Library and Information Science

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Abstract
Library and Information Science (LIS) is an interdisciplinary domain concerned with the creation, management, and uses of information in all its forms. Emerging from parallel developments in libraries and in information science, the field now encompasses diverse activities that are part of the information transfer cycle—such as the creation, instantiation, communication, acquisition, organization, management, regulation, preservation, distribution, and use of information. This entry traces the development of LIS from its beginnings in thinking about libraries and the growth of library science as a field. It then explores the nature of information science and the interweaving paths of the two—which eventually encountered the field of communications. It concludes with current trends, especially the difficulties that come from holding together what is in fact a vast interdisciplinary area.

INTRODUCTION

Library and Information Science (LIS) is an interdisciplinary domain concerned with creation, management, and uses of information in all its forms. Taught in colleges and universities at the undergraduate and graduate levels and a subject of research in both industry and academia, LIS brings together a variety of theoretical approaches. Its focus is on representations of information—the documentary evidence of civilization—as well as on the technologies and organizations through which information becomes accessible.

The research domain is young, beginning in the late 1960s and early 1970s, but its roots lie in the nineteenth century. LIS represents the intersection of library science, information science (originally called documentation), and communications (see Fig. 1). The first, library science, has sought to solve the problems of organizing and providing access to collections of materials. The second, information science, seeks to understand the properties of information and how to manage it. Aspects of the field of communication, always a facet of the first two, became interwoven with both as library science and information science matured and increasingly intersected with one another.

The field of LIS can be characterized as “user-focused.” The concern is not just for the isolated information artifact—e.g., data, reports, books, video, and museum objects. Instead, the social and technical systems that make recorded knowledge available and useful to the people who want or need it—or even happen upon it—are considered. These systems vary from cataloging and classification to development and management of collections, including licensing and intellectual property rights. LIS researchers also study ways in which the use of indexes, citations, and other bibliographic information can reveal such things as the relationship between disciplines, networks of scholarship, and the value of information in decision making. Such questions lead beyond the initial concerns of the field.

The LIS domain extends to the structures of the organizations that make information available and usable—such as libraries, archives, and museums, whose primary purpose is collecting, preserving, organizing, and making useful information and cultural artifacts. The field also includes systems—such as information resource management—within business and organizations.

Library and Information Science grew out philosophies of the Enlightenment. Its foundations were built in the United States in the late eighteenth and throughout the nineteenth century. Thomas Jefferson, James Madison, and other founders viewed both libraries and information as important to the new democracy. The Library of Congress was established in 1800 during the administration of John Adams; article 1, section 8 of the Constitution established copyright protection to “promote science and the useful arts.” Government support for the U.S. mail system, including roads over which the mail was carried, and for national surveys (including the Lewis and Clark expedition) are among the ways in which the new federal government promoted the creation and dissemination of information.

During the nineteenth century, scientific discovery and exploration grew rapidly, fueled by government subsidies and industrial growth. The U.S. government published 100,000 different titles between 1774 and 1881, and the Government Printing Office printed 41 million copies of their publications by 1894. Research universities and
library collections grew exponentially. Between 1850 and 1875, local communities and philanthropists created 2240 public libraries.\(^2\)

### FOUNDATIONS: 1880–1960

#### Library Science

Libraries are collections of recorded knowledge, organized for use. Libraries may exist in buildings of bricks and mortar or as digital collections held in the memory of one or more connected computers. Whatever the form or format, libraries are intended to provide access to cultural and scientific materials for an audience—for users who will take that information for enjoyment, increased understanding, or as the basis for creating new information.

The nineteenth century was a productive period for the development of tools for organizing information. These included William Frederick Poole’s (1821–1894) *Index to Periodical Literature*, begun in 1848, and several important indexing and abstracting services, among them *Index Medicus* (1879) and *Engineering Index* (1896). The *Library of Congress Classification* and *Dewey Decimal Classification* systems were developed in the late nineteenth century to help manage the growth of library collections. By the early twentieth century, the Library of Congress published catalog records from their collections for use by other libraries, a practice that encouraged standardization in library practice and contributed to the possibilities of automating library work.

In 1887 library science took the first step from education by apprenticeship—the usual way one gained occupational competence in nineteenth century America—to an academic area within higher education. Melvil Dewey (1851–1931) created the School of Library Economy at Columbia University, (see Refs. [3,4]). At its inception, library science focused on history and bibliography—the description and classification of recorded knowledge. (These areas remain the primary focus of library science in many countries, particularly those countries formerly associated with the Soviet Union.) The academic field did not begin to develop until the Carnegie Corporation funded two critical studies on the quality of library science education. The second of these *Training for Library Service* (1923), by Charles C. Williamson (1877–1965) is often credited with bringing about the changes necessary for library science to become a mature academic field.\(^5\)

In 1926 the Carnegie Corporation provided funding to create The Graduate Library School (GLS) at the University of Chicago. It was the first such program to offer a doctoral program and played a significant role in opening the field to change during the 1930s. Library science became more interdisciplinary and began to develop deeper theoretical foundations and more substantive research. The GLS faculty included Pierce Butler (1884–1953), Douglas Waples (1893–1978) and, for a time, Bernard Berelson (1912–1979) who received his doctoral degree from the GLS in 1941. These three applied various methods from the social and behavioral sciences to the examination of libraries. Their differing views were widely influential, partly because of their doctoral students and partly because of their research, including *The Library’s Public* (1949), of which Berelson was a principal author.

Two of those Chicago graduate students became faculty colleagues at Western Reserve University. Dean Jesse Shera (1903–1982) and Professor Margaret Egan (1905–1959) played a critical role in bringing the bibliographic history of library science together with communication. In a classic 1952 article,\(^6\) they argue that bibliography has a social purpose: an approach they called “social epistemology.” Bibliography does not exist for a small group of users; but is the way in which graphic communications move through society and contribute to shaping that society.

#### Information Science

Information Science is concerned with information itself and its representations—which information is; how to represent it; how to understand its functions; how it is used; and how to design systems to organize, classify, and retrieve information. Noted information scientist Harold Borko stated it “is that discipline that 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.”\(^7\)

The history of information science embodies technological developments, notably those in computing; theoretical advances in mathematics, and finding ways to measure information; and innovations in retrieving information for
research and scholarship. Historically, much of the work of information science was concerned with scientific, technical, and medical information.

Belgian lawyer Paul Otlet (1868–1944) is credited with identifying the field of documentation, a term more commonly used in Europe and the precursor to the phrase “information science.” With his colleague Henri La Fontaine (1854–1943) Otlet founded the Institut International de Bibliographie in 1895 and created the multilingual Universal Decimal Classification (1905). Both were created to provide universal access to all recorded knowledge, to support Otlet’s ambition to promote world peace.

It was not until the founding of the American Documentation Institute (ADI) in 1937 by Watson Davis (1896–1967) that the field began to coalesce in America. Prior to its founding, developments in information science were primarily the result of individual invention, such as the Hollerith punch cards for sorting data or independent organizations, and work of scholarly societies like the American Chemical Society. Originally a service organization with particular interest in microform technology, ADI’s membership began with representatives from government, professional societies, and foundations concerned about similar problems in information management. With a particular interest in scientific communication, ADI fostered collaboration among its members and sponsored research. In 1952, ADI also became a professional society by admitting individual members.

Most of the early developers of documentation and information science had a background in science and industry, and were involved in trying to solve problems of managing large amounts of data and information resources, often for government. A driving force for their work was scientific research and development during and after World War II, with the attendant growth in publication of scientific information. The military and defense industries provided significant funding not only for technical but also theoretical research in information storage and retrieval.

Information science historians often credit two researchers with post-World War II advances in their field. The first, Vannevar Bush (1890–1974), described his conception of the memex system, outlined in “As We May Think.”[10] The system, based on microform technology, was intended to make human knowledge easily and widely accessible. Contemporary scholars note that Otlet promoted many of Bush’s ideas earlier, but it is Bush who has received most of the credit for anticipating the development of the World Wide Web and other contemporary technologies.

The second was Claude Shannon (1916–2001), whose 1948 paper “A Mathematical Theory of Communication”[9] provided the foundation for information scientists seeking to quantify information and to understand its properties. His book, written with communications researcher Warren Weaver (1894–1978), also entitled, “A Mathematical Theory of Communication”[10] became the basis for significant research and change in social science work in communication. The field of LIS expanded well beyond these original models as it embraced the field of communications in its broader forms.

Communications

Literacy, book history, reading—tools for communicating history, culture, and information—have always been inextricably connected to libraries. By the late nineteenth century, librarians were considering their role in communicating with users, not just conserving materials. At the first American Library Association conference in 1876, for example, Samuel Green (1837–1918), then director of the Worcester Free Public Library, presented a paper entitled “The Desireableness of Establishing Personal Intercourse and Relations between Librarian and Reader in Popular Libraries.”[11] As early as 1910 librarians conducted studies of the types of books their users were reading; such studies became common in both the United States and Europe.

Both library science and documentation historically thought of themselves as related to communication, but communications research did not begin to mature until the 1940s. Histories of communication frequently mention the contributions of University of Chicago Professor Douglas Waples’ studies of reading conducted in the 1930s and 1940s. One of the areas of research in The Public Library Inquiry was The Effects of the Mass Media (1949)—a study in what was happening to popular taste and its effects on book reading and other library-related matters.

In 1955 Western Reserve University created the Center for Documentation and Communication Research with an explicit intention to bring those two disciplines—information science and communications—together. Allen Kent (1921– ) became Associate Director of the Center, performing important experiments in information retrieval before moving to the University of Pittsburgh (1963) where he established the Department of Information Science in 1970. It would not be until the 1960s and 1970s that researchers began significant research representing communication, library science and information science linked together.

EMERGENCE OF LIS

Library and Information Science theory and research coalesced over the last 40 years of the twentieth century. It was a time of rapid technological development that made more complex both managing information and making it accessible. In the early 1960s, works like Marshall McLuhan’s (1911–1980) <cite>Gutenberg Galaxy</cite> (1962) and Fritz Machlup’s (1902–1983) <cite>The Production of Knowledge</cite> (1986) began to challenge traditional understandings of libraries and information systems. The rise of the World Wide Web in the 1990s further transformed the way information was accessed and shared, leading to new models of information management and retrieval.

In the 1970s, the field of LIS began to coalesce, with organizations like the American Society for Information Science (ASIS) and the Association for Computing Machinery (ACM) providing a space for scholars and practitioners to share their work. This period saw the establishment of LIS programs at universities around the world, and the development of new methodologies for research in the field.

By the 1980s and 1990s, LIS continued to evolve, with the advent of the Internet and digital libraries. The field expanded to include new areas of research, such as information retrieval, data mining, and information visualization. The move towards digital and online resources also led to new challenges, such as the need for new tools to manage and make sense of vast amounts of data.

Today, LIS is a multidisciplinary field that spans the areas of information science, library science, and computer science. It continues to evolve as new technologies emerge and as the field responds to the changing needs of its users.
and Distribution of Knowledge in the United States, (1962) spurred public imagination about the role of information in society. The problems of classifying and organizing data, of creating tools for retrieval and of designing them so they could be used became the concern of many other researchers disconnected from the LIS community. Responses by a number of the U.S. and European library schools to this implicit challenge became important to LIS development.

In the early 1960s, two U.S. LIS schools developed research centers: the Library Research Center at the University of Illinois (1961) and the Institute of Library Research at the University of California (1964). Each provided research opportunities for faculty and student. At the University of Sheffield, England, the Centre for Research in User Studies (CRUS) within the Postgraduate School of Librarianship and Information Studies (1976) provided a similar foundation.

Federal funding for doctoral studies in LIS and for research in both library and information science increased dramatically beginning in the 1960s. Over less than a decade the profile of LIS faculty shifted dramatically with an increasing number holding doctoral degrees and actively engaged in research.[12]

Some of the leading post-World War II information scientists left government, business, and industry for faculty positions in LIS. Beside Allen Kent’s association with Case Western and Pittsburgh Universities other examples are Robert Hayes (1926–), President of Advanced Information Systems joining the University of California at Los Angeles’s faculty; Pauline Cochrane’s (1929–) move from the American Institute of Physics to Syracuse University (1966); and F.W. Lancaster’s (1933–) recruitment to the University of Illinois in 1970 after experience with the Cranfield Experiments (1962) and the MEDLARS Evaluation Project of the National Library of Medicine (1965–1968).

Cross-disciplinary faculty teaching was equally enriching to LIS programs. Stanford University communications professor William Paisley taught, for example, at Berkeley’s School of Librarianship. Doctoral students from Syracuse University’s newly named School of Information Studies took advantage of computer scientist Gerald Salton’s lectures at Cornell University.

Most significant for what LIS has become today was not, however, the addition of information science to the library science curriculum, but LIS’s shift away from a focus on libraries and scholarly communication to one on information. Research ranged from that on information retrieval to the accuracy of reference service. Throughout the 1970s many of the schools, formerly considered “library schools” added the word information to their name and broadened their curricula. In 1968 the American Documentation Institute became the American Society for Information Science. In 1970, a U.S. Government agency, The National Commission for Library and Information Science, was formally charged with research and policy regarding the two.

Robert S. Taylor (1919–2009), who in 1972 became dean of what is now the School of Information Studies at Syracuse University, led the evolution of LIS from a library-centered field to one that revolves around the cycle of information transfer (see Fig. 2). In this model LIS is concerned with all of the processes and institutions that finally make recorded knowledge available and accessible. These include not only the publication of scholarship and creative works, but also information storage and retrieval and libraries as a medium of distribution. Information transfer depends, for example, on social policy, including copyright law and censorship activities; it depends on the design of buildings or Web sites and user education to make information easy to use; and, on the coding and formatting of electronic materials so they might be retrieved. The adoption of this new model was not immediate and has not been adopted by all LIS schools; but it represents what LIS has become as a domain.

The use of information and its users has become a central concern of the domain in the process of this shift. Research of communication scholars like Paisley and Brenda Dervin (1938–) and their students became increasingly important to LIS research. Dervin and Nilan’s seminal 1986 article[13] identified the shift in LIS research, building on Taylor and Paisley, to widespread concern about information needs, seeking and use. This more theoretically grounded research has led LIS education toward its user focus.

Equally important, as the field has become more theoretical, LIS research has become cumulative and deeper and interdisciplinary ties among researchers have strengthened.

A particularly rich example of this change is the work of information behavior researchers who are both interdisciplinary in their theoretical approaches and also in the community of scholars with which they associate. Their work is presented at Information Seeking in Context (ISIC) conferences as well as in information science
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journals such as the Journal of Documentation and Journal of the American Society for Information Science and Technology. This research stream has matured well beyond Shannon and Weaver through the work of such theorists as T.D Wilson (models of information behavior), Brenda Dervin (evolving sense-making theory), Carol Kuhlthau (information search process), and others. Chun Wei Choo has provided one integrated model of information behavior research.

Shifting away from libraries as the center of LIS research and education did not remove libraries from the domain. Library and information science is built on such areas as cataloging, classification, and collection development that derive from library research, theory, and practice. Libraries, both virtual and concrete, are critical repositories of information in all forms. At the same time the shift in LIS programs starting in the 1970s has highlighted longstanding tensions between library science and information science. The signature for librarians is their code of ethics that emphasizes a commitment to intellectual freedom, resistance to censorship and equity of access to information. Information science, with its roots in business and industry, is without such a commitment. Some librarians express concerns that LIS has abandoned them by removing libraries from their center and in the process abandoning professional norms. Of particular concern is whether LIS programs adequately prepare students for practice in libraries.

Library and information science educators historically have sought to analyze and improve professional practice in libraries. That has not diminished today, although important developments in research in information retrieval, human computer interaction, and other such areas may be invisible in day-to-day practice. Most visible and immediately important to librarians is work such as that of Kuhlthau (1937-), on the information search process of users. Notable also are the strong contributions to the practice of reference including work of Dervin and Dewdney, of Durrance many works on community information needs and services and most recently analyses of the return on investment in public libraries carried out by Jose-Marie Griffiths and Donald W. King (1932-), and others.

The growth of the Internet and of digital collections have reinforced the continued importance of libraries to LIS. They also made LIS an increasingly attractive target of opportunity for disciplines outside LIS. In 1996 the National Science Foundation (NSF) awarded the first round of 4 year grants under its “digital library initiative.” National Science Foundation’s purpose was to “dramatically advance the means to collect, store, and organize information in digital forms, and make it available for searching, retrieval, and processing via communication networks—all in user-friendly ways.” The initiative, lasting 8 years, along with a similar joint effort of NSF and the Joint Information Systems Committee in the United Kingdom, advanced research in LIS, stabilized the domain and enhanced collaborations outside traditional LIS schools.

Federal funding for LIS in the 1960s and 1970s helped transform LIS in the United States by spurring research and doctoral study. Similarly funding in the 1990s and later contributed to expanding the domain of LIS and provided strong incentives for other disciplines to take up problems in LIS. Andrew Abbott’s 1988 study, The System of Professions, remains one of the most cogent sociological analyses of the challenges LIS has faced.

In 2005 a group of university programs in LIS, informatics, computer science, communications, and public policy formed the “i-schools caucus.” The Web site of the caucus refers to their focus on “iField,” an academic area of study and professional preparation in the intersection of technology, information, and people. Almost two-thirds of caucus members offer a program to prepare librarians that is accredited by the American Library Association. The focus of the i-Schools, however, is on the broad domain knowledge of LIS.

THE PRESENT

Throughout LIS’s history of creating and establishing itself, scholars have debated such questions as how to define information and communication and whether there is evidence that the related fields are truly converging. These questions are beyond the scope of this entry. Despite the debates, LIS teaching and research continues to expand into newly developing areas of information organization and use. Among those areas of expansion are discipline-specific applications of informatics—for example, medical informatics, and community informatics—the study of design, application, and use of information technology within specific domains. Another domain-specific area of development is data curation—the management of data through the information transfer cycle including data creation, management, preservation, and use. The fields of application are new, but essentially replicate in new disciplines approaches that historically were applied to libraries. And information retrieval research is now addressing issues in digital humanities that raise new questions about ontologies and retrieval of text.

CONCLUSION

The field of LIS began in the United States; it grew initially out of the interaction of library science and information science. Although the development of LIS in countries outside the United States has been constrained by different educational systems, scholars particularly in the Nordic countries and Britain have conducted significant LIS research notably at the Department of Information Studies at Sheffield University (England) and the
Danish Royal School of Library and Information Science. Within the past two decades universities both Finnish and Norwegian universities have created schools and departments apart from library education devoted to information science.

In the United States a wide range of Federal agencies, foundations and businesses now support LIS research. As a result LIS research is proceeding on larger questions within the domain. At the same time, changes in LIS’s relationship to libraries continue to be a source of concern to librarians. The effect of the i-Schools’ Caucus on the development of LIS is at present uncertain.

ACKNOWLEDGMENTS

I am grateful to numerous colleagues who have shaped my thinking about this field over the years. In particular I would like to acknowledge the contributions of Marcia Bates, Pauline Cochrane, Linda Smith, and Robert Taylor.

REFERENCES

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