opinion exist among educators concerning the validity of most so-called *core* programs.

(g) Library schools do not prepare students to accept responsibility for uses to which information is put.

(h) Library science curricula place mainly emphasis on administrative routines and on operational techniques and technologies.

(i) Library schools do not offer the students the sufficient field work and training.

(j) Library schools do little to acquaint prospective employers of their graduates with what trained professionals in information science

and services can do in helping to identify and resolve important information problems.

(k) Adequate preparation of media specialists to function in multi-media environments tends to be limited to only a small portion of students.

(l) Library schools do not provide the students the appropriate knowledge and technology with which they can identify and resolve the important information problems in our society.

(m) Library schools do not take advantage of a ever-broadening electro-mechanical devices developed for information transfer and handling.

(n) The capabilities to analyze, evaluate, design, develop and utilize improved information handling systems are not stressed in the existing library education programs.

(o) The library school programs do not reflect fully the effects of recent social, economic, and particularly technological development in our society.

(p) In the library school programs, there is short of curricular relevance of actual library work.

(q) There is no strong professional motivation among current students.

Therefore, the major conclusion emerged from the review of current problems of library education is that the most important changes or improvements may not be made unless the whole field of library science is redefined in terms of future information needs and the probable shape of future information infrastructure and industry, and unless related library educational responsibilities are restructured to cover the resulting spectrum of personal competencies required.

V. New direction of library education

In our modern society, "no single factor is more important to progress in any sector of society than availability of reliable information in terms of which judgements of worth can be made and reasoned decisions for action may be carried out."⁽¹⁸⁾ In other words, information, its flow and management, will become a major concern in our society during the next quarter of century. Peter Drucker has pointed out this fact in his book, *the age of discontinuity*, saying that "in the late 1970's every dollar earned and spent in the American economy will be earned by producing and distributing ideas and information and will be spent on procuring ideas and information..."⁽¹⁹⁾ Therefore, the role and responsibility of library and information profession is more and more vital to the development and well-being of our society. However, it is clear that library and information profession fails in its mission without the overall change and improvement of current library education system. For the purpose of improving library education, the profession, first of all, should honestly recognize its weakness and the following five facts which Robert S. Taylor has pointed out.⁽²⁰⁾

(1) Libraries grew out of two of the major technological revolutions of mankind: the invention of writing and the invention of printing. We are now in the midst of a third major technological change--the information revolution which will have a fundamental effect on all institutions concerned with information transfer, including libraries. Indeed, it will effect the totality of our lives as much as

(18) Stone, C. W. et al. *Needs for improvement of professional education in library and information science*, Center for the study of information and education, Syracuse Univ., p.1.

(19) Drucker, P. F. *The age of discontinuity*, New York, Harper & Row, 1968, p.263.

(20) Taylor, Robert S. *The information professions-an explosion of opportunity*, Syracuse Univ., 1974. (Mimeograph)

did the invention of writing, which signaled the start of our own civilization.

(2) The tradition of the library as conservator, as archive, may be unsuitable to the concept of true information service. The archival function is necessary one, but in order to meet the needs of information service it will be necessary to develop new methods of collecting, organizing, and purging highly dynamic information. Too much attention is still paid to formal packages, i.e. books and media packages, which satisfy only a small portion of the real demands for information. The present design of information systems are dictated by the package rather than by the needs of people. They are both necessary.

(3) Libraries are part of a larger information infrastructure, including publishing, mass media, information retrieval and data services, museums and archives, the information industry, community organizations, etc. A failure to understand the operation of the whole system and the role a library can play in the information transfer process will tend to isolate the library even more than it presently is. Such a failure will also strengthen alternative agencies more sensitive to real user needs.

(4) There is a real need to develop a societal consciousness of the value and pervasive role that information plays in our lives. Nowadays we swim in a sea of information, but, like fish, we really do not know much about the water. The recognition of the value of information may well initiate a power struggle, in which the profession is poorly equipped because it is institution-bound.

(5) As a profession, librarians have traditionally held low expectations of themselves and of what they could and should do. There is a need now to develop a profession of breadth, of confidence, and of high ability. The problem may well be outside the profession in, for example, the image of the library and librarians. However, the profession

must develop more fruitful interfaces with the public at large.

More specially, four aspects are in particular need of change in order to improve library education: curriculum, facilities, student recruiting, and faculty competence. The third and fourth may be more important than the first and second, as Jencks and Reisman point out in their book, *the acadmic revolution*: "we have repeatedly argued that this sorting and certifying is considerably more important than what the schools actually try to teach. Just as it is easier to change the character of a college by changing the admission requirements than by changing curriculum, so too it is easier to change a profession by recruiting new sorts of apprentices than by changing rules of apprenticeship. Schools have their students for only a few years and they can do only so much with whatever raw material they get. But to the extent that they are overapplied and can select their raw material according to some preconceived plan, they can influence the profession they serve decisively."⁽²¹⁾ However, in this paper, subjects on student recruiting and educational facilities will not be touched.

On the other hand, the whole field of library science should be redefined in terms of future information needs and the probable shape of future information-access mechanisms. Therefore, it is necessary to strengthen the view of the field as a spectrum from services to system design to information science. A student should be able to see himself along this spectrum, with some understanding of the inter-connectedness of the variety of activities, problems, and educational programs. The library schools themselves must also realize that individually they cannot cover the entire spectrum. They must also begin to specialize, thereby concentrating more of their efforts on program quality and program depth.

1. Types of curricular change required

The most basic kinds of change required for improving the content

of library education aim at training as professional workers of more students who will be able to demonstrate (1) increased knowledge about the structure of available information resources within society, industry and trade as well as practical insight and skill in their utilization; (2) basic theories and methods, and their application for the communication and organizing of information: (3) increased knowledge about the design and synthesis of information systems having large permanent storage files, and their use within a number of application areas and information handling activities: (4) abilities to design, develop, evaluate, and utilize the interactive information handling systems; (5) abilities to individually and critically suggest solutions to specific practical information service tasks within different application areas; and (6) capacity to make effective application to library and other information service tasks of computers and alternate forms of information storage, processing, transfer and distribution technology.

Another basic change needed is the problem relating to library education program organization and structure. "There are numerous fields and areas of study involved in library science including the nature of information, information technology, and information services."⁽²²⁾ Therefore, library schools should offer the students options to follow differing career paths concerning one or another of these areas.

A third category of changes needed for improving library education is the matter on instructional methods and strategies. The methods, materials and strategies employed in library education in general are traditional, antiquated or obsolescent. Therefore, library schools should make more and better use of new teaching techniques and technologies, and stress self-learning approaches by using introduction of case study methods, assignments and related testing methods, etc.

On the other hand, the educational objectives should be redefined

(21) Jencks, C. and D. Reisman *The academic revolution*, New York, Doubleday, 1968, p.254.

(22) Stone, C. W. et al. op. cit., p.18.

(1) to make it clear that prime concern is with information needs and with provision of access to information such as not simply with the location and delivery of library materials; (2) to prepare library and information specialists to reach people where they are, faster, utilizing modern media; (3) to include preparation for assisting the use of information and appraising consequences of such use; and (4) to better meet the needs of special groups in the population.

2. Education for competencies needed by information service personnel

It is clear that library school students should have some reasonably adequate background in elementary logic, mathematics, and statistics. In addition to a knowledge of these formal tools of analysis, library school students should have training in the techniques and methods of systems analysis and operations research. These new methods for analyzing, synthesizing, and evaluating complex information systems such as libraries, are becoming increasingly important for a career in information industry. Another group of topics that library school students should know are those that cluster around the computer, the principles of programming, and library applications of information technology.

On the other hand, library and information service personnel should have certain competencies. Accordingly, education program must be devised which will provide more adequate opportunities for development of the broad range of competencies required. The list that follows is not complete, but is intended as a frame of reference⁽²³⁾. However, it is extremely doubtful that all professional personnel can possess all the competencies listed. Therefore, library education programs should offer the students options to follow differing career paths. They are grouped into five categories: organization of

(23) The listing of these competencies has been aided by Robert S. Taylor, *Empirical investigation of library and information-related activities: implications for education of library and information professionals*, Syracuse Univ., 1975, (Mimeograph)

information, information needs and information use; information technologies; research methods; and management.

(1) Organization of information

- knowledge of and skill in standard library descriptive cataloging, library classification systems, and library subject analysis
- knowledge of and skill in indexing and abstracting
- knowledge of and skill in analyzing information for computerized retrieval systems, including vocabulary control, intersystem vocabulary compatibility, and computer file organization
- ability to utilize these knowledges and skills to information in any format and in any media
- ability to transfer these knowledges and to improvise from them to design information systems to meet the information needs of a variety of publics
- extensive familiarity with machine-readable bibliographic systems
- knowledge of basic types of information resources and services and their usefulness to various publics

(2) Information needs and information use

- knowledge about information-seeking and information-using behavior in all types of populations
- knowledge of community organization and community information structures
- ability to analyze community information processes and to translate findings to improved information services
- knowledge of organization theory and the role of information in the organizational and decision-making processes
- participation in experiential learning situations to develop self-awareness in information and communication contexts
- ability to work with a variety of populations in information situat-

- ions and to understand and serve their needs in a variety of media
- knowledge of the information transfer potential of various media to different audiences
- knowledge of the role of the growing information industry in meeting information needs for varying populations
- knowledge of interpersonal and non-verbal communication

(3) Information technologies

- knowledge of the impact of computers, and other related technologies on the current operations of information agencies such as libraries and networks
- knowledge and skill in computer programming
- knowledge of computer architecture and computer communication systems
- knowledge of telecommunications technology and its relationship to the transfer of bibliographic information, media images, and systems information
- knowledge of networking and support technologies, including the ability to analyze information flow, channel capacity, and comparative costs in systems ranging from interlibrary lending to bibliographic networks
- knowledge of and skill in systems analysis of libraries, information retrieval systems, and information networks of all types
- knowledge of cost-benefit analysis and ability to apply suitable criteria in judging relative merit of competing systems
- knowledge of and beginning skill in the production of messages in film, video, and other media

(4) Research methods

- beginning skills at least in the methods of experimental design and survey research
- skills in problem formulation, data collection, data analysis, and

data interpretation

- ability to develop and use mathematical models and/or simulation of library and information system networks
- ability to develop and apply suitable criteria for the evaluation, including cost-effectiveness, of comparable systems
- understanding of the role and approach of policy research in planning and policy development

(5) Management

- knowledge of the role and function of management in an organization, including the variety of managerial styles and their effectiveness
- knowledge of the structure and function of units and departments in information agencies such as libraries
- ability to envisage and implement alternative organizational structures for better utilization of personnel
- knowledge of and skill in budgeting and cost-accounting
- ability to develop and implement policy and to interpret policy both to parent organization and to staff
- ability to isolate and to define problems and to develop the necessary criteria and action for their solution
- ability to develop effective personnel policies, including criteria for selection and evaluation
- ability to work easily and effectively with personnel at all organizational levels and to develop management contexts in which the full potential of staff can be tapped and utilized
- knowledge of the varieties of organization structures and ways that they can be altered to meet different kinds of problems and organizational needs

VII. Conclusion

Nowadays we are interred and bombarded by information, and thus we have developed the various devices and agencies to filter this information ranging from the mass media to computer-based retrieval systems, from libraries to highly personal information activities. The spectrum of these services and the range of information need by individuals and groups is a major characteristic of the post-industrial society. Information has become a new form of wealth, as critical to the society's well-being as matter and energy have been in the past. Therefore, information, its flow and management, will become a major concern during the next quarter of a century. In addition, "ready access to information and knowledge is indispensable to individual advancement as well as to national growth. The right information provided when it is needed, where it is needed, and in the format in which it is needed, improves the ability of an individual, a business, a government, or some other kind of organization, to make informed decisions and achieve particular goals."⁽²⁴⁾ Therefore, the role and responsibility of library and information profession is more vital to the advancement and well-being of our society. However, the library and information profession can fulfill its mission only with the improvement of library education system, in full cooperation with the related public and private sectors of the society. In addition, it is desirable that a nationwide program of library and information service with a high-priority national goal, and the development policy and plan of library education system at national level be developed and implemented.

(24) United States. National Commission on Libraries and Information Science *Toward a national program for library and information services: goals for action*, 1975, pp. 2-3.

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