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IS Research Perspectives

Using Social Network Analysis to Analyze Relationships Among IS Journals*

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Abstract

Social network analysis (SNA) offers a richer and more objective way of examining individual journal influence and relationships among journals than studies based on individual perceptions, since it avoids personal biases. This article demonstrates how SNA can be used to study the nature of the IS discipline, by presenting results from an exploratory SNA of 125 previously ranked journals from IS and allied disciplines. While many of the most prominent journals in the network are still associated with IS's foundational disciplines, we identify several IS journals that play important roles in disseminating information throughout different subcomponents of the network. We also identify related groups of journals based not only on patterns of information flow, but also on similarity in citation patterns. This enables us to identify the core set of journals that is important for "pure IS" research, as well as other subsets of journals that are important for specialty areas of interest. Overall, results indicate that the IS discipline is still somewhat fragmented and is still a net receiver, as opposed to a net provider, of information from allied disciplines. Like other forms of analysis, SNA is not entirely free from biases. However, these biases can be systematically researched in order to develop an improved, consistent tool with which to examine the IS field via citations among member journals. Thus, while many challenges remain in applying SNA techniques to the study of IS journals, the opportunity to track trends in the discipline over time, with a larger basket of journals, suggests a number of valuable future applications of SNA for understanding the IS publication system.

Keywords: *Social network analysis, journal citation networks, IS journal rankings, IS research, reference disciplines*

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1. Introduction

IS journal ranking studies are important because they make researchers aware of the most respected publication outlets in their field or subdiscipline, helping them decide which sources to read to remain current, as well as which journals to target when publishing. Ranking studies also help track the progress of the field, identifying core journals and research topics, and tracking changes in these topics and perceptions. Many of the ranking studies have asked IS scholars for their perceptions of a journal's importance to the field. Such studies can be biased by where a scholar has published, the editorial boards on which he or she serves or has served, and the respondent's knowledge of individual IS journals. Furthermore, it is cognitively difficult and time consuming for a scholar to rank a long list of journals. While subjective studies play an important role in helping us understand researchers' perceptions of the field, we need a method for ranking journals that eliminates these biases and can also easily handle a large basket of journals. Ideally, such a method would also give us a richer understanding of the relationships among journals, the structure of the knowledge system in which we publish, metrics that can be used to support promotion and tenure decisions, and evidence of the import of IS to other disciplines' scholarly advance.

Social network analysis (SNA) is one of the newer approaches to obtaining citation-based measures of journal prestige and influence. SNA, a well-established methodology, allows examination of relationships among journals, and may potentially encompass all journals currently tracked by a citation service, such as SSCI or Google Scholar, as well as journals whose citations can be hand tabulated. The role that a journal plays within its designated network can be identified and explored, as can cliques or subgroups of journals representing particular streams of research. SNA avoids the biases of perceptual ranking approaches, can handle a large number of journals, and, as we will show, provides a richer understanding of the IS academic publishing network.

This article presents results from an in-depth, exploratory SNA of 125 journals from IS and closely related disciplines, based on citation data from 2003-2005. We have two objectives. First, we demonstrate SNA's potential for revealing the structure of the IS discipline, as seen through journal citations. We apply several SNA techniques that provide richer analyses than those obtained from more traditional citation-based approaches. We suggest that SNA using citation data (e.g., ISI's Journal Citation Reports [JCR]) can be used in the future to spot trends and changes in the population of journals publishing IS research. A single SNA study of citation patterns over a given time period (assuming it contains a large enough journal basket) should also eliminate the need for multiple studies addressing different IS subdisciplines (e.g., Cheng et al., 1995; Cheng et al., 1996; Goh et al., 1997; Holsapple et al., 1994; Holsapple et al., 1995; Holsapple and Luo, 2003). However, some limitations to this method (just as with all others) exist, and we elaborate on these as well.

Second, we present and evaluate our findings from the SNA. By using a larger basket of journals from both IS and allied disciplines than has been included in prior studies, we obtain a clearer picture of how information flows from journal to journal and from (sub)discipline to (sub)discipline in this larger network. While prior SNA studies (e.g., Biehl et al., 2006) focus on the role of (and relationships among) the top journals in each business discipline, we identify key roles played by additional journals, including those in niche areas of IS research. Finally, we can shed light on the overall structure of the discipline, which not only lays the foundation for future SNA studies to investigate changing trends in the field, but also aids IS researchers in identifying alternative outlets for both keeping up with the discipline and publishing their own work.

Our article is structured as follows. We begin with a discussion of previous journal ranking studies. We then present a brief overview of SNA, focusing on its potential as an alternative approach to evaluating the influence of individual IS journals, as well as the structure of the discipline as a whole. Next, we describe the journal selection, data collection, and data analysis processes used for an in-depth SNA of 125 journals, based on citation data from the years 2003-2005. We present evidence of the overall IS journal network structure and the role played by individual journals in the network, including an analysis of subgroups of journals within the network, based on both information flows and similarity of citation patterns. In discussing our results, we relate them to the extant IS literature. In some cases, our findings validate these prior studies; in others, they present a potentially opposing view, provide a finer level of analysis, or introduce new questions for future investigation. Just as importantly we demonstrate that these findings can be obtained from a single (though multi-part) analysis, potentially simplifying the work of future researchers who are interested in a better understanding our field and its publishing outlets. We close with a discussion of the study's limitations and future research directions.

2. Previous IS Journal Studies

Scholars have conducted numerous IS journal ranking studies (sometimes called *journal quality* studies). These vary in nature and may cover a very broad (even cross-disciplinary) basket of journals, or focus on examining journals associated with a specific research niche. Several reviews and composite analyses of past studies have already been published (e.g., Katerattanakul and Han, 2003; Lewis et al., 2007; Lowry et al., 2004; Rainer and Miller, 2005; Saunders, 2005), so we focus here on only those aspects of prior research that have implications for studying IS journal influence and relationships via SNA.

2.1. Common Research Questions and Objectives

Prior IS journal studies have focused on answering a number of different research questions, which we summarize in Table 1. The methods used to answer these questions have varied over time, but can be classified as either "subjective" in nature (involving measurement of individual perceptions) or "objective" (involving citation analyses). Studies may cover a wide range of journals (crossing multiple disciplines) or focus on specific niche areas of research within IS. We now briefly summarize these various methods.

2.2. Methods of Studying Journal Influence

Journal studies categorized as "subjective" rely on the opinions and perceptions of IS researchers or practitioners in order to determine a journal's status based on such diverse criteria as value, quality, prestige, relevance, innovativeness, or impact on research and practice (see Holsapple and Luo, 2003; Lowry et al., 2004; Peffers and Tang, 2003). Over time, as the IS field has matured, subjective studies have tended to de-emphasize multidisciplinary journals that publish few IS articles in favor of IS-specific journals (Peffers and Tang, 2003; Shim et al., 1987; Walstrom and Hardgrave, 2001). Many researchers have criticized subjective studies. Pre-selected lists can lead to ordering, memory, familiarity, anchoring, or selection biases; whereas, asking respondents to create their own lists can lead to inadvertent omissions. Despite these limitations, many researchers argue that subjective studies have value since the opinions of IS academics (whether subjectively or objectively valid) do have a large impact on the field (Lowry et al., 2004). Of course, objective analysis, such as the one we report in this article, can also inform perceptions.

Objective studies, which SNA can be considered, seek to determine journal influence through some variation of citation analysis, arguing that this indicates *actual* use of a journal's articles (Katerattanakul et al., 2003a).[1] However, citation-based studies are not without critics. Just as perception-based studies may tap different dimensions of a journal's influence, so too may the measures selected in citation analyses vary in addressing the issue of journal quality. Objectivity can be impacted by methods used to standardize the data (e.g., for journal age, number of articles published in a year, and editorial policies restricting the length of reference lists). Citation-based studies may also suffer from unavoidable bias due to negative citations, heavy citing of hallmark articles, perfunctory or redundant citations, and data integrity issues (Chubin and Moitra, 1975; Holsapple, 2008; Katerattanakul et al., 2003a; Katerattanakul et al., 2003b; Moravcsik and Murugesan, 1975). Selection of the journal basket also plays a critical role. Restricting the basket to a given set of base journals (usually those that have been ranked previously) can lead to "tunnel

[1] Recent studies have also looked at article download data as an objective alternative to citation analysis for judging journal influence (see Bollen et al., 2005).

vision," causing many new (or niche) journals to be ignored. The journal basket also impacts whether one can accurately measure what disciplines or journals *influence* a particular journal, or what that journal's *impact* is on other disciplines (or other journals within IS) (Katerattanakul et al., 2003b). The result is that rankings striving for objectivity can actually have hidden biases themselves (Peffers and Tang, 2003). Thus, it is important to make clear that when only counting citations exchanged among journals in a given basket, we can only make claims as to the influence of a journal *within that particular basket or network* and the assumptions made during the analysis. We can reduce basket bias by selecting larger baskets, but since some citation services (e.g., SSCI/SCI JCR) do not cover all journals, creating a larger basket often means hand-tabulating citations. Clearly stating what assumptions have been made and reporting sensitivity analyses for some critical assumptions surfaces assumption biases.

Table 1: Journal Study Research Questions

Research Question	Addressable with SNA?
Which journals make up the universe of publishing outlets available to IS researchers? (Peffers and Tang, 2003)	
Which journals make up the core of the discipline? (Cooper et al., 1993)	✓
What are the premier journals spanning the IS field? (Holsapple, 2008)	✓
Which journals are the most highly respected by researchers (both "senior" and "representative") in the IS field? (Peffers and Tang, 2003; Shim et al., 1987)	
Where do tenured faculty from the leading research institutions actually publish? (Holsapple, 2008; Holsapple, 2009)	
Which journals are perceived as being the most important for publishing IS research that is likely to advance the field? (Peffers and Tang, 2003; Shim et al., 1987)	
Which journals are the leading sources for monitoring developments in both general IS research, and in particular subject areas within IS? (Holsapple and Luo, 2003; Walstrom and Hardgrave, 2001)	✓
How should journal publications be ranked in order to facilitate hiring, merit review, promotion, and tenure decisions? (Holsapple and Luo, 2003; Walstrom and Hardgrave, 2001)	✓
How should journals be ranked in order to improve department ranking and grant disbursement decisions?	✓
On which journals should libraries focus their limited acquisition funds? (Rainer and Miller, 2005; Walstrom and Hardgrave, 2001)	✓
How should the various journals used by IS researchers be categorized? (Peffers and Tang, 2003; Rainer and Miller, 2005; Walstrom and Hardgrave, 2001)	✓
What do changes in rankings over time tell us about both changing perceptions of journal value and the maturity of the IS field? (Rainer and Miller, 2005; Walstrom and Hardgrave, 2001)	✓
To what extent are IS researchers still drawing from reference disciplines in their work? (Hamilton and Ives, 1982)	✓

Niche journal studies, both subjective and objective in nature, have become increasingly popular (e.g., Bharati and Tarasewich, 2002; Cheng et al., 1996; Goh and Holsapple, 1996; Holsapple et al., 1995; Holsapple and Luo, 2003; Mylonopoulos and Theoharakis, 2001; Omar and Goodwin, 1991). Subcommunities of IS research may exist based on methodology, geography, reference disciplines, and research topics, and research outlets for some of these groups may of necessity cross disciplinary lines. The narrow focus of high-quality specialty journals, however, often prevents them from receiving a suitably high ranking in broad-based journal studies (Chua et al., 2003; Peffers and Tang, 2003). Unfortunately, niche journals are often not represented in the JCR, making it much more difficult and time-consuming to tabulate a complete list of citations. This has forced most citation-based studies to rely primarily on the inclusion of journals for which bibliographic information is available electronically.

Regardless of the approach taken to measure journal quality, composite studies (e.g., Katerattanakul and Han 2003; Lewis et al., 2007; Lowry et al., 2004; Rainer and Miller, 2005; Saunders, 2005) have found *overall* rankings to be consistent over time and across different studies. However, a list of ranked journals is only a starting point to understanding the structure and relationships in the IS publication system. SNA offers the prospect of a richer analysis.

3. SNA as an Alternative Approach to Evaluating Journal Influence

SNA techniques are designed to “discover patterns of interaction between social actors in social networks” (Xu and Chen, 2005, p.105). They accomplish this by revealing the overall network structure, as well as that of subgroups within the network, then examining the patterns of interaction among these various groups. SNA also allows the researcher to identify central, prestigious, or otherwise influential network and subgroup members.

SNA has a long history of use for many different types of co-citation analysis involving individual authors, articles, journals, or entire academic disciplines. Most journal co-citation studies focus on either measuring individual journal influence or examining the structure of a journal network (rarely both). Each of these tasks can be accomplished in a number of different ways. Common SNA procedures include the following (see de Nooy et al., 2005; Hanneman, 2001; Xu and Chen, 2005):

- *information flow analysis* (to determine the direction and strength of information flows through the network, such as information being passed from one journal to others in the network)
- *calculation of centrality and prestige measures* (to determine the most influential journals within a network)
- *hierarchical clustering* (to uncover cliques whose members are fully or almost fully connected, such as groups of journals that highly cite each other)
- *block modeling* (to discover key links between different subgroups in the network, such as journals that serve as information brokers across disciplines or subdisciplines)
- *calculation of structural equivalence measures* (to identify network members with similar characteristics, such as journals with highly correlated “citing” or “cited by” patterns, thus indicating journals that can be considered as alternative publishing outlets to each other).

3.1. Contributions of the SNA Approach

SNA offers several benefits in investigating relationships among IS journals, over the more traditional survey-based and citation-based approaches. First, SNA has the potential to provide richer insights than traditional citation-based studies. This is because SNA is not only capable of producing a number of network-specific measures, but it can also produce visual representations detailing the exact relationship of journals both within the network as a whole and within individual subgroups of the network.

Second, SNA can provide a simple and more objective way of classifying journals than previous studies. The flow of citations between journals, and the similarity of these citation patterns, can be used to determine exactly which journals make up distinct groups based on subject matter and perhaps even methodological approach (Leydesdorff, 2004b). Thus, the use of SNA can eliminate the need for multiple studies in order to cover both general IS and specific niche group rankings. Combined with information on journal rankings within each distinct group, this will also aid researchers in targeting the appropriate outlets for publication (Biehl et al., 2006; Nerur et al., 2005).

Third, the biases (i.e., assumptions made) in an SNA study can be explicitly stated and subjected to sensitivity analysis. Such biases may include choice of the journal basket, methods used to standardize the data, and choices made when performing the various network analyses (e.g., thresholds used, symmetrizing method). Biases in a perceptual approach are hidden, and their influence on the outcome is not subject to further analysis.

Finally, SNA has the potential to inform the debate over whether to include (or exclude) journals from other disciplines in future ranking studies (see Holsapple and Luo, 2003 for opposing sides of this debate; Peffers and Tang, 2003). Since SNA can recognize cliques and subgroups both within the overall network and within individual components of it, we should be able to account for the true relationship among these different components. This will help resolve the problem of determining exactly which journals are truly "pure IS" journals[2] and which are a mix, or non-IS altogether, and what the boundaries of the IS discipline really are (see Peffers and Tang, 2003; Walstrom and Hardgrave, 2001). By analyzing the IS network through SNA techniques on a regular basis, it will also be possible to easily track trends as the discipline grows and evolves (Biehl et al., 2006) and to detect potential changes resulting from the shift from paper to electronic distribution.

3.2. Previous IS Journal Studies Using SNA

The potential for creating large data matrices of journal relationships for input into SNA programs, using data contained in journal citation reports, has long been recognized. However, until recently, algorithm and computer memory limitations prevented examination of the entire dataset(s) using a top-down approach (Leydesdorff, 2004b). Previous SNA studies, summarized in Table 2, provide a foundation for investigating relationships among IS journals.

Table 2: Prior Relevant SNA Studies

Study	Data Source	Study Focus
(Leydesdorff, 2004a)	5,518 journals indexed in SCI	Identified 62 journal clusters representing major fields of study (see http://users.fmg.uva.nl/lleydesdorff/jcr01/).
(Leydesdorff, 2004b)	1,399 journals indexed in SSCI	Identified 18 clusters representing major disciplines; clusters were delineated based on both theoretical topics and methodological differences within a single field.
(Biehl et al., 2006)	31 top ranked business journals (per *Financial Times*)	Examined information flows among ten academic business disciplines, based on their top journals. Also looked at network density, cliques, and structural equivalence. Goal was to identify inter-disciplinary journals, determine alternative publishing outlets, and examine the changing relationship of the business disciplines over time,
(Nerur et al., 2005)	27 previously ranked IS journals	Ranked IS journals as "knowledge sources" or "knowledge storers," and offered preliminary findings of subgroups within the overall network.

[2] Lowry et al. (2004) use the term "mainstream IS" to represent what we refer to here as "pure IS" journals.

Our study goes beyond that of Biehl et al. (2006) in that, while it includes many journals from related reference disciplines, it also includes a much larger basket of IS journals. Thus, whereas Biehl et al. focused on examining relationships among the various business disciplines (with IS being represented solely by *MIS Quarterly* and *Information Systems Research*), we examine relationships involving a much larger basket of IS journals and these other disciplines, and also examine relationships *among* these IS journals. We also focus more heavily on the *roles* played by individual IS journals.

We extend Nerur et al. (2005) by looking at a larger basket of IS journals and examining their relationships with journals from closely allied disciplines (which Nerur et al. excluded from their study). We also strive to present a richer and more in-depth analysis of these journals that goes beyond Nerur et al.'s focus on journals that act as "knowledge sources" and "knowledge storers," and their preliminary analysis of journal subgroups.

Just as importantly we aim to point out areas in which SNA can have challenges and pitfalls in the examination of the IS journal network. Where possible, we illuminate different ways in which these problems can be handled. In other cases, we point out areas for future research to make SNA of IS journals more robust.

4. Methodology

A summary of our data collection and analysis process is shown in Table 10 in the Appendix. We now discuss several of these steps in more detail.

4.1. Journal Selection

An important factor in conducting SNA is selection of the network's boundaries. Ideally, one would include all journals used by IS researchers when specifying the IS journal network.3 One could reduce the subjectivity of such a list by incorporating the entire universe of interconnected journals. Unfortunately, however, many of the IS journals ranked in previous studies (as well as many other unranked journals used by IS researchers), are not currently indexed by SCI or SSCI. The time and resources required to manually collect data on all these other journals would be prohibitive; thus, for this initial study, we used a subset of all possible IS and IS-related journals, based on an examination of 31 past journal ranking studies. We started with the list of 125 previously ranked journals on the AIS MIS Journal Rankings web page (Saunders, 2005). This site presents a composite ranking based on eight broad-based subjective and objective studies conducted between 1995 and 2005 (the actual number of unique journals on this list equals 120). We then included an additional 39 IEEE and ACM Transactions and ACM SIG publications as individual entities within the network, giving us an initial network size of 159 journals. This allowed us to get a feel for the actual citation patterns, contributions, and relationships of each individual IEEE and ACM publication, as suggested by Lowry et al. (2004). All ACM *Transactions* and SIG publications that were recorded in the 2003-2005 JCR were included in the study.[4] IEEE *Transactions* appearing in JCR were filtered for their level of IS-specificity, based on a review of each journal's official description and elimination of journals that were clearly targeted to other areas of research such as electric power and electronics. It is important to note that since time and resource constraints prevented an exhaustive study of all IS and IS-related journals, the results presented in this paper apply only to the specific network of journals delineated here.

[3] Authors of both objective and subjective studies have debated the relevance of including journals from other disciplines within IS journal ranking studies (see Chua et al. (2003) for a detailed discussion of IS specificity). However, the fact that a journal is not a strong publication outlet for IS-related articles does not necessarily mean that it does not have a strong influence on the field. As Biehl et al. (2006) have shown, SNA is, in fact, a useful tool for determining the exact nature of relationships between journals from other disciplines and those from the "IS discipline proper." Thus our approach was to include as many journals as possible that had been deemed important in previous studies (regardless of their discipline affiliation), in our initial network analysis. Our argument is that SNA should help us to delineate and visualize which journals have a strong influence on various subcommunities or cliques of IS research, even though they may not be viewed as typical publication outlets by all researchers.

[4] We captured all citations made by network journals in the years 2003-2005 to other network journals, with no limitations on the age of the cited article.

Only 91 of our initial 159 journals were indexed as "Cited Journals" by either SSCI or SCI in 2003-2005. By focusing instead on the "Citing Journals" reports, we were able to capture data on an additional 41 journals cited by the base 91, for a total of 132 journals (counting the three parts of *IEEE Transactions on Systems, Man, and Cybernetics* as a single journal[5]). We manually tabulated citations made by 34 of these 41 journals, using either electronic or print copies of their 2003-2005 articles.[6] We lacked access to three of the remaining journals, and another (*PC World*) received an insufficient number of citations; thus, we remove these four journals from our final list. While a large number of additional journals from our initial "wish list" (that were not found in the JCR reports) received at least one citation as a result of our manual tabulation, we decided in the interest of time and effort involved not to go forward with further manual tabulations on these additional journals at this time. Overall, these journals are very lightly cited, and the main impact of their absence is related to incomplete niche group analysis. Finally, since one of our goals was, in fact, to examine cliques of journals based on mutual citations, we also eliminated three journals that were cited in 2003-2005 but had ceased publication prior to 2003. Thus, our final journal basket included 125 journals. A complete list of these journals and their associated abbreviations appears in Table 11 of the Appendix.

4.2. Journal Classification

Journal categories used in previous IS journal ranking studies (e.g., Peffers and Tang, 2003; Rainer and Miller, 2005; Walstrom and Hardgrave, 2001) do not coincide well with each other. However, one benefit of SNA is that it can help with such journal classifications. We tried to follow the classification schemes of previous authors as much as possible with this thought in mind. Thus, when authors of the three studies listed previously did not differ in their classifications of a particular journal, we followed their precedent. However, if there was any discrepancy in how a particular journal was classified across these three studies, we placed the associated journal into a "Multiple / Unclassified" category (see Table 3), with the view that the results of the SNA would clarify a journal's category/discipline.

4.3. Data Standardization

After eliminating self-citations from the dataset, we normalized the data in order to account for differences due to citing journals having different reference list criteria, longer articles, more frequent publishing cycles, or more articles per issue. This normalization was accomplished from within UCINET by dividing the number of citations made by Journal A to Journal B by the total number of citations made by Journal A, excluding self citations (see Biehl et al., 2006; Holsapple and Luo, 2003). This procedure (also known as row normalization) results in the cells in each row of the data matrix summing to 1.00, with the individual cells for a given row representing the corresponding proportion of overall citations made by that journal to each other journal in the network.

4.4. Information Flow

We used UCINET 6 to create graphic visualizations of the information flow for the overall network. Spring embedding positions the journals on the graph based on their pairwise geodesic distances (Biehl et al., 2006; Borgatti et al., 2002). Arrows in the diagrams begin at the cited journal and point toward the citing journal, to represent the fact that information in a citation network flows from the source to the receiver. Arrow width is a function of the strength of each relationship (i.e., the higher the proportion of citations a receiving journals gives to its source journal, the thicker the line). Node colors in the diagrams indicate the classifications described earlier. Node size is a function of each journal's normalized degree ranking (discussed later in the paper). Given the size of the network and

[5] Unfortunately, characteristics of the JCR data prevent us from accurately separating out the influence of the three individual *Systems, Man, and Cybernetics* journals. More specifically, it is not always clear which of the three "SMC" journals JCR is referring to based on the abbreviations used in its citation lists. We suspect that this may be the reason why Rainer and Miller (2005) listed *IEEE Transactions on Systems, Man, and Cybernetics* as a single journal in their journal ranking study as well.

[6] For most journals, we were able to view either articles or reference lists online, from sources such as the AIS website, the ACM Portal, online databases such as EBSCOHost, or a journal's website. More information on the exact sources used appears in Table 11 of the Appendix.

number of ties present (leading to a diagram that is very difficult to read and interpret), we do not display all ties, but rather use thresholds representing different strengths of ties.

Table 3: Journal Classifications and Color Coding

Category	Color	Source
Computer Science (CS)	Blue ●	Rainer and Miller, 2005 – "CS" + Peffers and Tang, 2003 – "Allied" + ACM SIG and Transactions + IEEE Transactions
Information Systems (IS)	Red ●	Walstrom and Hardgrave, 2001 – "Pure IS" Peffers and Tang, 2003 – "IS" Rainer and Miller, 2005 – "MIS"
Management / Professional (Mgmt)	Green ●	Rainer and Miller, 2005 –"Mgmt" Peffers and Tang, 2003 – "Prof" + Peffers and Tang, 2003 – "Allied" + Walstrom and Hardgrave, 2001 – "Non-IS"
Operations Research (OR)	Yellow ●	Rainer and Miller, 2005 –"OR" + Peffers and Tang, 2003 – "Allied" + Walstrom and Hardgrave, 2001 – "Non-IS"
Multiple / Unclassified (Mult)	Gray ●	Walstrom and Hardgrave, 2001 – "Hybrid IS" Walstrom and Hardgrave, 2001 – "Partial IS" + all other conflicting classifications across authors

4.5. Journal Prominence within the Network: Centrality and Prestige

Actor prominence in a social network can be based on either centrality (where "central actors are visible because of their extensive involvement in relations") or prestige (where "prestigious actors are visible because of the extensive relations directed at them") (Knoke and Burt, 1983, p.195). In practice, prestige is simply a measure of centrality that looks at *asymmetric* as opposed to *symmetric* relationships. We argue that in a journal citation network, it is more appropriate to view prominence in terms of prestige rather than centrality. Thus, where possible, we present results based on asymmetric or directed data.

The prominence of individual actors within a network can be based on their having more direct ties with other actors (degree centrality/prestige), shorter path lengths to other actors (closeness centrality/prestige), or structurally advantageous positions between other actors (betweenness centrality/prestige) (Hanneman, 2001). Degree is a *localized* measure that provides information on an actor's immediate neighborhood; whereas, closeness and betweenness are *global* measures, providing information on an actor's role within the network as a whole. A number of prominence measures (see Table 4) have been proposed, with each measure being best suited for examining particular types of networks.

We believe that Freeman degree, the Bonacich power index, and information centrality are the most appropriate centrality or prestige measures for use in a journal citation network. Freeman degree prestige is commonly used for determining journal rankings (though not generally referred to by this name). The Bonacich power index provides more insight regarding degree prestige, since it is capable of discriminating between citations received from more popular journals vs. less popular journals, based on their respective degree scores.

Table 4. Common Measures of Network Prominence

Measure	Description	Key References
Freeman degree	A localized measure of the number of direct relationships that a node has with other members of the network. The strength of these relationships can also be taken into account.	(Freeman, 1979)
Bonacich power index	A localized degree measure that calculates a node's power within a network based on the power of other nodes to which it is connected.	(Bonacich, 1987; Borgatti et al., 2002)
Geodesic closeness	A global measure that takes the reciprocal of the sum of the geodesic distances to all other nodes in the network. It ranks nodes based on identifying the nodes that play a role in causing information to flow through the network more quickly and efficiently.	(Borgatti et al., 2002; Freeman, 1979)
Reciprocal closeness	A global measure that takes the reciprocal of the geodesic distances between nodes *before* summing them up. Purpose is similar to that of geodesic closeness.	(Borgatti et al., 2002)
Integration (reversed) closeness	A global measure that calculates the reverse of the geodesic distances between nodes, rather than their reciprocal. This results in a linear rather than nonlinear transformation of the data.	(Valente and Foreman, 1998)
Freeman betweenness	A measure of information control based on the number of times that a node occurs along the geodesic paths between other nodes.	(Freeman, 1977)
Flow betweenness	Takes into account the number of times a node falls along *all* paths between other nodes in the network, rather than just geodesic paths.	(Freeman et al., 1991)
Information centrality	Takes into account all paths between pairs of nodes, as well as the actual strength of ties between nodes.	(Porta et al., 2006; Stephenson and Zelen, 1989)

In a journal network, information often does not flow along the shortest path, thus, making closeness prestige and betweenness centrality measures inappropriate to use (see Borgatti, 2005). In addition, other techniques (e.g., block and cutpoint analysis) are available for determining which journals bridge the gap between two otherwise unconnected journals or groups of journals. Thus, we use information centrality to demonstrate the potential drop in network efficiency brought about by removing a particular journal (see Porta et al., 2006).

4.6. Journal Roles within the Network

We investigated several roles played by individual journals within the network, including roles as information sources or sinks, cutpoints, and bridges. We now briefly discuss these roles.

Information Sources and Sinks

Journals that receive citations from more journals than they cite themselves are known as *information sources*. Conversely, journals that make citations to many different journals, but are not cited by as many in return, are known as *information sinks*. A number of different methods have been used in the past to determine information sources and sinks in a journal network (see Biehl et al. (2006) for examples from the IS literature; Nerur et al. (2005)). We used a variation of Leydesdorff's (1991) approach, examining information provided vs. information received on a cell-by-cell basis for each pair of journals in the network. We dichotomized the data using a threshold of 0.0081 (the average proportion of citations made by any journal in the network to any other journal) to determine whether a substantial flow of information had taken place between each pair of journals. By tallying up the number of cells for which Journal A was a net source of information (coded as +1), a net sink (coded as -1), and neutral (coded as 0), we obtained scores representing each journal's status as a source or sink within the network as a whole.

Cutpoints and Bridges

Cutpoint analysis is based on the idea that there are certain journals in the network (referred to as cutpoints) that, if removed, would cause the structure to be divided into unconnected blocks. These journals can be viewed as brokers holding various subgroups in the network together. Bridge journals, on the other hand, represent connections between two journals (members of different groups), which hold these otherwise unconnected groups together (Hanneman, 2001). Cutpoint and bridge analyses are based on *reciprocal* ties between journals; whereas, information flow diagrams do not require that citations be reciprocated. Thus, we both dichotomized and symmetrized the data. We used UCINET's block analysis and Lambda set analysis features to identify both cutpoint and bridge journals in the network. A threshold of 0.04 was selected for dichotomizing the data (indicating one standard deviation above the average proportion of citations from one journal to another within the network, which is 0.0081).

4.7. Cliques

Cliques represent groups of journals that are more closely tied to each other than to other journals in the network. Clique analysis is a bottom-up approach to examining the sub-structures contained within a network. It works by first looking at the smallest units of a network, then building from these to construct the whole (Hanneman, 2001). To identify cliques, we dichotomized and symmetrized the data using a threshold of 0.04 to represent reasonably strong reciprocated ties between journals.[7]

4.8. Structural Equivalence

Structural equivalence analyses measure the strength of *similarity* in journal citation patterns. Two journals are considered structurally equivalent if they have identical ties not only with each other but with all other journals in the network. Higher levels of structural equivalence indicate higher levels of similarity. Using the concept of structural equivalence, we can group journals into different disciplines (or specialties within a discipline) and find journals that interact among these disciplines or specialties. Measures of structural equivalence can also be used to track changes in citation patterns over time and to determine alternative publication outlets (Biehl et al., 2006).

SNA software programs can perform structural equivalence analyses based on measures of either similarity or dissimilarity. In the former case, a matrix of correlation coefficients is generated; this new matrix can then be used as input for hierarchical clustering, principal components, or other multi-dimensional scaling procedures. Correlations can be based on *citations received* (telling us how a particular journal is perceived across the network), on *citations made* by that journal (telling us how that journal perceives others in the network), or on a *combination* of the two. However, correlations may be unreliable when a journal makes few citations. For our analysis, we first double-normalized the data (via a UCINET procedure that iteratively normalizes both the rows and columns of a data matrix simultaneously), then created a correlation matrix. We then used this matrix to generate a dendrogram in Pajek, based on Euclidean distance and Ward's method for hierarchical clustering.

5. Data Analysis

5.1. Graphical Display of Information Flow

The relationships in the network at a tie strength of 0.05 (i.e., the proportion of Journal A's citations

[7] While Biehl et al. (2006) used a 0.10 threshold to represent strong reciprocated relationships in their SNA of 31 top business journals, we found this threshold to be too high for a network of our size. Since cutpoint and bridge analysis represent a top-down approach to examining network structure, while clique analysis represents a bottom-up approach to the same, we again used a 0.04 threshold, which is one standard deviation above the average proportion of citations in the network.

that were made to Journal B is >=0.05) are shown in Figure 1.[8] As one might expect, several management journals are sources of information for IS journals at this threshold, including *Academy of Management Journal* (1), *Academy of Management Review* (4), *Administrative Science Quarterly* (3), *Organization Science* (11), *Harvard Business Review* (*HBR*) (9), and *Sloan Management Review* (3). *Management Science*, representing the operations research (OR) discipline, exchanges information reciprocally with journals in both the OR and management disciplines, and is a source of information for 18 IS journals and three computer science journals. *Communications of the ACM* (*CACM*) has a reciprocated tie with only one journal in the network (*MIS Quarterly*), although it draws substantial information from both *HBR* (management) and *IEEE Transactions on Computers* (computer science). *CACM,* in turn, provides information to a vast majority of the IS and computer science journals in the network (a notable exception being those related to communications and networking), but provides no information to journals from the OR or management disciplines at this threshold.

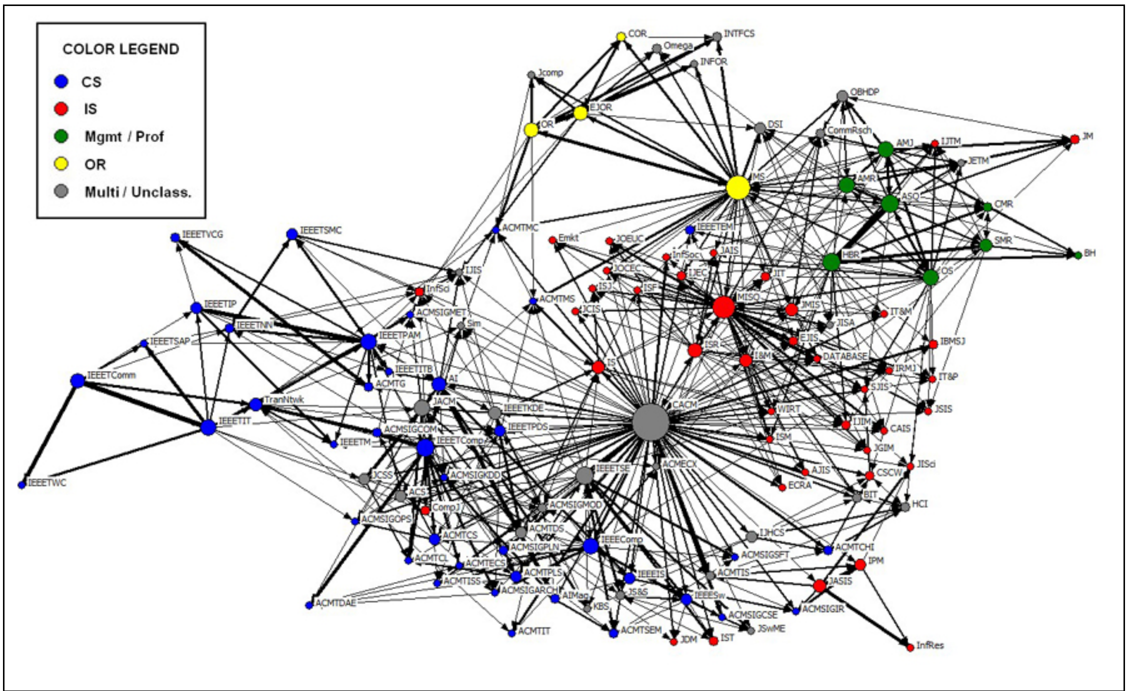

Figure 1. Information Flow Diagram (Spring Embedding, 0.04 Threshold)

Several niche and multidisciplinary journals play important roles in enabling the flow of information between diverse groups of journals at this threshold (see Table 12 in the Appendix for details), including *ACM Transactions on Information Systems*, *Decision Sciences*, *Human-Computer Interaction*, *IEEE Transactions on Software Engineering*, and *International Journal of Human-Computer Studies*. One journal, *Information Systems*, is notable in that it draws information from several computer science journals, and disseminates information to more traditional IS journals. As one might expect, the most important IS journals drawing information from the reference disciplines of OR and management, and sharing it broadly among a large number of IS journals in the network, are *Information & Management* (*I&M*), *Information Systems Research* (*ISR*), *Journal of Management Information Systems* (*JMIS*), and *MIS Quarterly*. *European Journal of IS* (*EJIS*) plays a similar role, but is limited in passing information to only *Information Systems Journal* at this threshold. Although

[8] Although many of our later analyses are based on a threshold of .04 (representing one standard deviation above the average proportion of citations from one journal to another within the network), we use .05 here, as it is the same threshold used by Biehl et al. (2006) to represent information flow in their SNA of 31 top business journals. This allows for direct comparison between their study and ours, which uses a much larger journal basket and more recent citation data.

Journal of the AIS and *IEEE Transactions on Engineering Management* each draw information from many reference disciplines, they have not (yet) become major disseminators of information to other network journals.

Increasing the information flow threshold from 0.05 to 0.10 (Figure 2) clarifies the network relationships by limiting the display to much stronger journal-to-journal ties. Here, we can see well-formed clusters representing the major disciplines (management, operations research, computer science, and IS), as well as specialty areas (e.g., information science, networking, software engineering, and database/data mining/AI).[9] It is important to note that while at this threshold, a "pure IS" cluster is clearly visible, it still receives information from several other disciplines and groups.

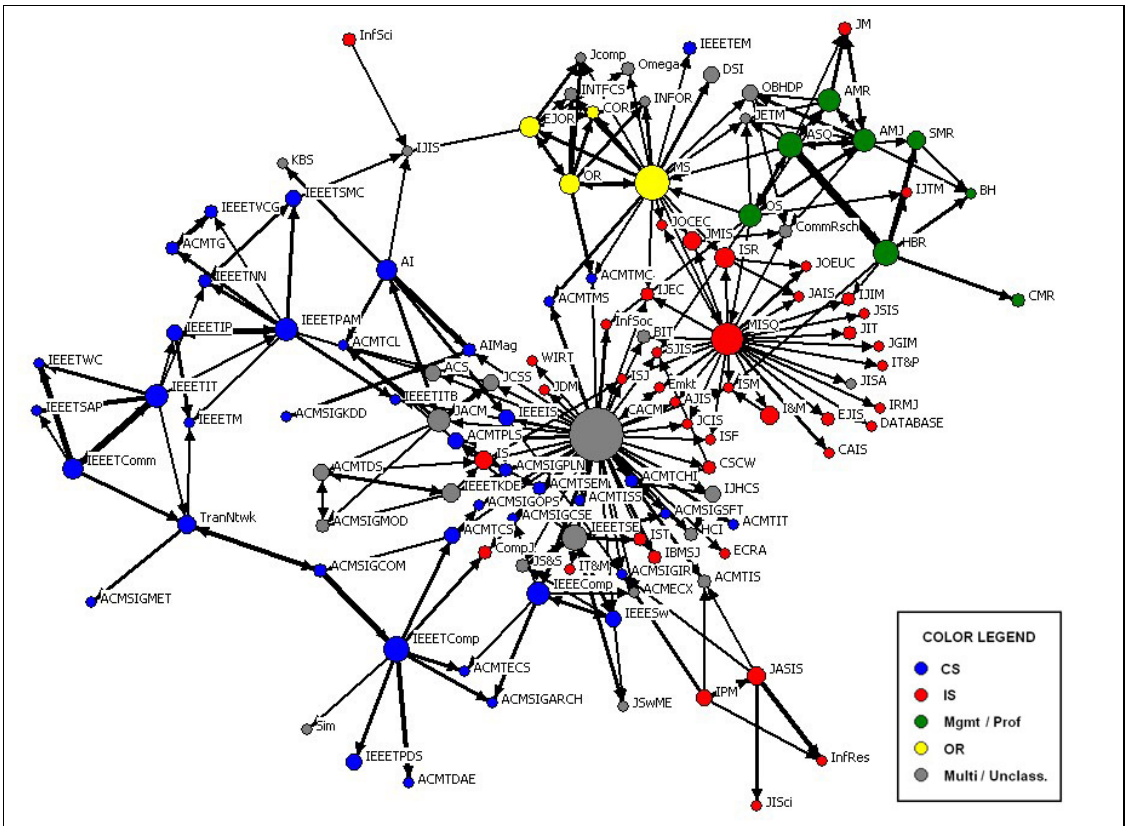

Figure 2. Information Flow Diagram (Spring Embedding, 0.10 Threshold)

We can use this diagram to identify those journals that share substantial information with more than one cluster. For example, *CACM* continues to be an important source of information not only for computer science journals, but also for nine pure IS journals from the cluster surrounding *MIS Quarterly*. *MIS Quarterly*, on the other hand, continues to receive a substantial amount of information from top journals in other clusters, including *Management Science* (*MS*) and *Organization Science* (*OS*). However, the lack of two-way arrows once again indicates that information is not flowing to the same extent from *MIS Quarterly* back to these journals in other disciplines.

We can also use this diagram to identify journals that do not play central roles in a cluster or discipline, but "connect" two disciplines by integrating information from both. It is important to note that these connections are solely the result of the journals residing in the space between clusters drawing information *from* more than one cluster, rather than providing information *to* more than one cluster.

[9] Please note that some prior studies (e.g., Grover et al., 2006) have elevated some of these "specialty areas" (such as artificial intelligence, e-commerce, and library/information science) to the status of a full discipline.

Organizational Behavior and Human Decision Processes (*OBHDP*) and *Journal of Engineering and Technology Management* (*JETM*), for example, both draw relatively large percentages of their information from the top journals in both the OR and Management disciplines. *ISR*, *JMIS*, and *Journal of Organizational Computing and Electronic Commerce* (*JOCEC*) all draw relatively large percentages of their information from both *MS* and *MIS Quarterly*. What this would seem to imply is that individuals who are interested in both OR and management, and individuals who are interested in both OR and IS, might find these subsets of journals particularly useful, both to read and to target as potential publication outlets.

Increasing the information flow threshold from 0.10 to 0.15 (Figure 3) further clarifies the network relationships. The pure IS cluster is almost completely separated from the remainder of the network, though *ISR* continues to draw information from the OR group. *MIS Quarterly* is the most influential journal in this cluster, with several other pure IS journals continuing to cite it heavily. The OR cluster is likewise separated from the rest of the network, but three journals (*MS*, *OR*, and *EJOR*) all continue to contribute knowledge across their cluster. The same is true for the management cluster, where several journals exchange information heavily. However, the specialty clusters of journals allied with computer science for the most part have only one key actor apiece.

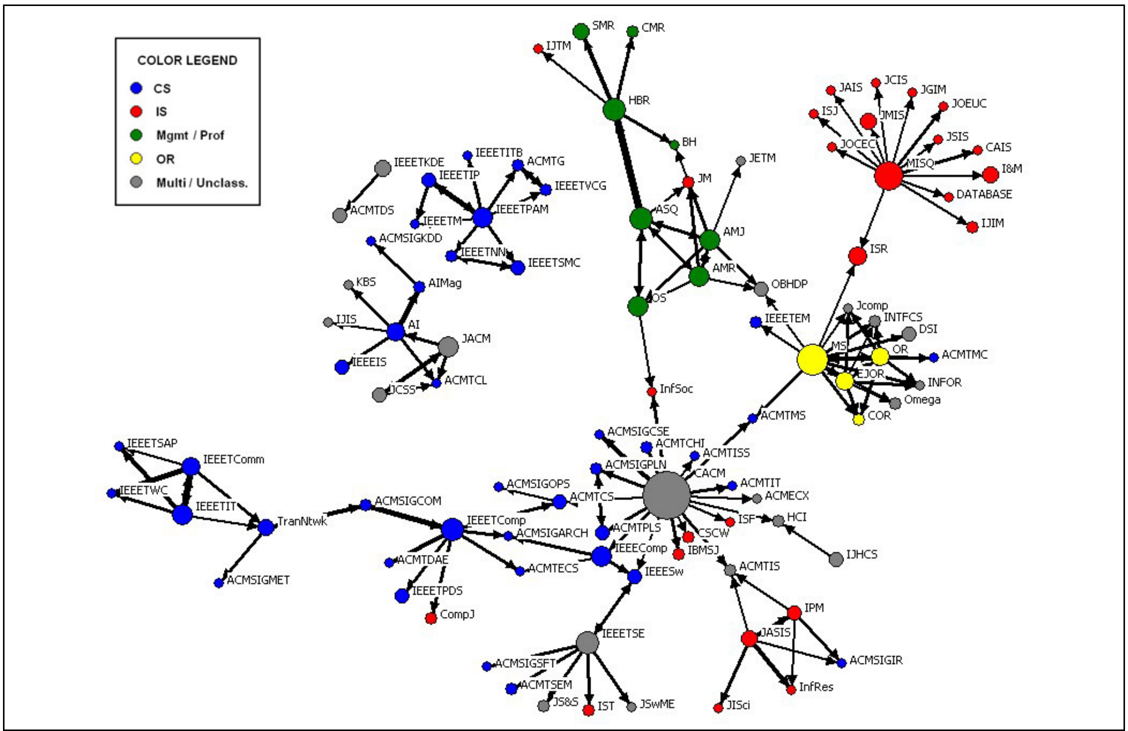

Figure 3. Information Flow Diagram (Spring Embedding, 0.15 Threshold)

At this threshold, information sharing across disciplinary boundaries has been greatly curtailed. It is particularly important to notice that all arrows connecting clusters at this threshold are one-way arrows pointing *away* from the cluster in question to individual journals that reside in the space between clusters. Thus, there is no longer a two-way exchange of information taking place between clusters. Once again, it is clear that *ISR* plays an important role in integrating information from both the OR and IS disciplines (as would be expected, given its origins), and *OBHDP* plays an important role in integrating information from the OR and management disciplines. Similar journals can be identified that potentially integrate information from more than one (sub)discipline in other parts of the graph (e.g., *ACMTIS*, *InfSoc*).

Viewing these three diagrams in unison, our findings support the conclusions of Wade et al. (2006;

based on 1990-2001 data from 31 top business journals) and others that IS has not yet achieved status as a full-fledged reference discipline, in that it is not being extensively cited by other disciplines. Please note that these diagrams do not entirely contradict Grover et al. (2006; based on 1990-2003 data from 16 top business journals) or Katerattanakul et al. (2005; based on 1997-2000 data from six top IS journals), as they do not indicate that *no information at all* is flowing from IS to other disciplines (an information flow diagram using a lower threshold than .05 indicates that this is not the case; in addition, several journals from the "pure IS" group are important sources of information to niche journals in related areas, such as *Communication Research*). However, it is apparent that IS still has a long way to go before it becomes a substantial source of information for its three foundational reference disciplines.

Finally, we can infer from these diagrams that the IS discipline is much less consolidated in its internal information sharing patterns than many of the other disciplines. While several clusters have numerous thick, two-way arrows indicating that the journals in those clusters are citing each other heavily, we do not see this same phenomenon occurring amongst the "red" journals, particularly those in the "pure IS" cluster. This implies that the IS journals are continuing to draw their information from diverse sources across the network, rather than simply citing each other heavily. The exceptions, of course, are *MIS Quarterly* and *ISR*, which both draw substantial proportions of their information from other disciplines and pass it on to other IS journals through the high levels of citations received. We make these statements with a caveat: it is possible that these findings result in part from the fact that we include fewer OR and management journals in our network than IS journals. In an established discipline, one would expect to see high proportions of citations among the top journals in that discipline (Grover et al., 2006). IS is a comparatively youthful field, and many of its top journals (based on prior objective and subjective ranking studies) are, likewise, relatively young. Thus, an alternate interpretation of these three diagrams could be that they simply show (1) the youth of journals in the IS discipline and (2) the results of using a more selective basket of journals from other fields. A more disconcerting interpretation for IS scholars is that the field has failed to develop a foundational IS theory or theories and, thus, borrows extensively from other fields.

5.2. Journal Prominence within the Network: Centrality and Prestige

The top 25 journals based on Freeman degree, Bonacich power (using an attenuation factor of .697, as suggested by the procedure described in Borgatti et al., 2002), and information centrality are shown in Table 5. Full results can be found in Table 13 of the Appendix; Table 14 in the Appendix shows a truncated view including only journals classified previously as IS according to the criteria in Table 3.

The rankings obtained using these three methods are highly correlated (correlation coefficients: Freeman degree vs. Bonacich power = .75, Freeman degree vs. information centrality = .95, Bonacich power vs. information centrality = .82; all are significant at $p<.05$). This makes sense, as in a network with short distances to the top journals (measured via degree), the removal of highly cited journals will obviously cause a serious disruption to information flow.

To determine whether the rankings were dependent on the basket of journals used (i.e., only including journals from previous IS ranking studies, and, hence, limiting the number of journals from other disciplines and subdisciplines), we conducted a sensitivity analysis by randomly selecting 25, 50, and 75 journals from the complete list. For each of these journal baskets, we created a new (reduced) network, and calculated valued Freeman degree rankings for each subnetwork. Finally, we ran a Spearman rank correlation test to determine what, if any, effect the journal basket had on overall rankings. Results of this test are shown in Table 6, indicating that relative rankings are preserved even when a substantial number of journals are randomly removed from the network.

One might also expect the age of a journal (i.e., how many years it has been publishing) to have an impact on the citations it receives and, thus, its ranking. A sigmoid curve might well describe the effect of age. Initially, a journal gains few citations because it is not known, and there is also a lag before citations appear in other journals. Citations increase once scholars become aware of a journal, and then its citation rate levels out. This is the familiar cumulative adoption curve (Rogers, 1983) of many products. Thus, to assess the relationship between rank and age, we fitted both a linear, as a base level, and sigmoid function. Both functions are significant ($p < 0.05$) and explain about the same level of variance (linear function R-squared = .21; sigmoid function R-squared = .22). Clearly, age is only one factor in explaining citation scores. The outliers (*CACM*, *MS*, and *MISQ*) indicate that additional explanatory variables (e.g., reputation or circulation) are needed for a more precise fit. Given that age explains about 20 percent of variance and that the three journals with the highest score are (valid) outliers, we decided that it is not appropriate to adjust rankings for journal age.[10]

Table 5. Most Prestigious / Central Journals in the Overall Journal Network

Valued Freeman Degree			Bonacich Power (Beta = 0.697)			Information Centrality		
Rank	Journal	Normed Score	Rank	Journal	Raw Score	Rank	Journal	Raw Score
1	*CACM*	11.421	1	*CACM*	389.666	1	*CACM*	0.5520
2	*MS*	6.335	2	*ASQ*	362.679	2	*MS*	0.5093
3	*MISQ*	5.431	3	*MS*	328.020	3	*MISQ*	0.5003
4	*ASQ*	3.972	4	*HBR*	280.341	4	*IEEETSE*	0.4621
5	*HBR*	3.644	5	*AMJ*	274.213	5	*ASQ*	0.4619
6	*IEEETComp*	3.618	6	*AMR*	255.730	6	*HBR*	0.4615
7	*IEEETSE*	3.561	7	*MISQ*	250.819	7	*IEEETComp*	0.4610
8	*AMJ*	3.051	8	*OS*	241.499	8	*IEEEComp*	0.4561
9	*IEEETIT*	3.000	9	*OR*	170.118	9	*OS*	0.4469
10	*JACM*	2.976	10	*ISR*	158.772	10	*JACM*	0.4455
11	*IEEEComp*	2.968	11	*IEEEComp*	156.708	11	*AMR*	0.4441
12	*AMR*	2.952	12	*SMR*	155.134	12	*AMJ*	0.4417
13	*IEEETPAM*	2.903	13	*IEEETSE*	152.693	13	*AI*	0.4372
14	*OS*	2.873	14	*EJOR*	147.368	14	*ISR*	0.4368
15	*AI*	2.682	15	*OBHDP*	146.015	15	*I&M*	0.4270
16	*EJOR*	2.402	16	*IEEETComp*	144.316	16	*JMIS*	0.4233
17	*OR*	2.366	17	*JMIS*	141.231	17	*EJOR*	0.4226
18	*IEEETComm*	2.319	18	*JM*	137.697	18	*OR*	0.4188
19	*ISR*	2.279	19	*JACM*	132.432	19	*IEEETPAM*	0.4183
20	*JASIS*	2.145	20	*I&M*	132.057	20	*IS*	0.4157
21	*I&M*	2.011	21	*CMR*	126.110	21	*IEEETKDE*	0.4123
22	*JMIS*	1.928	22	*DSI*	124.441	22	*ACS*	0.4049
23	*IEEETKDE*	1.725	23	*IEEESw*	118.865	23	*SMR*	0.4041
24	*TranNtwk*	1.707	24	*AI*	115.072	24	*JASIS*	0.4020
25	*IS*	1.675	25	*IEEETIT*	114.049	25	*IEEESw*	0.3995

[10] We refer the reader to Holsapple et al. (1994) and Goh et al. (1996) for a detailed discussion of the impact of age on citation-based journal rankings, alternative ways of adjusting for age in citation studies, and findings based on a comparison of these alternatives. Please note that Holsapple's suggested adjustment would only apply to the Freeman degree rankings, and based on how UCINET calculates the other measures of journal prominence, could not be applied to the Bonacich power or information centrality rankings.

Table 6. Journal Basket Sensitivity Analysis				
Basket Size	Spearman Correlation Coefficient			
	125	75	50	25
125	---	.98*	.96*	.82*
75		---	.96*	.84*
50			---	.83*
25				---
* indicates significance at .01. We made a Bonferroni correction and set p< .01 for significance because of the number of tests				

We can see several interesting things occurring when we compare the three full ranking lists (Table 13 in the Appendix). Several ACM and IEEE publications that receive high rankings based on Freeman degree (the most common way of ranking journals in past studies) drop significantly in the Bonacich power rankings (e.g., *IEEE Transactions on Computers* [-10], *IEEE Transactions on Information Theory* [-16], *IEEE Transactions on Pattern Analysis and Machine Intelligence* [-19]). On the other hand, many more traditional IS journals (including those of the European tradition) make large gains in the Bonacich power rankings (e.g., *ISR* [+9], *EJIS* [+10], *Journal of Information Technology* [+15], *Information Systems Journal* [+19], *Journal of Strategic Information Systems* [18], *JAIS* [+18], *CAIS* [+17]). This implies that while some ACM and IEEE publications are cited heavily by smaller and less prestigious journals, the citations being made to the aforementioned IS journals come from more prestigious journals overall. Similar, though smaller, shifts can be seen when comparing the Freeman degree and information centrality rankings. This would seem to support Katerattanakul and Han's (2003) argument that European journals are underrated in traditional ranking studies, although of comparable quality to the top North American journals, since they are receiving citations from more prestigious journals. In addition, it justifies Lowry et al.'s (2004) call for ranking studies (such as ours) that examine ACM and IEEE publications individually rather than considering them to all be equivalent when conducting both subjective and objective ranking studies.

5.3. Journal Roles within the Network

Information Sources and Sinks

Overall, 48 journals in the network could be classified as information sources in the years 2003-2005, and 74 as information sinks. The top 10 information sources are listed in Table 7. These results are highly correlated with the normalized Freeman degree rankings (Spearman rank correlation coefficient = 0.89; p<0.05). As one would expect, the list of top information sources includes many journals that are traditionally ranked highly in previous IS journal studies, and also in ranking studies within their own disciplines. This indicates that they still have a strong influence on IS research, even if not traditionally viewed as journals publishing IS research per se.

Table 7. Top Ten Network Information Sources		
Rank	Journal	Net Score
1	*Communications of the ACM*	100
2	*Management Science*	74
3	*Harvard Business Review*	60
4	*MIS Quarterly*	52
4	*Administrative Science Quarterly*	49
6	*Academy of Management Review*	48
6	*IEEE Computer*	48
6	*IEEE Trans. SW Engineering*	48
6	*Organization Science*	48
10	*Journal of the ACM*	47

The information sinks (Table 8), on the other hand, come largely from IS as opposed to allied disciplines. Most represent specialty, or niche, areas of research, based on either topic or geographic region. This supports the view that niche journals may play an important role within their own subdiscipline, even if not highly cited outside of it. Authors publishing in these journals use major journals as knowledge sources, which is not surprising, as academics will often publish their work in both general and niche journals. Thus, sink should not be viewed in any pejorative sense. It is merely the SNA term applied to describe the flow of information.

Table 8. Top Ten Network Information Sinks

Rank	Journal	Net Score
1	*Wirtschaftsinformatik*	-29
1	*Knowledge Based Systems*	-29
1	*Journal of Database Management*	-29
1	*Expert Systems & Applications*	-29
1	*Electronic Commerce Res. & Applic.*	-29
1	*Australasian Journal of IS*	-29
7	*Information Technology & Mgmt.*	-28
7	*Information Systems Frontiers*	-28
9	*ACM Trans. on Internet Technology*	-27
10	*Journal of Information Sciences*	-25
10	*Journal of Global Info. Mgmt.*	-25

When interpreting sources and sinks, it is also important to keep in mind that results may be influenced by factors such as a journal's restrictions on reference lists, the number of citable articles that a journal publishes per year, and the age of the journal. We have attempted to mitigate the effects of the latter two factors by using *proportions* of a journal's overall citations, rather than *raw number* of citations made, in all of our analyses. We have also discussed the role of journal age in influencing rankings in a previous section.

To further test the sensitivity of the information source/sink analysis, we ran a series of Spearman rank correlation tests, comparing the results with the normalized Freeman degree rankings, as well as other methods for determining sources and sinks. These alternative methods include using the raw number of journals that cite and are cited by each target journal (regardless of value), and adjusting the raw numbers by using thresholds of 0.0081 and 0.04 to represent meaningful flows of information (the former representing the average proportion of journal-to-journal citations across the entire network; the latter representing one standard deviation above this figure), as opposed to performing a cell-by-cell analysis. The correlations between each method are high (from 0.71 to 0.99) and significant at the .01 level (we made a Bonferroni correction and set $p < .01$ for significance because of the number of tests). The high correlation between the cell-wise method of determining sources and sinks, and the normalized Freeman degree rankings, indicates that highly ranked journals are generally classified as information sources, whereas lower-ranked journals are generally classified as sinks.

Cutpoints and Bridges

Cutpoint journals, which represent key information brokers between subgroups in the network, are identified in Figure 4 in the Appendix. A formal cutpoint analysis clarifies which journals truly play a connecting role in the overall network, based on symmetric ties. As we have discussed earlier, *ISR* is not a cutpoint in the network, even though it superficially appears to be so in Figure 3, because although it draws high levels of information from two different disciplines (OR and IS), it does not actually pass information in both directions at the same high level. While *ISR* draws information from OR and passes it on to IS, it does not play the same role in returning (the same volume of) new information back to OR. This is true even at lower thresholds of information exchange, such as that shown in Figure 1.

MIS Quarterly, on the other hand, *does* serve as a cutpoint in the network, as it is the key information broker for the pure IS journals, not only enabling a two-way flow of information between several of the top pure IS journals themselves, but also enabling a two-way flow of information between these journals and *CACM*. *CACM,* in turn, plays a key role in connecting *MIS Quarterly* with journals from the computer science discipline. Thus, it would appear that information is being mutually shared to a greater extent between IS and computer science than between IS and its other foundational disciplines. This finding is comparable to that of Katerattanakul et al. (2006; based on citation data prior to 2000), although their study looked at all citations made from 15 major disciplines to a basket of only six IS journals (with *CACM* classified as IS).[11]

Cutpoint analysis can also identify important information brokers for "niche" areas of study. Examples of journals that play such a role include *Human-Computer Interaction*, *Artificial Intelligence*, and *Information Processing & Management*; additional examples can be found in Figure 4 in the Appendix.

Bridge journals are identified in Table 9. Again, we see the critical role played by journals that scored highly on Freeman degree, Bonacich power, and information centrality, in enabling information flow throughout the journal network. In this case, it is the *linkages* between various pairs or groups of journals that ensure dissemination of knowledge throughout the network. The most critical linkage in the network is that between *CACM* and *Management Science*, followed by the linkage between these two journals and *MIS Quarterly*. We can see from Table 9 that, although *I&M*, *JMIS*, and *ISR* have not thus far been found to play critical roles within the network as a whole (although they are each prestigious when focusing on the subset of pure IS journals), these three journals *do* play a critical role in participating in linkages with other journals that aid in keeping information flowing within smaller components of the network.

Table 9. Top Journal-to-Journal Bridges in the Network

Lambda Value	Journals Included in Key Linkages
52	CACM + MS
48	All of the above + MISQ
30	All of the above + I&M, HBR
29	All of the above + IEEETComp
28	All of the above + ISR
26	All of the above + JMIS, AMR, OS
25	All of the above + IEEETSE
24	All of the above + JACM
23	All of the above + IEEEComp
21	All of the above + IS, ASQ

5.4. Cliques

At a threshold of 0.04 for reciprocated ties, 20 overlapping cliques were identified, with only two of these cliques containing more than three members. It is important to note that by using a threshold that is lower than that used for displaying information flow in Figures 1 through 3, we can identify groups of journals with high reciprocated ties that are not visible in these diagrams, but might still provide useful information on key substructures within the larger network.

The majority of the cliques identified belong to the management, OR, and computer science disciplines, and, thus, we do not discuss them here. However, three cliques involve IS journals. The first of these cliques is composed of *ISR*, *JMIS*, and *MISQ*, and the second is composed of *CACM*,

[11] It is difficult to compare and contrast our findings with those of Grover et al. (2006), as they used a much smaller basket of journals, classified some journals differently than we do here, and elevated some of the subdisciplines and niche areas of research shown in our graphs to full disciplinary status.

ISR, and *MISQ*. These two cliques include journals that are generally considered to be the premier publication outlets in prior subjective and objective IS journal studies. This simply indicates that the top IS journals tend to cite each other heavily, and does not provide much additional insight into the IS discipline. The third clique, on the other hand, is composed of *Behaviour & Information Technology* (*BIT*), *Human-Computer Interaction* (*HCI*), and the *International Journal of Human-Computer Studies* (*IJHCS*), and indicates the presence of a clique focusing on issues related to human-computer interaction.

The lack of other cliques involving IS journals could be the consequence of many things. For instance, it could indicate that even in areas of niche study, IS journals still tend to cite many different sources of information rather than focusing only on other journals in that area (see Holsapple and Luo (2003) for an example of this phenomenon from collaborative computing). This, in itself, provides important information about the field as a whole and its level of maturity. However, it does not help us to identify subdisciplines or alternative publication outlets for individuals performing niche research. Thus, we use structural equivalence for this purpose.

5.5. Structural Equivalence

The dendrogram (Figure 5 in the Appendix) represents the structural equivalence of all 125 journals, based on double-normalization of the data as described earlier in the paper. Journals representing the management, OR, and pure IS fields have been identified at the bottom of the dendrogram. Other smaller groupings in the dendrogram represent niche areas of study for both the IS and computer science fields (e.g., human-computer interaction, technology management, artificial intelligence, software engineering, library/information science, graphics).

The dendrogram clearly identifies journals that are similar in bi-directional citation across the network. Thus, it provides valuable information to researchers regarding alternative publication outlets. For example, there appears to be little difference in the bi-directional citation patterns of *MISQ* and *ISR*, or of *JMIS*, indicating (as one would assume, given these are generally considered the three premier mainstream IS journals) that a paper rejected at one could be relatively easily tailored for resubmission to one of the other two. Alternative publication outlets for *CACM* include *IEEE Computer*, *IEEE Software*, and *IBM Systems Journal*. Digging deeper into the journals in the pure IS group, our findings correspond well with those of Nerur et al. (2005) in recognizing noticeable differences in the bi-directional citation patterns of the top European journals (*EJIS*, *JIT*, *ISJ*, and *JSIS*) compared to North American journals.

There are some noticeable differences between the journal groupings in the dendrogram and the journal groupings of Nerur et al. (2005) that are worthy of mention. For example, while Nerur et al. showed *ISR*, *MISQ*, *JCIS*, *I&M*, and *DSS* as forming one fairly cohesive group of North American socio-technical journals, our dendrogram places *JCIS* at a great distance from these other four journals. In fact, it is most closely associated in our dendrogram with an eight-journal group that also includes *JOEUC*, *IT&P*, *JGIM*, *IT&M*, *SJIS*, *JDM*, and *ECRA*. The linkage distances for this group are much greater than those for the former group of pure IS journals, indicating that the latter group is not very cohesive. Most of the journals in this latter group receive low Freeman degree rankings, indicating low proportions of citations received from journals within this network. Thus it is possible that these journals group together simply because there are not enough citations received for the clustering program to discern clear citation patterns.

It is easy to see that a lack of adequate citations within the network can skew results for structural equivalence. Other examples in the dendrogram of this phenomenon occurring include *AJIS* (grouped with artificial intelligence and data mining journals) and *Quality Progress* (grouped with HCI and collaborative computing journals). Thus, a researcher looking for alternative publication outlets should be wary when basing decisions on hierarchical clustering where a particular threshold of raw numbers of network citations has not been achieved. An alternative approach in such cases might be to carry out a structural equivalence study based *only* on similarity in citations made, or in citations received, depending on the researcher's needs.

A final interesting finding is that the pure IS journals link first to the OR journals, rather than to the management journals. This might seem counterintuitive to some, given that pure IS researchers tend to use the same research methods (e.g., surveys, case studies) as most management researchers, rather than performing complex modeling procedures. More investigation is necessary to determine what causes this result, since it implies that IS and OR journals share greater similarity with each other in who they cite, or who cites them, than they share with management journals.

6. Discussion and Conclusions

We initiate the discussion of the results by first reviewing the key findings and situating them within the context of the extant IS journal literature. Next, we discuss key findings related to the sensitivity of SNA and ways in which the objectivity of the method can be improved. Finally, we discuss future research directions.

6.1. Key Findings and Contributions Related to the Study of IS Journals

Journal Prominence and Roles

The findings provide scholars a number of insights into the IS publication system. Prestige appears to be the most suitable approach for generating an overall ranking of IS journals. However, other measures can provide additional insight into the specific roles of journals in the network. Nevertheless, we have found the top-rated journals in our network to be consistent across a number of measures, indicating that roughly the same journals play key roles not only as important sources of information, but also in connecting various subdisciplines together and enabling information flow throughout the network. While these same journals have been identified as high quality journals in previous studies, we contribute here to the richness of understanding of the actual roles they play, both within the IS discipline, and between IS and related disciplines.

By including ACM and IEEE publications as separate nodes in the network (prior studies have generally combined them), we have demonstrated that traditional ranking methods can sometimes overestimate the prestige of journals that are highly cited, but receive many of their citations from less important journals in the network. The Bonacich power index enables us to see that many IS journals receiving lower rankings (including those from the European tradition) are actually cited by more prestigious journals and perhaps deserve to be ranked higher in perceptual ranking studies.

Finally, we have identified a number of additional journals that play important roles in the network, despite the fact that they are not highly ranked overall. *ACM Transactions on Information Systems*, *Decision Sciences*, *Human-Computer Interaction*, *International Journal of Human-Computer Studies* , and *Information Systems* all play important roles in relaying information throughout the network that are not evident by simply viewing their position in the numerical rankings. Other journals (e.g., *JAIS*, *IEEETEM*) are important consolidators of information from multiple disciplines, even though they have not (yet) been recognized for disseminating this information to other journals throughout the network.

The Relationship of IS to Other Disciplines

SNA can inform us, at a more macro level, regarding patterns of information flow between disciplines and subdisciplines. Recent SNA studies on the IS discipline (e.g., Biehl et al., 2006; Wade et al., 2006; and our own) indicate that IS has not yet become a reference discipline and is rather a sink for information from other disciplines. On the other hand, recent non-SNA citation-based studies (e.g., Grover et al., 2006; Katerattanakul et al., 2005) have come to the opposite conclusion, i.e., that IS *has* become a reference discipline and is being cited by a broad spectrum of other disciplines.

Why the discrepancy? The answer may lie in part on the basket of journals used by each study as well as the method for determining which citations to IS journals to include. Each of the three SNA studies has included only highly ranked journals from closely allied disciplines in its journal basket, and has focused on individual (journal-to-journal) citation levels rather than aggregated citation levels for each discipline. This leads to the conclusion that the highest ranked journals from other disciplines are not heavily citing individual IS journals (whether highly ranked or otherwise), with "heavy citations" defined as a single IS journal receiving a relatively large percentage of another individual journal's overall citations. However, Katerattanakul et al.'s study looks at *all* citations made by 586 different journals to their basket of six major IS journals, without discriminating whether these citations came from prestigious journals in their respective disciplines. The post hoc analysis of Grover et al. takes a similar approach. Both studies find a large number of citations to top IS journals at a macro level.

By triangulating across studies, we infer that IS is receiving an increasing number of citations from other disciplines, but that these citations make up a relatively small proportion of any one non-IS journal's overall citations, even for top-rated journals from other disciplines. This implies that challenges remain for IS to truly become an established reference discipline that contributes to other disciplines at the same level as its own three foundational reference disciplines contribute to it. From this perspective, SNA is an excellent tool for examining the prestige of journals from citing disciplines to determine the true impact of IS on other fields. Finally, we agree with Grover et al. that simply examining relationships among the IS foundational disciplines is not adequate, and that future SNA studies should incorporate not only a larger basket of journals, but also a basket of journals representing a much broader array of disciplines.

Journal Groupings and Classification

SNA allows us to identify related groups of journals based not only on patterns of information flow, but also on similarity in citation patterns. In discriminating journals based on the latter criteria, it appears that roughly two dozen journals represent the core set of journals for pure IS researchers. However, we can discriminate more closely related groupings of journals even within this relatively small subset, indicating differences in research focus. Outside the pure IS area, other subsets of journals take on importance for particular specialty areas of interest. Identification of these structurally equivalent journals is useful to scholars in targeting their work, and over time, can also enable us to track changes in the field as a whole. The further delineation and analysis of niche groups or cliques is perhaps one of the more interesting future applications for SNA in our field.

On the other hand, we find that clique analysis uncovers very few closely related subgroups of IS journals based on the criteria of strong reciprocal citing relationships. This provides further evidence that the IS field is not yet mature and still quite fragmented (see Grover et al., 2006) and that even IS journals from niche areas of interest continue to draw from a wide array of sources.

Our study also highlights some shortcomings of prior journal classification studies, demonstrating that subjective classifications of journals used in the past do not always coincide with journal relationships discovered via SNA. This is seen most clearly in our information flow diagrams, where some journals classified in the past as IS (red nodes) are clearly aligned with other disciplines (e.g., *Journal of Management*). Furthermore, the information flow diagrams and structural equivalence dendrogram enable us to classify journals that have been previously categorized in multiple, and sometimes conflicting, ways (gray nodes). For example, it is clear that *Decision Sciences* and *Omega*, as well as several other journals, should be classified in the OR (yellow) group, rather than with other more traditional IS journals, as most researchers working in this area would immediately recognize. A larger problem (and one that is less easily solved) is that there is a lack of consistency in extant studies regarding where to draw the line in defining IS, subdisciplines within IS, and distinct (albeit small) areas of study that qualify as disciplines in their own right. However, SNA might be able to inform debate on this topic. This larger problem is possibly a symptom of the field's lack of clarity. For example, scholars frequently treat the terms IS and IT as identical, but in our minds, information systems are comprised of people and multiple information technologies. If we are going to have any consistency in our field, then as a first step, we need to carefully define our key terms and rigorously enforce their use. No physicist would ever write mass/weight, but we see IS scholars use the term IS/IT too frequently. As a field, we need to take action to clarify our key concepts so that we don't confuse each other and, more importantly, create the definitional precision that is characteristic of other academic fields.

6.2. Key Findings and Contributions Related to the Use of SNA

We have demonstrated how SNA can be used to study relationships between journals in a relatively large citation network. Every choice made in conducting an SNA is an implicit assumption and can lessen the objectivity of the analysis. However, it is possible to systematically examine the sensitivity of the various measures to each key assumption, thus removing some of the limitations of studying journal networks via SNA, and increasing the objectivity and reliability of using SNA to study journal publication networks. We have presented results of sensitivity tests throughout the data analysis section and now summarize the findings.

Sensitivity to Journal Basket

SNA results can potentially be impacted by the size of the journal basket as well as the journals in the basket. With the exception of individual IEEE and ACM publications, our study includes only journals that have appeared in at least one previous ranking study. Including more journals, particularly those from specialty fields and different geographical regions, would be useful in order to provide a more complete picture of the IS research landscape today. Unfortunately, a number of these journals are not currently indexed by JCR, increasing the amount of manual work that has to be done to tally their citations to other journals.[12]

A sensitivity analysis indicates that the size of journal basket used has no significant impact on a journal's relative ranking compared to those in the particular basket. It is critical to ensure that highly regarded journals are in the basket, but increasing the basket to include more journals is unlikely to have an impact on the ranking of the more prestigious journals. Our findings suggest that we need not go beyond 125 journals if we are primarily interested in prestige and centrality measures.

A larger basket could support other analyses. Including more niche journals would enable determination of their position in the overall network and identify those journals that act as information brokers between niche groups. In addition, future studies could incorporate a broader basket of disciplines, demonstrating the emerging importance of other disciplines besides management, OR, and computer science on IS (e.g., marketing, social psychology, economics, accounting) (Grover et al., 2006).

Data Standardization Techniques

Citation data can be standardized in different ways prior to performing an SNA. Each of these methods can potentially impact the results. Following Biehl et al. (2006), we row-normalized the data to account for differences in the number of citations per year that a *citing* journal might make due to publishing more issues per year, or by limiting the length of its reference lists. Thus, our normalized rankings and flow diagrams are not sensitive to these differences.

While we examined citations *made* in 2003-2005, there is no limit to the age of articles that were *cited* during this time frame. A sensitivity analysis indicates that the effect of journal age on normalized rankings is relatively small (see Holsapple et al. (2006) for a detailed discussion on the problems of accounting for journal age in traditional ranking studies) and impacted only slightly by the presence of three extreme (though valid) outlier data points. More research needs to be done to determine the proper relationship between journal age and various network roles. However, we find that journal age does not play a substantial role in determining structural equivalence and plays only a limited role in investigating reciprocal citation patterns.

Row-normalization does not control for variability in cited journals, which, though the same age, may produce vastly different numbers of citable articles in a given year. Thus, the prestige rankings may be biased in favor of such journals. However, this impact is mitigated for other analyses – in particular, analysis of structural equivalence -- where double-normalization of the data matrix (i.e., iterative

[12] We encourage authors who manually tally citations to make their data available, and please contact us if you would like our data.

normalization of both rows and columns) allows us to examine similarities of journals in both their "citing" and "cited by" patterns. The type of normalization used in future SNA journal studies will depend on the goals of the study. For example, are we interested in similarity of readership (equivalence based on row-normalization) or similarity in terms of how a journal is referenced (equivalence based on column-normalization)?

Citation Thresholds

With few exceptions, the web version of JCR records an entry only for journals that have received at least two citations from another journal. This means that any journals for which we captured citation data electronically, and which received only one citation from a particular citing journal in each of the three years of our study, will not show a relationship to that other journal in the network. Given that these would tend to be very lightly cited journals overall, it is important both for this study and any future IS journal SNA studies to determine what is a proper threshold to use for representing ties between journals in the network.

One commonly used threshold is the strength of the average tie in the network (in our case, 0.0081, or slightly less than 1 percent of a journal's total network citations being made to another network journal). Using such a threshold will avoid showing trivial relationships between journals. On the other hand, a negative consequence of using row-normalization is that if journal A makes only five citations within the network over the time period of the study, its citations will all exceed this 0.0081 threshold. This results in any journals that are cited by journal A receiving a disproportionately high contribution to their overall ranking scores, and also results in an abnormally strong (one-way) relationship appearing in the information flow diagrams. Such journals may also be categorized improperly when performing other SNA techniques, as the dendrogram indicates. Thus, future studies could analyze the sensitivity of SNA to the threshold choice.

For many SNA techniques, a threshold higher than the network average is required. For example, clique analysis depends on the presence of relatively strong reciprocated ties between journals. This begs the question of what *is* a "strong tie" in the IS journal network? Biehl et al. (2006) selected a threshold of 0.10 to represent strong ties. However, their study included only the 31 highest ranked journals across business disciplines. In such a case, it was relatively easy to identify such ties. In our large network, there are very few ties above 0.10 in strength, and these are generally associated with reference disciplines (management, OR), which are only represented in our network by their most prestigious journals. It appears that in order to perform a meaningful clique analysis on such a large network, it would be necessary to select a much lower threshold, or else to examine subdisciplines in isolation, to look for cliques within each subdiscipline.

6.3. Future Research Directions

SNA provides the tools for an objective and rich analysis of relationships among journals. Future studies could focus on including a much larger basket of journals, determined not by a pre-conceived list, but strictly by importing all journals indexed by a citation service into a social networking tool, and eliminating any journal clusters for which the strength of ties to IS or allied discipline publications do not meet an appropriate threshold. Google Scholar potentially limits the need to manually tabulate citations depending on the release of an API.

In the future, the ability of SNA to analyze subgroups and cliques could eliminate the need to publish multiple studies based on citation data from the same time frame in order to cover both broad-based IS and niche group rankings. This obviously has implications for researchers who publish journal ranking studies, as quantity of publications plays an important role in tenure and promotion decisions at many, if not most, universities. Such researchers could still publish multiple studies using SNA techniques; however, their focus could shift to exploring what network journal relationships say about different aspects of the IS field, rather than focusing on publishing different sets of ranking lists.

SNA could assist researchers in tracking trends over time as the IS discipline continues to grow and evolve and also in examining the effects of changes in journal accessibility and characteristics. For example, has the introduction of search engines, such as Google Scholar, broadened the base of literature that IS scholars cite? Does the inclusion of a journal in SSCI have an impact on its network measures? Does openness (e.g., free access) affect a journal's network characteristics? Finally, the use of SNA to analyze relationships among journals could help to make the debate over whether to include (or exclude) journals from other disciplines in future studies a moot point, since the true relationships (or lack thereof) between each group of journals would be illuminated by SNA.

Journal rankings concern IS scholars because the reputation of the journals in which one has published has a strong impact on tenure and promotion decisions. Thus, studies that ask scholars to rank journals could be affected by where respondents have published or with whom they are affiliated (e.g., as an associate editor). Thus, while subjective journal studies have their place, the field is better served by methods, such as SNA, that provide for an objective and richer analysis of the relationships among journals.

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Appendix: Tables

Table 10. The Data Collection Process

Step	Description
1	Determine the journal basket to be used for collecting citation data.
2	Capture all citation data for these journals from the JCR website in a text file (with separate files for each of the years 2003, 2004, and 2005).
3	Create a list of the journal abbreviations used within JCR for the journals in the initial basket (this step is necessary since several journals have multiple listings, not all of which are documented by ISI).
4	Create a Java-based program to parse the text files and store only those journal-to-journal pairs from the list in Step 3, in a new output file (with a separate output file for each year of data).
5	Check the output data for anomalies, and make corrections as necessary.
6	Add manually tabulated citations from journals that are not indexed in either the SCI or SSCI versions of JCR, to each output file.
7	Convert the output into a DL file format that can be read into UCINET for further analysis (with separate DL files for each year of data).
8	Create a matrix of network data for each DL file, and export the matrices to MS Excel.
9	Add the three matrices together to create one final matrix of network data covering the years 2003, 2004, and 2005, for use in UCINET.
10	Remove self-citations from the master UCINET file.
11	Normalize the data, and make adjustments for journal age.
12	Analyze the data using UCINET 6 and Pajek software.

Table 11: Background Information for Examined Journals

JOURNAL NAME	ABBREV	Year Established	Walstrom & Hardgrave 2001 Category [a]	Peffers & Tang 2003 Category [b]	Rainer & Miller 2005 Category [c]	Category for this Study	INCLUDED IN ANALYSIS ?	SOURCE FOR "JOURNALS CITED" DATA	SOURCE FOR "CITED BY" DATA	COMMENTS
Academy of Management Journal	AMJ		Non-IS	Allied	Mgmt	Mgmt/Prof	X	JCR Citing (SSCI)	JCR Citing	
Academy of Management Review	AMR		Non-IS	Allied	Mgmt	Mgmt/Prof	X	JCR Citing (SSCI)	JCR Citing	
ACM Computing Surveys	ACS		Hybrid	Allied	CS	NA	X	JCR Citing (SCI)	JCR Citing	
ACM J. of Computer Documentation						---		n/a	n/a	ceased pub. in 2002
ACM SIGARCH Computer Architecture News	ACMSIGARCH	1972			CS	CS	X	ACM Portal	JCR Citing	tabulated manually
ACM SIGCHI Bulletin	ACMSIGCHI				CS	---		ACM Portal	JCR Citing	ceased pub. in 2003
ACM SIGCOMM Computer Communication Review	ACMSIGCOM	1970			CS	CS	X	ACM Portal	JCR Citing	tabulated manually
ACM SIGCSE Bulletin (Inroads)	ACMSIGCSE	1969			CS	CS	X	ACM Portal	JCR Citing	tabulated manually
ACM SIGecom Exchanges	ACMECX	2000		IS	CS	NA	X	ACM Portal	JCR Citing	tabulated manually
ACM SIGIR Forum	ACMSIGIR	1965			CS	CS	X	ACM Portal	JCR Citing	tabulated manually
ACM SIGKDD Explorations Newsletter	ACMSIGKDD	1999			CS	CS	X	ACM Portal	JCR Citing	tabulated manually
ACM SIGMETRICS Performance Evaluation Review	ACMSIGMET	1972			CS	CS	X	ACM Portal	JCR Citing	tabulated manually
ACM SIGMOD Record	ACMSIGMOD	1969		IS	CS	NA	X	ACM Portal	JCR Citing	tabulated manually
ACM SIGOPS Operating Sys. Review	ACMSIGOPS	1967			CS	CS	X	ACM Portal	JCR Citing	tabulated manually
ACM SIGPLAN Notices	ACMSIGPLN	1966			CS	CS	X	JCR Citing (SCI)	JCR Citing	
ACM SIGSOFT Software Eng. Notes	ACMSIGSFT	1976			CS	CS	X	ACM Portal	JCR Citing	tabulated manually
ACM Trans. on Computational Logic	ACMTCL	2000				CS	X	ACM Portal	JCR Citing	tabulated manually
ACM Trans. on Comp. Hum. Interaction	ACMTCHI	1994				CS	X	ACM Portal	JCR Citing	tabulated manually
ACM Trans. on Computer Systems	ACMTCS	1983				CS	X	JCR Citing (SCI)	JCR Citing	
ACM Trans. on Database Systems	ACMTDS	1976	Hybrid	Allied	CS	NA	X	JCR Citing (SCI)	JCR Citing	
ACM Transactions on Design Automation of Electronic Systems	ACMTDAE	1996				CS	X	JCR Citing (SCI)	JCR Citing	
ACM Transactions on Embedded Computing Systems	ACMTECS	2002				CS	X	ACM Portal	JCR Citing	tabulated manually
ACM Transactions on Graphics	ACMTG	1982				CS	X	JCR Citing (SCI)	JCR Citing	
ACM Transactions on Information and System Security	ACMTISS	1998				CS	X	ACM Portal	JCR Citing	tabulated manually
ACM Trans. on Information Systems	ACMTIS	1983	Pure IS	IS	CS	NA	X	JCR Citing (SCI)	JCR Citing	
ACM Trans. on Internet Technology	ACMTIT	2001				CS	X	ACM Portal	JCR Citing	tabulated manually
ACM Trans. on Mathematical Software	ACMTMS	1975				CS	X	JCR Citing (SCI)	JCR Citing	

ACM Transactions on Modeling and Computer Simulation	ACMTMC	1991				CS	X	ACM Portal	JCR Citing	tabulated manually
ACM Letters/Trans. on Programming Languages and Systems	ACMTPLS	1979				CS	X	JCR Citing (SCI)	JCR Citing	
ACM Transactions on Software Engineering and Methodology	ACMTSEM	1992				CS	X	JCR Citing (SCI)	JCR Citing	
Administrative Science Quarterly	ASQ	1956	Non-IS	Allied	Mgmt	Mgmt/Prof	X	JCR Citing (SSCI)	JCR Citing	
AI Expert	AIExp			Allied		---		n/a	n/a	ceased pub. in 1995
AI Magazine	AIMag	1980		Prof		CS	X	JCR Citing (SCI)	JCR Citing	
Artificial Intelligence	AI	1970		Allied		CS	X	JCR Citing (SCI)	JCR Citing	
Australasian J. of Information Systems	AJIS	1993		IS		IS	X	Journal web site	JCR Citing	tabulated manually
Behaviour & Information Technology	BIT	1982	Hybrid	IS		NA	X	JCR Citing (SSCI)	JCR Citing	
Business Horizons	BH	1958		Prof		Mgmt/Prof	X		JCR Citing	tabulated manually
California Management Review	CMR	1960		Prof		Mgmt/Prof	X	JCR Citing (SSCI)	JCR Citing	
Communication Research	CommRsch		Non-IS	Allied		NA	X	JCR Citing (SSCI)	JCR Citing	
Communications of the ACM	CACM	1958	Hybrid	Prof	CS	NA	X	JCR Citing (SCI)	JCR Citing	
Communications of the AIS	CAIS	1999		IS	MIS	IS	X	AIS website	JCR Citing	tabulated manually
Computer Decisions						---		n/a	n/a	ceased pub. in 1989
Computer Journal	CompJ	1958		IS		IS	X	JCR Citing (SCI)	JCR Citing	
Computer Supported Cooperative Work	CSCW	1992		IS		IS	X	EBSCOHost	JCR Citing	tabulated manually
Computers & Operations Research	COR	1974		Allied	OR	OR	X	JCR Citing (SCI)	JCR Citing	
Computers and Automation	C&A			Allied		---		n/a	n/a	ceased pub. in 1988
Computers in Human Behavior	CHB	1985	Hybrid	Allied		NA	X	JCR Citing (SSCI)	JCR Citing	
Data Management						---		n/a	n/a	ceased pub. in 1988
Database	DB					---		n/a	n/a	ID questionable
DATABASE for Advances in Info. Sys.	DATABASE	1969	Pure IS	IS	MIS	IS	X	ACM Portal	JCR Citing	tabulated manually
Database Programming and Design	DPD				MIS	---		n/a	JCR Citing	ceased pub. in 1998
Datamation	Dtmn		Hybrid	Prof		---		n/a	JCR Citing	bibliographic data ceased in 1998
Decision Sciences	DSI	1970	Partial	Allied	OR	NA	X	JCR Citing (SSCI)	JCR Citing	
Decision Support Systems	DSS	1985	Pure IS	IS	MIS	IS	X	JCR Citing (SCI)	JCR Citing	
Electronic Commerce Research and Application	ECRA	2002		IS		IS	X	Elsevier	JCR Citing	tabulated manually
Electronic Markets	Emkt	1991		IS		IS	X	EBSCOHost	JCR Citing	tabulated manually
E-Service Journal				IS		---		n/a	n/a	excluded due to insufficient citations
European J. of Information Systems	EJIS	1991	Pure IS	IS	MIS	IS	X	JCR Citing (SCI)	JCR Citing	
European J. of Operational Research	EJOR	1977		Allied		OR	X	JCR Citing (SCI)	JCR Citing	

Expert Systems with Applications	ESA	1990	Hybrid	Allied		NA	X	JCR Citing (SCI)	JCR Citing	
Harvard Business Review	HBR	1922	Non-IS	Prof	Mgmt	Mgmt/Prof	X	JCR Citing (SSCI)	JCR Citing	
Human-Computer Interaction	HCI	1985	Hybrid	Allied		NA	X	JCR Citing (SCI)	JCR Citing	
IBM Systems Journal	IBMSJ	1962			MIS	IS	X	JCR Citing (SCI)	JCR Citing	
IBSCUG Quarterly	IBSCUG		Hybrid	Allied		---		n/a	n/a	ceased publication
IEEE Computer	IEEEComp	1968		Allied	CS	CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Intelligent Systems (IEEE Expert)	IEEEIS	1986		Allied		CS	X	JCR Citing (SCI)	JCR Citing	manually tabulated
IEEE Software	IEEESw	1984		Allied		CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Communications	IEEETComm	1972				CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Computational Biology and Bioinformatics	IEEETCBB					---		n/a	JCR Citing	lacked journal access
IEEE Transactions on Computers	IEEETComp	1968			CS	CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Dependable and Secure Computing	IEEEDSC					---		n/a	JCR Citing	lacked journal access
IEEE Trans. on Engineering Mgmt.	IEEETEM	1963		Allied		CS	X	JCR Citing (SCI, SSCI)	JCR Citing	
IEEE Trans. on Image Processing	IEEETIP	1992				CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Information Technology in Biomedicine	IEEETITB	1997				CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Trans. on Information Theory	IEEETIT	1963				CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Knowledge and Data Engineering	IEEETKDE	1989	Hybrid	Allied		NA	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Mobile Computing	IEEETMC					---		n/a	JCR Citing	lacked journal access
IEEE Transactions on Multimedia	IEEETM	1999				CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Neural Networks	IEEETNN	1990		Allied		CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Parallel and Distributed Systems	IEEETPDS	1990				CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Pattern Analysis and Machine Intelligence	IEEETPAM	1979				CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Trans. on Software Engineering	IEEETSE	1975	Hybrid	Allied	CS	NA	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Speech and Audio Processing	IEEETSAP	1993				CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Transactions on Systems, Man, & Cybernetics	IEEETSMC	1971		Allied	CS	CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Trans. on Visualization and Computer Graphics	IEEETVCG	1995				CS	X	JCR Citing (SCI)	JCR Citing	
IEEE Trans. on Wireless Commun.	IEEETWC	2002				CS	X	JCR Citing (SCI)	JCR Citing	
IEEE-ACM Transactions on Networking	TranNtwk	1993				CS	X	JCR Citing (SCI)	JCR Citing	
INFOR	INFOR	1963	Partial	IS		NA	X	JCR Citing (SCI)	JCR Citing	
Information						---		n/a	n/a	no citations found

Information & Management	I&M	1977	Pure IS	IS	MIS	IS	X	JCR Citing (SCI, SSCI)	JCR Citing	
Information and Organization (Accounting, Management, & Information Technology)	I&O			IS	MIS	---		n/a	n/a	no citations found in JCR 2003-2005
Information and Software Technology	IST	1987		IS		IS	X	JCR Citing (SCI)	JCR Citing	
Information Processing & Management	IPM	1975		IS		IS	X	JCR Citing (SCI, SSCI)	JCR Citing	
Information Research	InfRes	1995		IS		IS	X	JCR Citing (SSCI), Journal web site	JCR Citing	2003 data was tabulated manually
Information Resources Mgmt. Journal	IRMJ	1988	Pure IS	IS	MIS	IS	X	Idea Group	JCR Citing	tabulated manually
Information Sciences	InfSci	1968				IS	X	JCR Citing (SCI)	JCR Citing	
Information Society, The	InfSoc	1981		IS		IS	X	JCR Citing (SSCI)	JCR Citing	
Information Systems	IS	1975	Pure IS	IS		IS	X	JCR Citing (SCI)	JCR Citing	
Information Systems Frontiers	ISF	1999		IS		IS	X	JCR Citing (SCI)	JCR Citing	
Information Systems Journal	ISJ	1994		IS	MIS	IS	X	JCR Citing (SSCI)	JCR Citing	
Information Systems Management	ISM	1991	Pure IS	IS	MIS	IS	X	JCR Citing (SCI)	JCR Citing	
Information Systems Research	ISR	1990	Pure IS	IS	MIS	IS	X	JCR Citing (SSCI)	JCR Citing	
Information Technology and Mgmt.	IT&M	2000		IS		IS	X	EBSCOHost	JCR Citing	tabulated manually
Information Technology and People	IT&P	1992		IS		IS	X	Emerald	JCR Citing	tabulated manually
INFORMS Journal on Computing	Jcomp	1996	Hybrid	Allied		NA	X	JCR Citing (SCI)	JCR Citing	
Infosystems	InfoSys					---		n/a	n/a	ceased pub. in 1988
Interface: The Computer Educ. Quarterly						---		n/a	n/a	no longer published
Interfaces	INTFCS	1970	Partial	Allied	MIS	NA	X	JCR Citing (SSCI)	JCR Citing	
International J. of Electronic Commerce	IJEC	1996		IS		IS	X	JCR Citing (SCI, SSCI)	JCR Citing	
International Journal of Human-Computer Studies	IJHCS	1969	Hybrid	IS	MIS	NA	X	JCR Citing (SSCI)	JCR Citing	
International J. of Information Mgmt.	IJIM	1986		IS		IS	X	JCR Citing (SSCI)	JCR Citing	
International J. of Intelligent Systems	IJIS	1986				NA	X	JCR Citing (SCI)	JCR Citing	manually tabulated
International J. of IT Mgmt. Systems						---		n/a	n/a	no citations found in JCR 2003-2005
International J. of Technology Mgmt.	IJTM	1985		Allied	MIS	IS	X	JCR Citing (SCI, SSCI)	JCR Citing	
Int'l J. of Intelligent Systems in Acctg, Fin, & Mgmt (Expert Systems Review)	ESR			Allied		---		n/a	n/a	no citations found in JCR 2003-2005
J. of Computer and System Sciences	JCSS	1967				NA	X	JCR Citing (SCI)	JCR Citing	
J. of Computer Information Systems	JCIS	1985	Pure IS	IS		IS	X	JCR Citing (SCI)	JCR Citing	
Journal of Database Administration	JDBA				MIS	---		n/a	n/a	could not be located
Journal of Database Management	JDM	1992	Pure IS	IS		IS	X	Idea Group	JCR Citing	tabulated manually

Journal of Education for Mgmt. Info. Sys.					MIS	---		n/a	n/a	could not be located
Journal of Engineering and Tech. Mgmt.	JETM	1985				NA	X	JCR Citing (SCI)	JCR Citing	
Journal of Global Info. Management	JGIM	1993	Pure IS	IS		IS	X	Idea Group	JCR Citing	tabulated manually
Journal of Global Information Technology Management	JGITM			IS		---		n/a	n/a	no citations found in JCR 2003-2005
Journal of Information Management	JIM			IS	MIS	---		n/a	n/a	ceased pub. in 1988
Journal of Information Science	JISci	1979		IS	MIS	IS	X	JCR Citing (SSCI)	JCR Citing	
Journal of Info. Systems (Accounting)	JISA	1986	Hybrid	Allied	MIS	NA	X	EBSCOHost	JCR Citing	tabulated manually
Journal of Info. Systems Education	JISE		Pure IS	IS	MIS	---		Library hard copy	n/a	no citations found in JCR 2003-2005
Journal of Information Systems Mgmt.	JISM			IS		---		n/a	n/a	no citations found in JCR 2003-2005
Journal of Information Technology	JIT	1986		IS		IS	X	JCR Citing (SCI, SSCI)	JCR Citing	
Journal of Info. Technology Education	JITE			IS		---		Journal web site	n/a	no citations found in JCR 2003-2005
Journal of Info. Technology Mgmt.	JITM		Pure IS	IS	MIS	---		Journal web site	n/a	no citations found in JCR 2003-2005
Journal of Information Technology Theory and Application	JITTA			IS		---		n/a	n/a	no citations found in JCR 2003-2005
Journal of International (Technology and) Information Management	JIIM				MIS	---		n/a	n/a	no citations found in JCR 2003-2005
Journal of IT Case and Application Research	JITCA			IS		---		n/a	n/a	no citations found in JCR 2003-2005
Journal of Management	JM	1975		IS		IS	X	JCR Citing (SSCI)		
Journal of Mgmt. Info. Systems	JMIS	1984	Pure IS	IS	MIS	IS	X	JCR Citing (SSCI)		
Journal of Management Systems	JMS			Allied	Mgmt	---		Journal web site (2004-2005)	n/a	no citations found in JCR 2003-2005
Journal of Microcomputer Sys. Mgmt.						---		n/a	n/a	could not be located
Journal of Operations Research	JOR			Allied		---		n/a	n/a	could not be located
Journal of Org. and End User Computing	JOEUC	1988	Pure IS	IS		IS	X	EBSCOHost	JCR Citing	tabulated manually
Journal of Org. Computing and Electronic Commerce	JOCEC	1991	Pure IS	IS		IS	X	JCR Citing (SCI)	JCR Citing	
Journal of Software Maint. and Evolution	JSwME	1989	Hybrid	IS		NA	X	JCR Citing (SCI)	JCR Citing	
Journal of Strategic Information Systems	JSIS	1991	Pure IS	IS	MIS	IS	X	JCR Citing (SCI)	JCR Citing	
Journal of Systems and Software	JS&S	1979	Hybrid	IS		NA	X	JCR Citing (SCI)	JCR Citing	
Journal of Systems Management	JSM			IS	MIS	---		n/a	n/a	ceased pub. in 1996
Journal of the ACM	JACM	1954		IS	CS	NA	X	JCR Citing (SCI)	JCR Citing	
Journal of the AIS	JAIS	2000		IS		IS	X	AIS website	JCR Citing	tabulated manually
Journal of the American Society for	JASIS	1970		IS		IS	X	JCR Citing (SCI,	JCR Citing	

Information Science								SSCI)		
Knowledge-Based Systems	KBS	1987	Hybrid	Allied		NA	X	JCR Citing (SCI)	JCR Citing	
Management Science	MS	1954	Non-IS	Allied	OR	OR	X	JCR Citing (SSCI)	JCR Citing	
MIS Quarterly	MISQ	1977	Pure IS	IS	MIS	IS	X	JCR Citing (SSCI)	JCR Citing	
MISQ Discovery	MISQD			IS		---		Journal website	n/a	ceased publication in 1998
OMEGA	Omega	1973	Non-IS	Allied	MIS	NA	X	JCR Citing (SSCI)	JCR Citing	
Operations Research	OR	1952	Non-IS	Allied		OR	X	JCR Citing (SCI)	JCR Citing	
Organization Science	OS	1990	Non-IS	Allied	Mgmt	Mgmt/Prof	X	JCR Citing (SSCI)	JCR Citing	
Organizational Behavior and Human Decision Processes	OBHDP	1985	Non-IS	Allied		NA	X	JCR Citing (SSCI)	JCR Citing	
PCWorld	PCW			Prof		---		EBSCOHost	JCR Citing	excluded due to insufficient citations
Quality Progress	QP	1968		Allied		NA	X	JCR Citing (SCI)	JCR Citing	
Scandinavian J. of Information Systems	SJIS	1989		IS		IS	X	Journal website	JCR Citing	tabulated manually
Simulation	Sim	1963	Non-IS	Allied		NA	X	JCR Citing (SCI)	JCR Citing	
Sloan Management Review	SMR	1959	Non-IS	Prof	Mgmt	Mgmt/Prof	X	JCR Citing (SSCI)	JCR Citing	
Wirtschaftsinformatik	WIRT	1958		IS		IS	X	JCR Citing (SCI)	JCR Citing	

[a] Walstrom & Hardgrave 2001 Categories:
Pure IS = "Pure IS" journal
Hybrid = "Hybrid IS" journal
Partial = "Partial IS" journal
Non-IS = "Non-IS" journal

[b] Peffers & Tang 2003 Categories:
Allied = Allied Discipline journal
IS = Information Systems journal
Prof = Professional/Managerial journal

[c] Rainer & Miller 2005 Categories:
CS = Computer Science journal
Mgmt = Management journal
MIS = "Pure" MIS journal
OR = Operations Research / Operations Management journal

Table 12. Selected Journal Relationships from Figure 1 (Information Flow, .05 Threshold)

Journal	Reciprocated Ties With	Receives Information From	Source of Information For
ACMTIS	IPM	CACM, IEEETDKE, JASIS	ACMSIGIR, ACMSIGMOD, ACMTCHI, HCI
DSI	-------	AMJ, AMR, ASQ, EJOR, HBR, MS, MISQ, OS	JISA, Omega
EJIS	-------	CACM, HBR, I&M, MISQ, MS, OS	ISJ
HCI	CSCW, IJHCS, ACMTCHI	ACMTIS, CACM, OS	BIT
I&M	-------	CACM, JMIS, MISQ, MS	ACMECX, AJIS, BIT, CAIS, CommRsch, EJIS, DATABASE, IJIM, IRMJ, ISM, JCIS, JGIM, JOCEC, JOEUC, WIRT
IEEETEM	-------	AMJ, AMR, ASQ, CACM, HBR, MISQ, MS, OS	-------
IEEETSE	ACMTPLS, IEEESw, IST, JS&S	ACMTISS, CACM	ACMSIGPLN, ACMSIGSFT, ACMTCS, ACMTMS, ACMTSEM, ACS, CompJ, IS, JSwME, KBS, Sim, WIRT
IJHCS	-------	BIT, CACM, HCI	ACMTCHI, BIT, CSCW, HCI, IEEEIS, KBS
IS	ACMSIGMOD, IEEEComp	ACMTDS, CACM, IEEETDKE, IEEETSE, IEEETSMC	IJIM, ISF, ISJ, ISM, JIT, MISQ, WIRT
ISR	MISQ	AMR, CACM, MS, OS	ACMECX, AJIS, CAIS, DATABASE, ECRA, Emkt, IJEC, IRMJ, ISJ, IT&P, JAIS, JGIM, JISA, JMIS, JOCEC, JOEUC, SJIS
JAIS	-------	CACM, ISR, MISQ, MS, OS	-------
JMIS	MISQ	AMJ, ASQ, CACM, MS	CAIS, CommRsch, I&M, IRMJ, ISF, JGIM, JOCEC, JOEUC, JSIS
MISQ	ISR, JMIS		24 IS journals: AJIS, CAIS, DATABASE, ECRA, Emkt, I&M, IJEC, InfSoc, IRMJ, ISF, ISJ, ISM, IT&M, IT&P, JAIS, JCIS, JGIM, JISci, JIT, JOCEC, JOEUC, JSIS, SJIS, WIRT 6 unclassified journals: ACMECX, BIT, CACM, CommRsch, DSI, JISA 1 CS journal: IEEETEM

Table 13. Full Network Centrality / Prestige Rankings

Valued Freeman Degree			Bonacich Power (Beta = 0.697)			Information Centrality		
Rank	Journal	Normed Score	Rank	Journal	Raw Score	Rank	Journal	Raw Score
1	*CACM*	11.421	1	*CACM*	389.666	1	*CACM*	0.5520
2	*MS*	6.335	2	*ASQ*	362.679	2	*MS*	0.5093
3	*MISQ*	5.431	3	*MS*	328.020	3	*MISQ*	0.5003
4	*ASQ*	3.972	4	*HBR*	280.341	4	*IEEETSE*	0.4621
5	*HBR*	3.644	5	*AMJ*	274.213	5	*ASQ*	0.4619
6	*IEEETComp*	3.618	6	*AMR*	255.730	6	*HBR*	0.4615
7	*IEEETSE*	3.561	7	*MISQ*	250.819	7	*IEEETComp*	0.4610
8	*AMJ*	3.051	8	*OS*	241.499	8	*IEEEComp*	0.4561
9	*IEEETIT*	3.000	9	*OR*	170.118	9	*OS*	0.4469
10	*JACM*	2.976	10	*ISR*	158.772	10	*JACM*	0.4455
11	*IEEEComp*	2.968	11	*IEEEComp*	156.708	11	*AMR*	0.4441
12	*AMR*	2.952	12	*SMR*	155.134	12	*AMJ*	0.4417
13	*IEEETPAM*	2.903	13	*IEEETSE*	152.693	13	*AI*	0.4372
14	*OS*	2.873	14	*EJOR*	147.368	14	*ISR*	0.4368
15	*AI*	2.682	15	*OBHDP*	146.015	15	*I&M*	0.4270
16	*EJOR*	2.402	16	*IEEETComp*	144.316	16	*JMIS*	0.4233
17	*OR*	2.366	17	*JMIS*	141.231	17	*EJOR*	0.4226
18	*IEEETComm*	2.319	18	*JM*	137.697	18	*OR*	0.4188
19	*ISR*	2.279	19	*JACM*	132.432	19	*IEEETPAM*	0.4183
20	*JASIS*	2.145	20	*I&M*	132.057	20	*IS*	0.4157
21	*I&M*	2.011	21	*CMR*	126.110	21	*IEEETKDE*	0.4123
22	*JMIS*	1.928	22	*DSI*	124.441	22	*ACS*	0.4049
23	*IEEETKDE*	1.725	23	*IEEESw*	118.865	23	*SMR*	0.4041
24	*TranNtwk*	1.707	24	*AI*	115.072	24	*JASIS*	0.4020
25	*IS*	1.675	25	*IEEETIT*	114.049	25	*IEEESw*	0.3995
26	*SMR*	1.618	26	*IBMSJ*	106.532	26	*IEEETIT*	0.3942
27	*IEEESw*	1.537	27	*JASIS*	101.618	27	*IJHCS*	0.3919
28	*ACS*	1.501	28	*IS*	99.803	28	*TranNtwk*	0.3883
29	*ACMTPLS*	1.394	29	*ACMTMS*	99.417	29	*DSI*	0.3870
30	*IJHCS*	1.295	30	*IEEETComm*	98.955	30	*ACMTPLS*	0.3847
31	*DSI*	1.206	31	*ACMTPLS*	97.755	31	*IEEETSMC*	0.3773
32	*IEEETSMC*	1.204	32	*IEEETPAM*	97.200	32	*DSS*	0.3771
33	*IPM*	1.188	33	*IEEETEM*	96.406	33	*ACMTDS*	0.3761
34	*ACMTDS*	1.116	34	*IJEC*	96.288	34	*IBMSJ*	0.3742
35	*ACMTCS*	1.111	35	*INTFCS*	95.333	35	*ACMTCS*	0.3734
36	*JCSS*	1.074	36	*DSS*	95.023	36	*IEEEIS*	0.3711
37	*OBHDP*	1.028	37	*IJHCS*	94.655	37	*OBHDP*	0.3679
38	*IEEETIP*	1.023	38	*ACS*	94.120	38	*IEEETPDS*	0.3675
39	*IEEETPDS*	1.010	39	*InfSoc*	92.700	39	*ACMTIS*	0.3648
40	*IEEEIS*	1.001	40	*JETM*	89.669	40	*JCSS*	0.3636
41	*DSS*	0.996	41	*IEEETKDE*	89.615	41	*IEEETComm*	0.3612

42	*IBMSJ*	0.957	42	*BH*	88.176	42	*IPM*	0.3608
43	*ACMTIS*	0.912	43	*EJIS*	87.610	43	*CMR*	0.3580
44	*CMR*	0.874	44	*ACMSIGCSE*	87.392	44	*ACMSIGMOD*	0.3523
45	*IEEETNN*	0.799	45	*IJTM*	86.314	45	*HCI*	0.3491
46	*ACMSIGMOD*	0.770	46	*ACMTCS*	86.085	46	*JS&S*	0.3456
47	*HCI*	0.757	47	*JCSS*	86.052	47	*IEEETNN*	0.3438
48	*JM*	0.730	48	*JIT*	84.206	48	*JM*	0.3397
49	*ACMSIGPLN*	0.695	49	*Omega*	83.784	49	*ACMSIGPLN*	0.3386
50	*JS&S*	0.681	50	*ACMTIS*	83.518	50	*IJEC*	0.3383
51	*ACMTG*	0.656	51	*HCI*	81.013	51	*EJIS*	0.3375
52	*AIMag*	0.641	52	*TranNtwk*	80.996	52	*IEEETIP*	0.3368
53	*EJIS*	0.555	53	*DATABASE*	80.987	53	*CompJ*	0.3312
54	*IJEC*	0.553	54	*IEEETPDS*	80.462	54	*AIMag*	0.3302
55	*ACMSIGCOM*	0.518	55	*ISJ*	80.299	55	*IST*	0.3273
56	*CompJ*	0.489	56	*ACMSIGPLN*	80.227	56	*Omega*	0.3264
57	*INTFCS*	0.481	57	*IJIM*	79.152	57	*ACMTCHI*	0.3263
58	*ACMTCHI*	0.480	58	*JSIS*	78.802	58	*InfSci*	0.3255
59	*IST*	0.465	59	*CommRsch*	78.651	59	*JIT*	0.3243
60	*InfSci*	0.457	60	*ACMTCHI*	77.836	60	*BIT*	0.3195
61	*Omega*	0.451	61	*ACMTDS*	76.582	61	*INTFCS*	0.3195
62	*IEEETVCG*	0.424	62	*JOCEC*	76.455	62	*IEEETEM*	0.3194
63	*JIT*	0.420	63	*IPM*	76.118	63	*IJIM*	0.3182
64	*COR*	0.415	64	*COR*	76.017	64	*ACMSIGCOM*	0.3152
65	*BIT*	0.387	65	*ISM*	75.824	65	*DATABASE*	0.3144
66	*IEEETEM*	0.369	66	*JAIS*	75.275	66	*CSCW*	0.3126
67	*ACMTSEM*	0.362	67	*JS&S*	75.216	67	*COR*	0.3122
68	*IJIM*	0.359	68	*BIT*	74.804	68	*ISJ*	0.3122
69	*CSCW*	0.340	69	*Emkt*	74.439	69	*InfSoc*	0.3110
70	*CommRsch*	0.330	70	*CAIS*	74.069	70	*CommRsch*	0.3106
71	*DATABASE*	0.324	71	*IEEEIS*	73.986	71	*ACMTSEM*	0.3106
72	*CHB*	0.306	72	*CSCW*	72.934	72	*CHB*	0.3096
73	*InfSoc*	0.303	73	*IT&P*	72.159	73	*ISM*	0.3019
74	*ISJ*	0.303	74	*SJIS*	71.809	74	*JSIS*	0.3008
75	*Jcomp*	0.254	75	*JISA*	71.618	75	*ACMTMS*	0.2998
76	*JSIS*	0.216	76	*JCIS*	70.821	76	*Emkt*	0.2990
77	*ISM*	0.212	77	*ISF*	70.743	77	*ESA*	0.2981
78	*ACMTMS*	0.210	78	*Jcomp*	70.416	78	*JISA*	0.2962
79	*IJIS*	0.203	79	*CHB*	70.021	79	*Jcomp*	0.2959
80	*Emkt*	0.190	80	*IST*	69.929	80	*IJIS*	0.2947
81	*ACMSIGARCH*	0.176	81	*IRMJ*	69.830	81	*CAIS*	0.2932
82	*ESA*	0.171	82	*IEEETSMC*	69.006	82	*KBS*	0.2928
83	*ACMTMC*	0.169	83	*IT&M*	68.427	83	*IRMJ*	0.2914
84	*JISA*	0.166	84	*JGIM*	68.027	84	*ACMTMC*	0.2901
85	*ACMSIGKDD*	0.160	85	*JOEUC*	67.938	85	*ACMSIGARCH*	0.2890
86	*KBS*	0.149	86	*WIRT*	67.616	86	*ACMSIGKDD*	0.2890

87	*CAIS*	0.147	87	*CompJ*	67.565	87	*JAIS*	0.2884
88	*BH*	0.139	88	*INFOR*	67.014	88	*ACMTIT*	0.2884
89	*IRMJ*	0.136	89	*AIMag*	66.784	89	*JOCEC*	0.2877
90	*IEEETWC*	0.126	90	*ACMTMC*	66.641	90	*ISF*	0.2869
91	*ACMSIGOPS*	0.125	91	*ACMTSEM*	66.400	91	*ACMSIGOPS*	0.2868
92	*ACMSIGMET*	0.119	92	*ECRA*	63.121	92	*Sim*	0.2850
93	*JAIS*	0.115	93	*AJIS*	62.235	93	*BH*	0.2846
94	*IEEETM*	0.114	94	*ACMSIGMOD*	61.985	94	*JCIS*	0.2839
95	*Sim*	0.110	95	*ACMTIT*	61.558	95	*IJTM*	0.2831
96	*IJTM*	0.107	96	*IEEETIP*	60.097	96	*JGIM*	0.2825
97	*ACMTIT*	0.106	97	*JISci*	58.069	97	*IT&P*	0.2820
98	*ACMTDAE*	0.105	98	*ACMTISS*	56.363	98	*ACMSIGMET*	0.2816
99	*JOCEC*	0.102	99	*ACMSIGSFT*	56.178	99	*JDM*	0.2815
100	*IEEETSAP*	0.099	100	*ACMECX*	55.946	100	*ACMTISS*	0.2813
101	*InfRes*	0.087	101	*ESA*	55.719	101	*IT&M*	0.2807
102	*JISci*	0.086	102	*ACMSIGARCH*	55.544	102	*AJIS*	0.2789
103	*INFOR*	0.085	103	*JDM*	55.329	103	*ACMSIGCSE*	0.2783
104	*ISF*	0.084	104	*Sim*	54.464	104	*SJIS*	0.2783
105	*JCIS*	0.071	105	*IEEETNN*	53.612	105	*WIRT*	0.2783
106	*JGIM*	0.069	106	*ACMSIGCOM*	53.388	106	*JOEUC*	0.2781
107	*ACMSIGIR*	0.067	107	*InfSci*	53.328	107	*JISci*	0.2780
108	*IT&P*	0.066	108	*JSwME*	53.059	108	*ACMSIGSFT*	0.2770
109	*JSwME*	0.066	109	*ACMSIGOPS*	51.944	109	*ACMTG*	0.2766
110	*ACMTISS*	0.066	110	*ACMTDAE*	50.917	110	*JSwME*	0.2763
111	*ACMSIGSFT*	0.063	111	*IEEETITB*	50.484	111	*ACMTDAE*	0.2760
112	*ACMTCL*	0.053	112	*KBS*	49.624	112	*ECRA*	0.2758
113	*JDM*	0.048	113	*ACMTECS*	49.247	113	*ACMECX*	0.2756
114	*SJIS*	0.047	114	*ACMTCL*	48.435	114	*ACMSIGIR*	0.2734
115	*ACMSIGCSE*	0.042	115	*ACMSIGMET*	48.212	115	*ACMTECS*	0.2732
116	*JOEUC*	0.039	116	*ACMSIGIR*	48.069	116	*IEEETM*	0.2726
117	*IT&M*	0.039	117	*ACMTG*	47.409	117	*ACMTCL*	0.2710
118	*ACMTECS*	0.039	118	*InfRes*	46.991	118	*INFOR*	0.2705
119	*AJIS*	0.036	119	*IJIS*	44.567	119	*JETM*	0.2703
120	*QP*	0.033	120	*ACMSIGKDD*	43.217	120	*IEEETITB*	0.2690
121	*WIRT*	0.029	121	*IEEETWC*	41.039	121	*InfRes*	0.2687
122	*JETM*	0.022	122	*IEEETSAP*	39.281	122	*IEEETSAP*	0.2615
123	*ACMECX*	0.015	123	*IEEETM*	39.132	123	*IEEETVCG*	0.2572
124	*IEEETITB*	0.013	124	*IEEETVCG*	38.459	124	*IEEETWC*	0.2413
125	*ECRA*	0.007	125	*QP*	2.024	125	*QP*	0.0319

Table 14. Centrality / Prestige Rankings for Only Journals Classified as "IS"								
Valued Freeman Degree			Bonacich Power (Beta = 0.697)			Information Centrality		
Rank	Journal	Normed Score	Rank	Journal	Raw Score	Rank	Journal	Raw Score
3	*MISQ*	5.431	7	*MISQ*	250.819	3	*MISQ*	0.5003
19	*ISR*	2.279	10	*ISR*	158.772	14	*ISR*	0.4368
20	*JASIS*	2.145	17	*JMIS*	141.231	15	*I&M*	0.4270
21	*I&M*	2.011	18	*JM*	137.697	16	*JMIS*	0.4233
22	*JMIS*	1.928	20	*I&M*	132.057	20	*IS*	0.4157
25	*IS*	1.675	26	*IBMSJ*	106.532	24	*JASIS*	0.4020
33	*IPM*	1.188	27	*JASIS*	101.618	32	*DSS*	0.3771
41	*DSS*	0.996	28	*IS*	99.803	34	*IBMSJ*	0.3742
42	*IBMSJ*	0.957	34	*IJEC*	96.288	42	*IPM*	0.3608
48	*JM*	0.730	36	*DSS*	95.023	48	*JM*	0.3397
53	*EJIS*	0.555	39	*InfSoc*	92.700	50	*IJEC*	0.3383
54	*IJEC*	0.553	43	*EJIS*	87.610	51	*EJIS*	0.3375
56	*CompJ*	0.489	45	*IJTM*	86.314	53	*CompJ*	0.3312
59	*IST*	0.465	48	*JIT*	84.206	55	*IST*	0.3273
60	*InfSci*	0.457	53	*DATABASE*	80.987	58	*InfSci*	0.3255
63	*JIT*	0.420	55	*ISJ*	80.299	59	*JIT*	0.3243
68	*IJIM*	0.359	57	*IJIM*	79.152	63	*IJIM*	0.3182
69	*CSCW*	0.340	58	*JSIS*	78.802	65	*DATABASE*	0.3144
71	*DATABASE*	0.324	62	*JOCEC*	76.455	66	*CSCW*	0.3126
73	*InfSoc*	0.303	63	*IPM*	76.118	68	*ISJ*	0.3122
74	*ISJ*	0.303	65	*ISM*	75.824	69	*InfSoc*	0.3110
76	*JSIS*	0.216	66	*JAIS*	75.275	73	*ISM*	0.3019
77	*ISM*	0.212	69	*Emkt*	74.439	74	*JSIS*	0.3008
80	*Emkt*	0.190	70	*CAIS*	74.069	76	*Emkt*	0.2990
87	*CAIS*	0.147	72	*CSCW*	72.934	81	*CAIS*	0.2932
89	*IRMJ*	0.136	73	*IT&P*	72.159	83	*IRMJ*	0.2914
93	*JAIS*	0.115	74	*SJIS*	71.809	87	*JAIS*	0.2884
96	*IJTM*	0.107	76	*JCIS*	70.821	89	*JOCEC*	0.2877
99	*JOCEC*	0.102	77	*ISF*	70.743	90	*ISF*	0.2869
101	*InfRes*	0.087	80	*IST*	69.929	94	*JCIS*	0.2839
102	*JISci*	0.086	81	*IRMJ*	69.830	95	*IJTM*	0.2831
104	*ISF*	0.084	83	*IT&M*	68.427	96	*JGIM*	0.2825
105	*JCIS*	0.071	84	*JGIM*	68.027	97	*IT&P*	0.2820
106	*JGIM*	0.069	85	*JOEUC*	67.938	99	*JDM*	0.2815
108	*IT&P*	0.066	86	*WIRT*	67.616	101	*IT&M*	0.2807
113	*JDM*	0.048	87	*CompJ*	67.565	102	*AJIS*	0.2789
114	*SJIS*	0.047	92	*ECRA*	63.121	104	*SJIS*	0.2783
116	*JOEUC*	0.039	93	*AJIS*	62.235	105	*WIRT*	0.2783
117	*IT&M*	0.039	97	*JISci*	58.069	106	*JOEUC*	0.2781
119	*AJIS*	0.036	103	*JDM*	55.329	107	*JISci*	0.2780
121	*WIRT*	0.029	107	*InfSci*	53.328	112	*ECRA*	0.2758
125	*ECRA*	0.007	118	*InfRes*	46.991	121	*InfRes*	0.2687

Note: In following the classification criteria from Table 3, this truncated list (based on centrality/prestige within the full 125-journal network) includes journals that are not typically seen in a list of IS journals (e.g., *JM*), thus readers should treat with caution the results for some of the journals with a high rank score.

Appendix: Figures

```
BI-CONNECTED COMPONENTS (BLOCKS)
---------------------------------------------------------------------
Block  1:  ISR MISQ
Block  2:  JMIS MISQ
Block  3:  CACM MISQ
Block  4:  CACM IEEETComp
Block  5:  ACMSIGPLN ACMTPLS
Block  6:  ACMSIGMOD IS
Block  7:  ACMSIGMOD ACMTDS
Block  8:  ACMTDS IEEETKDE
Block  9:  ACMTDS JACM
Block 10:  AIMag IEEEIS
Block 11:  AI AIMag
Block 12:  IEEETIP IEEETPAM
Block 13:  AI IEEETNN IEEETPAM IEEETSMC
Block 14:  AI JACM
Block 15:  JACM JCSS
Block 16:  ACMTPLS JACM
Block 17:  ACMTPLS IEEETSE
Block 18:  IEEEComp IEEESw IEEETSE IST JS&S
Block 19:  IEEEComp IEEETComp
Block 20:  ACMTCS IEEETPDS
Block 21:  IEEETComp IEEETPDS
Block 22:  IEEETComp TranNtwk
Block 23:  ACMSIGCOM TranNtwk
Block 24:  BIT HCI IJHCS
Block 25:  CSCW HCI
Block 26:  ACMTCHI HCI
Block 27:  ACMTG IEEETVCG
Block 28:  IPM JASIS
Block 29:  ACMTIS IPM
Block 30:  ACMTMC Sim
Block 31:  COR EJOR
Block 32:  INTFCS OR
Block 33:  EJOR MS OR
Block 34:  AMJ AMR ASQ JM MS OBHDP OS
Block 35:  CHB CommRsch
Block 36:  CMR SMR
Block 37:  IEEETComm IEEETIT
Block 38:  IJIS InfSci

Articulation points (cutpoints)
---------------------------------------------------------------------
Node  8:  ACMSIGMOD      Node 52:  HCI          Node 94:  JACM
Node 16:  ACMTDS         Node 55:  IEEEComp     Node114:  MISQ
Node 24:  ACMTPLS        Node 59:  IEEETComp    Node115:  MS
Node 27:  AI             Node 67:  IEEETPAM     Node117:  OR
Node 28:  AIMag          Node 68:  IEEETPDS     Node124:  TranNtwk
Node 35:  CACM           Node 70:  IEEETSE
Node 48:  EJOR           Node 81:  IPM
```

Figure 4. Modified UCINET Printout of Network Blocks and Cutpoints

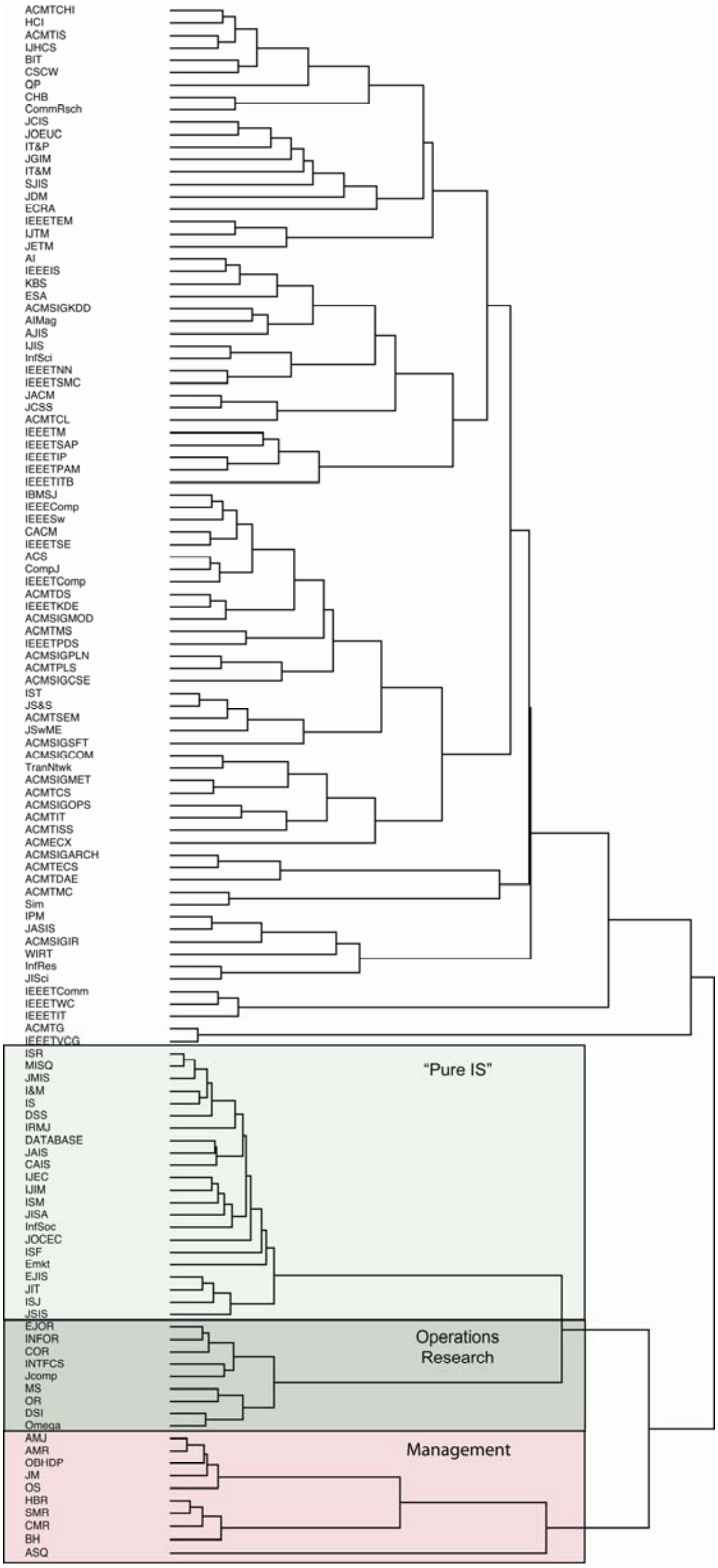

Figure 5. Dendrogram (Double Normalized Data)

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