Citation Networks of Communication Journals, 1977-1985

Cliques and Positions, Citations Made and Citations Received

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This article analyzes the pattern of citations among all communication journals covered by the first nine years of the Journal Citation Reports *volume of the* Social Sciences Citation Index *(Garfield, 1977-1985). It approaches these analyses from two perspectives: (1) bibliometric analysis of citation flows, ratios, and impact factors, and (2) network analysis of both cohesion-based and position-based citation patterns. The field of communication exhibits clear clustering and inbreeding, consisting of cliques of interpersonal journals, mass media journals, and residual isolate journals. Citation patterns within and across these cliques have been very stable from 1977 through 1985. The cohesion analyses show that* Human Communication Research *and* Communication Education *provide weak ties from mass media journals to interpersonal communication journals. The* Journal of Communication *is cited the most strongly by the most journals, and provides, by means of citations, bidirectional channels for the flow of scientific information between mass media journals and interpersonal journals. The positional analyses show that the set of journals that has similar citing patterns is somewhat different from the set of journals that is cited similarly. In particular, the set of sources for the research reported in articles in these journals is not similar to the set of journals that refer to the articles in these journals.*

Bibliometric studies assume that journal citations are an important (but not the sole) indicator of patterns of scientific communication, and therefore are one indicator of the structure of scientific knowledge and disciplinary boundaries such as invisible colleges (Crane, 1972; Garfield, 1979; Price, 1965). A reference

Human Communication Research, Vol. 15 No. 2, Winter 1988 256-283

to an article in a journal generally indicates that the cited article is a relevant source of information for the topic being reported, and important enough to bring to the attention of other scholars. It may be a reference to findings of fundamental research, to a research method, a critique of prior research, an acknowledgment of a peer's contribution or some other intellectual debt, or sometimes a symbolic or cosmetic act (Garfield, 1972; Moravcsik & Murugesan, 1975).

The purpose of this article is to update and expand an earlier evaluation of citation patterns among core journals in communication (Reeves & Borgman, 1983). The original study, conducted with data drawn from the volumes of nine journals published from 1977 through 1979, selected informally but confirmed as the core cluster by an analysis of the discipline impact factors (Hirst, 1978). The article described citations to journals within and outside of communication, and presented a network of communication links between journals based on the frequency of citations. This information was used to evaluate the contributions of communication journals within the field of communication and relative to other social sciences. The amount of scholarly exchange between communication research specialties was also assessed, especially the exchange between the traditionally distinct areas of mass communication and interpersonal communication.

The main conclusions from the prior study included: (1) communication journals made only 13% of their citations to the set of nine core communication journals (and 44% of those were self-citations to articles published in the same journal); (2) the journals made an average of five citations for every one citation they received (see So, this issue, for a criticism of this conclusion); and (3) the nine core journals clustered

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into two distinct groups, interpersonal and mass communication, with one journal (*Human Communication Research)* linking them. Three generalizations emerged: (1) communication is a field with two separate subliteratures—mass communication and interpersonal communication; (2) the field is heavily dependent on sources outside of the core journals; and (3) communication cites other literatures more often than it is cited. These results were consistent with other recent analyses that demonstrate a split between mass and interpersonal communication (Paisley, 1984, 1986; Reardon & Rogers, this issue; So, this issue). The results were also similar to earlier analyses that showed communication citations to be scattered through the social sciences with no particular common core (Parker, Paisley, & Garrett, 1967; Schramm, 1966).

The present analysis expands the dataset to the full list of 20 unique communication journals covered by the *Social Sciences Citation Index (SSCI)* over the first nine years of *SSCI* coverage (1977-1985). Updating the analysis of the division between mass and interpersonal communication was of particular interest in the present study because the history and rationale for this division continues to be an important issue for current scholarship, histories of communication research, and university administration (Bochner & Eisenberg, 1985; Paisley, 1984; Reardon & Rogers, this issue). Most writers attribute the distinctions between these areas to politics and convenience rather than to intellectual differences. Consequently, the rigid separation may inhibit the growth of communication theory that could benefit from intellectual convergence (Chaffee, 1982).

What reasons are there to expect a shift in citation patterns from the 1970s to the 1980s? Establishing a direct link between shifts in the conduct of research and citation patterns is difficult, but there are field activities that suggest possible changes. Most relate to interactions among subareas of the field rather than to any increased prestige, or use, of communication journals outside the field of communication. The most obvious differences are overt attempts to link scholars and literatures. These activities include convention programs and association activities designed to integrate scholars (e.g., the 1985 and 1986 ICA programs titled *Paradigms in Dialogue* and the *Journal of Communication* special issue "Ferment in the Field"). Other administrative indices of change include the increased hiring of assistant professors with significant training (and often a degree) outside of communication, greater emphasis on behavioral science issues in academic departments with practical training programs in rhetoric,

journalism, or library/ information science, and the development of joint communication, information, and library science programs. There has also been a rise in edited books that specifically combine literatures within communication or across communication and information science (e.g., Berger & Chaffee, 1987; Jablin, Putnam, Roberts, & Porter, 1987; Roloff & Berger, 1982), and annual series by editors such as Dervin and Voigt, Ruben, and Williams (see references) that extend this process. Substantive influences toward integration or at least cross-citation also include the growing importance to both interpersonal and mass communication, in research and practice, of computer-based information and communication technologies. The processes supported by these systems (communication, organizational structuring, information processing, and decision support) provide common arenas for testing theories and require interdisciplinary approaches for deeper understanding of communication processes (Rice & Associates, 1984).

There also may be greater theoretical similarities in current research. The emergence of process-oriented topics in mass communication research, rather than policy- and issue-oriented research, could influence scholarly exchange. Research about media effects is less focused on issues such as violence, Saturday morning television advertising, or televised political debates. Instead, studies tend to examine processes, common to several issues, that focus on concepts such as attention and memory, emotion, or language. These concepts accent the similarities between subareas in communication and have prompted use of theoretical literatures based in more traditional disciplines, especially psychology. If these activities open communication researchers to new literatures, eventually this should be apparent in citation exchanges between subareas within communication and between communication and other disciplines.

There are, however, similarities between current and older patterns of communication that suggest change may be difficult, even if warranted. Paisley (1984), using several different indices of communication among researchers (based on data from 1981), found continued evidence for academic "ethnocentrism" or inbreeding. His results included the following: (1) the same small group of universities continues to dominate the field, as indicated by placement of new Ph.D.'s, participation at academic conferences in communication, and authorship in review books; (2) two distinct interest groups are still apparent (mass communication and speech/interpersonal communication), and these groups react more ethnocentrically to each

other than to other areas in the broader social sciences; (3) mass communication journals and researchers are more closed to other areas than are some other interest groups; and (4) subgroups within the field (as indicated by major divisions of the International Communication Association) still do not share the same concepts or have the same roots in older literature.

Our questions, then, are still quite fundamental: (1) Are there two (or more) distinct subdisciplines of communication research as indicated by citation patterns among communication journals? (2) Has the pattern of making and receiving citations changed in the past decade? (3) Do journals represent different subdisciplines in communication research based upon the citations they make versus the citations they receive?

DATA

Data Collection

The data used for this study were drawn from the *Journal Citation Reports* (*JCR*) volume of the *Social Sciences Citation Index (SSCI)* for the years 1977 through 1985 (Garfield, 1977-1985). The data compilation for the prior year is issued late in the following year; hence, the 1985 volume issued in late 1986 was the most recent data available as of this writing.

The *JCR* is a compilation of data on citations made to and from social sciences journals; in addition, citations to and from journals covered in the *Social Science Citation Index* and the *Arts and Humanities Index* are included. For example, the data for the 1979 *JCR* were drawn from 700,000 articles published in the 1979 issues of 6,000 journals. The data used to create the *JCR* are (1) journal titles and years of publication of articles cited during a given year and the titles of journals that cited them, and (2) articles in a given year and the titles and years of all journals they cited during that year.

These citation data can be used to assess the frequency of reference to a particular journal, by what other journals, and the reliance of a given journal on other journals for its sources of prior research. While these data provide a quantitative, unobtrusive, and computerized measure of the flow of research information between journals within and across disciplines (Paisley, 1984; Rice & Borgman, 1983), they do not indicate the content of those links. Further, these particular

aggregated data measure flow only between journals, and not between specific articles or authors. However, the brief analysis by Reardon and Rogers (this issue) concludes that structural patterns of journal citations reflect patterns of individual articles and their authors.

Selection of Dataset

The present analysis expands the prior dataset to the entire list of communication journals covered by *SSCI* for the full time period available (1977-1985). While some argument can be made with the journals designated as communication journals by *SSCI*, it is a standardized list for which data are available. Some of these journals fall outside common definitions of the field, while other journals that might be included are either assigned to other fields by the *SSCI* or not covered at all by *SSCI*. The list of journals covered by the *SSCI* changes annually. Some of the journals were not covered by *SSCI* for the full nine years. As a result, the dataset is richer in the later years. Several of the journals changed titles and we were careful to include both citing and cited data made under prior titles of a given journal. Table 1 lists all these journals by their former and current (1985) titles along with the abbreviations used throughout this article and the years in which they were covered by *JCR*.[1]

CITATION RESULTS

Citation Levels and Ratios Among Communication Journals

Table 2 shows the overall pooled citation matrix and summary citation levels and ratios for the years 1977-1985 (justification for this pooling is provided below). The average number of citations *made* to communication journals by communication journals in the period 1977-1985 was 650; for citations *received*, 650. *JQ* made 2,926 and received 2,680 citations, the largest number, due largely to its high level of self-citation (1,706). *JC* made the next highest number of citations (1,208), and *PQ* received the next highest number of citations (1,585). Readers of *JQ, JC, CE, QJ,* and *JB* are *absolutely* more likely to be exposed to citations to scientific information published in other communication journals (assuming readers access the whole journal instead of receiving, say, a photocopy of just one specific article).

TABLE 1
Communication Journals Listed as Fully Covered in the *Social Sciences Citation Index*

Abbreviation	Full Journal Name	Years Covered
CE	*Communication Education* (formerly *Speech Teacher*)	79-85
CJ	*Columbia Journalism Review*	79-85
CM	*Communication Monographs* (formerly *Speech Monographs*)	77-85
CO	*Communication*	none
CR	*Communication Research*	77-85
CS	*Central States Speech Journal*	77-84, 85 (cites only)
EC	*Educational Communication and Technology Research* (formerly *A V Communication Review*)	77, 79-80, 82-85
HC	*Human Communication Research*	83-85
JB	*Journal of Broadcasting and Electronic Media* (formerly *Journal of Broadcasting*)	77-85
JC	*Journal of Communication*	77-85
JT	*Journal of Technical Writing and Communication*	77, 79, 82-85
JQ	*Journalism Quarterly*	77-85
LA	*Language and Communication*	84-85
ME	*Media Culture and Society*	83-85
PQ	*Public Opinion Quarterly*	75-85
PR	*Public Relations Review*	83-85
QJ	*Quarterly Journal of Speech*	77-85
SC	*Speech Communication*	85
TP	*Telecommunications Policy*	85
WR	*Written Communication*	none

NOTE: Data from aberrant titles may be available for years not covered; see Note 1. This article uses the abbreviations shown here.

The journals with the highest ratios of citations made to citations received included *CE* (1.91), *CS* (1.57), *ME* (1.53) and *CR* (1.49). The lowest ratios belonged to *SC* (.11; because it was covered only in 1985), *PQ* (.54), and *CJ* (.56). *CJ* essentially does not cite other communication journals (its ratio of self-citations to citations received or made are both near 1.0), while *JQ* provides the bulk of the outside cites to *CJ*. *PQ* is cited nearly twice as often as it makes citations (in spite of its second-highest level of self-citations, its ratio of self-citing to cites made is only .58, and to citations received, .64), and across a wide range of other communication journals. The journals showing the lowest ratios of self-citation to cites made or received include *CM*, *CS*, *ME*, *CR* and *JC*; readers of these journals are *proportionally* more likely to be exposed to citations to scientific information flows published in other communication journals.

Impact of Communication Journals Among Social Science Journals

Table 3 shows each journal's impact value for each year and overall. The impact factor is computed by the *JCR* for all journals "fully covered" and is a standard bibliometric indicator of the "importance" of the journal within the social sciences (it is calculated differently than So's impact variable) (Hirst, 1978). The impact factor is the ratio of the citations made to articles appearing in the last two years of the journal, divided by the number of articles published in that journal in those two years. This yields an average number of citations per article for a moving two-year period.[2]

The average impact factor for all communication journals, for 1977 through 1985, is .43, ranging from .37 in 1978 and 1980, to .50 in 1983. This average is 20% lower than the value reported by So (this issue) for 1984 who found that communication had the lowest impact factor of 10 social science fields for that year. An impact factor value of .50 means that, on average, half of all articles in communication journals do not receive even one citation in the subsequent two years. The two highest-impact communication journals are *HC* (average 1.08) and *PQ* (.81). *CM* shows the most consistent long-term rise, while *HC* jumped to the highest level once *JCR* began including it in the annual citation index. The top-impact journals appear to be slightly growing in influence over

(text continues on p. 267)

TABLE 2

Citations and Citation Ratios of Communication Journals, Pooled from 1977 to 1985

	Journal-to-Journal Citation Matrix																			
Journal	*QJ*	*CE*	*CM*	*HC*	*CS*	*LA*	*SC*	*WR*	*EC*	*JT*	*CO*	*TP*	*NE*	*CJ*	*PR*	*CR*	*JB*	*JC*	*PQ*	*JQ*
QJ	626	6	222	37	131	0	2	0	0	0	19	0	0	0	0	8	6	34	9	11
CE	196	534	144	58	111	0	37	0	2	0	0	0	0	0	0	0	25	97	0	0
CM	237	15	384	136	63	2	9	0	0	0	0	0	0	0	0	23	7	43	22	30
HC	40	28	217	255	19	0	19	0	0	0	0	0	0	0	0	44	24	83	17	12
CS	294	33	214	0	117	0	0	0	0	0	6	0	0	0	0	1	4	37	18	0
LA	0	0	2	3	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WR	5	0	5	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	4
EC	0	0	1	0	0	0	0	0	285	0	0	0	0	0	0	0	0	0	0	0
JT	4	3	0	0	2	0	0	0	11	288	0	0	0	3	0	0	0	4	4	6
CO	27	1	4	4	4	0	0	0	0	0	0	0	1	1	1	7	0	24	20	7
TP	0	0	0	0	0	0	0	0	0	0	8	18	0	0	0	0	0	6	0	0
NE	0	0	0	0	0	0	0	0	0	0	8	0	22	2	0	5	0	19	8	5
CJ	0	0	0	0	0	0	0	0	0	0	1	0	0	213	0	0	0	0	0	0
PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	95	12	12	19	9	37
CR	0	8	15	30	3	0	0	0	0	0	0	0	5	1	5	256	64	154	187	207
JB	5	1	4	14	3	0	0	0	7	0	5	0	0	2	0	75	370	189	111	277
JC	16	0	14	26	4	0	0	0	0	0	19	7	17	16	1	63	101	456	174	294
PQ	0	1	16	0	0	0	0	0	0	0	0	0	0	5	0	22	11	46	667	84
JQ	15	1	17	3	4	0	0	0	1	0	74	0	0	137	35	112	253	229	339	1,706
Citation Totals and Ratios																				
Cites	1,111	1,206	971	758	724	15	8	18	286	325	101	32	69	214	184	935	1,063	1,208	852	2,926
Cited	1,465	631	1,261	566	461	14	75	0	306	290	140	25	45	380	137	628	877	1,440	1,505	2,680
Cites/Cited	.76	1.91	.77	1.34	1.57	1.07	.11	—	.93	1.12	.72	1.28	1.53	.56	1.34	1.49	1.21	.84	.54	1.09
Cites/Total	.57	.93	.53	.71	.68	.79	.11	1.00	.93	.99	.42	.82	.75	.56	.81	.72	.68	.55	.48	.75
Self/Cites	.56	.44	.40	.34	.16	.67	1.00	0	1.00	.89	0	.56	.32	1.00	.52	.27	.35	.38	.78	.58
Self/Cited	.43	.85	.30	.45	.25	.71	.11	—	.93	.99	0	.72	.49	.56	.69	.41	.42	.32	.42	.64
Journal	*QJ*	*CE*	*CM*	*HC*	*CS*	*LA*	*SC*	*WR*	*EC*	*JT*	*CO*	*TP*	*NE*	*CJ*	*PR*	*CR*	*JB*	*JC*	*PQ*	*JQ*

NOTE: Table 1 provides full journal titles for abbreviations listed. "Cites" is the total number of citations made by the journal to each of the 20 journals, including self-citations and aberrant forms of title abbreviation. "Cited" is the total number of citations received by the journal from each of the 20 journals studied, including self-citations and aberrant forms of title abbreviation. "Total" is the sum of Cites and Cited. "Self" is the total number of citations that articles in a journal make to past articles published in that same journal (the diagonal values).

the period. The 12 journals with lower impact values, however, appear to be either maintaining their levels of impact or slightly declining.

NETWORK ANALYSIS OF CITATION PATTERNS

Network Analysis: Cohesion and Position Approaches

Network analysis was used to identify the structural aspects of the citation patterns among the 20 communication journals from 1977 to 1985.

Cohesion and positional network analysis are two broad approaches to analyzing the pattern of relations among nodes in a system (Burt, 1980). Typically, the basis for *cohesion* network analyses is the *degree of linkage* between any pair of nodes. If a set of nodes is sufficiently interconnected, that set qualifies as a "group" or "clique." The basis for *positional* network analyses is the *structural equivalence* between nodes. If a set of nodes has sufficiently similar patterns or relationships to all other nodes, that set qualifies as a "position" in the network. Note that members of a *clique* are well connected to each other, while members of a *position* are not necessarily connected at all to each other.

With respect to journal citation analysis, these two approaches answer conceptually different questions. The cohesion approach asks, which communication journals cite each other heavily, and what subdisciplines exist? That is, what areas of communication research exist as shared channels for research results and theoretical debate? The position approach asks, which communication journals exhibit similar patterns either of citing other journals or of being cited by them, and what positions in the system of communication journals exist? (See, for example, Doreian, 1988.) That is, which journals perceive the field of communication research in similar ways or are seen as being similar? We use both approaches to answer both conceptual questions.

Stability of the Journal-to-Journal Citation Network

Stability of the yearly citation networks was tested by first adding together all nine citation matrices, then correlating each yearly matrix with the pooled matrix, using a nonparametric technique for comparing matrices, called Quadratic Assignment (Hubert & Baker, 1978). Each

TABLE 3
Impact Factors of Communication Journals, Yearly from 1977 to 1985 and Pooled

Journal	*QJ*	*CE*	*CM*	*HC*	*CS*	*LA*	*SC*	*WR*	*EC*	*JT*	*CO*	*TP*	*ME*	*CJ*	*PR*	*CR*	*JB*	*JC*	*PQ*	*JQ*
Impact Factor																				
1977	.42	—	.06	—	.11	—	—	—	.39	.10	—	—	—	—	—	.70	.32	.39	1.17	.56
1978	.66	—	.01	—	.23	—	—	—	—	—	—	—	—	—	—	.41	.43	.52	.77	.28
1979	.68	.10	.43	—	.23	—	—	—	.82	—	—	—	—	.15	—	.50	.40	.44	.60	.33
1980	.40	.38	.51	—	.21	—	—	—	.03	—	—	—	—	.23	—	.62	.32	.49	.64	.22
1981*	.45	.16	.43	—	.13	—	—	—	—	—	—	—	—	.09	—	1.12	.32	.46	.87	.31
1982	.27	.41	.68	—	.15	—	—	—	.39	.60	—	—	—	.43	—	.81	.22	.62	.66	.12
1983	.63	.21	.74	1.14	.36	—	—	—	.83	.15	—	—	.34	.34	.13	.85	.39	.55	.64	.14
1984	.30	.46	.84	1.14	.31	.34	—	—	.56	.11	—	—	.26	.32	.44	.51	.26	.68	.73	.26
1985	.24	.25	.94	.69	.07	.71	.41	—	.35	.09	—	.25	.11	.06	.11	.59	.45	.52	1.20	.18
1977-1985	.45	.28	.52	1.08	.20	.53	.41	—	.48	.18	—	.25	.24	.23	.23	.68	.35	.52	.81	.27

NOTE: "Impact factor" is the ratio of the citations made to articles appearing in the last two years of the journal, divided by the number of articles published in that journal in those two years.

year's raw matrix was correlated an average of r = .91 (from .85 in 1982 to .94 in 1981) with the pooled matrix, indicating that the journal-to-journal citation network is stable across this time period.

Analyses of Citation Patterns Using the Cohesion Approach

To detect differentiation in journal-to-journal citation patterns based upon cohesion, the yearly and the pooled citation matrices were analyzed by NEGOPY (Rice & Richards, 1985; Richards & Rice, 1981; Rogers & Kincaid, 1981).[3] Three roles were identified by the network analysis: interpersonal journals, mass media journals, and isolate journals (here, isolate status usually occurs because the journal was not yet published or cited). The roles correspond to the dense citations clustered in three areas around the diagonal of the pooled citation matrix shown in Table 2: interpersonal journals (primarily *QJ, CE, QJ, HC, CS*), isolates (*LA, SC, WR, EC, CO, JT, TP, ME,* and *CJ*), and mass media journals (*PR, CR, JB, JC, PQ,* and *JQ*). Table 4 provides yearly summary statistics of NEGOPY analyses of the raw citation matrix shown in Table 2. The interpersonal and mass media cliques each had an average yearly citation density of approximately 50% (approximately half of all the possible relationships among the journals within each clique actually occurred). The number of shared citation linkages for the mass media journals was generally stable, ranging from 25 to 30 in the last six years, while the number in the interpersonal clique ranged from 11 to 23. The average yearly reciprocation ratio (the percentage of all relationships among journals that represents mutual citation between two journals) for all 20 journals was approximately 33%, and about 50% for each clique, although the mass media clique generally showed a higher yearly reciprocation rate. These reciprocation rates were generally stable except for the last year, 1985 (due probably to incomplete reporting). The average yearly number of citations among interpersonal journals was 17.4, and among mass media journals was 17.1; both averages were generally stable.

The top half of Table 5 shows that active journals were a member of the same clique in consecutive years 75% of the time. Because the prior correlation analysis and this role analysis both indicate a stable overall structure and stable clique membership, most subsequent analyses use the *pooled* citation matrix (Table 2).

The bottom half of Table 5 shows the sharp division between, and inbreeding among, the mass media and interpersonal journal cliques.

TABLE 4
Summary NEGOPY Statistics of Citation Patterns Among Communication Journals, 1977-1985

Journal	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1977-1985 (pooled)*
Membership in Citation Network Clique[a]										
QJ	I	II	II	I	I	I	I	I	I	I
CE	I	I	I	I	I	I	I	I	I	I
CM	I	I	I	I	I	I	I	I	I	I
HC	–	–	–	–	M	I	I	I	I	I
CS	I	I	I	I	I	I	I	I	I	I
LA	–	–	–	–	–	–	II	–	I	I
SC	–	II	I	II	–	–	I	II	I	I
WR	–	–	–	–	–	–	–	–	I	I
EC	–	–	I	–	–	IM	–	–	M	M
JT	M	–	I	M	–	–	–	I	M	M
CO	–	IM	I	M	I	II	I	IM	M	M
TP	–	–	–	–	–	–	IM	–	M	M
ME	–	–	–	M	–	M	M	M	M	M
CJ	M	IM	I	M	M	M	IM	M	IM	M
PR	IM	–	–	–	–	M	M	M	M	M
CR	M	M	I	M	M	M	M	M	M	M
JB	M	M	I	M	M	M	M	M	M	M
JC	M	M	I	M	M	M	M	M	M	M
PQ	M	M	I	M	M	M	M	M	M	M
JQ	M	M	I	M	M	M	M	M	M	M
Density of Relationships Within Cliques										
Interp	.75	.67	.32	.92	.65	.75	.55	.70	.39	.52
MassMed	.60	.90	–	.42	.60	.48	.62	.50	.27	.47
Interp	9	8	50	11	13	15	23	21	22	29
MassMed	18	18	–	30	25	27	26	28	30	67
Mean Number of Citations Within and Between Cliques[b]										
Interp										
Within	19	13	14	19	15	15	19	20	23	69
Between	3	6	6	10	9	8	8	7	8	15
MassMed										
Within	20	17	–	14	18	14	17	18	19	61
Between	3	7	–	5	5	7	7	8	14	9

(continued)

TABLE 4 Continued

Percentage of Citations Reciprocated and Unreciprocated, Overall, and Within										
Overall										
Recip	.28	.32	.31	.30	.30	.23	.31	.31	.20	.33
Unrecip	.44	.36	.37	.39	.40	.54	.38	.37	.59	.34
Interp										
Recip	.39	.41	.47	.57	.31	.30	.44	.53	.20	.51
Unrecip	.39	.36	.26	.26	.31	.49	.33	.24	.50	.23
MassMed										
Recip	.43	.59	–	.40	.51	.31	.56	.44	.31	.48
Unrecip	.23	.16	–	.28	.27	.25	.17	.28	.26	.27

NOTE: Results from NEGOPY, using directionality, forced reciprocation.
a. I = interpersonal clique; II = isolate linked to interpersonal clique; M = mass media clique; IM = isolate linked to mass media clique; – = not published or did not cite others that year.
b. Rounded.

Overall, 61% of the total citations were among mass media journals, 32% were among interpersonal journals, 5% were from interpersonal to mass media, and 2% were in the opposite direction. Of the citations that mass media journals made, 97% were to mass media journals, with 3% going to interpersonal journals; 87% of interpersonal journal citations were to other journals within its clique, and 13% were to mass media journals. Inbreeding within each journal clique, especially among mass media journals, is quite clear.[4]

For clarity of presentation, NEGOPY was again run on the pooled matrix, but with a cutoff equal to the mean citation strength (45) as in the earlier article (Reeves & Borgman, 1983). The results provide a more detailed analysis of the basic division into two core sets of journals, as Figure 1 shows: mass media (*PQ*, *CR*, *JB*, *JC*, and *JQ*) and interpersonal (*HC*, *CS*, *QJ*, *CM*, and *CE*). Both cliques had 5 member journals, but the mass media clique had far greater density (90% versus 60%), more links (18 versus 12), and more reciprocated links (72% versus 44%), again indicating greater inbreeding. However, those reciprocated links that the interpersonal clique had were stronger (an average of 189 citations between any two interpersonal journals versus 166 for any two mass media journals).

Inbreeding within the cliques is further reflected by the presence of only two journals that cite journals in another clique, both interpersonal

TABLE 5
Transition of Communication Journals Within and Across Journal Cliques, and Amount and Percentage of Citations Within and Across Journal Cliques, Based on Journal Citations, 1977-1985

Transitions by Journals Within and Across Cliques

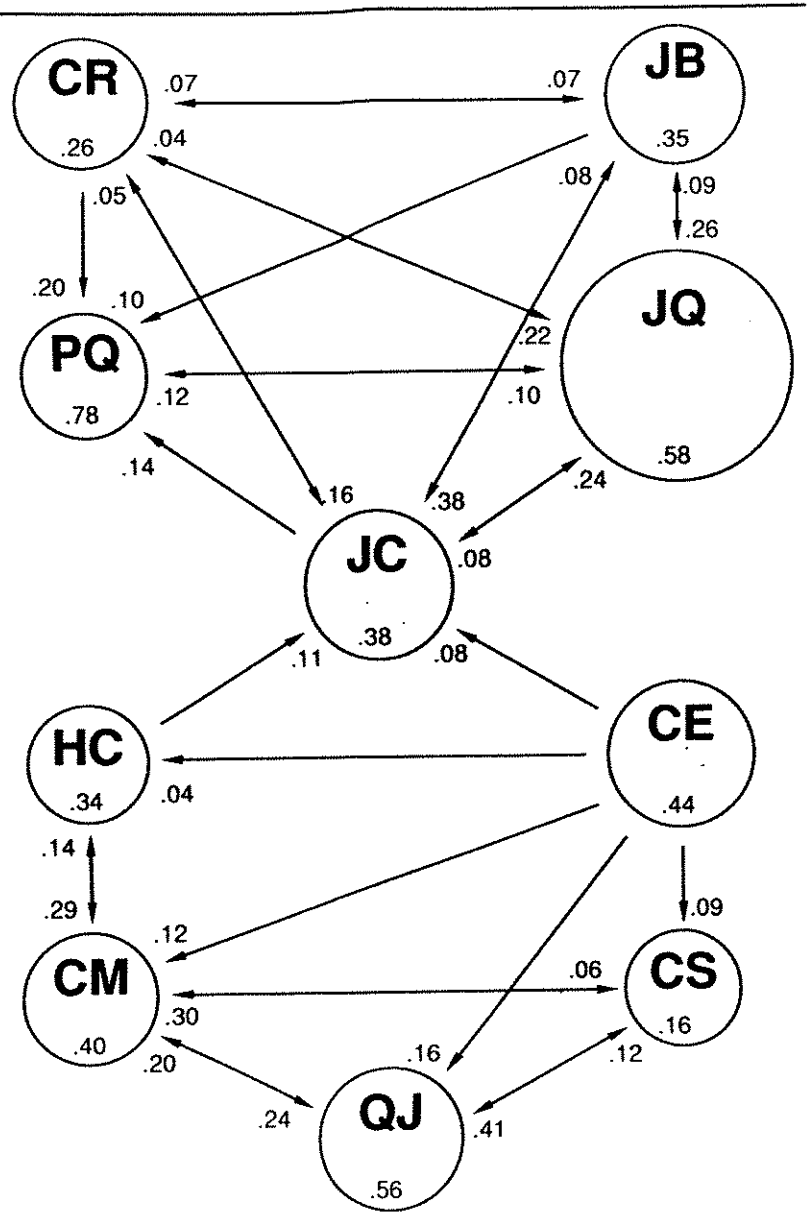
	Interpersonal	*Mass Media*	*Not Cited or Published*	*Grand Total of Transitions*
Interpersonal	41[a]	10	3	
	.76[b]	.19	.06	
Mass Media	9	43	6	
	.16	.74	.11	
Not Cited or Published	8	9	31	160
	.17	.19	.65	

Citations by Journals Within and Across Cliques

	Interpersonal	*Mass Media*	*Grand Total of Transitions*
Interpersonal	4223[c]	588	
	.87[d]	.13	
	.32[e]	.05	
Mass Media	250	7945	
	.03	.97	
	.02	.61	13006

a. Total instances that a journal that was a member of the clique listed in the row in year k was a member of the clique listed in the column in year k + 1.
b. Percentage of the eight yearly comparisons that a journal that was a member of the clique listed in the row in year k was a member of the clique listed in the column in year k + 1.
c. Total citations from articles in journals belonging to the clique listed in the row to articles in journals belonging to the clique listed in the column.
d. Percentage of citations from articles in journals belonging to the clique listed in the row to articles in journals belonging to the clique listed in the column.
e. Percentage of the total number of citations made and received among communication journals, 1977-1985.

journals, both with asymmetric links, and both citing *JC*: *HC* with 83 citations and *CE* with 97 citations. The asymmetric nature of these citations indicates that *HC* and *CE* are "weak links" for the other interpersonal journals, and, as such, may play a valuable role in expanding the diversity of scientific information within the interpersonal



NOTE: Areas of circles are proportional to the total number of citations made listed as "cites" in Table 2. Values are the percentages of citations to a specific journal relative to the total number of citations made by the citing journal. Arrows indicate the direction of flows of more than 45 citations (the mean of all cross-citation flows among the set of communication journals). Results based upon NEGOPY (cohesion) analysis described in text.

Figure 1: Structure of Communication Journal Citation Network, 1977-1985

clique (Granovetter, 1982). Articles in *CE* cite articles in other journals throughout the field of communication research, but are not cited (at the 45 citation cutoff level) as a source of research by articles in any other journal. *JC* receives citations from the most journals (6), and reciprocates all of its mass media citations. *JQ* has 4 reciprocated links, while *PQ* receives citations from four journals, but reciprocates only those from *JC* and *JQ*. Thus *CE*'s position is that of a *follower* in terms of citation status because it only *receives* information flow; *JC* and *JQ* occupy a position of *leadership* as information *carriers* that both *transmit* and *receive* citations; while *PQ* is somewhat of a *snob* within the field of communication because it *transmits* but does not serve primarily as a *receiver* of information flow from other journals (Rice, 1982).

Analyses of Citation Patterns Using the Position Approach

Two methods were used to identify positions in the system of communication journals as indicated by citation patterns: cluster analysis and multidimensional scaling.

Cluster analysis. Two correlation matrices were derived from the pooled citation matrix. The first was created by correlating the *columns* (citations received by pairs of journals) and the second was by correlating the *rows* (citations made by pairs of journals).[5] These two matrices of correlations (similarities) were converted into matrices of distances (dissimilarities), then analyzed by Johnson's hierarchical clustering method (Johnson, 1967).[6]

Figure 2 portrays the cluster analysis only of the distance matrix of citations *received* by journals, to illustrate the nature of clustering results. The results identify clusters of journals that are cited in similar ways by other communication journals, at a given distance threshold. (Note 6 describes the calculation of this threshold, at $p < .01$). The first cluster—interpersonal journals—consists of *HC*, *CM*, *CS*, *QJ*, *CE*, and *SC*. The second cluster—mass media journals—consists of *CR*, *JC*, *JB*, *CO*, and *JQ*. *PQ* and *CJ* would be included in the clique in the next two levels of clustering. Except for *CO*, these are exactly the journals occupying the dense regions of the matrix in Table 2.

Dimensional analysis. Figure 3 shows the (approximate) plot of each journal according to its dimensional coordinates based first on citations received (distances derived from columns of the raw citation matrix) and then on citations made (rows).[7] Using the previous clustering

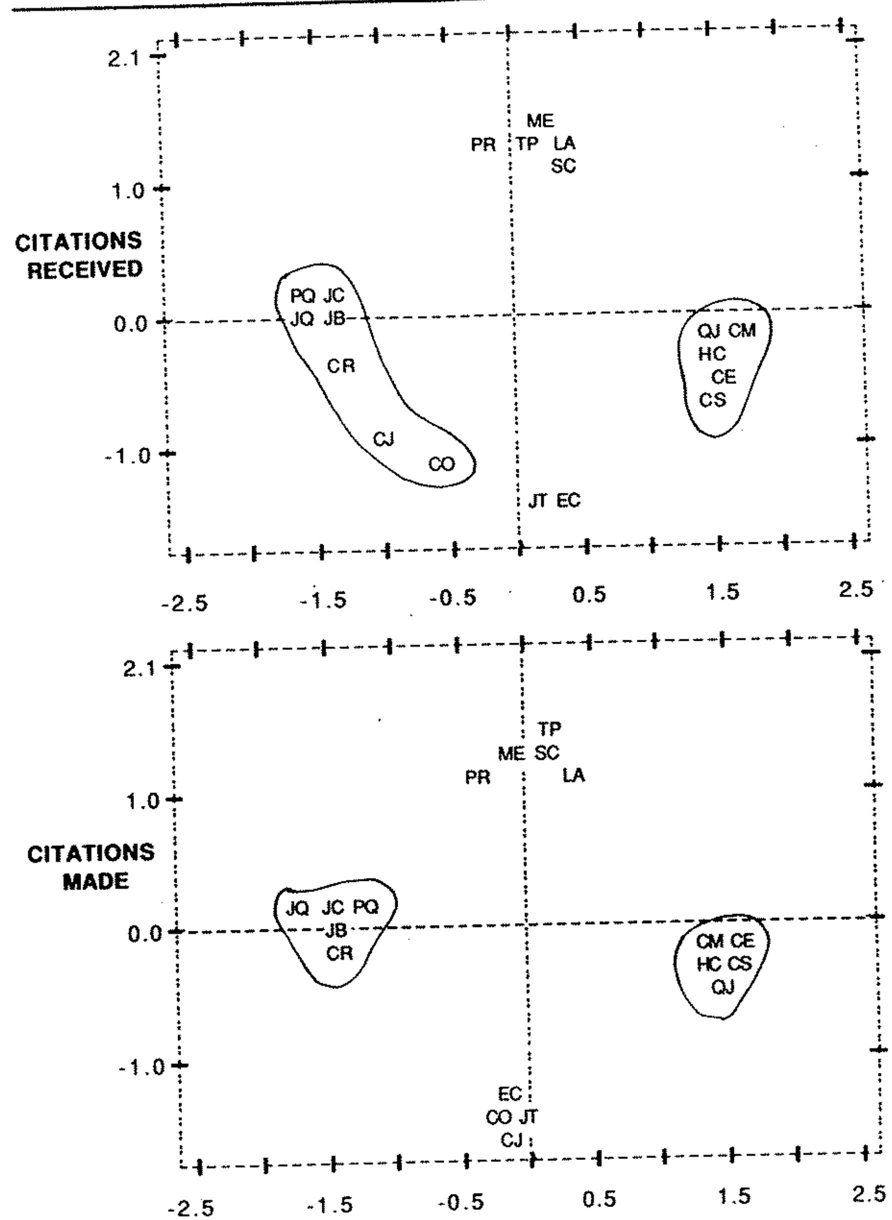
```
Iteration History          Journals..........................
                           E J L H C C Q C S M C C J J C J P P T
                           C T A C M S J E C E J R C B O Q Q R P
   ITER     DISTANCE
    1        1.063         . . . . . . . . . . . . . . . XXX . . .
    2        1.086         . . . . . XXX . . . . . . . . XXX . . .
    3        1.126         . . . . . XXX XXX . . . . . . XXX . . .
    4        1.251         . . . . XXXXX XXX . . . . . . XXX . . .
    5        1.322         . . . XXXXXXX XXX . . . . . . XXX . . .
    6        1.346         . . . XXXXXXX XXX . . . . . XXXXX . . .
    7        1.395         . . . XXXXXXX XXX . . . . XXXXXXX . . .
    8        1.438         . . . XXXXXXXXXXX . . . . XXXXXXX . . .
    9        1.479         . . . XXXXXXXXXXX . . . XXXXXXXXX . . .
 Threshold - - - - - - - - - - - - - - - - - - - - - - - - - - - -
   10        1.529         . . . XXXXXXXXXXX . XXXXXXXXXXX . . .
   11        1.548         . . . XXXXXXXXXXX . XXXXXXXXXXXXX . .
   12        1.564         . . . XXXXXXXXXXX XXXXXXXXXXXXXXX . .
   13        1.717         . . . XXXXXXXXXXX XXXXXXXXXXXXXXXXX .
   14        1.843         . . . XXXXXXXXXXX XXXXXXXXXXXXXXXXXXX
   15        1.907         . . . XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   16        2.001         . . XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   17        2.019         XXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   18        2.060         XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

NOTE: Threshold is the distance at which clusters are significantly distant, $p < .01$. The clustering method, derivation of distances, and significant clustering threshold are described in Note 6.

Figure 2: Analysis Based Upon Distance Matrix Derived from Correlation Matrix of Citations Received, 1977-1985

results to identify journals occupying significantly close dimensional space, the scaling results clearly show separate groupings of mass media journals, interpersonal journals, and "isolate" journals. The results are generally similar to those from the NEGOPY analysis with a citation cutoff of 45. However, for the scaling of the *cited* patterns (column correlation) *CO* is, and *PQ* is not, included in the mass media cluster. That is, CO is slightly more structurally similar to other mass media journals, as indicated by patterns of being cited, than is *PQ*.

For the scaling of the *citing* patterns (row correlation), the core mass media and interpersonal journals are included in one cluster, except that *ME* is, and *PQ* is not, included in the mass media cluster and *CE* is not included in the interpersonal cluster. (Indeed, the extreme asymmetry between *CE*'s citing and cited patterns shown in the cohesion analysis is reflected in *CE*'s being so *close* to but not being *included* in the interpersonal cluster.) Only a difference of .08 (between the correlations representing the two distances in the clustering threshold)



NOTE: For citations received configuration, stress = .32, R-square = .67. For citations made configuration, stress = .32, R-square = .59.

Figure 3: Multidimensional Scaling of Communication Journal Citations, Based on Patterns of Correlations of Citations Received (Columns) and Citations Made (Rows)

separates this result from a clustering of all but *ME* into two separate cliques, so this general similarity in structural position based upon citing patterns is very tenuous. *ME* cites the rest of the field in ways similar to the mass media journals though it is not cited as part of the mass media position. *CJ* cites the rest of the field as do the other isolates, even though it is cited in ways nearly similar to those in the mass media clique. *SC* becomes an isolate with respect to its pattern of *citing* even though it is *cited* in ways similar to those of the interpersonal clique.[8] Thus the set of journals used as *sources* for some of the information used in articles in *ME*, *CJ*, and *SC* is not similar to the set of journals that in turn *use* the articles in these journals. One interpretation of this dual identity is that these journals serve to bridge gaps in the flow of information between different sets of researchers. Another interpretation is that the identity of these journals is uncertain, due either to the nature of research articles they publish, or to the nature of those who regularly read and use those articles.

DISCUSSION

In spite of, or perhaps as increased justification for, the arguments by Bochner and Eisenberg (1985), Chaffee (1982), and Reardon and Rogers (this issue), the subfields of interpersonal and mass media communication not only represent a real dichotomy in the communication field but also exhibit inbreeding, as claimed by Paisley (1984), Reeves and Borgman (1983), and So (this issue), at least as reflected in citation patterns from 1977 through 1985.

Overall, bibliometric and network analyses of citation patterns among communication journals as identified by ISI in its annual citation report identified two cliques of journals—interpersonal and mass media—with an intermediary set of "isolate" journals. Further, this pattern of citation networks is generally stable over the 1977-1985 period, both with respect to their matrices of raw citations and to the occupancy of journals in network cliques from one year to the next. The two cliques differ primarily in (1) higher reciprocal citing in the mass media journal clique, and (2) greater referencing of the mass media journals by the interpersonal journals than vice-versa.

Separate analyses of citations *made* and of citations *received* by journals provided additional insights. Some journals are not cited by the other communication journals in ways completely similar to the ways in which they cite the rest of the communication journals. For example,

cohesion analyses show that *CE* cites a wide range of other journals while few journals cite it. Position analyses show that *CO*, *PR*, *ME*, *SC*, and *LA* exhibit different patterns of citing and being cited. As transmitters of scientific information, they are not structurally equivalent with themselves as receivers.

Future bibliometric and network analyses of journal citation patterns may expand our understanding of the exchange of scientific information by using both cohesion and positional analyses, as well as separately considering citations made and received.

Both cliques display extreme "inbreeding" (Paisley, 1984), as only two interpersonal journals (*HC* and *CE*) provide bridges from interpersonal journals to mass media journals; there is little flow in the opposite direction. When the nine-year period of citation patterns is considered, rather than the three-year analyses by Reeves and Borgman (1983) and So (this issue), *JC* appears to be the most central and reciprocating communication journal, and *JQ* is the most heavily self-citing, though *PQ* continues in its role as the nonreciprocating "transmitter" of scientific flows of information (in the form of citations made by articles in other journals to articles published in *PQ*). It must be noted, however, that Reeves and Borgman relied on hand-collected data from *HC*, as it was not covered by the *JCR* during the period of their study. *HC* was found to be the "bridge journal" for the period 1977-1979; these additional data were not included here. The present results agree overall with Paisley (1984) and So's (this issue) assessments that *HC* and *JC* may facilitate interclique and interdisciplinary "drift." That is, they may represent "weak ties," or channels for the awareness of research information not provided by the other communication journals.

So (this issue) suggested that the higher linkage in journals with the word "communication" indicated a development of consciousness about communication that mirrored the use of the name of their field by other leading social science journals. We should note that, based upon nine years of similar data, journals with the word "communication" in their titles had the highest *and* the lowest citation levels, shared the highest linkages with journals that had *quarterly* in their title, and displayed both high *and* low citing-to-cited ratios. Further, while 50% of the top 10 communication journals had the word "communication" in their titles, 50% of all the journals analyzed here included the word, so there is no disproportionate influence of journals that explicitly indicated their disciplinary affiliation. Therefore, while the other citation

data may have indicated this development in the field of communication, trend and pooled data do not support this proposition. As additional evidence of the influence that the communication discipline has yet to achieve, only one journal, *HC*, had an average impact factor greater than 1.0. So (this issue) reports, as did Paisley (1986), that the field of communication continues to have the lowest impact factor of ten social science disciplines, and, along with the absence of a dominant disciplinary journal, this low impact underlies the youth and/or low influence of communication research.

As with other bibliometric analyses the present analysis suffers from some inherent weakness in the *JCR* data (see Note 1). However, we have attempted to overcome some of these weaknesses in these data and in other bibliometric analyses of communication research by (1) using the complete listing of communication journals, (2) analyzing the complete and most recent reporting periods (1977-1985), and (3) supplementing the dataset by including aberrant and changed journal titles. These improvements, of course, do not overcome perhaps the main criticism of such data: There are many other important channels for the flow of scientific information besides journal articles, and there are many reasons for a citation besides indicating the source of information (Lievrouw, Rogers, Lowe, & Nadel, 1987; Rice, Borgman, Bednarski, & Hart, 1988; Smith, 1981). In fact, these analyses indicate that patterns of citations among these communication journals seem impervious to the many obvious activities summarized at the beginning of this article that involve intra- and interdisciplinary communication of concepts, research, authors, and audiences.

NOTES

1. As Rice, Borgman, Bednarksi, and Hart (1988) discuss in greater detail, the *JCR* data have several anomalies that the present analyses have attempted to correct.

Aberrant Title Abbreviations. While the *JCR* has a standard form for abbreviating each journal title, sometimes alternative abbreviations also exist but are not recognized by *JCR* and therefore must be incorporated from the raw journal data. We captured data from aberrant title abbreviations, both cited and citing, from all communication journals.

Citation List Truncation. The *JCR* does not list every journal citing or cited by a given journal. Rather, it lists a maximum of 100 items or the number of items that account for 85% of the total citations, with several limiting conditions. The remaining data are totaled in an "all other" category, indistinguishable by journal title. As a result, we have a more complete listing of journal titles for those earlier in the alphabet than later, and more complete data for cited than for citing references.

Incomplete Coverage. Even when a journal was listed as being "fully covered" for a given year, sometimes data were not included for either citing, cited, or both. This is the case for both *Communication* and *Written Communication*, which, although listed in the 1985 *JCR* as "fully covered," have no official entries in any of the nine *JCR* volumes.

2. The impact factor tends to discount the advantage of large, established, and frequently issued journals over those that are small (in terms of number of articles), new, and issued fewer times per year. The higher the impact factor, the more likely it is that articles from a particular journal are being used by other scholars.

3. While NEGOPY is a cohesion-based clique-detection program, it differs from most other cohesion programs by taking into account the strength of links. Also unlike other cohesion methods, NEGOPY can indicate to some degree the effect and distribution of the decidedly asymmetric patterns found in citation matrices. While NEGOPY was set to add the missing half of a one-way link (forced reciprocation) in order to identify clique membership, it reports the direction and actual reciprocation of linkages in its summary tables. Like nearly all cohesion and most positional methods, however, it does not take into account self-citation values, as there is definitionally no "link" from a node to itself. Therefore, NEGOPY analyses consider only patterns *across* journals, and are not influenced by levels of *self*-citation. This type of analysis seems appropriate for detecting channels of *diffusion* of scientific information across journals, that is, cohesion among journals or the structure of flows in a social science discipline. The effects of self-citation could be included by dividing the cell values for each journal by the total number of citations made by that journal before entering the values into NEGOPY. Thus the analysis would be based upon the *proportion* of non-self-cites made, rather than the absolute totals. Another approach is to use log-linear analysis to parametrize the effects of row, column, and diagonal network frequencies (as used by Rice, 1982). However, both of these methods would greatly exaggerate the influence of journals with small overall citation totals. Note 8 discusses one solution to this problem when using a positional approach.

4. Positional analysis, described in the next section, was also used. To match the analytical characteristics of the cohesion method (NEGOPY) as closely as possible, CONCOR (Arabie, Boorman, & Levitt, 1978) was used. It can simultaneously take into account the bidirectional cited and citing patterns, by combining matrices. The pooled matrix and its transpose were "stacked" to create a single 40×20 matrix representing the similarity of both receiving and making citations. CONCOR analyzes similarities based upon the correlation matrix derived from these stacked matrices, but, like NEGOPY, ignores self-citations (the diagonal values of the raw citation matrix). It correlates successive matrices until the values converge near 1.0 and -1.0. Journals having a similarity near 1.0 occupy a position, and journals having a similarity near -1.0 occupy a position. The positional analyses provide highly similar results to the cohesion results, even though they take into consideration self-citations, and assume a fundamentally different concept of network roles. CONCOR finds an interpersonal position, making up the first 10 journals in the pooled citation matrix of Table 2, and a mass media position, making up the second 10 journals. That is, it lumps the isolates in their respective

substantive position. The overall citation rates for interpersonal and mass media were .37 and .56; the percentage of clique citations were .89 and .97, respectively.

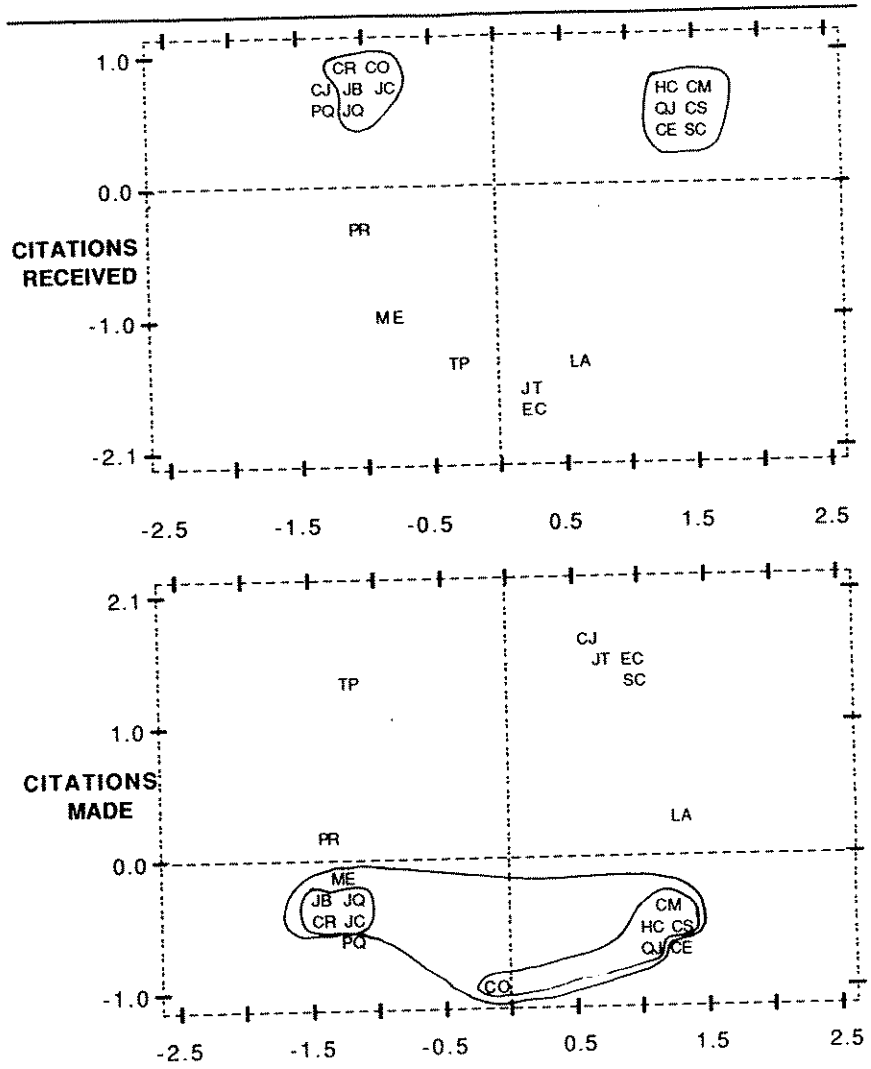
5. Because *WR* did not receive any citations, and thus had no variance in the column, it is not included in the positional analyses.

6. Correlations are measures of symmetric similarity between two journals with respect to the rest of the system (thus the diagonals are 1.00), and must be transformed into distances for most position-based methods. The two matrices (one based upon correlating the columns, the other based upon correlating the rows) were each transformed by subtracting each correlation from 2.0, resulting in distance values with a theoretical range from 1.0 (exactly similar) to 3.0 (exactly dissimilar). The cluster cutoff is determined by identifying the correlation for N = 20, which is significant at alpha = $p < .01$ (one-tailed test), then subtracting that from 2.0 (because the distance is calculated as 2.0 minus the original correlation). The correlation is .52 for $p < .01$, so the cutoff is 1.48, as noted by the dashed line in Figure 2. That is, distances between clusters greater than 1.48 are significantly different.

7. The scaling procedure was the ALSCAL multidimensional scaling program in SPSSX. As in the cluster analysis, *WR* was dropped from the matrices.

8. Because cluster analysis and multidimensional scaling both use a symmetric correlation matrix, they fail to portray two kinds of information: the *asymmetry* of linkages, and differences in *mean* levels of citations. Consider that all levels of self-citing equally produce a correlation of 1.0 in the diagonals of the distance matrix, so *JQ*'s 1,706 citations has the same effect as *LA*'s 10 citations. One alternative approach is clustering and scaling of the *covariance* matrices after they are transformed into distances. This analysis does not stay quite as close to the raw data as the principal components approach, but does portray more clearly distinctions among journals on the basis of citation levels. However, the scaling algorithm cannot easily fit the distances between *JQ* and all other journals and the distances among all other journals into the same configuration (because *JQ* cites itself so heavily, its self-citing covariances are approximately 152,000 while other journal-journal covariances are typically in the thousands); therefore, the scaling stress levels are quite high (approximately .40) and the R-square levels are low (.30). Figure 4 shows the multidimensional scaling results based upon the covariance matrices.

The results of the *cited* patterns display fairly clearly the distinctions among journals that receive numerous citations and those that do not (vertical dimension), and among interpersonal and mass media journals (horizontal dimension). *CJ* and *CO* are distant from, but still clustered within the mass media journal position. *JT* and *EC* are slightly closer to the interpersonal journal position, in agreement with their categorization by the bidirectional CONCOR analysis discussed in Note 4. The results of the *citing* patterns display much more clearly the dimensional clustering of the journals in dimensions that reveal an interaction between citing/nonciting levels and interpersonal/mass media content. The same five interpersonal and five mass media journals that heavily cite similar journals are clustered at opposite ends of the horizontal axis but the isolate journals appear separately as a low-citing writing/journalism position (*CO, EC, JT, CJ*) and a low-citing media/policy position (*PR, ME, SC, TP, LA*) at opposite ends of the vertical axis. Thus in the sense of absolute, rather than proportional, number of citations made and received, *CJ* and *CO* are cited by the rest of the field as more similar to the mass media position than they actually make citations to the rest of the field of communication.



NOTE: For citations received configuration, stress = .39, R-square = .28. For citations made configuration, stress = .40, R-square = .31.

Figure 4: Multidimensional Scaling of Communication Journal Citations, Based on Patterns of Covariances of Citations Received (Columns) and Citations Made (Rows)

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