Intellectual Structure and Subject Themes in Information Systems Research: A Journal Cocitation Study

Linda S. Marion

School of Information Systems, Technology and Management, Faculty of Commerce and Economics, University of New South Wales, Sydney, New South Wales, Australia and Goodwin College, Drexel University, Philadelphia, PA 19104. Linda.Marion@drexel.edu.

Concepcion S. Wilson

School of Information Systems, Technology and Management, Faculty of Commerce and Economics, University of New South Wales, Sydney, New South Wales, Australia. c.wilson@unsw.edu.au.

Mari Davis

School of Information Systems, Technology and Management, Faculty of Commerce and Economics, University of New South Wales, Sydney, New South Wales, Australia. m.davis@unsw.edu.au.

Information Systems (IS) is a discipline in which research and practice are closely intertwined. IS is also closely related to and overlapping several other disciplines, including Information Science. Thus, IS provides an excellent case for examining the interplay of research and practice in a rapidly changing discipline. We explore the intellectual structure and subject themes in Information Systems (IS) research for 1990 to 1999 through the identification and analysis of the field's core journal literature. A core journal list of 100 titles was created and examined with journal cocitation analysis (JSA). JSA demonstrates that IS is a coherent discipline with research ranging from technology-oriented software and hardware to the application of IS in business and organizations. Journals are grouped into seven subject clusters:

computer science, computer networking, computer engineering, information science, software engineering, human-computer interaction, and management information systems. Information Science journals occupy a bridging position between technically oriented and application-focused clusters. ASIST publications, JASIST, ARIST, and PASIS, figure prominently in the Information Science cluster.

Introduction

Information Systems (IS) research addresses phenomena related to planning, developing, implementing, maintaining, using, and managing information systems (Ackoff, 1967; Weber, 1997). Its roots can be traced to a 1958 paper by Leavitt & Whisler that speculates on the impact of "information technology" on American business and points to contributions from an array of fields ranging from electrical engineering to social psychology. In a remarkably accurate prediction they assert that despite the difficulty in determining "who started what, what preceded what, and which is method and theory...application has not, and probably will not in the future, wait on completion of basic research" (p.42). Publications in the late 1960s focused on the possible impact of management information systems on organizations (cf. Ackoff, 1967). However, no dedicated publication outlets existed until the late 1970s when journals such as MIS Quarterly commenced. The first International Conference on Information Systems (ICIS) took place in 1980. Thus, it is only within the last several decades that there has been a distinct community of researchers identifying themselves as belonging to an IS field.

Some controversy about the subject content of IS has arisen from the rapid growth and changes in a young field that evolved from several related disciplines, namely, Computer Science, Management Science, and Organization Science (Culnan & Swanson, 1986). According to Cecez-Kecmanovic (2002), the question of drawing the boundaries and sub-fields of IS and the relation of IS to other disciplines is complicated by the rapid diffusion of IS throughout organizations fuelled by the conjoint advancement of computer technology. In her account, during the 1970s IS relied on intellectual content from Computer Science, Engineering, and Business Management. A decade later, Decision Theory and Management Science were added to the IS body of knowledge. By the 1990s IS are pervasive in all areas of an organization. New intellectual content from the Social Sciences was added to meet the challenges posed by advances in email, CSCW (computer supported cooperative work), groupware, and other developments. One result of the changes is that core knowledge for IS draws on a large and expanding array of disciplines, particularly in areas where IS has not yet

developed a core literature.

A number of empirical studies have been published with the aim of describing the status of IS and its relation to reference disciplines, maturity, and publication patterns. Many studies were conducted using surveys of academics and sometimes practitioners (Lowry, et al., 2004; Mylonopoulos & Theoharakis, 2001; Walstrom & Hardgrave, 2001; Whitman et al., 1999). A few researchers used a combination of bibliometric and survey methodologies (e.g., Donohue & Fox, 2000), while some were based entirely on bibliometric or informetric analyses, usually citation analysis or content analysis Hamilton & Ives, 1983; Culnan & Swanson, 1981; Culnan, 1986; Cheon et al., 1992).

Journals occupy a key role in the communication processes of IS. Although there is a "wealth of diverse and pluralistic literature in IS" (Hirshheim & Klein, 2003), journals are the primary source of information, comprising the bulk of documents cited (Cunningham & Dillon, 1997). Indeed, journals "reflect the value systems, paradigms, cultural practices, reward systems, political hierarchy, and aspirations" of IS (Lowry et al., 2004). Journal cocitation analysis (JCA) offers a method for generating an empirically based perspective of a knowledge domain. The chief advantage of JCA is that it is based on the actual use of journals by authors whose work has been positively evaluated by journal editors.

Methods

Selection of the Core Journal Set

The goal of this study is to generate a broad picture of the intellectual structure of IS that encompasses an international perspective. We used a centripetal approach; that is, we began with a broad set of journals, eliminating the least significant titles and clustering the remainder into subgroups. For this study we generated a candidate journal list of 122 titles and subsequently used the 100 most frequently cited journals in that list as the basis for JCA in order to explore the intellectual subject structure and sub-fields of IS between 1990 and 1999. IS congealed in the 1970s and 1980s, which means that examining journal usage in the 1990s allows sufficient time for the field to develop a "structure." The 1990s includes years between 1990 and 1999 of citers (papers in journals with references to journals) that have cited the selected journals. A random selection of 10 titles from the 100-journal list confirmed that citers in the late 1990s are more likely to cite journals from the early 1990s.

Several methods were used to generate the candidate journal list, which formed the basis for subsequent analyses. First, we used journal lists assembled by a number of studies which identified the most prominent IS journals based on surveys of expert judgement of quality rankings (e.g., Gillenson & Stutz, 1991; Holsapple et al., 1994; Walstrom et al., 1995; Hardgrave & Walstrom, 1997).[1] Second, we included journals selected and indexed by the Institute for Scientific Information (ISI), which were assigned to the subject category incorporating both narrow and broad aspects of IS.[2] Third, with the help of an IS expert, we included journal titles not selected in the first and second lists in order to achieve a more international balance. Initially 122 journal titles were selected and each in turn was searched as a cited journal (for the study period 1990 to 1999) and paired with each of the remaining 121 journal titles. To arrive at a final list of 100 journals for analysis,[3] the journals were ranked by the total number of cocitations (ranging from zero to 12505). Journals with a minimum of 180 cocitations were selected. The final list of 100 "core" journals appears in Table 1.

Table 1. List of final journals

ACMCS	ACM Computing Surveys
ACMTDS	ACM Transactions on Database Systems
ACMTIS	ACM Transactions on Information Systems
ACMTMCS	ACM Transactions on Modeling and Computer Simulation
ACMTPLS	ACM Transactions on Programming Languages and Systems
ACTAINF	Acta Informatica
AIEXP	AI Expert
AMIT	Accounting, Management & Information Technologies
AMJ	Academy of Management Journal
AMR	Academy of Management Review
ARIST	Annual Review of Information Science and Technology
ASLIBP	Aslib Proceedings

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ARIST	Annual Review of Information Science and Technology
ASLIBP	Aslib Proceedings
ASQ	Administrative Science Quarterly
BIT	Behaviour and Information Technology
BLTJ	Bell Labs Technical Journal
CACM	Communications of the ACM
CHB	Computers in Human Behavior
COMMRES	Communication Research
COMPCOMM	Computer Communications
COMPJ	Computer Journal
COMPNET	Computer Networks
COMPUTER	Computer (IEEE Computer Magazine)
CSCW	Computer Supported Cooperative Work
DATABASE	Database
DATAMATN	Datamation
DBAIS	Data Base for Advances in Information Systems
DECSCIS	Decision Sciences
DKE	Data & Knowledge Engineering
DPD	Distributed and Parallel Databases
DSS	Decision Support Systems
EJIS	European Journal of Information Systems
ESA	Expert Systems with Applications

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EJIS	European Journal of Information Systems
ESA	Expert Systems with Applications
HBR	Harvard Business Review
HCI	Human-Computer Interaction
IBMSJ	IBM Systems Journal
IEEEACMT	IEEE-ACM Transactions on Networking
IEEEIS	IEEE Intelligent Systems
IEEEMM	IEEE Multimedia Magazine
IEEENET	IEEE Network
IEEEPC	IEEE Personal Communications
IEEESOFT	IEEE Software
IEEETKDE	IEEE Transactions on Knowledge and Data Engineering
IEEETPAM	IEEE Transactions on Pattern Analysis and Machine Intelligence
IEEETSE	IEEE Transactions on Software Engineering
IEICETFE	IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences
IEICETIS	IEICE Transactions on Information and Systems
IJCIS	International Journal of Cooperative Information Systems
IJGIS	International Journal of Geographical Information Science
IJHCS	International Journal of Human-Computer Studies
IJIM	International Journal of Information Management
INFCOMP	Information and Computation

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IJHCS	International Journal of Human-Computer Studies
IJIM	International Journal of Information Management
INFCOMP	Information and Computation
INFMGT	Information & Management
INFOR	INFOR
INFSCIS	Information Sciences
INFSYS	Information Systems
INTFLIN	Interfaces (Linthicum)
INTNETR	Internet Research
IPL	Information Processing Letters
IPM	Information Processing & Management
ISJ/JISA	Information Systems Journal / Journal of Information Systems (Accounting)
ISM	Information Systems Management
ISR	Information Systems Research
IST	Information and Software Technology
ITL	Information Technology and Libraries
JACM	Journal of the ACM
JAMIA	Journal of the American Medical Informatics Association
JASIS	Journal of the American Society for Information Science
JCICS	Journal of Chemical Information and Computer Science
JCIS	Journal of Computer Information Systems
JCMC	Journal of Computer-Mediated Communication

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JCIS	Journal of Computer Information Systems
JCMC	Journal of Computer-Mediated Communication
JDM	Journal of Database Management
JEUC	Journal of End User Computing
JHSN	Journal of High Speed Networks
JIS	Journal of Information Science
JIT	Journal of Information Technology
JMIS	Journal of Management Information Systems
JOCEC	Journal of Organizational Computing and Electronic Commerce
JRPIT	Journal of Research and Practice in Information Technology
JSIS	Journal of Strategic Information Systems
JSM	Journal of Systems Management
JSMRP	Journal of Software Maintenance: Research and Practice
JSS	Journal of Systems and Software
JVCIR	Journal of Visual Communication and Image Representation
KBS	Knowledge-Based Systems
MGTSCI	Management Science
MISQ	MIS Quarterly
MTA	Multimedia Tools and Applications
MULTMSYS	Multimedia Systems
OBHDP	Organizational Behavior and Human Decision Processes
OCDROMR	Online & CDROM Review

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OBHDP	Organizational Behavior and Human Decision Processes
OCDROMR	Online & CDROM Review
OMEGA	Omega
OPNSRES	Operations Research
ORGSCI	Organization Science
PASIS	Proceedings of the American Society for Information Science Annual Meeting
PROGRAM	Program - Electronic Library and Information Systems
QUALPRO	Quality Progress
RAIROITA	RAIRO Informatique Theorique et Applications – Theoretical Informatics and Applications
SIMULN	Simulation
SMR	Sloan Management Review
WIRTSINF	Wirtschaftsinformatik

Cocitation Analysis of the 100 Journals[4]

Raw cocitation counts of all journals in the core journal list (totalling 91,393 citations) were retrieved from the Social SciSearch and SciSearch databases using the Dialog Information System for the period 1990 to 1999 and assembled in a matrix.[5] **The cocitation counts in the off-diagonal cells of the matrix represent counts of all source articles (indexed by ISI) that cite at least one article from a given pair of journals. We used the means of row data in the diagonals of the cocitation frequency matrix for the multivariate procedures. We converted the raw co-occurrence matrix to a proximities matrix with SPSS PROXIMITIES (Pearson's product-moment correlation coefficient). The proximities matrix is the input for the multivariate procedures of cluster analysis (SPSS CLUSTER) and**

multidimensional scaling (SPSS ALSCAL).

Results

We begin by presenting and discussing the results of the profile similarities analysis.

Cluster Analysis

The proximities matrix is used for the cluster analysis (SPSS CLUSTER). We chose the hierarchical agglomerative approach with complete linkage, which is frequently employed in cocitation studies McCain (1990). We followed the convention of drawing loops around the data points on the MDS map (Figure 1 discussed in the next section) corresponding to the clusters on the dendrogram. Cluster labels are determined by consultation with subject experts and an examination of the cited literature. Below are descriptions of each cluster.

Management Information Systems (MIS)

A classic definition of MIS is "the effective design, delivery, and use of information systems in organizations" Keen, (1980). The Association for Computing Machinery defines MIS as "the management of information systems and technologies and the use of these systems and technologies." The subjects covered by this cluster comprise several important subjects in MIS, including Management Science, Operations Research, Decision Science and Organizational Behaviour. Although technology is a critical component of MIS the focus here is on the application, implementation, and maintenance of IS. In this data set the technology-oriented journals are grouped separately.

Human-Computer Interaction (HCI)

Zhang and Dillon (2003) point out that the study of the human response to technology has been labelled variously as computer-supported collaborative work, management information systems, or human factors, labels that reflect some confusion over disciplinary boundaries. Some authors even consider HCI a part of MIS. Several of these labels are reflected in the titles of the eight journals in the core list that comprise a small but coherent HCI cluster, for example, CSCW (Computer Supported Cooperative Work), HCI (Human-Computer Interaction), and BIT (Behaviour and Information Technology). Research in HCI is concerned with the "ways humans interact with information, technologies, and tasks, especially in business, managerial, organizational, and cultural contexts" Zhang & Li (2002).

Computer Science (CSci)

Computer Science, a parent discipline of IS and reference discipline for IS research, is composed of many specialties, including both hardware and software design. According to Denning (2004), "the fundamental principles are in design and in the mechanics of computation, communication, coordination, recollection, and automation ... [and the] four core practices are programming, engineering of systems, modelling, and innovation." The left side of the MDS map is largely occupied by journals devoted to computer hardware and software. This broad techno-centric subject area is apportioned among several smaller clusters with Computer Science as the largest with 17 titles.

The Association of Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE) publish a number of journals in this group. ACM describes itself an international scientific and educational organization "dedicated to advancing the arts, sciences, and applications of information technology." ACM consists of 34 SIGS (Special Interest Groups), many of which publish individual journals. According to their web page IEEE publishes more than 30% of the world's literature in electrical, electronics and computer engineering and science. IEEE publishes the top eight journals in electrical and electronics engineering and the top seven journals in telecommunications (Journal Citation Reports, 2002).

The Computer Science cluster includes several subject themes that do not rise to the level of a separate cluster. For example, several journals focus on multimedia research, including *IEEE Multimedia Magazine (IEEEMM)*, *Multimedia Systems (MULYISYS)*, and *Multimedia Tools and Applications (MTA)*. Articles about ATM networks and image representations and retrieval are important topics for journals in this cluster. Databases are yet another important subject for journals in this cluster as evidenced by the inclusion of *ACM Transactions on Database Systems (ACMTDS)* and *Distributed and Parallel Databases (DPD)*.

Computer Engineering (CE)

Software engineering is a relatively new but distinct discipline whose definition and boundaries are still evolving (Marion & McCain, 2001). The name was coined in 1968 at the first International Conference on Software Engineering to describe a systematic and scientific method to develop software (Glass, 1992; Nerur, 1994). It has been defined as "programming-in-the-large activities" (Coulter et al., 1998) and less succinctly as "the practical application of scientific knowledge in the design and construction of computer programs and the associated documentation required to develop, operate, and maintain them" (Boehm, 1976, p. 1226). Software engineering covers not only the technical aspects of building software systems, but also management issues, such as directing programming teams, scheduling, and budgeting. This cluster is located in the top left quadrant of the map between Computer Science and Human-Computer Interaction, indicating these journals affinity with its parent discipline (Computer Science) and a related field (Human-Computer Interaction).

Computer Networking (Net)

Computer Networking is a specialized area within IS. This small cluster of six journals, including *IEEE Network* (IEEENet) and Computer Networks (CompNet), is located between its parent discipline (Computer Science) and its specialized cousin (Computer Engineering). Computer Networking, as the name suggests, focuses on building the architecture and managing the system of a group of two or more linked computer systems. Types of computer networks such as local-areas networks (LANs), wide-area networks

(WANs), and ATMs were prominent subjects for journals in this cluster.

Information Science (Info Sci)

Information Science occupies an interesting position on the left (technology-oriented) side the MDS map but is stretched from the top to the bottom of the map indicating a breadth of scope that ranges from the design of systems and software to information retrieval and automatic abstracting. Three of the titles, Journal of the American Society for Information Science (JASIS), Annual Review of Information Science and Technology (ARIST), and Proceedings of the American Society for Information Science Annual Meeting (PASIS) are published by one professional society, the American Society for Information Science & Technology (ASIST).[6] ASIST views its role as one of bridging designers and users of information systems, a view that is supported by the results of this study.

Two of the journals in this cluster, Journal of the Medical Informatics Association (JAMIA) and Internet Research: Electronic Networking Applications and Policy (InterR) are situated in the middle of the Software Engineering cluster reflecting the affinity of these journals for programming-in-the-large activities. The most common topic in JAMIA was clinical IS in hospitals. Other subjects covered by Information Science journals were natural language processing, automatic abstracting, information retrieval, and digital library systems.

Multidimensional Scaling

The proximities matrix computed above provides the input data for the SPSS ALSCAL routine. The two-dimensional model (R square = .92, Kruskal's stress = .13) appears as Figure 1. Interpretation of the axes is based on: (1) analysis of author-assigned article descriptors and indexer-assigned identifiers (both available from the ISI database files); (2) descriptors from the INSPEC database covering IS, computer science and information science; and (3) consultation with subject experts.

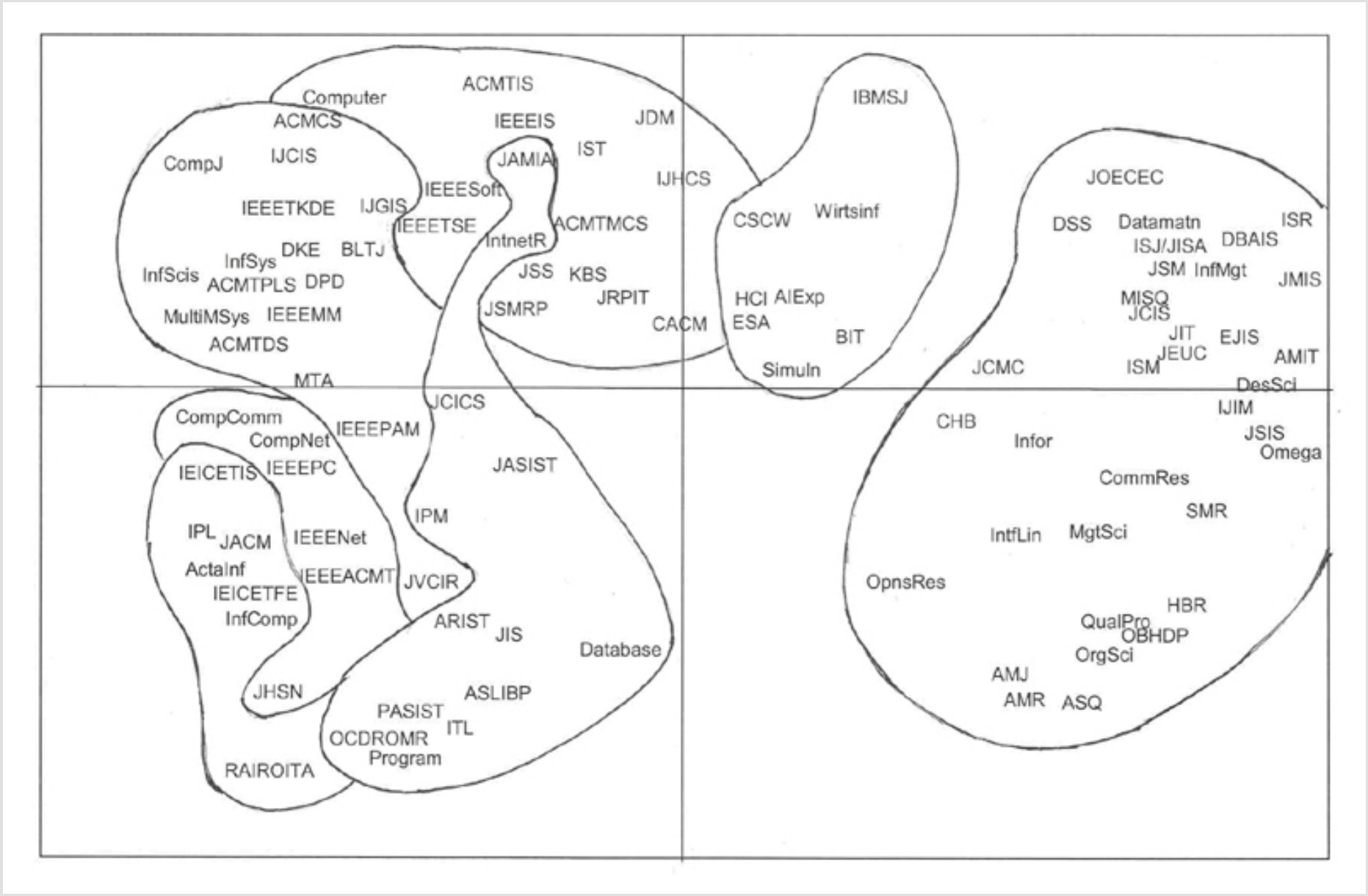

Figure 1: Interpretation of the axes

This MDS solution displays two rather clear foci for journals in this data set. The horizontal or X-axis represents a clear differentiation between an emphasis on technology on the left side of the map to a focus on organizational and business contexts for IS on the right. On the left half of the map are found, therefore, journals related to computer hardware and software while the right half of the map are journals that focus on the application of IS in organizations. The HCI and Software Engineering clusters are found appropriately between these two poles, which reflect these subjects combining the organizational application of the technology, albeit emphasizing one pole or the other. This corresponds to Gorgone et al.'s (1999) definition of IS as "technology-enabled business development."

The Y-axis represents a continuum from System Design on the top of the map to Formal Methods on the bottom. The top of the Y-axis focuses on subjects such as human factors and e-commerce. Software Engineering and HCI occupy space above the horizontal axis, indicating their applied orientation. Parnas (1997) asserted that software engineers "build products," which is consistent with the results here. The bottom of the Y-axis includes topics with a mathematical focus such as neural networks, complexity theory, and natural language processing. For example, the most frequently occurring article descriptors for RAIROITA, the journal farthest down on the Y-axis, include cellular automata, coalgebra, and formal languages.

Journals appearing close to the centre of the map, in this case Communications of the ACM (CACM) and Simulation (Simuln) are regarded as those with ties to many others, while those with fewer ties are located on the periphery. CACM, an influential but generalist journal, publishes articles covering a broad range of computing topics. Simulation concentrates on systems modelling and simulation; although clustered with the HCI journals, its articles cover both the human factors as well as the technical components of IS.

General Discussion

Information Systems as a Coherent Discipline

The results of this study provide a picture of the content and structure of IS research during the decade of the 1990s. One criterion for a separate discipline is the existence of a disciplinary literature. These results demonstrate that IS is an identifiable discipline composed of a number of interrelated fields. The research themes found in IS journals offer empirical support for the description of IS

as combining technical innovation and business application. IS research can indeed be succinctly summarized as the "application of computer technology to human enterprises." The results of the MDS map graphically portray a continuum extending from technically oriented topics to their application in businesses and organizations.

An interesting question is how to characterize the interrelated fields. Some fields, such as Information Science, Computer Science, or Management Information Science, have long defined themselves as disciplines while the consensus is that Software Engineering is a new and rapidly developing discipline. Therefore, the definition of IS as a multidiscipline seems quite accurate.

The ubiquitous, continuously developing, applied nature of IS makes any description possibly outdated by the time it is published; however, it is important to establish empirically based benchmarks to complement expert opinion. Identifying recent research themes helps to delineate the boundaries of a discipline and point the way for further research. For example, new subject content is likely to emerge in areas related to e-commerce. Databases may possibly cohere to form a separate cluster. Other subjects may fade from view and lose their identity as a separate cluster.

IS research has a decidedly applied focus. Journals near the centre of the graph are those with the most ties to others in the data set. Journals that emphasize specialized topics in theoretical and/or mathematical research were placed on the periphery of the MDS map and the PFNet. A number of the journals in the core list are interested in publishing theoretical papers but the journals are cited for their applied work.

In order to ameliorate the "US-centric" focus in many journal rankings we included significant titles from other global regions. A number of non-US journals were sufficiently cited for inclusion in the core list but journals from outside the US tended to be placed on the periphery of the graphs. The bulk of IS research remains in and authors are more likely to cite US journals.

A core journal list and the analysis of subject content are useful in analysing educational curricula for the discipline. The IS community has revised the curriculum in response to rapid change in the field. Development of a core journal list not only provides resource support for academic programs but can also help define the boundaries and content of a discipline. Successful new sub-fields develop their own journals as a dedicated channel for communicating research. The IS discipline would benefit from future research that tracks changes in the discipline over time, particularly as new outlets for scholarly communication arise.

A cluster of journals ultimately represents a domain of discourse. Above all, it represents textual transactions on the subject of interest. Future research might also turn from research themes to determining the central problems addressed by IS research. IS is a vibrant young discipline that will undoubtedly continue to provide opportunities to study the structural changes in an evolving and differentiating field that combines research and practice.

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NOTES

[1] Journals in later studies on IS journal rankings from http://www.isworld.org/csaunders/rankings.htm, Whitman & Hendrickson (1999), Mylonopoulos & Theoharakis (2001) were, for the most part, included in our initial selection. Journals (e.g., *CAIS* and those relating to e-commerce and knowledge management) that started in the late 1990s or early 2000s would not have been cited sufficiently during our study period of 1990 to 1999 to be selected. Back

[2]The ISI assigns journals that it indexes to one or more subject categories, and then publishes the *Journal Citation Reports (JCR)* which present aggregated journal citation data in several different formats, including Impact Factors (a measure of journal prominence based on usage through citations) and journal title rankings derived from total citation counts. For our study, the 1999 *JCR* subject category, 'Computer Science, Information Systems' was used. This journal subject category overlaps to some degree with that of 'Information Science' and 'Management'. Sources from one or both the first and second journal lists have frequently been used in studying the literature of scholarly fields and in the identification and evaluation of core journal sets (see for example, McCain, 1991a, 1991b, 1998; Marion & McCain, 2001). Back

[3]The selection of 100 journals is a limitation of the SPSS package used for some of our analyses. Back

[4]Cocitation analysis began with the conceptual work of Henry Small (1973). Using the document as the unit of analysis, Small and his colleagues conducted a number of studies that began with studies in the natural sciences and spread to include the social sciences. A significant development in citation studies was the technical innovation of studying the cited author (representing the entire oeuvre or a subset of it) as the unit of analysis, pioneered by White (1981) and White & Griffith (1981a, 1981b). Culnan (1986) used author cocitation analysis in her oft-cited paper on the intellectual development of MIS. Journal cocitation mapping is an extension of

techniques used in author cocitation analysis and has proven useful describing the intellectual structure of many fields including an analysis of the software engineering literature (Marion & McCain, 2001). (See McCain (1990, 1991a) for a detailed exposition of the procedures used in author and journal cocitation analysis.) Back

[5]The search procedure to produce the journal cocitation counts is not trivial. For example, it was necessary to examine the cited reference results for a number of 'non-journal' like titles (e.g., *Operations Research*) and to eliminate (from the search sets) those referring to, for example, books with the same titles. The corresponding author is happy to provide detailed information on the searching technique used for nine such journals which were 'treated' in this way. Back

[6]It should be noted that ARIST and PASIS are annuals; the former includes substantive review articles, while the latter contains refereed papers presented at the ASIST annual meetings. These two 'journals' were included in the 1999 *JCR* for the journal subject category, 'Computer Science, Information Systems' and were well above the selected threshold for inclusion in the 100 core journals. Back

References

Ackoff, R. (1967). Management misinformation systems (design). In R. Ackoff, *Key Papers in the Design and Evaluation of Information Systems*. White Plains: Knowledge Industry Publications, Inc. 1978.

Boehm, B. (1976). Software engineering. *IEEE Transactions on Computers 25*(12), 1226-1241.

Cecez-Kecmanovic, D. (2002). The discipline of Information Systems—issues and challenges, in: R. Ramsower and J. Windsor (Eds.) In *Proceedings of the Eighth Americas Conference on Information Systems. AMCIS 2002, Mini track Philosophical Foundations of Information Systems*. Dallas, Texas, USA, 9-11 August, 2002, (pp. 1696-1703).

Cheon, M. Choong, C. Grover, V. (1992). Research in MIS – Points of work and reference: A replication and extension of the Culnan and Swanson study. *DATABASE for Advances in Information Systems 23*(2), 21-29.

Coulter, N., Monarch, I., Konda, S. (1998). Software engineering as seen through its research literature: A study in co-word analysis. *Journal of the American Society for Information Science 49*(13), 1206-1223.

Culnan, M. (1986). The intellectual structure of management information systems, 1972-1982: A co-citation analysis. *Management Science 32*(2), 156-172.

Culnan, M., Swanson, E.B. (1986). Research in management information systems 1980-1984: Points of work and reference. *MIS Quarterly 10*(3), 289-301.

Cunningham, S., Dillon, S. (1997). Authorship patterns in information systems. *Scientometrics 39*(1), 19-27.

Denning, P. (2004). The profession of IT. *Communications of the ACM 47*(7), 15-20.

Donohue, J., Fox, J. (2000). A multi-method evaluation of journals in the decision and management sciences by US academics. *Omega 28*, 17-36.

Gillenson, M., Stutz J., (1991). Academic issues in MIS: Journals and books. *MIS Quarterly 15*(4), 447-452.

Glass, R.L. (1992). A comparative analysis of the topic areas of Computer Science, Software

Engineering and Information Systems. *Journal of Systems and Software 19*, 277-289.

Gorgone, J., Topi, H., Feinstein, D., Valacich, J., Longenecker, H., Davis, G. (2002). Undergraduate Information Systems Curriculum update—IS 2002. In *Proceedings of the Eighth Americas Conference on Information Systems. AMCIS 2002, Mini track Philosophical Foundations of Information Systems*. Dallas, Texas, USA, 9-11 August, 2002, (pp. 808-815).

Hamilton, S., Ives, B. (1983). The journal communication system for MIS Research. *Data Base, Winter*, 3-14.

Hardgrave, B., Walstrom, K. (1997). Forums for MIS scholars. *Communications of the ACM 40*(11), 119-124.

Hirschheim R., Klein, H. (2003). Crisis in the IS field: A critical reflection on the state of the discipline. *Journal of the Association for Information Systems 4*(5), 237-293.

Holsapple, C., Johnson, L., Manakyan, H., Tanner, J. (1994). Business computing research journals: A normalized citation analysis. *Journal of Management Information Systems 11*(1), 131-140.

Journal Citation Reports. (2002). Philadelphia, PA: Institute for Scientific Information.

Keen, P. (1980). MIS research: Reference disciplines and a cumulative tradition. In *Proceedings of the First International Conference on Information Systems*, Philadelphia, PA, USA, December 8-10, 1980, (pp. 9-18).

Leavitt, H., Whisler, T. (1958). Management in the 1980's. *Harvard Business Review, 36*(6), 41-48.

Lowry, P., Romans, D., Curtis, D.A. (2004). Global journal prestige and supporting disciplines: A scientometric study of Information Systems journals. *Journal of the Association for Information Systems 5*(2), 29-77.

Marion, L.S., McCain, K.W. (2001). Contrasting views of software engineering journals: Author cocitation choices and indexer vocabulary assignments. *Journal of the American Society for Information Science 52*(4), 297-308.

McCain, K.W. (1990). Mapping authors in intellectual space: A technical overview. *Journal of the American Society for Information Science 41*(6), 433-443.

McCain, K.W. (1991a). Mapping economics through the journal literature: An experiment in journal cocitation analysis. *Journal of the American Society for Information Science 42*(4), 290-296.

McCain, K.W. (1991b). Core journal networks and cocitation maps: New bibliometric tools for serial research and management. *Library Quarterly 61*(3), 311-336.

McCain, K.W. (1998). Neural networks research in context: A longitudinal journal cocitation analysis of an emerging interdisciplinary field. *Scientometrics, 41*(3), 389-410.

Mylonopoulos, N., Theoharakis, V. (2001). *On-Site: Global perceptions of IS journals*.

Communications of the ACM 44(9), 29-33.

Nerur, S. (1994). *Paradigmatic issues in software development: The case of object-orientation*. Unpublished doctoral dissertation, The University of Texas at Arlington.

Parnas, D.L. (1997). Software engineering: An unconsummated marriage. *Communications of the ACM 40*(9), 128.

Small, H.G. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of*

the American Society for Information Science 24(4), 265-269.

Walstrom, K., Hardgrave, B. (2001). Forums for Information Systems scholars: III. *Information & Management 39*(2), 117-124.

Walstrom, K., Hardgrave, B., Wilson, R. (2001). Forums for Management Information Systems scholars. *Communications of the ACM 38*(3), 93-107.

Weber, R. (1997). *Ontological Foundations of Information Systems*. Coopers and Lybrand Accounting Research Methodology Monograph No. 4. Melbourne, Australia: Coopers and Lybrand Australia.

White, H.D. (1981). Cocited author retrieval online: An experiment with the social indicators literature. *Journal of the American Society for Information Science 32*, 16-21.

White, H.D. (1990). Perspectives on author cocitation analysis: Introduction. *Journal of the American Society for Information Science 41*(6), 430-431.

White, H.D., Griffith, B.C. (1981a). A cocitation map of authors in judgment and decision research. In B.F. Anderson, D.H. Deane, K.R. Hammond, G.H. McClelland, J.C. Shanteau (Eds.), *Concepts in Judgment and Decision Research: Definitions, Sources, Interrelations, Comments*. New York: Praeger, (261-271).

White, H.D., Griffith, B.C. (1981b). Author cocitation: A literature measure of intellectual structure. *Journal of the American Society for Information Science 32*, 163-171.

Whitman, M., Hendrickson, A., Townsend, A. (1999). Research commentary. Academic rewards for teaching, research, and service: Data and discourse. *Information Systems Research 10*(2), 99-109.

Zhang, P., Dillon, A. (2003). HCI and MIS: Shared concerns. *International Journal of Human-Computer Studies 59*(4), 398-402.

Zhang, P., Li, N. (2004). An assessment of human-computer interaction research in management information systems: Topics and methods. *Computers in Human Behavior 20*, 125-147.