dual master's holders.[18] Other employers such as the US government and state school systems, seem to prefer hiring cheaper, less well trained personnel. There is no doubt that library schools are under pressure to change. The question is how? Despite their attempts to offer the specializations demanded by employers, with joint degree in management, technology and subject areas such as user studies, as Herbert White points out the job market does not seem to justify the efforts made by schools or students.[19] It seems unfair, therefore, to blame the joint degree programs themselves.

Some suspicions have been raised to the effect that some joint master's programs in history and humanities have been offered mainly to keep up student enrollment in these programs in the face of recent shifts to business, computer science and professional degrees. Opposing joint master's programs, Guy Garrison says that:

> I am particularly alarmed at the hasty marriages evident in the proliferation of joint degree programs. These sound like a good thing until you look closely at the structure and realize that in many cases, the library science content is sacrificed and the programs seem more directed at finding jobs for surplus humanities and social science graduates than toward preparing information scientists.[20]

The number of sixth year certificate or post-master's programs and students enrollments in them has increased substantially since 1972. The 1985 statistical report shows 36 post-master's programs in ALISE member schools.[21]

Pressure from the job market for information science specialists, the long-standing problems of relatively superficial one year master's programs, and the general structure of existing master's programs, have been important factors in creating this situation in the United States.

In 1971-72, 19 post-master's or sixth year master's programs were offering by the ALA accredited library schools in the United States with total sutdent enrollment of 117. Among these schools, the University of Denver had the highest student enrollment in this year, though seven library schools reported none. In 1973, the number of programs further increased to 26 and student enrollment increased to 373.[22]

In the 1970's substantial increases in the number of programs and students enrollment occurred. This growth has slowed sharply since 1980. Table 15 shows the fluctuation of student enrollment year by year. Though post master's programs have been increased from 31 to 36 during the period of 1980-85, there have been relatively little increases in student enrollments. Further, the ALISE Statistics of 1985 show that 48.4 percent of post-master's students were enrolled in only five major library schools, the University of California (Berkeley), Drexel, Illinois, Pittsburgh and Syracuse.[23]

Most post-master's programs provide an opportunity for their students to specialize in areas related to computer and information science. But some schools offer programs in children's, media, school, music, law and health science librarianship.

The credit requirements for the post-master's program also vary from school to school from 15 to 40. The Graduate Library School at Chicago offers 9 courses beyond the master's degree in library science. The Pratt Institute offers 10. It seems likely that most of these were what basically are called "paper courses". In fact admission for the

Table 15

Student Enrollment by Degree Programs of the ALISE Member Schools from 1979-80 to 1984-85

Year	Undergraduate			Master's			Post-Master's			Doctoral's		
	FT	PT	Total	FT	PT	Total	FT	PT	Total	FT	PT	Total
1979-80	216	1074	1290	3726	5454	9180	45	247	292	202	316	518
1980-81	83	1557	1640	3659	5111	8770	40	265	305	196	319	515
1981-82	138	2152	2290	3562	5306	8868	56	248	304	197	295	492
1982-83	151	2286	2437	3138	4673	7811	36	171	207	190	299	489
1983-84	139	3210	3349	3280	4859	8139	59	168	227	183	315	498
1984-85	175	2303	2478	3289	5259	8548	64	226	290	174	328	502

Source: ALISE, Library and Information Science Education Statistical Report, (1980), P. S-3; (1981), P.S-3; (1982), P. S-3; (1983), P. S-3; (1984), P. S-3; (1985), P. S.4.

lack of depth in programs previously offered by three library schools have increased the minimum number of credit hours for specialization.[24] Kent and Texas raised their requirements from 12 to 24 credit hours, Wisconsin-Madison from 18 to 24.[25]

The post-master's program at the University of Illinois at Urbana was designed to provide special instructions according to the need and interest of the students, to refresh and update students' skills, to emphasize their particular areas of professional speciality and to permit them to change their careers to another subject area.[26]

The Catholic University's sixth year program too is designed as continuing professional education, as the Pratt Institute's emphasis on urban librarianship and information science in its sixth year program. The University of California at Berkeley offers specialties in bibliography, library management and library automation in its sixth year master's and certificate programs.[27] The sixth year program at Columbia and Pittsburgh allow students to choose courses in the library school or other appropriate departments in the University.[28]

Since 1949 the master's in library science has consolidated its status as the first professional degree, and the basic entry level qualification into the profession; yet it is once again under threat. A large number of undergraduate programs in library/information science have developed in the last few years.[29]

By 1975, a number of community colleges and faculties of education have offered undergraduate programs for teacher librarians, media specialists or information scientists. Librarians have been trying, without success, to upgrade such programs and to bring them within the

scope of ALA accreditation since the 1970's. It seems likely that such programs will persist and grow, despite their low standards, as long as school systems and governments continue to hire their graduates.

A report of the US Department of Education, A Nation at Risk showed the declining standards in recruitment, training and certification of media specialists in 1984. Later it introduced the Education Consolidation and Improvement Act, (ECIA) Chapter 2. This Act subsidized state governments to improve the standards of school library training, always the weakest area of the profession.[30]

In Canada also, the responsibility for training and certification of teacher librarians and the improvement of school libraries falls on the provincial rather than the federal government. In 1985, the provinces of Nova Scotia and New Brunswick established library technician programs. Newfoundland was planning to start in this year.[31]

The University of Pittsburgh's experiment in undergraduate programs in information science marks a new direction in library and informtion science education since 1981. This program emphasizes computer and information management for more than other undergraduate programs. The other notable feature of this program is its standard admission requirements; it is part of a four year undergraduate degree in liberal arts or science. Drexel University established a fully integrated undergraduate program in information science. Minnesota is planning a similar integrated program.

The statistical report of ALISE for academic year 1983-84 shows 10 library schools offering an undergraduate major in library and information science, and 16 schools with an undergraduate minor

including 3 new programs at Tennessee, Montreal and Florida State. Among ALISE universities, the student enrollment is highest at Alberta, Ball State, Montreal, Southern Connecticut and Texas.[32] Total student enrollment in undergraduate programs has increased since 1979-80, while student enrollment in other programs has declined.

Though the undergraduate programs in library/information science are growing, these programs have not yet been recognized by the profession. John Berry shows that there is a growing need for "protection" of the MLS, at all levels, and concludes that "the new threats to the MLS are not from personnel offices, but from library schools."[33]

Provision of practical work experience to the students in the master's programs as a part of their formal education is another current development. This practical training allows students to apply theoretical knowledge in actual practice. Norman Horrocks emphasizes the usefulness of the work experience in Canadian library education:

> ...I am happier with the freedom which our Canadian two year program permits. Our graduates must fulfill a work experience requirement, and if this is not undertaken during a term, it is being met increasingly by summer employment. Having students back for a second year brings many strengths.[34]

Six library schools require field work or work experience from all students in the master's program. These library schools are British Columbia, Dalhousie, Montreal, North Carolina, Southern California and Texas Woman's Universities. But work experience is not compulsory for students in many other schools.[35]

In addition to that, post-master's internship programs have been

established by some US library schools and libraries. Practical experience for the fresh graduates is provided by the Library of Congress, Ohio State University, (discontinued in 1973), the Universities of Iowa, New Mexico, Illinois and Simmons College. These programs provided an opportunity to the graduate to work closely with subject specialists and gain overall knowledge in a particular field. Iowa University program specially emphasizes system analysis and New Mexico's program emphasizes Latin American studies. But most of these programs are restricted to few students because of financial difficulties.[36]

Another trend in this period was the decrease in full time student enrollment and increase in part time students in library schools. (See table 15) In 1975-80 student enrollment declined by 37.5% while accredited programs increased by 5%, a trend which evidently continued into the 1980's.[37] Six accredited library schools in the US were also closed in 1984. (Ball State, Case Western Reserve, Denver, Minnesota, Mississippi and Southern California) and one in Canada in 1972—Ottawa.

Cutbacks in US federal financing after 1970, decreasing support for graduate students by parent institutions, limited opportunities in the job market, and frequent increases in tuition and other fees in library schools contributed to this situation.

Partly as a remedy for declining student enrollment, some library schools established part-time programs, particularly weekend and evening courses on campus as well as in large metropolitan areas. Remote television programs and two-way radio communications were frequently employed in the remote delivery of these programs.

In 1982-83, twenty-eight off campus courses were offered in the United States and Canada. A year later the number had increased to 31. Leaders in this effort were Indiana University, Kent State, Long Island, Northern Illinois and South Florida.[38] Among the Canadian off campus programs the extension MLS program at the University of Western Ontario is especially designed for the students in the Ottawa/Hull area.

Establishment of continuing education leading to a certificate or post-master and non degree program is another current development in education for librarianship. Most of these programs provide instruction for the students through workshops, conferences and special lectures. Their objective is to refresh practioners' knowledge of the theory and techniques of library and information science. The continuing education program at the School of Library and Information Studies of Dalhousie University was designed to provide instruction throughout the Atlantic Province.[39] Another approach is shown by Simmons College which provides instruction for degree and non degree students.[40]

According to the latest ALISE statistical report, 55 library schools offer non-credit courses, and 15 schools offer credit courses in continuing education programs.[41]

CHAPTER 6

EDUCATION FOR INFORMATION SCIENCE AND ITS IMPACT ON LIBRARY SCHOOLS

Chapters three, four and five examined the beginnings of the integration of information science into library school curricula. The present chapter further analyzes the present day nature and concepts of information science, as well as its impact on curriculum development in North American library schools.

Although information science is a relatively new field of study, the terms "library" and "information" have been closely interrelated from the beginnings of "library economy" up to the emergence of informatics."[1] As far as the nature and functions of the academic and research libraries are concerned they can be defined as a type of information collection system involving organization, storage, retrieval and dissemination. But electronic computation, media recording and reproduction have wrought great changes in the traditional ways.

Today the term "information" is both ambiguous and pervasive. It includes not only printed but also all non-print materials: photographs, films, microfilms, photographic records, magnetic tapes, audio-visual materials and video disks, all of which, in many places in the world, have become the responsibility of library repositories. National repositories in particular have the obligation to reveal the materials in their possession, making descriptions, abstracts or copies for the rest of the world. Therefore, improving the method of

selection of relevant information from a variety of formats is critical in the sphere of library science.[2]

From the 1960's on, electronic technology became the most important influence on libraries and this has resulted in modernizing library operation, information storage, retrieval and dissemination. One of the most significant advances in library technology of this period was the introduction of online systems for accessing bibliographic information.

Indeed, the development of information technology has influenced not only libraries but also the daily life and work of people, a process sometimes termed the "information explosion". There was also a concomitant increase of jobs in the information-related fields in the U. S. A. .According to Donald W. King:

> We are in a post-industrial information revolution in which close to 68 percent of all positions in the market place, accounting for more than 1.6 million working Americans are information related.[3]

Daniel Bell has characterized post-industrial society as an information society. His opinion offers a tremendous potential for the information profession to assume a dominant position in society.[4]

As these innovations have taken place within the past two decades, educational institutions, particularly library schools, have changed their curricula to meet the demand for information scientists by introducing new courses. Some observers, like Charles H. Davis, see the change as reason for confidence in, rather than concern about, the traditional values of librarianship.

> ....we are talking no longer about a profession of librarianship, but rather an emerging interdisciplinary field called library and information science. Librarians and educators have always dealt with a variety of media, not just with the printed word.[5]

Although computerization has had its major effects on librarianship since the 1960's, Harmon points out that it had its origin in several communication and behavioral disciplines as far back as the 1940's.[6] According to Hans Wellisch, the term "information science" was first used in 1959 as a term "for the study of recorded knowledge and its transfer in the widest sense."[7] Reconstructing the history of the concept, Shera and Cleveland trace its transformation from "documentation" to "information science" in the United States in the 1960's.[8] Whatever the origin and the date of its influence on the field of librarianship, it is safe to view it as a newly emerged discipline closely related to the field of librarianship.

One of the best definitions of the new discipline is offered by Wilfrid Lancaster:

> ....information science is the science that investigates the properties and behavior of information, and the forces governing the flow of information for optimum accessibility and usability.[9]

He further avers that "information" in this sense is related to mathematics, logic, linguistic psychology, computer technology, operations research, the graphic arts, communication, library science, management and some other fields. According to Swanson, information science is the study of how "information is transformed from the point of generation to the point of use" and all the intermediate steps of collecting, organizing, interpreting, storing, retrieving, and

transforming information.[10] Harold Borko defines information science as a body of knowledge relating to origination, collection, organization, storage retrieval, interpretation, transmission, transformation and utilization of information. This includes the investigation of information representation in both natural and artificial systems, the use of codes for efficient message transmission and the study of information processing devices and techniques such as computers and their programming systems.[11]

The distinction between librarianship and information science, in Shera's view, is that librarianship is the "generic term" and information science is an area of research drawing its techniques from a variety of disciplines, in order to understand the properties and behavior of information.[12]

> Information science is not souped-up librarianship or information retrieval, nor is it antithetical to either. Rather information science contributes to the theoretical and intellectual base for the librarian's operations.[13]

On the other hand, Saracevic argues that information science, unlike library science, tries to develop a theoretical base using scientific methods with a tradition of theoretical and experimental inquiries.[14] Tague differs from both Shera and Saracevic in her view that neither should be subordinated to the other; they are overlapping but not co-extensive disciplines. The former is concerned with all aspects of library operation and practice, the latter with the characteristics of public information and behavior of its uses. The boundary between the two is difficult to fix.[15]

However, Foskett points out that library science and information

science represent a continuous spectrum rather than two sets of completely separate studies.[16]

The first formal courses in information science were associated with Shera's Center for Documentation and Communications Research at the School of Library Service of Western Reserve University in 1955. He viewed documentation and information science as integral parts of librarianship, and the Center's programs were concerned with the use of computers and computer devices for the organization, storage, and retrieval of information in libraries and other bibliographic centers.[17] Education for information science further expanded with the impetus which the National Science Foundation of the USA gave to graduate and training programs for science information personnel. With this in view, the Office of Science Information Service of the NSF sponsored conferences in 1960, 1961, and 1962.

Among these conferences, the conference held at Georgia Institute of Technology in 1962 was most significant because it has directly influenced the establishment of programs for training information scientists at Georgia Institute of Technology, funded by a grant from the NSF in 1963.[18] The new program of the GIT envisaged training three kinds of personnel for scientific and technical libraries: science librarians, technical literature analysts, and information scientists. The courses for the latter included what we now call computer science: electronic storage and retrieval of bibliographic information, programming, coding and related topics.[19]

Lehigh University also followed the GIT pattern, offering courses in information science with seminars in syntactic concepts, the design

of experiments, industrial information systems, engineering, psychology, and mathematical models of learning.[20] Programs like theirs which originated in the science and engineering fields, and became associated with computer science, constituted a significant trend in education because they marked a clear break from the traditional library schools.

The information science programs which have emerged in various types of academic institutions since the 1960's can be divided into five categories:

(1) separate academic units (Harvard, Lehigh),

(2) computer science departments (Cornell, Georgia Institute of Technology and Ohio State University),

(3) schools of management and business (American University, Massachusetts Institute of Technology and New York University),

(4) communication science departments (Stanford University and University of Southern California), and

(5) engineering departments (Purdue).[21]

Despite the sharp rise in education for information science, most of the ALA accredited library schools did not rush to embrace the emerging discipline. However, a limited number of schools, the Drexel Institute of Technology, the University of California at Los Angeles, the University of Chicago, the University of Maryland, the University of Minnesota, and the University of North Carolina initiated courses in information science, the automation of traditional library systems, and the use of computers in bibliographic searching.

The integration of librarianship with information science was

further developed in an experimental program at the University of Pittsburgh. Its interdisciplinary doctoral program in information science began in 1969 and its master's program in information science in 1974. Despite some cooperation at the faculty level, however, the student body and courses in library science even in 1985 remained traditional and separate.

Although remarkable progress in education for information science has been made at the academic level, there is controversy among the library educators on how information science should be integrated with library science, and how many information science courses are to be added to the library school's curriculum. Saracevic is convinced that information science is neither adequately provided nor properly taught in most library schools.[22] Pauline Wilson charges that the information science component in the majority of library schools is merely "cosmetic"; they have merely introduced "new names for old courses".[23]

While outlining the role of information science professionals in post-industrial society, and challenging library schools to turn out such professionals, Allen Kent points out that many library schools give less attention to teaching information science concepts than librarianship to their students. Discussing the experimental curriculum of the School of Library and Information Science of the University of Pittsburgh, he suggests that an "interface" program of both library science and information science is the best way to teach information science adequately in library schools.

> The troubles in library science education are revealed in the troubles seen in library practice. Infusion of information science into conventional library science programs is not sufficient. A two-way infusion is needed.[24]

Indeed master's programs at the University of Pittsburgh, Syracuse and Drexel are the more advanced in the teaching of information science than other library schools. The University of Pittsburgh operates two distinctly separate master's programs and doctoral programs, the Department of Library Science and the Interdisciplinary Department of Information Science. Syracuse University offers a master's in library science and master's in information resource management. The latter includes courses from the departments and schools of management, engineering, computer/ information science, and in citizenship and public affairs.

Moreover, Louisiana State University's M S program in system science has pioneered an interdisciplinary program between the faculties of computer science and library science to include accounting, engineering, mathematics and statistics. An M S program for information specialists at Oklahoma State University was established under its departments of computer and information science. Case Western Reserve University established joint programs between information science and law, health science, drug information, management, music and archives.

Reviewing these new trends in library education, Edward Holley found two kinds of curriculum developments in library schools. The first was a sharp delineation between library science and information science, and establishment of two separate programs. Schools

following these routes attempted to change their curricula entirely to behaviorist, technological or managerial approaches. A second but less common type of development is the "integration" of information science with library school courses.[25]

Although some library schools have already established separate bachelor's and master's programs in information science, (Pittsburgh, Drexel and Minnesota) and others are planning to do so (Toronto, Master's of Information Science). But most Canadian and US library schools have stressed the integration of library science with information science, providing a new approach to the whole field.[26] The Council of Ontario Universities explained in 1972,

> A fruitful approach, perhaps is to think of it (information science) in the present context as being concerned with the scientific foundations of the work of libraries and information specialists...The methods of information science even at their most elementary, call for quantitative attitudes and approaches to library problems and situations.[27]

The Information Science and Automation Division of the ALA also stressed the need of information science as a new approach to library science, because traditional library operations have changed with the advent of new technology: the adoption of computers, micrographs, television, system analysis, networking and audio-visual media.[28]

Library educators and professional associations, however, have shown different and contradictory attitudes both toward information science and the extent of its inclusion in library school curricula. Perhaps the best overview is supplied by Wilfred Lancaster. He divides the curriculum of information science into four different parts: 1. theoretically oriented; 2. computer science oriented;

3. library oriented; and 4. system oriented. According to Lancaster, information science curricula should recognize that computer applications will drastically alter library technical services, bibliographic retrieval and dissemination. Information science, he continues, has impact on library science in three major areas:

(1) the application of modern technology to library problems including automation of cataloguing and related services, reprography and facsimile transmission, networking and computer programming;
(2) the application of scientific methodologies to library problems, including systems analysis and other related techniques from management sciences, engineering and operation research, and
(3) the design and implementation of information services, including new methods of information storage, retrieval and dissemination, indexing, abstracting, vocabulary control and searching techniques.[29]

In this part of the chapter, I intend to examine the curriculum shift in accredited library schools from traditional courses in librarianship to information science and the integration of library science and information science programs in the United States and Canada. In 1971 only 5 schools had added "information science" to their names; one in Canada and four in the United States. In 1980 this number increased to 24, with 1 in Canada.[30] At present 41 library schools in the United states and 6 in Canada, (The School of Library Service at Dalhousie University changed its name recently to

School of Library and Information Studies) have added the term "information science", "service", "management" or "studies" to their traditional names, indicating a broader approach to professional training. Of these schools, 28 use the term information science, 14 information studies, 3 information management, 1 information service and 1 library and instructional technology.[31]

Increasingly in recent years, library schools have assimilated the relevant concepts of information science and applied them to the curriculum, often before adding the label information science. Table 16 shows the early development of information science oriented courses. This data does not give the whole picture, because the more recent trend, rather than establishing separate computer-based courses, has been to integrate information science methods throughout the curriculum.

Table 16

Development of Information Science Oriented Courses in Schools

Course Title	1968 No.	1972 No.
Introduction to Information Science	18	51
System Analysis, Design, Evaluation	12	47
Information Storage and Retrieval	36	43
Data Processing	7	33
Computer Programming	6	29
Theory of Classification, Indexing, Abstracting	-	23
Communication	-	22
Library Automation	15	19
Mathematics	9	18
Research Methods in Information Science	10	11
Data Structures (File Organization)	-	11
Interactive Systems and Networks	-	11
Language and Linguistics	9	-

Source: Jack Belzer, et al. "Curricula in Information Science: Four Year Report." Journal of the American Society for Information Science 26 (1975): 18

Although Table 16 does not indicate the academic level of the information science courses, it provides a clear picture of the growth of the courses in information science in the United States and Canada. However, it is difficult to trace the development of information science courses offered by the library schools in this period, because this table is not limited to their offerings.

Table 17

Total Number of Courses Added and Dropped by the Library Schools

Subject Areas	Number of Courses Added 82-83	83-84	Number of Courses Dropped 82-83	83-84
Technology	36	46	3	1
Management	25	21	7	5
Resources & Services	17	12	18	5
Librarianship	23	12	15	11
Processes	24	14	15	15
School/Media	6	4	4	20
Special Group and Types	7	0	12	4

ALISE, Library and Information Science Education Statistical Report, (1985). p. SCA-8.

Table 17 further shows the development of information science oriented courses in undergraduate, master's and doctoral programs in ALISE member schools over the period 1982-1984. The main area of expansion in this period was technology--this included 20 new courses in micro-computers. The table further reveals the decline of the courses in resources and services, librarianship, processes, school media and special groups and types.

In the 1970's there were 23 graduate degree programs in information science in the United States and Canada.[32] Of these programs, 15 were located in library schools or library and information science schools, offering an information science specializtion within a library science major. 13 of these schools offered master's and doctoral programs in library and information science. Of the latter group, the College of Information Studies at Drexel University offers master's programs in general librarianship, information science and education media. Drexel's doctoral program includes information resources management, communication of scientific and technical information, and information system design and evaluation. The College of Library and Information Services at the University of Maryland offers master's and doctoral programs in collaboration with the Information Systems Management Department of the Division of Behavioral and Social Sciences. The Graduate School of Library and Information Science at the University of Pittsburgh offers master's and doctoral programs in library and information science in its Department of Information Science.

The Department of Computer Science at Cornell University, the Division of Information Science at Lehigh University, the Department

of Computers and Information Science at Ohio State University and the School of Information Studies at Syracuse University also offers separate programs in information science leading to master's and doctoral degrees. In addition, the Annenberg School of Communications at the University of Southern California, the Institute for Communication Research at Stanford University and the Centre for Technology and Administration at American University offer information science either as an area of specialization within their major programs, or as separate programs.[33]

Howard Fosdick groups the courses in information science offered by library school bachelor's, master's and doctoral programs into five categories:[34]

1. Library Automation--the application of computers and new technologies to traditional library operations.
2. Information Storage and Retrieval--instruction on theoretical and practical knowledge of indexing and abstracting, controlled vocabularies, thesauri, searching methods for retrieval, and comparisons of different systems.
3. System Analysis--statistical and mathematical studies, measurement and evaluation of library operation and services.
4. Interactive Computer Systems--includes online search service, retrieval systems, search logic and query languages.
5. Programming--includes computer programming languages and methodology.

Table 18

Number of Schools Offering Courses in Five Categories of Information Science

Course Category	No. of Schools Offering 1 or More Courses		No. of Schools Offering 2 or More Courses	
Library Automation	44 (81%)	45 (75%)	22 (41%)	13 (27%)
Information Storage and Retrieval	43 (80%)	57 (95%)	18 (33%)	36 (66%)
Systems Analysis	26 (48%)	37 (62%)	5 (9%)	9 (15%)
Interactive Computer System	15 (28%)	39 (65%)	3 (6%)	9 (15%)
Programming	6 (11%)	23 (38%)	-	11 (18%)

Source: Howard Fosdick, "Library Education in Information Science Present Trends", Special Libraries 69 (1978): 103; 75 (1984):294.

This table shows the number of library schools offering courses in information science, and the increasing number of information science courses during the period of 1976-1982. It is worth noting that in 1976 Library Automation, and Information Storage and Retrieval courses were already offered by more than 80% of library schools. The 1982 statistics appear to show a 6% decrease in Library Automation, (probably due to its integration throughout the curriculum); and increases of 15% in Information Storage and Retrieval courses, 14% in Systems Analysis courses, 37% in Interactive Computer System courses and 27% in Programming courses. These data reveal that three quarters

of all library schools offer four or more information science courses, while over half offer five or more courses.

Library school calendars also indicate a significant increase in information science courses. Since 1970 most library schools have been offering introductory courses on library automation, mainly concerned with the computerization of the technical services; acquisition, cataloguing, classification, circulating and reference service. But today, the concept of technical services has itself changed. Cataloguing is linked with cooperative acquisition, computer networks, and databases. Because of these developments, library schools have provided instruction in library and information networks, circulation systems, MARC, automation of serials, online catalogs and automation of book reservation systems. Further some library schools provide an introduction to computers and data processing as part of the library automation, systems analysis and networking courses.

Introductory courses on computers or information technology emphasize computer hardware and software, e.g. microcomputers, videodiscs, word processing, computer output on microforms, programming, flowcharting, and computer applications in library and information services.[35] Advanced courses focus on office technologies, file organization, database management, programming, using MARC formats and natural languages.[36]

The Graduate School of Library and Information Science at the University of Illinois at Urbana-Champaign offers two courses on library automation. These courses include introduction to systems planning, automation concepts and computer use, and programming for

library processes. The Faculty of Library and Information Science at the University of Toronto emphasizes basic theory, computer applications including automated file handling, control programming and computer languages, e.g. LSS (Toronto),[37] BASIC (Simmons College).

The directory issue of the Journal of Education for Library and Information Science of 1985/86 reveals that most library schools offer systems analysis as a required or core course. This course includes analysis and evaluation of information service, introduction to basic system analysis tools, flow charts, decision tables, critical path analysis, cost-benefit analysis, system design evaluation and selection.

Among the information science oriented courses in the library schools are interactive computer system courses directly linked with databases, networks and systems. ERIC, PSYCINFO, and SOCIAL SCISEARCH and NTIS are the databases most often utilized for these courses. These courses provide instruction on systems such as BRS, SDC, ORBIT, Lockheed's Dialog, OCLC, BALLOTS, RLIN, WLN, UTLAS/GATTS and others.[38]

Simmons College for instance, offers a separate course on OCLC and MARC coding. Another Simmons course provides instruction and experience on MEDLEARN in its medical librarianship course. The library school at the University of Illinois at Urbana-Champaign provides OCLC terminals, PLATO (computer assisted instruction) terminals and various equipment for database searching for the students.[39] The School of Library and Information Studies at Dalhousie University offer two courses; database systems and

management, and networks, databases and systems. These courses provide instruction on theory of information systems and major vendors of online information systems, with introduction to I.P. Sharp and Q L Systems, the PSS networks DIALOG, CAN/OLE, CAN/SDI, and command languages for SDC, ORBIT, and BRS.[40]

Programming courses for library and information science students are conducted by separate computer science departments as an integral part of the curriculum as well as a separate program. Most library schools included programming design for library and information management, manipulation of files, information retrieval methodology and data processing concepts. For instance, the library automation course at the School of Library Service of the University of Southern Mississippi provides instruction on theory of computer programming and its application to the solution of library problems.[41]

Information storage and retrieval courses in the library schools provide instruction in classification, cataloguing, indexing, abstracting, file organization, theory and models of information retrieval, natural languages, thesauri and content analysis.

In addition to separate courses in information storage and retrieval, most of the library schools offer this knowledge in their traditional cataloguing, classification and reference classes. "Integration", as this is called, is especially true of Canadian library education programs; cataloguing, classification, indexing, organization of information and reference courses have been integrated with computer applications.[42] The MARC format, and shared cataloguing systems, such as UTLAS/CATSS, BALLOTS, CAN/OLE, OCLC and

the production of cards, microform, and book catalogs by the computer are common topics in Canadian library education programs.

Reference courses include: instruction on using of online systems such as CAN/OLE, CAN/SDI, BRS, SDC, RLIN, ORBIT, DIALOG, QL and others.[43]

Further we can deduce the pattern of integration of library science and information science in accredited library schools in the United States and Canada by an examination of the core or required courses of master's programs in library and information science. The catalogs of the library schools reveal that almost all of the master's programs have included information science oriented courses; an introduction to library and information science, database systems and networks, system analysis, online reference/information science, programming for information systems, information storage and retrieval, and interactive computer systems. The two year master's programs in Canadian library schools provide a further opportunity for their students to select particular courses in information science and to specialize in their second year. Although some library schools in the United States also provide an opportunity for their students to specialize in information science in their one year program, other library schools have established sixth year programs or post-master's level programs for this purpose.[44]

The impact of information science on the library school curricula, and growth of information science oriented courses in library schools can be traced by examination of the annual directory issue of the Journal of Education for Library and Information

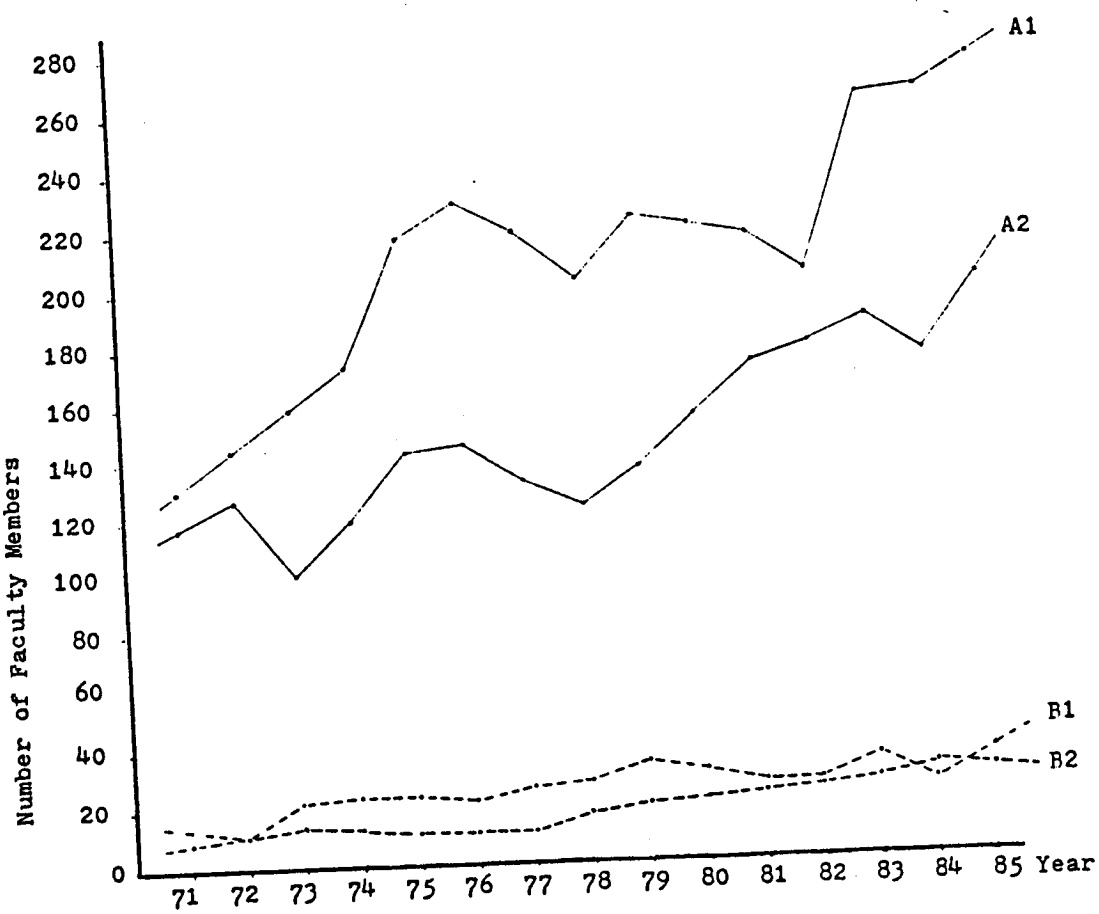
Science. Its statistics on faculty members of accredited library schools in the United States and Canada show those who have specialized in areas of information science, such as information science, systems and networks, library automation and data processing, indexing and abstracting, online search service, and system analysis.

To estimate the number of faculty members who have specialized in areas of information science in the accredited library schools, (the number of accredited library schools in the US and Canada has varied from 52 to 64 during this period) the directory issue of the JELIS was examined for the years 1971 to 1986. The graphs in Figure 1 to 4 are based on these findings. (pp. 99, 100, 101, and 102-103)

The graphs in Figure 1-3, represent the number of faculty members at the library schools in the United States and Canada, who specialized in such areas as: 1. information science, information systems and networks, 2. library automation and data processing, 3. online searching, 4. system analysis, and 5 indexing and abstracting. These graphs clearly show increasing numbers of experts in these areas, over time, even though slight decreases may occur from one year to the next. The graphs in Figure 1 shows the number of experts in information science, information systems and networking; and library automation and data processing in the library schools of the United States increased 110% and 71.55%, and in Canada this number increased 337.5% and 123.7% respectively during the period of 1971-1985. The number of experts in online searching and system analysis in the library schools of the United States increased 62.65% and 27.5%, and in Canada this number increased 133% and 45% respectively during the period of 1981-1985. (See Figure 2).

Figure 1

Number of Faculty Members in the US and Canadian Library Schools Specializing in Information Science, Information Systems and Networks, and Library Automation and Data Processing, 1971-1985.

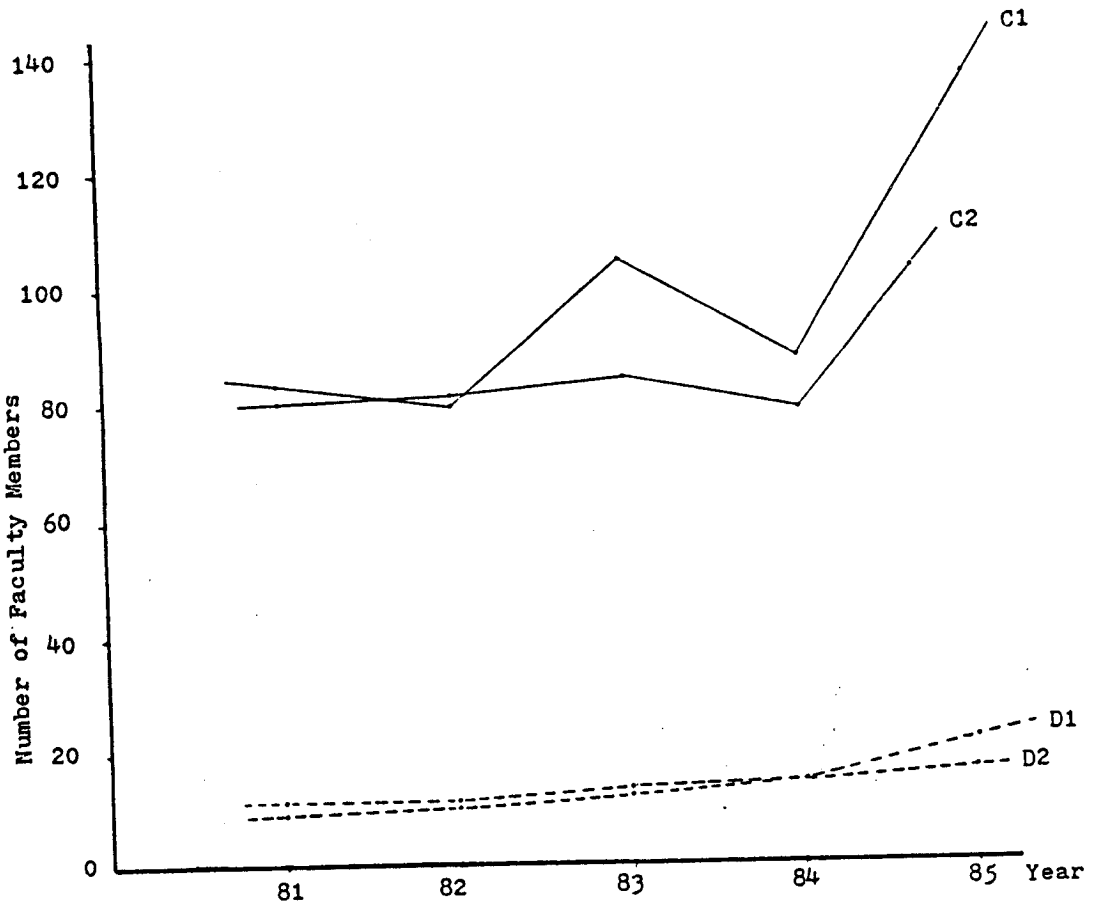


Source: Journal of Education for Library and Information Science: Directory Issue. (1971-1985).

A1: Information Science, Information Systems and Networks--US; A2: Library Automation and Data Processing--US; B1: Information Science, Information Systems and Networks--Canada; B2: Library Automation and Data Processing--Canada.

Figure 2

Number of Faculty Members in the US and Canadian Library Schools Specializing in Online Search Service and Systems Analysis, 1981-1985.



Source: Journal of Education for Library and Information Science: Directory Issue. (1981-1985).

C1: Online Search Service--US; C2: System Analysis--US;

D1: Online Search Service--Canada; D2: System Analysis--Canada

Figure 3

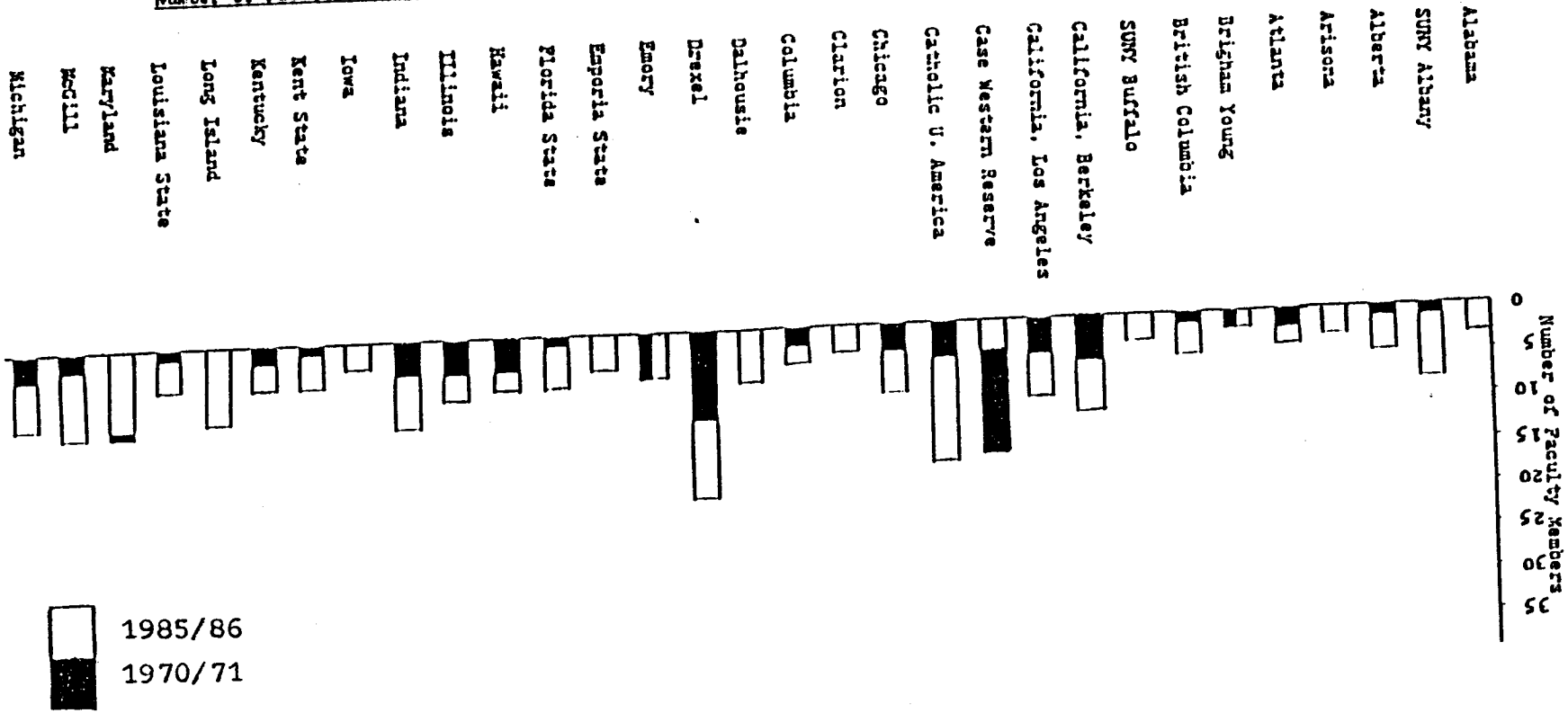
Number of Faculty Members in the US and Canadian Library Schools Specializing in Indexing and Abstracting, 1973-1985.

Source: Journal of Education for Library and Information Science: Directory Issue. (1973-1985).

E: Indexing and Abstracting—US; F: Indexing and Abstracting —Canada.

Figure 4

Number of Faculty Members in the US and Canadian Library Schools Teaching Information Science Courses

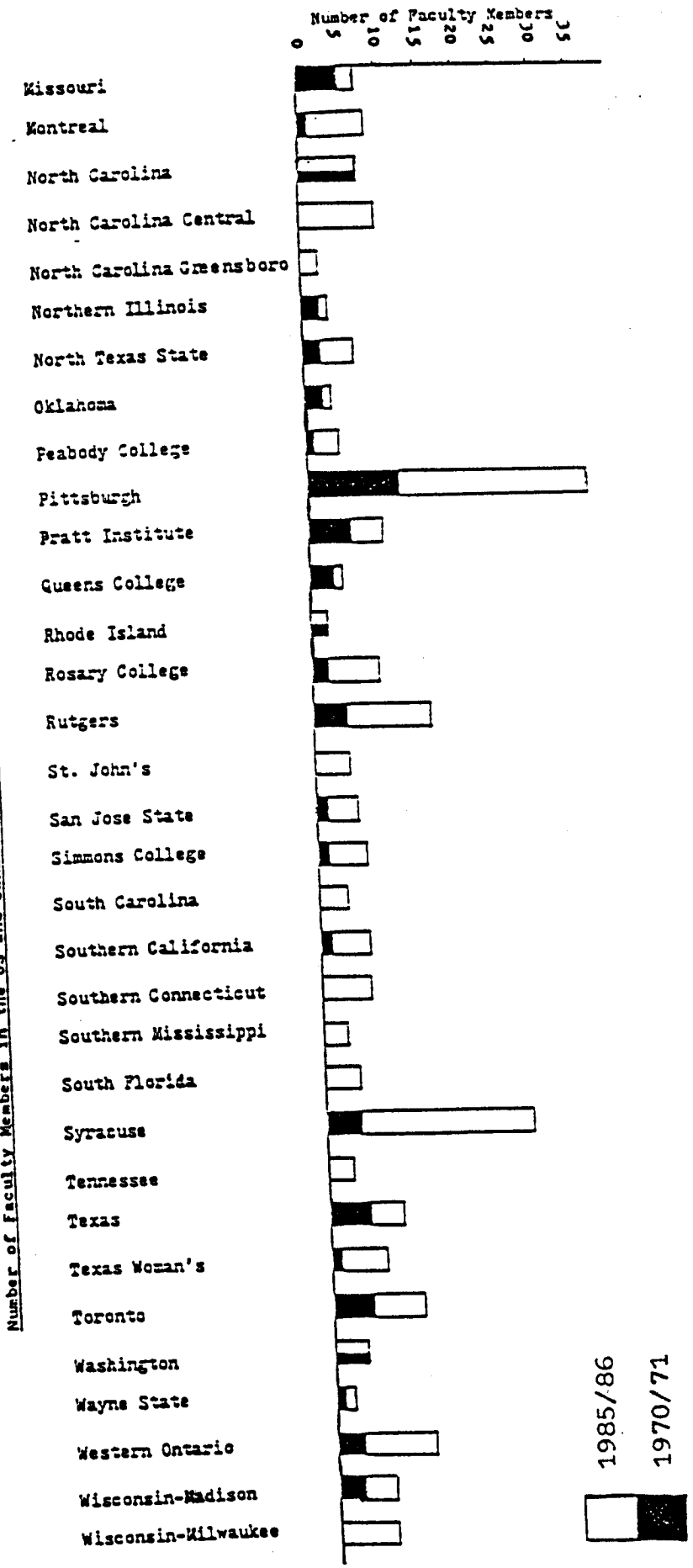


Source: Journal of Education for Library and Information Science: Directory Issue. (1971-1985)

(continued on p. 103)

Figure 4

Number of Faculty Members in the US and Canadian Library Schools Teaching Information Science Courses



Source: Journal of Education for Library and Information Science: Directory Issue. (1971-1985)

The graphs in Figure 3, representing the number of experts in abstracting and indexing in the library schools shows those in the United States increased 325%, and in Canada increased 100%, during the period of 1973-1985.

Figure 4 shows the number of faculty members in accredited library schools in the United States and Canada teaching information science courses in 1970/71 (shaded areas) and in 1985/86. (unshaded areas) Among these library schools in 1970/71, Case Western Reserve University had the highest number of subject specialists in the various fields of information science followed by the University of Pittsburgh, Drexel, Maryland and others. But in 1985/86, the University of Pittsburgh led the library schools, followed by Syracuse University, Drexel, Catholic University of America, Rutgers, University of California, Berkeley, and other library schools.

Information science teaching in Canadian library schools also increased rapidly during this period, with six Canadian library schools offering courses led by the University of Toronto, followed by the University of Western Ontario, McGill, and others. However, in 1985/86 the University of Western Ontario had overtaken Toronto, followed by McGill, Montreal, Dalhousie, Alberta and British Columbia.

Long term trends in both countries reveal how deeply information science has influenced education for librarianship. But as Figure 4 shows, though many library schools have added the term "information" to their names, they have a relatively small number of courses in information science or related topics.

SUMMARY AND CONCLUSION

The evolution of education for librarianship during the past hundred years reveals the continuing change of the profession in response to the challenge of post-industrial society and the advance of intellectual knowledge. Today the majority of the library schools are extending their curricula to areas such as automation, database management, economy of information and telecommunication policy.

By the 1960's library schools had developed significantly as a result of interaction with the needs of the profession, the university tradition in liberal arts and sciences, and both social and economic changes. The period after 1962 further shows the rising influence of government and non-governmental agencies upon education for librarianship. In addition professional organizations, with government funding, embarked on programs for improvement of library training in both countries. The ALA drew up separate sets of standards and established the Office of Library Education in 1966, and both US and Canadian governments extended federal aid to students and library schools.

The rise of documentation and information science for handling information in the 1950's brought major innovations to the field of library science. A twofold development in the library school curriculum resulted:

1. In an integration of information science with library science and modernization of traditional course structure of library schools.

2. Development of separate information science programs in the library schools with interdisciplinary cross-listings at the bachelor, master's and doctoral levels.

Entire information science programs were set up: a four year undergraduate degree at Pittsburgh and Drexel, the University of Toronto's separate MIS program in the Faculty of Library and Information Science, the decision of the University of Minnesota to phase out its MLS program in favour of bachelor's, master's and doctoral programs in information science, and interdisciplinary doctoral programs in various other library schools.

Despite such sweeping changes in formal structures of some programs, the majority of library schools had an insufficient number of faculty members in the field of information science.

Though some library schools have established integrated (or separate) courses in library and information science, job structure analysis so far reveals a very low percentage of library school graduates in non-traditional positions. The current placement rate of library school graduates is between 5-10 percent of the total number of jobs in non-library positions.[1] Reasons for this include: inadequate or incomplete training by library schools and inability to compete with the graduates of computer science and MBA as well as inadequate recognition of the importance of the information science sector by the individual job-seeker or student.

In addition, library schools are experimenting with the introduction of joint or dual master's degrees. The major subject areas of joint degree programs are archival, administration, computer

science, health science, law, music, pharmacy and social work. Such programs help students secure two professional degrees at once rather than wasting time and money for separate programs. Despite these benefits, most of the dual degree programs have been unsuccessful and exist merely "on paper" because of poor enrollment of students.[2]

Although the master's in library science has consolidated its status as the first professional degree, a large number of undergraduate programs in the US and Canada produce library technicians and teacher librarians. However, these programs like the more recent undergraduate programs in information science fall outside the scope of professional accreditation. A number of ALA members view these trends with alarm, as a "threat to the MLS".[3]

Another unresolved problem is the duration of master's programs. Canadian library schools provide wider knowledge with their two year programs, while only a limited number of library schools in the U.S.A. (UCLA, Chicago, Washington and Illinois) provide instruction for more than one year. The ALA has periodically held long range discussions on two year master's programs as a higher standard, but no consensus among library educators has been reached.[4] Therefore we may conclude that the basic structure of the U.S. master's programs in library and information science has not changed significantly during the last twenty-five years.

Admission requirements for the master's programs at accredited library schools have changed. This, however may be in part a result of the technological evolution in the library school curriculum, with computerization, the integration of information science, and

increasingly limited library school resources. Although the basic requirement for admission to graduate library schools is a bachelor's degree with a grade point average of "B" (GPA), and an adequate Score on the Graduate Record Examination, most US library schools have additional standards. University of California, Los Angeles requires at least one year's background in statistics, Toronto now makes a statistics course a prerequisite for the MLS program. Some schools require previous experience in computer programming, mathematics, and foreign languages. The current trend in admissions is to limit the enrollment of students with a background in social science and humanities, as well as foreign students.

A growing number of doctoral programs in library and information science are being combined with other academic disciplines such as arts and business administration, communication, computer science education and public health. This trend presages future changes in traditional training for librarianship. So far, these specialized courses are mostly limited to theoretical research rather than practical training. Moreover, graduate library schools put less emphasis on research and quantitative methods at the master's level than other disciplines.

Finally it can be concluded that the period after 1962 was remarkable in two ways.

1. Broadening of the curriculum of library schools by introducing specialized interdisciplinary and dual master's degree programs to provide broader knowledge for the students.
2. Education for librarianship has recognized the need for a scientific basis for the discipline, integrated with computer,

telecommunications and other fields, such as computer science, information science and business administration.

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APPENDIX

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School of Library and Information Science
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Albany, NY 12222

UNIVERSITY OF ALBERTA
Faculty of Library Science
3-20 Rutherford South
Edmonton, Alberta
T6G 2J4

UNIVERSITY OF ARIZONA
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Tucson, AZ 85719

1 ATLANTA UNIVERSITY
School of Library and Information Studies
223 Chestnut Street, S.W.
Atlanta, GA 30314

1 BRIGHAM YOUNG UNVIERSITY
School of Library and Information Sciences
Room 5042 Harold B. Lee Library
Provo, UT 84602

UNIVERSITY OF BRITISH COLUMBIA
School of Library, Archival and Information Studies
#831 - 1956 Main Mall
Vancouver, B.C. V6T 1Y3

1 STATE UNIVERSITY OF NEW YORK, BUFFALO
2 School of Information and Library Studies
381 Baldy Hall
Buffalo, NY 14260

1 UNIVERSITY OF CALIFORNIA, BERKELEY
2 School of Library and Information Studies
113 South Hall
Berkeley, CA 94720

1 UNIVERSITY OF CALIFORNIA, LOS ANGELES
2 Graduate School of Library and Information Science
405 Hilgard Avenue
120 Powell Library
Los Angeles, CA 90024

3 CASE WESTERN RESERVE UNIVERSITY
Baxter School of Information and Library Science
10950 Euclid Avenue
Cleveland, OH 44106

1 CATHOLIC UNIVERSITY OF AMERICA
School of Library and Information Science
620 Michigan Avenue, N.E.
Washington, DC 20064

1 UNIVERSITY OF CHICAGO
2 Graduate Library School
1100 East 57th Street
Chicago, IL 60637

1 CLARION UNIVERSITY
College of Library Science
Clarion, PA 16214

1 COLUMBIA UNIVERSITY
2 School of Library Service
516 Butler Library
New York, NY 10027

* DALHOUSIE UNIVERSITY
School of Library and Information Studies
Halifax, Nova Scotia
B3H 4H8

1 DREXEL UNIVERSITY
2 College of Information Studies
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Philadelphia, PA 19104

1 EMORY UNIVERSITY
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Atlanta, GA 30322

EMPORIA STATE UNIVERSITY
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Emporia, KS 66801

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Iowa City, IA 52242

1 KENT STATE UNIVERSITY
School of Library Science
Kent, OH 44242

UNIVERSITY OF KENTUCKY
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New Brunswick, NJ 08903

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Jamaica, NY 11439

4 SAN JOSE STATE UNIVERSITY
Division of Library Science
Washington Square
San Jose, CA 95192

2 SIMMONS COLLEGE
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1 UNIVERSITY OF SOUTH CAROLINA
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2 UNIVERSITY OF SOUTHERN CALIFORNIA
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1 SOUTHERN CONNECTICUT STATE UNIVERSITY
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1 TEXAS WOMAN'S UNIVERSITY
2 School of Library and Information Studies
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2 UNIVERSITY OF TORONTO
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Toronto, Ontario
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UNIVERSITY OF WASHINGTON
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WAYNE STATE UNIVERSITY
Library Science Program
315 Kresge Library
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Madison, WI 53706

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1. Offers post-Master's specialist or certificate program. (The ALA does not accredit these programs.)
2. Offers programs for Doctoral degree (The ALA does not accredit programs leading to the Doctoral degree.)
3. Admitting no new students; closed in June 1986.
4. Conditionally accredited January 1986 for a period of two years.

* Dalhousie Library School changed its name recently to School of Library and Information Studies

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