

The Contributing Disciplines to Information Science: 1973 to 1993

Boyd P. Holmes

Faculty of Information and Media Studies
University of Western Ontario
bholmes@julian.uwo.ca

ABSTRACT

For fifty years information scientists have argued that information science, or IS, is an interdisciplinary subject area, a claim I appraise here. I am mapping a representative sample of citations from IS article literature, from the period of 1973 to 1998, against the Dewey Decimal and Library of Congress classification schemes; thus far, through Dewey, I have de facto charted the 1970s, 1980s and early-1990s. My findings reveal just a limited interdisciplinarity for IS: the principal contributor was library science, followed by computer science, and management. Minor providers were economics, education, engineering, medicine, psychology and sociology.

RÉSUMÉ

Pendant 50 ans, les informaticien-ne-s constataient que l'informatique est un sujet interdisciplinaire. Je trace un prélèvement représentatif des citations de la littérature informatique de la période entre 1973 et 1998, contre les plans de classification de Dewey Daniel et de la Bibliothèque du Congrès. Mes conclusions révèlent une interdisciplinarité limitée pour l'informatique : le collaborateur principal était la bibliothéconomie, suivi par l'informatique et puis la gestion. Quelques pourvoyeurs mineurs étaient l'économie politique, l'éducation, l'ingénierie, la psychologie et la sociologie.

STATEMENT OF THE PROBLEM

Information science, or IS, has failed to reach a consensual understanding of its confines and concerns.

Scholars have, however, argued extensively, since at least 1950 (Tate 1950, 3-4), that IS, and its antecedent, documentation, are a *interdisciplines* – that is, subject areas that absorb, within their borders, and in a manner pertinent to their operations as a research disciplines, all, or parts, of specific other fields. Claims for interdisciplinarity have, however, only rarely included supportive argument, and almost never proof. Tate (*op cit.*), Borko (1968, 3), *Proceedings* (c.1962, 115) Saunders (1974, 64), Herner (1984, 157), Froehlich (1986, 272), Chaudhry (1988, 189), Garrison (1988, 362), Martha E. Williams (1988, 17-18), Saracevic (1992, 12-13), Rayward (1996, 7), James G. Williams (1997, 10), Buckland (1999, 974), Saracevic (1999, 1059), Summers et al. (1999, 1159) and Hawkins (2001, 51-52) have all proposed the existence of an interdisciplinary function for IS, and included, as part of their respective claims, those subject areas that, they argued, were disciplinary providers. Only Saracevic, in both 1992 and 1999,

provided any actual supportive argument – citing cognitive science, communication, computer science and librarianship as contributing fields to information science.

“Information science,” wrote Riitta Kärki in 1996, “has often been regarded as a good example of a specialty area that is remarkably interdisciplinary in nature, but there is not very much empirical evidence either to support or to refute this assumption” (Kärki 1996, 323). I offer that evidence. The focus of my research, for which I give preliminary results below, is the determination of which disciplines have contributed to the knowledge base of information science during the past three decades.

METHOD

Scholars cite what they use: my method thus includes a citation analysis. If we classify, against an accepted classificatory mapping of the universe of knowledge, the source materials for IS research, we ascertain those disciplines to which information science subscribes. The fact that each contribution is itself quantifiable allows us to divine, albeit only approximately, the relative *extent* to which each contributing discipline gives to information science.

All the citations I scrutinized were from mainstream *serial* IS literature;^{15, 16} the chronological scope of my data provider – Social SciSearch – limited me to the period of

¹⁵Researchers in both library science and information science usually publish their work in journals, and not in, or as, monographs (Garland 1991, 55-6; Pettigrew and Nicholls 1994, 146).

¹⁶To create my list of source serials, I employed first the *Social Sciences Citation Index* annual publication *Guide and Lists of Source Publications*. I used the issue for 1997, the most recent volume accessible when I started my data collection – March 1999. The *Guide* provided a list of fifty-eight journals that ISI classified as “Information Science and Library Science” (1998, 118-9). I started my list with that one. Then, to cut, from that enumeration, those journals that would likely be considered library science only, I located the Library of Congress Subject Headings (LCSH) that the Library itself assigned all fifty-eight journals. I chose, as source serials, those publications that held at least one subject heading that started with either the term “Information Science” or the term “Documentation,” and that ended with the modifier “Periodicals.” This process created a list of sixteen journals. The LCSH, I then discovered, also recognized specific earlier and later versions of certain of these serials as information-science periodicals; adding those versions produced the following enumeration of journals, which became my source-citation list: **1(a)**: *The Canadian Journal of Information Science* (1976-92); **(b)**: *The Canadian Journal of Information and Library Science* (1993 -); **2**: *The Information Society* (1981 -); **3(a)**: *Information Storage and Retrieval* (1963-74); **(b)**: *Information Processing and Management* (1975 -); **4(a)**: *The Information Scientist* (1967-78); **(b)**: *Journal of Information Science* (1979 -); **5**: *Information Technology and Libraries* (1982 -); **6**: *International Forum on Information and Documentation* (1975 -); **7**: *International Information and Library Review* (1992 -); **8**: *Journal of Academic Librarianship* (1974 -); **9**: *Journal of the American Society for Information Science* (1970 -); **10**: *Journal of Documentation* (1945 -); **11**: *Journal of Education for Library and Information Science* (1984 -); **12**: *Journal of Information Ethics* (1992 -); **13**: *Library Hi Tech Journal* (1984 -); **14**: *Library and Information Science Research* (1983 -); **15a**: *Nachrichten für Dokumentation* (1950-97); **b**: *NFD Information: Wissenschaft und Praxis* (1997 -); **16a**: *Social Science Information Studies* (1980-85); and **b**: *International Journal of Information Management* (1986 -).

1973 to 1978 inclusive.¹⁷ The magnitude of my data set¹⁸ made it impossible to map *all* citations, for the period under investigation, forcing me to sample. I decided to map only certain of the twenty-six years available to me for investigation: the years I chose were 1973, 1978, 1983, 1988, 1993 and 1998.¹⁹

Below, as Table 1, is the number of citations, per year, for all six of the years considered in the inquiry; I include also, for completeness, the number of articles, for each of the six years.

Table 1:
Respective Number of Articles and Citations for
the Six Years Under Investigation

Year	Number of Articles	Number of Citations
1973	161	1995
1978	203	2367
1983	266	4071
1988	330	5488
1993	352	6719
1998	536	10904
Total	1848	31544

¹⁷I was concerned in this inquiry only with research *articles*; other document types, such as editorials, errata, published articles, and book reviews, I judged as too peripheral, relative to the focus of the discipline, for consideration here.

At the time I started my thesis, Social SciSearch only started attaching the article delimiter to bibliographic records starting in 1973. This limitation prevented me from considering any IS articles published in 1972. The logistics of my research also prevented me from considering articles published after 1998: it was my experience that ISI did not index all the IS serials under consideration, for that year, until March 2000 – a gap of fifteen months. A stretch of such length, if, I reasoned, repeated for 1999, would prevent all 1999-data from being indexed until 2001, a date too late in my research agenda.

¹⁸From 1973 to 1998, the citing IS serials under consideration, for the years for which Social SciSearch indexed those journals respectively, published 7,834 articles. Between them, these articles included 131,343 citations.

As I demonstrate in my thesis, ISI makes occasional errors in its compilation of citations: the figure of 131,343 is almost certainly not correct. However, as I also show, errors on the part of ISI are sufficiently rare for me to claim that the figure is *approximately* right.

¹⁹I selected them with care. They were equidistant from each other, thus preventing, as would happen were each year not spaced in such a way from the other, the slanting of my analysis in the direction of any specific periods, an effect I call *blurring*. The five-year gap between the years allowed for differences between the periods to be seen with clarity: changes in citation patterns were made stark, whereas a blurring between areas would occur were I instead to pick two years, or ranges, either close or next to each other. In addition, the arrangement of years allowed the greatest possible reach into the past (back to 1973) while remaining as close as possible to the present.

Each of the six distributions I then mapped by frequency;²⁰ the resulting sizes of the tails necessitated further sampling. Thus, for the tails only, I mapped only each *tenth* citation, in each case allowing it to represent both itself and the citations in the nine rankings immediately prior to it.

Once the identities of the individual citations were determined, I classified them against the Dewey Decimal (DDC) and Library of Congress (LC) classification schemes, locating the classification notations from OCLC CatME, the University of Toronto online library catalogue, and, for serials only, *Ulrich's* online. The DDC notations I confirmed against the software Dewey for Windows 1.20, which recognizes the twenty-first, and most recent version, of the DDC.

Because I was also interested in the relationship between the presence of the contributing discipline, and the form in which it contributes, I also recorded the document type of the cited item – specifically, whether the item, if mapped, was a serial, monograph, or belonged to any additional categories of document type. Almost all citations were for serials, monographs, or, in much rarer cases, personal communications.

RESULTS FOR DDC

Below, I provide results for my mappings of information science, against DDC 21, for the years 1973, 1978, 1983, 1988 and 1993.

The percentage of citations for which I was able to obtain DDC 21 notations – for both the heads and tails of the respective distributions, made proportional accordingly – were, rounded, as follows:

Table 2: Percentage of Citations with Dewey 21 Notations

1973	1978	1983	1988	1993
54.289	62.472	69.927	76.545	74.539

To be considered a contributing discipline, a subject area needed to give, for the five years in question, a simple mean value of at least one percent of those citations charted successfully against the DDC. I do not here consider specifically the contribution of information science itself.

²⁰Specifically, I (1) assembled, in one set, my source set of serials, (2) limited by date (say, py=1988), (3) restricted by document type (dt=article), then (4) ranked the resulting data set (rank cw).

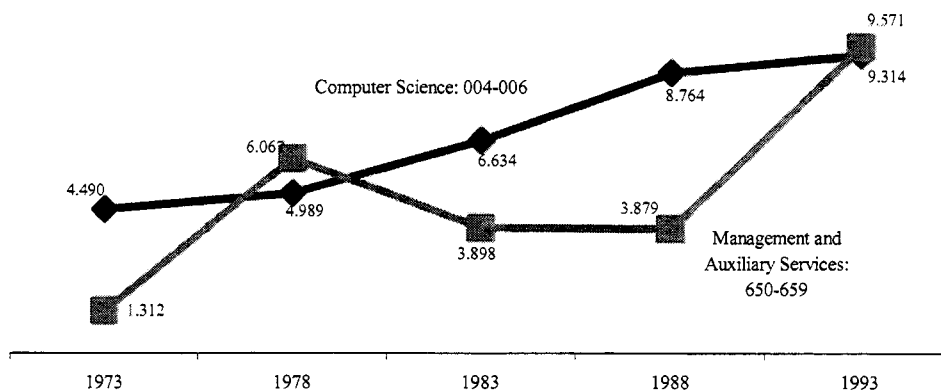
My results divide into three parts: the major contributor, intermediate contributors, and minor contributors.

Major Contributor

The sole discipline to make a major contribution to information science was library science. I present the percentage of contribution, by year, for library science, as Figure 1, immediately following.

In DDC, the classifications represented by the notations 021 to 028 represent aspects of library science, while the classification represented by the notation 020 is a generic classification for both library *and* information science. Because information science cannot therefore, in DDC, be separated from library science, in any clean, obvious way, I present, in my figure, the mappings for both (1) library and information science (020 to 028) and (2) library science without the generic 020 classification (021 to 028). (The simple mean values, when rounded, were 35.182 percent, for 020 to 028, and 16.344, for 021 to 028.) The former results are thus almost certainly *inflated*, while the latter results are *deflated*; still, it is clear that the contribution of library science to information science is huge.

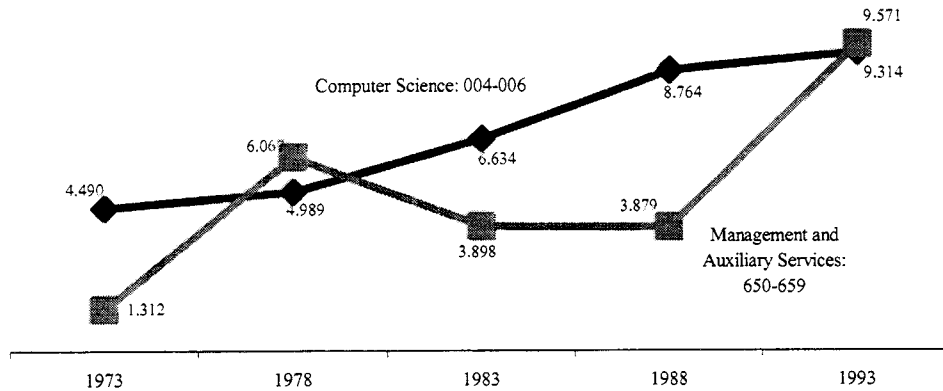
Figure 2: Intermediate Disciplinary Contributors:
Percentages of Contribution, 1973 to 1993



Intermediate Contributors

Two disciplines gave to information science in a manner neither great nor small: computer science (with a rounded simple mean contributing value of 6.838 percent), and management (4.945). The figure on the next page shows, by year, the respective contributions of these two fields. I call to the reader's attention the curiously steady nature of the growth of the contribution of computer science.

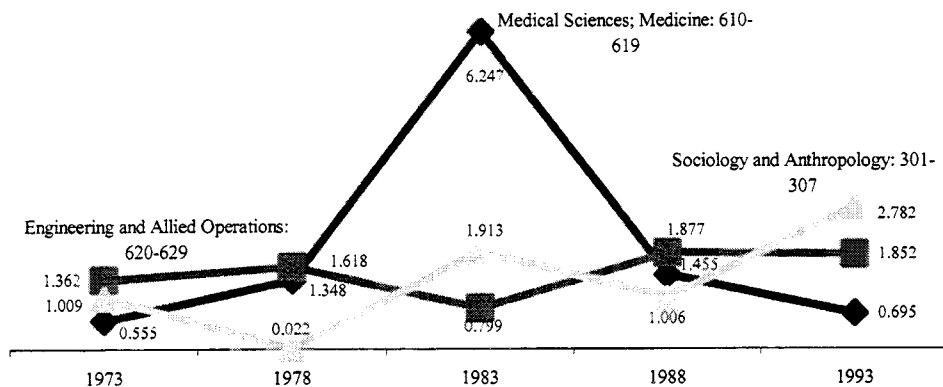
Figure 2: Intermediate Disciplinary Contributors:
Percentages of Contribution, 1973 to 1993



Minor Contributors

Six disciplines contributed to information science to an extent real, though minor. The first three areas, represented in the figure immediately following, were engineering (with a rounded simple mean contributing value of 1.502 percent), medicine (2.06), and sociology and anthropology (1.346). Note that the results for medicine are exaggerated, for 1983 only, due to a flaw in the sampling procedure, the details of which I will provide in my thesis.

Figure 3: Minor Disciplinary Contributors:
Percentages of Contribution, 1973 to 1993:
Part A

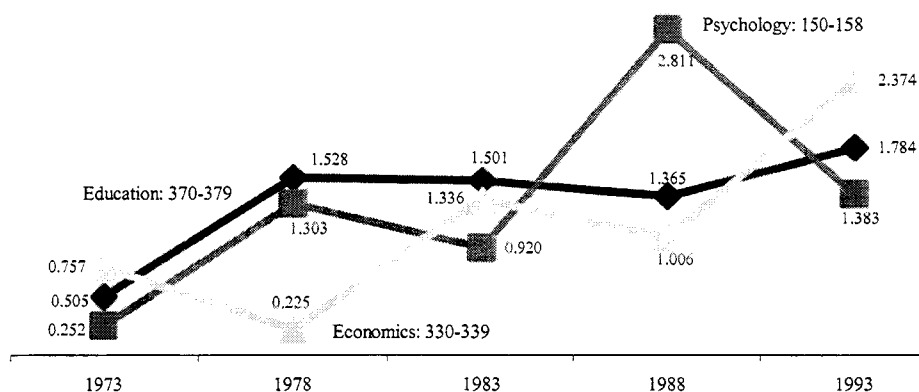


The second three minor contributors, shown in the second figure following, were economics (1.139), education (1.337) and psychology (1.334).

I am presenting the six minor providers in no particular order, as the respective sizes of their respective contributions to information science are *de facto* identical.

DDC 21 essentially collapses sociology and anthropology into each other. Because of this feature, we could, of course, argue, defensibly, that there are in fact seven minor contributors to information science, with anthropology being that seventh.

**Figure 4: Minor Disciplinary Contributors:
Percentages of Contribution, 1973 to 1993:
Part B**



CONCLUSION

My conclusion is clear: information science uses scholarship from fewer disciplines than, collectively, scholars have thus far advocated. Of those fields that do give to IS, only computer science, management and, in particular, library science, have, for the past thirty years, done so to a point that was significant. Among those disciplines that failed, for the period under study, to provide to information science – either substantially, or at all – were communications, electronics, the graphic arts, law, linguistics, logic, mathematics, philosophy and political science; every one of these subject areas appeared in at least one of the published enumerations, of contributing disciplines, that I cited earlier. Overall, my findings testify to the likely superficiality with which those lists were created (an exception is Saracevic). All my discoveries, regarding the interdisciplinarity of information science, will be recorded in my thesis, of which this paper constitutes just a taste.

REFERENCES

- Borko, H. 1968. Information Science: What is It? *American Documentation*. 19:3-5.
 Buckland, Michael. 1999. The Landscape of Information Science: the American Society for Information Science at 62. *Journal of the American Society for Information Science*. 50:970-74.

- Chaudhry, Abdus Sattar. 1988. Information Science Curricula in Graduate Library Schools in Asia. *International Library Review*. 20:185-202.
- Froehlich, Thomas J. 1986. Challenges to Curriculum Development in Information Science. *Education for Information*. 4:265-89.
- Garland, Kathleen. 1991. The Nature of Publications Authored by Library and Information Science Faculty. *Library and Information Science Research: An International Journal*. 13:49-60.
- Garrison, Guy. 1988. Challenges to Information Science Education. *Journal of the American Society for Information Science*. 39:362-66.
- Hawkins, Donald T. 2001. Information Science Abstracts: Tracking the Literature of Information Science. Part 1: Definition and Map. *Journal of the American Society of Information Science*. 52:44-53.
- Herner, Saul. 1984. Brief History of Information Science. *Journal of the American Society for Information Science*. 35:157-63.
- Kärki, Riitta. 1996. Searching for Bridges between Disciplines: An Author Co-Citation Analysis on the Research into Scholarly Communication. *Journal of Information Science*. 22:323-34.
- Pettigrew, Karen E., and Paul T. Nicholls. 1994. Publication Patters of LIS Faculty from 1982-1992. *Library and Information Science Research: An International Journal*. 16:139-56.
- Proceedings of the Conferences on Training Science Information Specialists. October 12-13, 1961[,] April 12-13, 1962. Georgia Institute of Technology. c. 1962.*
- Rayward, W. Boyd. 1996. The History and Historiography of Information Science: Some Reflections. *Information Processing and Management*. 32:3-17.
- Saracevic, Tefko. 1992. Information Science: Origin, Evolution and Relations. In *Conceptions of Library and Information Science: Historical, Empirical and Theoretical Perspectives: Proceedings of the International Conference Held for the Celebration of 20th Anniversary of the Department of Information Studies, University of Tampere, Finland, 26-28 August 1991*, edited by Pertti Vakkari and Blaise Cronin. London: Taylor Graham. 5-27.
- Saracevic, Tefko. 1999. Information Science. *Journal of the American Society for Information Science*. 50:1051-63.
- Saunders, W.L. 1974. The Nature of Information Science. *The Information Scientist*. 8:57-70.
- Social Sciences Citation Index: 1997 Annual: Guide and Lists of Source Publications*. 1998. Philadelphia: Institute for Scientific Information.
- Summers, Ron, and Charles Oppenheim, Jack Meadows, Cliff McKnight and Margaret Kinnell. 1999. Information Science in 2010: A Loughborough University View. *Journal of the American Society for Information Science*. 50:1153-62.
- Tate, Vernon D. 1950. Introducing American Documentation: A Quarterly Review of Ideas, Techniques, Problems and Achievements in Documentation. *American Documentation*. 1:3-7.
- Williams, James G. 1997. Information Science: Definition and Scope. In *Information Science: Still an Emerging Discipline*, edited by Williams, and Toni Carbo. Pittsburgh: Cathedral. 3-11.
- Williams, Martha E. 1988. Defining Information Science and the Role of ASIS. *Bulletin of the American Society for Information Science*. 14:17-18.