

50 Years of ITAL/JLA: A Bibliometric Study of Its Major Influences, Themes, and Interdisciplinarity

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ABSTRACT

Over five decades, Information Technology and Libraries (and its predecessor, the Journal of Library Automation) has influenced research and practice in the library and information science technology. From its inception on, the journal has been consistently ranked as one of the superior publications in the profession and a trendsetter for all types of librarians and researchers. This research examines ITAL using a citation analysis of all 878 peer-reviewed feature articles published over the journal's 51 volumes. Impactful authors, articles, publications, and themes from the journal's history are identified. The findings of this study provide insight into the history of ITAL and potential topics of interest to ITAL authors and readership.

INTRODUCTION

Fifty-one years have passed since the first publication of the *Journal of Library Automation (JLA)*, the precursor to *Information Technology and Libraries (ITAL)*, in 1968: 51 volumes, 204 issues, and 878 feature articles. Information technology and its use within libraries has evolved dramatically in the time since the first volume, as has the content of the journal itself. Given the interdisciplinary nature of Library and Information Science (LIS) and *ITAL*, and the celebration of this momentous achievement, an examination of the journal's evolution, based on the authors, publishers, and works that have influenced its content, seems apropos. The following article presents a comprehensive study of all 7,575 references listed for the 878 articles (~8.6 refs/article average) published over *ITAL*'s fifty years, identifying those authors and publishers whose work has been cited the most in the journal and major themes in the cited publications, and an evaluation of the interdisciplinarity of references in *ITAL* publications. This study not only frames the history of the *ITAL* journal, but demonstrates an evolution of the journal that suggests new paths for future inquiry.

CONCEPTUAL FRAMEWORK

A major influence for the organization and methodology of this paper is Imad Al-Sabbagh's 1987 dissertation from Florida State University's School of Library and Information Studies, *The Evolution of the Interdisciplinarity of Information Science: A Bibliometric Study*.¹ In this study, Al-Sabbagh sought to examine the interdisciplinary influences on the burgeoning field of information science by examining the references of the *Journal of the American Society of Information Science (JASIS)*, today known as the *Journal of the Association for Information Science and Technology (JASIST)*. In Al-Sabbagh's study, a sample of ten percent of JASIS references was selected for examination.² The references were sorted into disciplines based on the definitions supplied by

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Dewey Decimal Classification categories, with the percentages compared to the total number of the sampled references to derive percentages (e.g., if 150 references of 1,000 total JASIS references examined belonged to the category of library science, then 15 percent of references belonged to library science, and so on for all disciplines). The present study deviates slightly from Al-Sabbagh's in that it does not use a sampling method. Instead, all 878 articles published in *JLA/ITAL* and their 7,575 references will be examined. The categories for disciplines, instead of being based on Dewey Decimal, will be based on definitions derived from *Encyclopedia Britannica*, and will include new disciplines that were not used in Al-Sabbagh's original analysis, such as Information Systems and Instructional Design.³ Additionally, the major authors, publishers, and articles cited throughout *JLA/ITAL*'s history will be identified; this was not done in Al-Sabbagh's study, but will likely provide additional beneficial information for researchers and potential contributors to *ITAL*.

ITAL is an ideal publication to study using Al-Sabbagh's methodology, in that it is affiliated with librarianship and library science but, due to its content, is also closely associated with the disciplines of information science, computer science, information systems, instructional design, psychology, and many others. *ITAL* is likely one of the more interdisciplinary journals to still fall within the category of "library science." In fact, as part of Al-Sabbagh's 1987 study, he distributed a survey to several prominent information science researchers, asking them to name journals relevant to information science (this method was used to determine that *JASIS* was the most representative journal for the discipline of information science). On the list of 31 journals compiled from the respondents' rankings, *ITAL* ranked as the seventh most representative journal for information science, above *Datamation*, *Scientometrics*, *JELIS*, and *Library Hi-Tech*.⁴ This shows that, for a long time, *ITAL* has been considered as an important journal not just in library science, but in information science and likely beyond.

Key Terminology

While the findings of this study are pertinent to the *ITAL* reader, some of the terminology used throughout the study may be unfamiliar. To acclimate the reader to the terminology used in this study, brief definitions for key concepts are provided below.

Bibliometrics. "Bibliometrics" is the statistical study of properties of documents.⁵ The present study constitutes a "citation analysis," a type of bibliometric analysis that examines the citations in a document and what they can reveal about said document.

Cited Publications. "Cited Publications" are the references ("publications") listed at the end of a journal article.⁶ The purpose of Al-Sabbagh's study (and the present study) is to analyze these cited publications to determine what disciplines influenced the research published in a specific journal. This bibliometric analysis methodology is distinct from those that examine the influence of a specific journal on a discipline (i.e., the present study looks at what disciplines *influenced ITAL*, not what disciplines *are influenced by ITAL*).

Discipline. In this study, the term "discipline" is used liberally to refer to any area of study that is presently or was historically offered at an institution of higher education (sociology, anthropology, education, etc.). In this study, library science and information science are considered as distinct disciplines (as was the case with Al-Sabbagh's study).⁷ As discussed in the methodology section, the names and definitions of disciplines are all derived from the *Encyclopedia Britannica*.



LITERATURE REVIEW

The type of citation analysis used by Al-Sabbagh and as the basis of the current study are used frequently to examine the interdisciplinarity of library and information science and specific LIS journals, as noted by Huang and Chang.⁸ Tsay used a similar methodology to Al-Sabbagh to examine cited publications in the 1980, 1985, 1990, 1995, 2000, and 2004 volumes of *JASIST*. In this study, the researcher found that about one-half of the citations in *JASIST* came from the field of LIS.⁹ Butler examined LIS dissertations using a similar approach, finding that about 50 percent of the cited publications in the dissertations originated in LIS, with education, computer science, and health science following in the second, third, and fourth positions.¹⁰ Chikate and Paul and Chen and Liang conducted similar studies of dissertations in the India and Taiwan.¹¹ Each study found different degrees of interdisciplinarity, possibly indicating a fluctuation within the discipline of LIS based on publication type, country of origin, etc. for the publications used in the study. Several researchers have used these methods recently to examine library and information science journals, such as *Chinese Librarianship*,¹² *Pakistan Journal of Library and Information Science*,¹³ *Library Philosophy and Practice*,¹⁴ and the *Journal of Library and Information Technology*.¹⁵ These studies are more common for journals published outside of the United States, but there is no reason why the methodology would not hold true for a U.S.-based journal like *ITAL*.

Recently, publications in a wide array of fields have used similar methodologies as Al-Sabbagh to evaluate interdisciplinarity in a discipline. Ramos-Rodriguez and Ruiz-Navarro (2004) examined reference trends in the *Journal of Strategic Management*.¹⁶ Fernandez-Alles and Ramos-Rodriguez (2009) conducted a bibliometric analysis to identifying those publications most frequently cited in the journal *Human Resource Management*.¹⁷ Crawley-Low (2006) used a similar methodology to identify the core (most frequently cited) journals in veterinary medicine from the *American Journal of Veterinary Research*.¹⁸ These studies show a growing interest in the use of citation analysis to present new information about a publication to potential authors, editors, and readers.

Jarvelin and Vakkari (1993) noted trends in LIS from 1965 to 1985 based on an examination of cited publications in LIS journals. The authors noted a trend in interest in the topic of information storage and retrieval, with a de-emphasis on classification and indexing and a strengthened emphasis on information systems and retrieval.¹⁹ This study deviated from Al-Sabbagh and related studies of interdisciplinarity—though it employed a similar methodology—in that it examined trends or subtopics within the discipline of LIS. Though it is not a primary focus of the present study, the use of subtopics to further divide the discipline of library science and examine what aspects (management, technology, cataloging, reference) of the discipline are the focus of cited publications is incorporated in several tables in the results section.

METHODS

All references from the 878 articles published in the *JLA/ITAL* journals (n=7,575) were transcribed to an Excel spreadsheet for analysis (this spreadsheet can be found as a supplemental file [<https://ejournals.bc.edu/index.php/ital/article/view/10875/9469>]). The spreadsheet includes separate columns for primary author, title, publisher, and discipline of each reference. The list of disciplines with their definitions, derived from *Encyclopedia Britannica*, is displayed in table 1 below.

Table 1. Definitions of Disciplines Used for this Study.

Discipline	Definition
Library Science	The principles and practices of library operation and administration, and their study.
Information Science	The discipline that deals with the processes of storing and transferring information.
Information Systems	The study of the integrated set of components for collecting, storing, and processing data and for providing information, knowledge, and digital products.
Computer Science	The study of computers, including their design (architecture) and their uses for computations, data processing, and systems control.
Engineering	The application of science to the optimum conversion of the resources of nature to the uses of humankind.
Instructional Design	The systematic development of instructional specifications using learning and instructional theory to ensure the quality of instruction.
Education	The discipline that is concerned with methods of teaching and learning in schools or school-like environments as opposed to various nonformal and informal means of socialization.
Government	Resources produced within the political system by which a country or community is administered and regulated.
Sociology	A social science that studies human societies, their interactions, and the processes that preserve and change them.
Popular	Newspaper, magazine, media reports that do not fit better within another category.
Philosophy	The rational, abstract, and methodical consideration of reality as a whole or of fundamental dimensions of human existence and experience.
Psychology	The scientific discipline that studies mental states and processes and behaviour in humans and other animals.
Corporate	Business, corporate, private organization publications that do not fit better within another category.
Archival Science	The study of the repository for an organized body of records produced or received by a public, semipublic, institutional, or business entity in the transaction of its affairs and preserved by it or its successors.
Management	The study of the process of dealing with or controlling things or people.
Linguistics	The scientific study of language.
Literature	The art of creation of a written work.
Law	The discipline and profession concerned with the customs, practices, and rules of conduct of a community that are recognized as binding by the community.



Discipline	Definition
Mathematics	The science of structure, order, and relation that has evolved from elemental practices of counting, measuring, and describing the shapes of objects (also includes statistics).
Health Science	Study of humans, the extent of an individual's continuing physical, emotional, mental, and social ability to cope with his or her environment.
Communication Science	The study of the exchange of meanings between individuals through a common system of symbols.
Geography	The study of the diverse environments, places, and spaces of Earth's surface and their interactions.
Physics	The science that deals with the structure of matter and the interactions between the fundamental constituents of the observable universe.
Art/Design	The study of the nature of art, including such concepts as interpretation, representation and expression, and form.
Economics	The social science that seeks to analyze and describe the production, distribution, and consumption of wealth.
Biology	The study of living things and their vital processes.
Museum Studies	The study of institutions dedicated to preserving and interpreting the primary tangible evidence of humankind and the environment.
Music	The art concerned with combining vocal or instrumental sounds for beauty of form or emotional expression, usually according to cultural standards of rhythm, melody, and, in most Western music, harmony.
Chemistry	The science that deals with the properties, composition, and structure of substances (defined as elements and compounds), the transformations they undergo, and the energy that is released or absorbed during these processes.
Science and Technology Studies	The study, from a philosophical perspective, of the elements of scientific inquiry.
Journalism	The collection, preparation, and distribution of news and related commentary and feature materials through such print and electronic media as newspapers, magazines, books, blogs, webcasts, podcasts, social networking and social media sites, and e-mail as well as through radio, motion pictures, and television.
Anthropology	The study of human beings in aspects ranging from the biology and evolutionary history of <i>Homo sapiens</i> to the features of society and culture that decisively distinguish humans from other animal species.

To determine the discipline in which a cited publication would be classified, the researcher used the cited publication's title, abstract, and journal to select the most appropriate discipline from the table. In those cases where a source could not be easily identified as falling within one specific discipline, the researcher conferred with additional reviewers (professional librarians) to determine the best fit.

Several analyses of this data were conducted to explore various aspects of *JLA/ITAL*'s publication history. For the complete data of the publication's 51 volumes, the top ten most referenced authors, articles, publishers (journals/publishing houses/organizations/websites), and disciplines were identified with the aid of Excel's functions. The same was done separately for both the *JLA*'s 14 volumes and *ITAL*'s 37 volumes. This will allow for the comparison of the journal before and after the 1982 rebranding. The 51 volumes of *JLA/ITAL* were also divided into the five decades of its history: 1968-77, 1978-87, 1988-97, 1998-2007, 2008-18 (eleven volumes instead of ten). For each of these decades, the top ten authors, publishers, and disciplines were identified. For each of the three categories, a table was created to show the top ten of each decade side-by-side.

Lastly, the titles of the 7,575 cited publications in *JLA/ITAL* articles were examined using a content analysis, to identify major concepts and themes that appear to have influenced *JLA/ITAL* articles. NVivo content analysis software was utilized for this analysis. Titles were fed from the Excel spreadsheet into the NVivo software, and the word frequency tools were used to identify the most frequently used terms and "generalizations," or types or themes of statements in the titles.²⁰

RESULTS

Table 2 displays the top ten most-cited authors, articles, publishers/publications, and disciplines throughout *ITAL*'s fifty-year history. Among the authors, four of the top six are associated with two institutions: Library of Congress and OCLC. There are four corporate or nonprofit organizations, three academics (associated with institutions of higher education), two women and four men. Of the top ten articles, eight were published before 1973; three were published in *JLA/ITAL* and five were published in journals versus five in other (non-journal) publications. Of the top ten publishers, seven are journals; five of the publishers are directly associated with library science. Within the disciplines, LIS represents 60 percent of the total. There are 31 total disciplines represented throughout the 51 volumes, a greater number of disciplines than identified in Al-Sabbaugh's study of *JASIST*.

Table 3 displays the results for *JLA*. *JLA* emerged at the same time as the Machine-Readable Catalog (MARC) and OCLC, and this is evident in the authors, articles, and publishers cited in the journal. During this phase of the journal's history, the top three authors—Fred Kilgour, the Library of Congress, and Henriette Avram—dominated the citations. These three authors were cited more than the next seven combined (143 to 101). The cited publications during this period reflected a focus on systems, corporate, and government publications.

Results for the 37 volumes of *ITAL* are displayed in table 4. During this period, Marshall Breeding emerged as one of the biggest influences on information technology and libraries. All but two of the top articles (Larson and Bizer) were written before 1985. While six publishers were the same as with *JLA*, three of these six (Library of Congress, Association for Computing Machinery, and College and Research Libraries) changed position in the top ten. The disciplines of systems, psychology, educational and instructional design rose, while government, corporate, management, linguistics, and electrical engineering dropped; library science, information science, and computer science remained at the top.



Table 2. Overall Most Cited.

	Top Ten Authors (Affiliation)	Top Ten Articles	Top Ten Publishers	Top Ten Disciplines	Top Ten Disciplines with Percentages	
1	U.S. Library of Congress	American Library Association. (1967). <i>Anglo-American cataloging rules</i> . Chicago, IL: American Library Association.	<i>ITAL/JLA</i>	Library Science—Technology	Library Science	44%
2	Fred G. Kilgour (OCLC)	Avram, H. D. (1968). <i>The MARC II Format: A Communications Format for Bibliographic Data</i> . Washington, DC: Library of Congress.	ASIST	Information Science	Information Science	16%
3	Henriette D. Avram (Library of Congress)	Ruecking Jr, F. H. (1968). Bibliographic retrieval from bibliographic input; the hypothesis and construction of a test. <i>Information Technology and Libraries</i> , 1(4), 227-238.	Association for Computing Machinery	Library Science—Cataloging	Computer Science	8%
4	American Library Association	Kilgour, F. G., Leiderman, E. B., & Long, P. L. (1971). <i>Retrieval of bibliographic entries from a name-title catalog by use of truncated search keys</i> . Ohio College Library Center.	<i>College and Research Libraries</i>	Computer Science	Information Systems	7%
5	IBM: International Business Machines	Kilgour, F. G. (1968). Retrieval of single entries from a computerized library catalog file. <i>Proceedings of the American society for information science</i> , 5, 133-136.	Library of Congress	Information Systems	Government	3%
6	Ohio College Library Center/Online Computer Library Center (OCLC)	Long, P. L., & Kilgour, F. (1972). A truncated search key title index. <i>Information Technology and Libraries</i> , 5(1), 17-20.	American Library Association	Library Science—General	Instructional Design	3%
7	Marshall Breeding (Vanderbilt University/Independent)	Hildreth, C. R. (1982). <i>Online public access catalogs: The user interface</i> . OCLC Online Computer Library Center, Incorporated.	<i>Library Resources and Technical Services</i>	Government	Corporate	2%
8	Jakob Nielsen (Independent)	Nugent, W. R. (1968). Compression word coding techniques for information retrieval. <i>Information Technology and Libraries</i> , 1(4), 250-260.	Library Hi-Tech	Library Science—Administration	Education	2%
9	Karen Markey (University of Michigan)	Curwen, A. G. (1990). International Standard Bibliographic Description. In <i>Standards for the international exchange of bibliographic information: papers presented at a course held at the School of Library, Archive and Information Studies, University College London</i> (pp. 3-18).	<i>Library Journal</i>	Instructional Design	Psychology	2%
10	Walt Crawford (Research Libraries Group/Independent)	Fasana, P. J. (1963). <i>Automating cataloging functions in conventional libraries</i> (No. ISL-9028-37). Lexington, MA: ITEK Corp Information Sciences Lab.	OCLC	Library Science—Academic	Sociology	2%

Table 3. JLA Most Cited.

	Top Ten Authors (Affiliation)	Top Ten Articles	Top Ten Publishers	Top Ten Disciplines	Top Ten Disciplines with Percentages	
1	Fred G. Kilgour (OCLC)	Avram, H. D. (1968). <i>The MARC II Format: A Communications Format for Bibliographic Data</i> . Washington, DC: Library of Congress.	<i>Journal of Library Automation</i>	Library Science—Technology	Library Science	58%
2	U.S. Library of Congress	American Library Association. (1967). <i>Anglo-American cataloging rules</i> . Chicago, IL: American Library Association.	ASIST	Information Science	Information Science	14%
3	Henriette D. Avram (Library of Congress)	Ruecking Jr, F. H. (1968). Bibliographic retrieval from bibliographic input; the hypothesis and construction of a test. <i>Journal of Library Automation</i> , 1(4), 227-238.	Library of Congress	Library Science—Cataloging	Computer Science	6%
4	IBM: International Business Machines	Kilgour, F. G., Leiderman, E. B., & Long, P. L. (1971). <i>Retrieval of bibliographic entries from a name-title catalog by use of truncated search keys</i> . Ohio College Library Center.	<i>Library Resources and Technical Services</i>	Library Science—General	Government	5%
5	American Library Association	Long, P. L., & Kilgour, F. (1972). A truncated search key title index. <i>Journal of Library Automation</i> , 5(1), 17-20.	IBM	Computer Science	Corporate	5%
6	William R. Nugent (Inforonics, Inc.)	Kilgour, F. G. (1968). Retrieval of single entries from a computerized library catalog file. <i>Proceedings of the American society for information science</i> , 5, 133-136.	American Library Association	Government	Information Systems	4%
7	Paul J. Fasana (Columbia University)	Livingston, L.G. (1973). International standard bibliographic description for serials. <i>Library Resources and Technical Services</i> , 17(3), 293-298.	Association for Computing Machinery	Corporate	Management	2%
8	Philip L. Long (OCLC)	Fasana, P. J. (1963). <i>Automating cataloging functions in conventional libraries</i> (No. ISL-9028-37). Lexington, MA: ITEK Corp Information Sciences Lab.	University of Illinois Press	Information Systems	Linguistics	1%
9	Martha E. Williams (University of Illinois)	Nugent, W. R. (1968). Compression word coding techniques for information retrieval. <i>Journal of Library Automation</i> , 1(4), 250-260.	<i>College and Research Libraries</i>	Library Science—Academic	Electrical Engineering	1%
10	University of California	Avram, H. D. (1970). The RECON pilot project: a progress report. <i>Journal of Library Automation</i> , 3(2), 102-114.	Special Libraries	Library Science—Special	Psychology	1%



Table 4. *ITAL* Most Cited.

	Top Ten Authors (Affiliation)	Top Ten Articles	Top Ten Publishers	Top Ten Disciplines	Top Ten Disciplines with Percentages	
1	U.S. Library of Congress	American Library Association. (1967). <i>Anglo-American cataloging rules</i> . Chicago, IL: American Library Association.	<i>Information Technology and Libraries</i>	Library Science—Technology	Library Science	41%
2	American Library Association	Hildreth, C. R. (1982). <i>Online public access catalogs: The user interface</i> . OCLC Online Computer Library Center, Incorporated.	ASIST	Information Science	Information Science	16%
3	Marshall Breeding (Vanderbilt University/Independent)	Markey, K. (1984). <i>Subject searching in library catalogs</i> . OCLC Online Computer Library Center.	Association for Computing Machinery	Library Science—Cataloging	Computer Science	9%
4	Jakob Nielsen (Independent)	Malinconico, S. M. (1979). Bibliographic Data Base Organization and Authority File Control. <i>Wilson library bulletin</i> , 54(1), 36-45.	<i>College and Research Libraries</i>	Computer Science	Information Systems	7%
5	Karen Markey (University of Michigan)	Matthews, J. R., Lawrence, G. S., & Ferguson, D. (1983). <i>Using online catalogs: A nationwide survey</i> . Neal-Schuman Publishers, Inc..	Library Hi-Tech	Information Systems	Instructional Design	3%
6	OCLC	Bizer, C., Heath, T., & Berners-Lee, T. (2011). Linked data: The story so far. In <i>Semantic services, interoperability and web applications: emerging concepts</i> (pp. 205-227). IGI Global.	American Library Association	Instructional Design	Government	2%
7	Walt Crawford (Research Libraries Group/Independent)	Tolle, J. E. (1983). <i>Current Utilization of Online Catalogs: Transaction Log Analysis</i> . Volume I of Three Volumes. Final Report.	Ohio College Library Center	Library Science—Administration	Education	2%
8	Clifford A. Lynch (University of California/Coalition for Networked Information)	Larson, R. R. (1991). The decline of subject searching: Long-term trends and patterns of index use in an online catalog. <i>Journal of the American Society for Information Science</i> , 42(3), 197-215.	<i>Journal of Academic Librarianship</i>	Library Science—General	Sociology	2%
9	Charles R. Hildreth (Read LTD.)	Markey, K. (1983). <i>Online Catalog Use: Results of Surveys and Focus Group Interviews in Several Libraries</i> . Volume II of Three Volumes. Final Report.	<i>Library Journal</i>	Library Science—Academic	Psychology	2%
10	J.R. Matthews (San Jose State University/Independent)	Ludy, L.E., & Logan, S.J. (1982). Integrating authority control in an online catalog. <i>American Society for Information Science Meeting</i> , 19, 176-178.	Library of Congress	Government	Management	2%

The top ten authors of each decade are shown in Table 5. For the first two decades, Fred Kilgour was a dominate influence, receiving 15 more citations than the next closest author (the Library of Congress). In the third decade, Kilgour dropped entirely from the top ten and was supplanted at the top spot by Karen Markey, professor at the University of Michigan. During the fourth decade, in the wake of CIPA and the U.S. Patriot Act, the Library of Congress rose to the top spot and John

Bertot and Paul Jaeger, who wrote extensively on these topics and their legal, social, and administrative implications, rose up the list. Web resources, such as Google, also began to emerge in the fourth decade. In the final decade, Breeding, who writes on library systems as well as information technology in general, rose to the top spot. Tim Berners-Lee, one of the pioneers of the Internet and linked data, took the second spot. Jakob Nielsen, known for his contributions to usability testing, appears in the top three of the rankings for both the fourth and fifth decade. Only the Library of Congress and American Library Association appear in the top ten list for all five decades.

Table 5. Top Ten Authors of Each Decade.

	1968-77	1978-87	1988-97	1998-2007	2008-18
1	Fred G. Kilgour (OCLC)	Fred G. Kilgour (OCLC)	Karen Markey (University of Michigan)	U.S. Library of Congress	Marshall Breeding (Vanderbilt University/Independent)
2	U.S. Library of Congress	Robert De Gennaro (Harvard University/ Pennsylvania University)	U.S. Library of Congress	Jakob Nielsen (Independent)	Tim Berners-Lee (W3 Consortium/ University of Oxford/ Massachusetts Institute of Technology)
3	Henriette D. Avram (Library of Congress)	Henriette D. Avram (Library of Congress)	Clifford A. Lynch (University of California/Coalition for Networked Information)	John C. Bertot (University of Maryland)	Jakob Nielsen (Independent)
4	IBM: International Business Machines	IBM: International Business Machines	Michael K. Buckland (University of California)	OCLC	U.S. Library of Congress
5	American Library Association	S. Michael Malinconico (New York Public Library/ University of Alabama)	American Library Association	Paul T. Jaeger (University of Maryland)	American Library Association
6	Paul J. Fasana (Columbia University)	U.S. Library of Congress	Christine L. Borgman (University of California-Los Angeles)	Walt Crawford (Research Libraries Group/Independent)	National Information Standards Organization
7	William R. Nugent (Inforonics, Inc.)	Frederick W. Lancaster (University of Illinois)	Charles R. Hildreth (Read LTD)	American Library Association	U.S. Government
8	University of California	Allen B. Veaner (Stanford University/ University of California)	Joseph R. Matthews (San Jose State University/Independent)	Roy Tennant (University of California/ OCLC)	John C. Bertot (University of Maryland)
9	Kenneth J. Bierman (Oklahoma State University/ University of Nevada-Las Vegas)	Alan L. Landgraf (OCLC)	Walt Crawford (Research Libraries Group/Independent)	Google	OCLC
10	Robert M. Hayes (University of California-Los Angeles)	American Library Association	Lois M. Chan (University of Kentucky)	Thomas B. Hickey (OCLC)	Jung-Ran Park (Drexel University)



JLA/ITAL appears as the most cited publisher in all decades except the fourth, as shown in table 6. During that decade, ACM and *JASIST* rose above *ITAL*, and *Library Journal* and websites (websites are considered in this study as a collective group) emerged on the list. *Library Journal* was a frequently used source for Bertot and Jaeger, who authored several *ITAL* articles during this period. There were also more articles about the Internet, digital libraries, Google and Google Scholar, and the future of libraries during the fourth decade. *JASIST* appears in the top four of every decade but has declined in the fifth decade of *ITAL*. OCLC, IBM, *College and Research Libraries*, *Cataloging and Classification Quarterly*, *Journal of Academic Librarianship*, *Library Resources and Technical Services*, and *Library Hi-Tech* all appear in multiple decades of this list.

Table 6. Top Ten Publishers of Cited Articles for Each Decade.

	1968-77	1978-87	1988-97	1998-2007	2008-18
1	<i>JLA</i>	<i>JLA/ITAL</i>	<i>ITAL</i>	Association for Computing Machinery	<i>ITAL</i>
2	Library of Congress	<i>JASIST</i>	<i>JASIST</i>	<i>JASIST</i>	<i>Library Hi-Tech</i>
3	<i>JASIST</i>	<i>Library Journal</i>	<i>College and Research Libraries</i>	<i>ITAL</i>	Association for Computing Machinery
4	<i>Library Resources and Technical Services</i>	OCLC	American Library Association	<i>College and Research Libraries</i>	<i>JASIST</i>
5	IBM	University of Illinois Press	<i>Library Resources and Technical Services</i>	American Library Association	<i>Journal of Academic Librarianship</i>
6	American Library Association	Library of Congress	OCLC	<i>Library Journal</i>	<i>College and Research Libraries</i>
7	Special Libraries	<i>Library Resources and Technical Services</i>	Library of Congress	<i>Journal of Academic Librarianship</i>	<i>Computers in Libraries</i>
8	<i>College and Research Libraries</i>	American Library Association	<i>Library Hi-Tech</i>	General Websites	<i>D-Lib</i>
9	Association for Computing Machinery	Prentice-Hall	<i>Journal of Academic Librarianship</i>	<i>Library Hi-Tech</i>	<i>Cataloging and Classification Quarterly</i>
10	University of Illinois Press	IBM	<i>Cataloging and Classification Quarterly</i>	OCLC	IEEE

As shown in table 7, library science and information science maintained the first and second positions for every decade of *JLA/ITAL*'s publication, while computer science and information systems jockeyed for the third and fourth positions every decade except the first (when government reports had a major impact on the journal). Government and corporate (IBM particularly) were important in the first three decades but were replaced by instructional design and education in the final two decades. Sociology appears in four of five decades, while psychology appears in three of five. In the first two decades, electrical engineering (as it applied to the design of computer systems) rounded up the top ten; law emerged in decade four, following CIPA and the

Patriot Act; in the final decade, with the discussion about Encoded Archival Description in *ITAL*, archival science rose to the tenth spot.

Table 7. Top Ten Disciplines of Each Decade (Library Science Subcategories Combined).

	1968-77	1978-87	1988-97	1998-2007	2008-18
1	Library Science	Library Science	Library Science	Library Science	Library Science
2	Information Science	Information Science	Information Science	Information Science	Information Science
3	Computer Science	Information Systems	Computer Science	Computer Science	Information Systems
4	Government	Computer Science	Information Systems	Information Systems	Computer Science
5	Corporate	Corporate	Government	Instructional Design	Instructional Design
6	Information Systems	Government	Philosophy	Education	Psychology
7	Management	Management	Sociology	Corporate	Government
8	Linguistics	Sociology	Literature	Sociology	Education
9	Electrical Engineering	Psychology	Psychology	Philosophy	Sociology
10	Chemistry	Electrical Engineering	Education	Law	Archival Science

Table 8 compares all disciplines (including subcategories of library science) in the first decade of *JLA/ITAL* and the fifth decade. Compared to the first decade, the fifth decade saw greater diversification of subtopics under library science, which led to “information science” supplanting “library science—technology” in the top spot. Instructional design and archival science emerged from disciplines not discussed in the first decade to become some of the most important disciplines of the fifth decade. The library science subtopics of accessibility and teaching grew significantly as the roles of the librarian evolved.



Table 8. First Ten Years vs. Last Eleven Years Disciplines (with subcategories of library science).

	1968-77	2008-18
1	Library Science—Technology	Information Science
2	Information Science	Library Science—Technology
3	Library Science—Cataloging	Information Systems
4	Library Science—General	Computer Science
5	Computer Science	Library Science—Cataloging
6	Government	Instructional Design
7	Corporate	Library Science—Accessibility
8	Library Science—Academic	Library Science—Academic
9	Information Systems	Library Science—Reference
10	Library Science—Special	Library Science—Administration
11	Management	Psychology
12	Linguistics	Government
13	Electrical Engineering	Library Science—General
14	Library Science—Medical	Education
15	Popular	Popular
16	Library Science—Reference	Library Science—Teaching
17	Chemistry	Sociology
18	Physics	Archival Science
19	Engineering—General	Management
20	Psychology	Law
21	Mathematics	Corporate
22	Library Science—Local	Mathematics
23	Communication Science	Philosophy
24	Health Science	Literature
25	Library Science—Accessibility	Linguistics
26	Library Science—School	Physics
27	Philosophy	Health Science

	1968-77	2008-18
28	Library Science—Administration	Geography
29	Journalism	Electrical Engineering
30	Government	Library Science—Medical
31	Music	Biology
32	Education	Art/Design
33	Literature	Museum Studies
34		Economics
35		Communication Science
36		Engineering-General
37		Journalism
38		Library Science—Special
39		Chemistry
40		Science and Technology Studies
41		Library Science—School
42		Library Science—Local
43		Anthropology

Table 9 show the ten biggest themes and most frequently used terms throughout *JLA/ITAL*'s 51 volumes. Library is the most common theme and term. The library catalog, and the associated concept of the Integrated Library System (ILS), influence the second and third themes. "Online" is an interesting theme/term for the different ways in which it was used throughout the history of the journal. In the early years, "online" was used to refer to the retrieval of computerized bibliographic information; in later years, "online" came to refer almost exclusively to the use of the World Wide Web. Rounding out the top ten terms are several that associated with the study of information science: data, bibliography, and retrieval.

Finally, table 10 depicts the top ten themes for each of *ITAL*'s five decades. Libraries remained at the top for all decades; the second spot, however, shifted dramatically. In the first decade, with MARC being a major topic of discussion, "system" and "catalog" rose to the top. In decades two and three, with the melding of the disciplines of library science and information science, "information" rose to the top. In the final two decades, the World Wide Web was influential on the *ITAL* discourse. Users, usability, and accessibility remain an important theme throughout the history of the journal.



Table 9. Major Themes and Term Frequency in Titles of Cited Publications (All 51 volumes).

	Themes	Terms
1	Library	Library
2	Catalog	Information
3	System	Online
4	Information	System
5	Online	Web
6	Usability	Catalog
7	Web	Digital
8	Search	Data
9	Computer	Bibliography
10	Digital	Retrieval

Table 10. Major Themes in Titles of Cited Publications (By Decade).

	1968-77	1978-87	1988-97	1998-2007	2008-18
1	Library	Library	Library	Library	Library
2	System	Information	Information	Web	Web
3	Catalog	System	Catalog	Information	Digital
4	Information	Catalog	Web	Digital	Information
5	Online	Online	System	Usability	Usability
6	Usability	Web	Digital	Users	Data
7	Web	Usability	Online	Catalog	Users
8	Search	Digital	Usability	Search	Accessibility
9	Computer	Users	Users	Accessibility	Studies
10	Digital	Search	Accessibility	Data	Academic

DISCUSSION

One of the major benefits of a bibliometric study/citation analysis is the production of a set of themes, disciplines, seminal sources, influences, and influencers that may benefit potential authors in determining whether their manuscript is suitable for publication in a specific discipline or journal.²¹ The results of this study demonstrate that *ITAL* is undoubtedly a library science journal, but that it invites a high-level of interdisciplinarity and has experienced a growing impact from the disciplines of information science, computer science, and information systems (which combined presently comprise about 30 percent of total *ITAL* references). Throughout the journal's history, there has been an emphasis on library systems, particularly systems for library cataloging. Recently, however, there has also been an emphasis on technology, law, and the library as well as instructional technology, teaching, and the library. *ITAL* authors take the majority of their citations/ideas from other *ITAL* articles, *JASIST*, *ACM*, and other library technology (*Library Hi-tech*, *D-Lib*) and academic librarianship (*College and Research Libraries*, *Journal of Academic Librarianship*) journals. Some of the major authors to read to familiarize oneself with the history and themes of the *ITAL* publication include Fred Kilgour, Henriette Avram, Karen Markey, and Marshall Breeding. These are some findings that potential *ITAL* authors may find practical use while preparing crafting their research and writing.

With *ITAL* having a sustained role as a leading publication in library and information science, this study may have some generalizable findings for the discipline. In 2015, Richard van Noorden produced an interactive chart of the interdisciplinarity of a variety of disciplines, based on data from Web of Science and the National Science Foundation.²² If *ITAL* is considered representative of a sub-discipline called "library and information science—technology," it can be compared to the interdisciplinarity of the disciplines listed in van Noorden's study. In the last decade of *ITAL*, 45.4 percent of citations came from outside of LIS. Compared to van Noorden's findings, only 42 of 144 (29 percent) "fields" (or "disciplines," as they have been referred to as in this study) have a higher proportion of references to outside disciplines. This LIS-Tech sub-discipline would have a level of interdisciplinarity comparable to the fields of oceanography, botany, philosophy, history, and psychology, and on-par with the average for all social sciences.²³ This shows that the discipline certainly has its own proprietary knowledge-base to build upon, but also values the contributions of knowledge from other disciplines.

Though it is not necessarily the purpose of this study to examine the influence of *ITAL* on other journals and within the discipline of LIS, some of this information can be gathered rather easily from Google Scholar (by searching for the journal and comparing the number of citations for each article, as displayed by Scholar) and is worth sharing. Table 11 shows the top ten most-cited articles published over the history of *JLA/ITAL*, with McClure's 1994 article "Network Literacy: A Role for Libraries," receiving the most references of any article published in the journal. Three *ITAL* articles have been cited by articles which themselves have over 1,000 citations, including one article (2007's "Checking Out Facebook.com") that has been cited by an article which itself has been cited over 10,000 times. Fifty-seven *ITAL* articles have at least 57 citations, giving the journal an h-index²⁴ of 57.



Table 11. Citations of *ITAL* Articles in Outside Journals.

Rank	Journal Citation	Number of Citations
1	McClure, C. R. (1994). Network literacy: A role for libraries? <i>Information Technology and Libraries</i> , 13(2), 115-26.	447
2	Charnigo, L., & Barnett-Ellis, P. (2007). Checking out Facebook.com: The impact of a digital trend on academic libraries. <i>Information Technology and Libraries</i> , 26(1), 23-34.	391
3	Antelman, K., Lynema, E., & Pace, A. K. (2006). Toward a 21st century library catalog. <i>Information Technology and Libraries</i> 25(3), 128-39.	267
4	Spiteri, L. F. (2007). The structure and form of folksonomy tags: The road to the public library catalog. <i>Information Technology and Libraries</i> 26(3), 13-25.	260
5	Katz, I. R. (2007). Testing information literacy in digital environments: ETS's iSkills assessment. <i>Information Technology and Libraries</i> 26(3), 3-12.	226
6	Jeng, J. (2005). What Is Usability in the Context of the Digital Library and How Can It Be Measured. <i>Information Technology and Libraries</i> 24(2), 47-56.	196
7	Lankes, R. D., Silverstein, J., & Nicholson, S. (2007). Participatory networks: the library as conversation. <i>Information Technology and Libraries</i> 26(4), 17-33.	189
8	Dickstein, R., & Mills, V. (2000). Usability Testing at the University of Arizona Library: How to Let the Users in on the Design. <i>Information Technology and Libraries</i> 19(3), 144-51.	188
9	Schaffner, A. C. (1994). The Future of Scientific Journals: Lessons from the Past. <i>Information Technology and Libraries</i> 13(4), 239-47.	177
10	Kopp, J. J. (1998). Library consortia and information technology: the past, the present, the promise. <i>Information Technology and Libraries</i> 17(1), 7.	166

LIMITATIONS OF THIS STUDY

There were couple of potential limitations to this study. This bibliometric analysis was conducted in the “old-fashioned” way, using Excel and hand-typing out all 7,575 cited publications. This was deemed the most effective way to collect the data, based on the availability of *ITAL* journal, but did take a great deal of time. To save time in recording data, only the first author for each cited publication was listed and no publication dates were collected, nor were abstracts retained and analyzed (which may provide additional compelling details about the content of these cited publications).

Greater validity for the assignment of disciplines to cited publications may be achieved by having a large team of researchers for analysis, or using multiple researchers for all citations, not just those that the first researcher deems questionable.²⁵ As with a content analysis, independent review of data and comparison and compromising of coding is likely to provide the most consistent and accurate results.

CONCLUSION

Fifty-one volumes of the *Journal of Library Automation/Information Technology and Libraries* have been published, over which time library technology has evolved from early-MARC, a time in which the exceptional library would have perhaps a single computer for “online retrieval,” to the Internet Age, characterized by personal computing, library management systems, and technology-aided instruction. As time has passed, many of the major influences on the journal have changed, yet the journal has remained one of the most influential for library and information science technology. Increased interdisciplinarity in cited publications and new directions in information law and education offer new directions as the journal enters its sixth decade.

ENDNOTES

- ¹ Imad Al-Sabbagh, “Evolution of the Interdisciplinarity of Information Science: A Bibliometric Study” (PhD diss., Florida State University, 1987).
- ² Ibid.
- ³ *Encyclopedia Britannica*, <https://www.britannica.com/> (accessed Sept. 13, 2018).
- ⁴ Al-Sabbagh, “Evolution of the Interdisciplinarity.”
- ⁵ Melissa K. McBurney and Pamela L. Novak, “What is Bibliometrics and Why Should You Care?” *Professional Communication Conference, IEEE* (2002): 108-14, <https://doi.org/10.1109/IPCC.2002.1049094>.
- ⁶ Lutz Bornmann and Rudiger Mutz, “Growth Rates of Modern Science,” *Journal of the Association for Information Science and Technology* 66, no. 11 (2015): 2, 215-222, <https://doi.org/10.1002/asi.23329>.
- ⁷ Al-Sabbagh, “Evolution of the Interdisciplinarity.”
- ⁸ Mu-Hsuan Huang and Yu-Wei Chang, “A Study of Interdisciplinarity in Information Science: Using Direct Citation and Co-authorship Analysis,” *Journal of Information Science* 37, no. 4 (2011): 369-78, <https://doi.org/10.1177/0165551511407141>.
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- ¹³ Nosheen Fatima Warraich and Sajjad Ahmad, "Pakistan Journal of Library and Information Science: A Bibliometric Analysis," *Pakistan Journal of Information Management and Libraries* 12, no. 1 (2011): 1-7. <http://eprints.rclis.org/25600/>.
- ¹⁴ S. Thanuskodi, "Bibliometric Analysis of the Journal Library Philosophy and Practice from 2005-2009," *Library Philosophy and Practice* 437 (2010): 1-6. <https://digitalcommons.unl.edu/libphilprac/437/>.
- ¹⁵ Manoj Kumar and A.L. Moorthy, "Bibliometric Analysis of DESIDOC Journal of Library and Information Technology During 2001-2010," *DESIDOC Journal of Library and Information Technology* 31, no. 3 (2011): 203-08.
- ¹⁶ Antonio Ramos-Rodriguez and Jose Ruiz-Navarro, "Changes in the Intellectual Structure of Strategic Management Research: A Bibliographic Study of the *Strategic Management Journal*, 1980-2000," *Strategic Management Journal* 25, no. 10 (2004): 981-1,004, <https://doi.org/10.1002/smj.397>.
- ¹⁷ Mariluz Fernandez-Alles and Antonio Ramos-Rodriguez, "Intellectual Structure of Human Resources Management Research: A Bibliometric Analysis of the Journal *Human Resource Management*, 1985-2005," *JASIST* 60, no. 1 (2009): 161, <https://doi.org/10.1002/asi.20947>.
- ¹⁸ Jill Crawley-Low, "Bibliometric Analysis of the *American Journal of Veterinary Research* to Produce a List of Core Veterinary Medicine Journals," *JMLA* 94, no. 4 (2006): 430-34.
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- ²⁴ Lutz Bornmann and Hans-Dieter Daniel, "What Do We Know about the h index," *Journal of the American Society for Information Science and Technology* 58, no. 9 (2007): 1,381-385, <https://doi.org/10.1002/asi.20609>.
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