Scientometrics (2011) 88:449–469
DOI 10.1007/s11192-011-0381-2

Citations among communication journals and other disciplines: a network analysis

George A. Barnett · Catherine Huh · Youngju Kim · Han Woo Park

Received: 20 December 2010 / Published online: 16 April 2011
© Akadémiai Kiadó, Budapest, Hungary 2011

Abstract This article describes the results of a network analysis based on the citation among Communication journals and those academic disciplines that are cited by those journals labeled as "Communication" by the Web of Science. The results indicate that the journals indexed solely as Communication rather than those also tagged as another social science are more central in the citation network. Further, a cluster analysis of the cited disciplines revealed three groupings, a micro psychological cluster, a macro socio-political group and a woman's studies clique. A two-mode network analysis found that the most central Communication journals cited multiple clusters, while the peripheral journals cited only one, suggesting that the structure of influence on the field of Communication is more complex than suggested by Park and Leydesdorff (Scientometrics 81(1):157–175, 2009). Also, the results indicate that the macro cluster is about twice as influential as the micro cluster, rather than as Park and Leydesdorff suggest that Psychology is the discipline's primary influence.

Keywords Citation analysis · Network analysis · Communication

Introduction

Compared to the other social sciences, Communication joined the social science family relatively late (Berger et al. 2009). Yet, the discipline of Communication has experienced steady growth. The International Communication Association (ICA), the largest international association, is celebrating its 60th anniversary. Over the years, both the membership of the ICA and its publication programs have expanded (Chung et al. 2009). ICA's core journals include *Journal of Communication* (JOC), *Human Communication Research*

G. A. Barnett (✉) · C. Huh · Y. Kim
Department of Communication, University of California – Davis, Davis, CA 95616, USA
e-mail: gbarnett@ucdavis.edu

H. W. Park
Department of Media & Communication, YeungNam University, 214-1, Dae-dong, Gyeongsan-si, Gyeongsangbuk-do 712-749, South Korea

(HCR), *Communication Theory* (CT), and *Journal of Computer Mediated Communication* (JCMC). In the United States, the National Communication Association (NCA) represents the entire field of communication. NCA promotes communication scholarship, from a humanistic as well as a scientific perspective, sponsoring communication journals such as *Communication Monographs* (CM), *Critical Studies in Media Communication* (CSMC) and *Journal of Applied Communication* (JAC). NCA was founded in 1914 as The National Association of Academic Teachers of Public Speaking. After a number of changes, the association adopted its current name in 1998. Along with its name, NCA has evolved throughout the time. Through scholars' efforts, communication has been established as an independent academic field. At this point of time, therefore, it is meaningful to evaluate the present state and the developmental status of Communication in respect that self-reflection is a mark of maturity (So 1988).

To a certain extent, the perceptions of the nature of communication tend to diverge. On the one hand, researchers emphasize the duality of mass and interpersonal communication studies, as well as the disparate nature of the two domains (Rogers and Chaffee 1983; Delia 1987; Park and Leydesdorff 2009). On the other hand, scholars argue that the field of study cannot be dichotomized into mass and interpersonal communication, but is complex and diverse (Wiemann et al. 1988; Berger and Chaffee 1988). For instance by examining the ICA membership, Barnett and Danowski (1992) found three dimensions within the discipline; mass communication—interpersonal communication, a humanistic—scientific division, and theoretical versus applied studies.

Communication is often perceived as an "interdisciplinary clearinghouse" for other fields (Craig 1999), implying that it is influenced by multiple disciplines outside the field. Berger et al. (2009) note that the intellectual bases of early mass communication and interpersonal communication researchers were from cognate areas such as Sociology, Social Psychology and Political Science. Similarly, Rogers (1994, p. 9) observed, "The history of communication study is the story of the social science, with important contributions also from biology, mathematics, and electrical engineering". In some respects, such attributes of communication bring into questions the independency of Communication as a discipline. However, the conventional idea of an institutional discipline is not always applied to every field of study (Chung et al. 2009). Rather, researchers can benefit by using multi-discipline-compatible tools which stimulate a broader contextual comprehension of practical human issues through social relevance (Craig 1993).

Revealing one's intellectual linkage by using bibliographic citations has become a standard practice in academic scholarship (So 1988). Citations in journal articles serve as useful tools in studying various networks of relationship among authors, journals and fields in an objective and quantitative manner (So 1988; Freeman 2004). Thus, evaluating the developmental status of Communication by studying citation patterns both within the field and between Communication and other fields is the goal of this research. By using network analysis, previous studies found that nine journals from 1975 to 1979 clustered into two groups: speech-communication journals (QJS, CCSJ, and CM) and mass communication journals (JQ, CR, POQ, JOB, and JOC), with HCR as the bridge between the two groups (Reeves and Borgman 1983). Please refer to Table 1 for full titles of abbreviated journals. Reeves and Borgman suggest Communication remains a field with separate subdivisions, and it is very dependent on journals outside communication research. However, this analysis was confined to only nine core journals. Rice et al. (1988) expended the dataset to twenty unique communication journals covered by the Social Science Citation Index over the first nine years of SSCI coverage (1977–1985). Still, this study focused only on these two major divisions.

Table 1 Communication journals indexed in Web of Science

Journals	Co-disciplines
Argumentative and Alternative Communication (AAC)	
Communication Monographs (CM)	
Communication Research (CR)	
Communication Theory (CT)	
Critical Studies in Media Communication (CSMC)	
Cyberpsychology & Behavior (CB)	Psychology, Applied
Discourse & Society (DSOC)	Psychology, Multidisciplinary Sociology
Discourse Studies (DS)	
European Journal of Communication (EJC)	
Harvard International J. of Press-Politics (HIJPP)	Political Science
Health Communication (HC)	Health Policy & Services
Human Communication Research (HCR)	
IEEE Transactions of Professional Communication (ITPC)	
International J. of Conflict Management (IJCM)	
International J. of Public Opinion Research (IJPOR)	
J. of Advertising (JA)	Business
J. of Advertising Research (JAR)	Business
J. of Applied Communication Research (JACR)	
J. of Broadcasting & Electronic Media (JBEM)	
J. of Business and Technical Communication (JBTC)	Business
J. of Communication (JOC)	
J. of Computer-Mediated Communication (JCMC)	Information Science & Library Science
J. of Health Communication (JHC)	Information Science & Library Science
J. of Media Economics (JME)	Economics
J. of Social and Personal Relationships (JSPR)	Psychology, Social
Javnost-The Public (JTP)	
Journalism & Mass Communication Quarterly (JMCQ)	
Language & Communication (LC)	Linguistics
Media Culture & Society (MCS)	Sociology
Media Psychology (MP)	Psychology, Applied
Narrative Inquiry (NI)	Linguistics
New Media & Society (NMS)	
Political Communication (PC)	Political Science
Public Culture (PCUL)	Anthropology
Public Opinion Quarterly (POQ)	Political Science
	Interdisciplinary Social Science
Public Relations Review (PRR)	Business
Public Understanding of Science (PUS)	History & Philosophy of Science
Quarterly J. of Speech (QJS)	
Research on Language and Social Interaction (RLS)	Linguistics
	Psychology, Social
Science Communication (SC)	
Technical Communication (TC)	

Table 1 continued

Journals	Co-disciplines
Telecommunication Policy (TP)	Information Science & Library Science
Text (TEXT)	Linguistics
Text & Talk (TT)	Linguistics
Written Communication (WC)	

Parker et al. (1967) examined citations of 17 journals, including 6 Communication journals, from 1950 to 1965 and found that researchers cited journals within the field frequently but depended less on other social science journals. Each of the social science disciplines was barely connected to any other. This study is meaningful in terms of considering cross disciplinary research although a limited number of journals were used. Park and Leydesdorff (2009) focused on the citation patterns of one specific journal, *JOC*, and identified other journals that cited it. Their findings suggested that the primary external influence on Communication was Psychology. Considering the multiple subdivisions of Communication, however, a single journal, which is traditionally mass communication focused (Barnett and Danowski 1992), is insufficient for an examination of the structure of the discipline. Thus, this article examines the network of citations among all Institute for Scientific Information (ISI) journals listed as Communication, some of which are joint listed with other academic disciplines, in order to determine the various influences on Communication from other fields. Here, the frequency of citation was measured over time in order to examine the intellectual linkages within the communication discipline and from other disciplines in order to (1) determine the structure of the citation process within the field of Communication, and (2) to determine the influence of other academic disciplines upon Communication.

Methods

This research examines the pattern of citations within the field of Communication, and with other academic disciplines using network analysis. Network analysis is a set of research methods for identifying structures in systems based on the relations among the system's components (Rogers and Kincaid 1981). In this study, the components are the various journals and the system is composed of journals both within and either cited by or citing Communication journals. By analyzing these relations, the flow of influence in a system can be traced, and the structure can be determined (Rogers and Kincaid 1981; Monge and Contractor 2003; Leydesdorff 2007). In defining the network of Communication, the frequency of information exchange among journals or articles, individuals or organizations, may be examined (Lievrouw et al. 1987; Barnett et al. 2010). Rogers and Kincaid (1981) suggest that network analysis can be used to demonstrate the linkages created by the sharing of information, as well as their interrelationships in the structure. In this respect, a network perspective has been applied to examine the structure of citations among a set of authors, articles, or journals (Lievrouw et al. 1987; Park and Leydesdorff 2009). Leydesdorff (1998) assumes that network citations among journals are reproduced from year to year, exhibiting their own dynamics, which determines the way networks absorb new variants.

The most influential citation databases were created by the ISI, which developed the Science Citation Index (SCI) and the Social Science Citation Index (SSCI; Garfield 1979, 2006). Today, they are part of *Thomson Reuters Web of Science.* Citations of communication journals likely reflect out-of-field impact more than in-field impact, which help us to understand the relationship between Communication and other disciplines. In 2009, 45 journals were indexed as *Communication*. Articles in these 45 journals cited 236 journals from thirty other disciplines. ISI's subject categories tend to classify sub-disciplines as separate disciplines. For example, Psychology is divided into Social Psychology, Clinical Psychology, Experimental Psychology, Educational Psychology, Applied Psychology, Developmental Psychology and Biological Psychology. Considering the close relationship between Communication and Psychology, it provides meaningful insights for this study. The Web of Science database indexed 45 journals as Communication, 23 of which were defined as inter-disciplinary journals and 22 journals were exclusively Communication. Tables 1 and 2 list the Communication journals and non-communication counterparts.

Table 2 disciplines citing or cited by communication journals in Web of Science

Non-communication disciplines	Times cited
Anthropology	16
Area & Ethnic Studies	5
Biology	0
Business	282
Economics	3
Education	65
Geography, Planning & Environment	7
Health Science	52
History & Philosophy of Science	23
Hospitality, Leisure, Sport & Tourism	0
Information Science & Library Science	65
International Relations	0
Linguistics	262
Management	30
Political Science	147
Psychiatry	0
Psychology	191
Psychology (Applied)	89
Psychology (Biological)	0
Psychology (Clinical)	68
Psychology (Developmental)	39
Psychology (Educational)	30
Psychology (Experimental)	29
Psychology (Social)	221
Rehabilitation	0
Social Science	149
Social Science Math	23
Social Work	0
Sociology	124
Women's Studies	39

In this study, the frequency of citation was measured in two different ways. First, the number of citations among Communication journals was examined in order to determine the structure of citations *within* the field of Communication. Second, cited non-Communication journals were aggregated into 30 disciplines as specified by The Web of Science and the citations *with* the Communication journals' examined at the discipline level to determine the influence of these fields upon Communication as well as Communication's influence upon these disciplines. As will be discussed later this data set was analyzed using a two-mode network analysis.

The citation patterns were examined with a variety of network measures. To the extent that multiple measurements provide varied descriptions of the network structure, they help to prevent bias from an idiosyncratic interpretation based on a single measure (Barnett et al. 2010). UCINET 6.2 (Borgatti et al. 2002) was used to measure degree, betweenness and eigenvector centrality. *Degree centrality* represents the number of links to the other components. Specifically, *in-degree* centrality measures how many times a journal was cited in other journals, and *out-degree* centrality represents the frequency with which a journal cites the others (Freeman 1979). For instance, high in-degree centrality indicates that a journal has been cited frequently in other journals. *Betweenness* centrality focuses on whether a component is located between two other components. It is extent to which a journal mediates between two others on the shortest path between those journals. The mediating component is viewed as being in a position of influence over others in the network (Freeman 1979). Leydesdorff (2007) argues that betweenness can be considered an indicator of a journal's degree of interdisciplinariness. *Eigenvector* centrality represents the journal's centrality based upon the overall structure of citations. The centrality of a component depends on the strength of its links to other components located more centrally. Eigenvector centrality determines a journal's overall centrality in the network (Bonacich 1972).

Another indicator of the structure of the citation pattern is how journals cluster. Cluster analysis identifies groups within data that have significant similarities (Johnson 1967). In the current study, clusters of journals are used to determine the underlying structure of the network. Since networks provide the channels through which individuals are exposed to others' information and influence, similar citation patterns among the members of a cluster represent similarities of academic perceptions and opinions. Thus, it provides an indication of the extent to which a journal is similar to neighboring journals.

The underlying structure of the pattern between the journals may be graphically presented through the use of multidimensional scaling (Woelfel and Fink 1980). The frequency of citation is taken to be a measure of the similarity between journals and disciplines. Metric MDS was used to analyze the structure of the citation network in using UCINET 6.90 (Borgatti et al. 2002). From MDS, figures were drawn using Netdraw that represent the structure of the citation network (Borgatti 2005).

To determine the degree of influence from the other 30 disciplines upon the various communication journals a two-mode network analysis was conducted. Two-mode analyses describe the ties between two sets of nodes at two different levels of analysis. In this case, the Communication journals and the various disciplines that are cited in these journals. Each mode is analyzed using the methods described above. There are no new technical issues in using graphs to visualize two-mode data. Both Communication journals and the cited disciplines are treated as nodes, and lines are used to show the connections of journals to disciplines. There are no lines from journals to journals directly, or from disciplines to disciplines.

Results

Table 3 shows the citation for the 45 Communication journals for 1998–2007. As can be seen, not all the journals cite each other, suggesting that citation patterns are structured. The average number of citations of Communication journals by other Communication journals was 111. *Media Psychology* had the highest level of citations at 584 and *Journal of Communication* had the second highest level of citations at 460. *TEXT* had zero citations. *Human Communication Research* (713) and *Journal of Communication* (712) were the two most cited by other Communication journals, while *Political Opinion Quarterly* received the second highest numbers of citations (442). *Text & Talk* received zero citations. Journals frequently cited themselves, 67 times on average. *Argumentation Alternative Communication* had the highest level of self-citation (267).

The journals' centralities are shown in Table 4. Out-degree centrality indicates that *Journal of Applied Communication Research* (0.318) and *Journal of Communication* (0.318) cited communication journals the most. In-degree centrality shows that *Journal of Communication* (0.636) was the most central journal, followed by *Communication Research* (0.500) and *Public Opinion Quarterly* (0.455), indicating that *Journal of Communication* was the cited journal by other communication journals. *Journal of Broadcasting and Electronic Media* (0.115), *Journal of Communication* (0.106), and *Discourse & Society* (0.102) showed the highest betweenness centrality, suggesting that those journals had the greatest influence over other journals. Eigenvector centrality revealed that *Communication Research* (64.640) was the most central, followed by *Journal of Communication* (62.166) and *Media Psychology* (61.508). Across all measures *Communication Research* and *Journal of Communication* are the two most central journals.

Figure 1 presents the results of the multidimensional scaling of the Communication field network, the links among journals and their relative strengths. The thickness of lines between journals is proportional to their inter-citation frequencies and can be considered as the strength of influence among those journals and the authors who published in them. The direction of citation is indicated by the arrowhead. As indicated in Fig. 1, there were two separate groups and a group of mainstream journals. The core journals in the network were connected mostly to other core journals. Most central in this group were *Health Communication, Communication Research, Journal of Communication*, and *Journal of Broadcasting and Electronic Media*. This figure lends support to the centrality results.

The two isolated groups of journals may be characterized as technical writing and text analysis. The text analysis journals included *Text & Talk, TEXT, Discourse & Society, Discourse Studies,* and *Research on Language and Social Interaction.* The technical writing journals included *Written Communication, Journal of Business and Technical Communication, Technical Communication,* and *IEEE Transactions of Professional Communication.* In addition, business journals, such as *Journal of Advertising* and *Journal of Advertising Research*, created a cluster that is relatively peripheral within the mainstream group.

There are differences between those journals that are exclusively Communication journals and inter-disciplinary journals. For instance, *Journal of Social and Personal Relationships* is indexed as Social Psychology as well as Communication, *Public Understanding of Science as History*, *Journal of Media Economics as Economics*, and *Media Culture & Society* as Sociology, while the *Journal of Communication* and *Human Communication Research* are only listed as Communication. Statistically, those journals that are labeled only as Communication are significantly more central in the network than those that are listed in two or more disciplines in terms of in-degree ($t = 1.77, p < 0.041$), and betweenness ($t = 2.027,\ p < 0.025$). Exclusively Communication journals receive

Table 3 Citations among 45 communication journals 1998–2007

	AAC	CM	CR	CT	CSM	CB	DSO	DS	EJC	HIJ	HC	HCR	ITP	IJC	IJP	JA	JAR	JAC	JBE	JBT	JOC	JCM
AAC	267	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CM	0	60	29	29	0	0	0	0	0	0	0	51	0	0	0	0	0	17	9	0	20	0
CR	0	33	107	9	0	0	0	0	0	0	11	52	0	0	15	0	0	0	25	0	36	0
CT	0	19	21	37	0	0	0	0	0	0	6	31	0	0	0	0	0	7	0	0	18	0
CSMC	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0
CB	0	0	25	0	0	236	0	0	0	0	0	18	0	0	0	0	0	0	17	0	21	17
DSOC	0	0	0	0	0	0	63	10	0	0	0	4	0	0	0	0	0	0	0	0	0	0
DS	0	9	0	0	0	0	23	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EJC	0	0	4	0	0	0	0	0	16	4	0	0	0	0	0	0	0	0	22	0	12	0
HIJPP	0	0	16	0	0	0	0	0	0	19	0	0	0	0	7	0	0	0	6	0	49	0
HC	0	29	25	12	0	0	0	0	0	0	83	27	0	0	0	0	0	16	9	0	37	0
HCR	0	35	55	18	0	0	0	0	0	0	5	58	0	0	0	0	0	0	8	0	28	8
ITPC	0	0	0	0	0	0	0	0	0	0	0	8	71	0	0	0	0	0	0	24	0	0
IJCM	0	0	0	0	0	0	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0
IJPOR	0	0	14	0	0	0	0	0	4	5	0	0	0	0	29	0	0	0	4	0	12	0
JA	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	178	163	0	9	0	17	0
JAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	93	0	4	0	4	0
JACR	0	19	10	16	0	0	0	0	0	0	19	14	0	0	0	0	0	27	6	0	9	0
JBEM	0	7	48	6	0	0	0	0	10	8	0	24	0	0	0	0	0	0	114	0	65	0
JBTC	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	33	0	0
JOC	0	17	80	12	0	0	0	0	9	0	0	31	0	0	28	11	0	0	26	0	112	0
JCMC	0	0	28	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	16	0	12	94
JHC	0	0	10	10	0	0	0	0	0	0	18	10	0	0	0	0	0	0	10	0	15	0
JME	0	0	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	14	0	6	0
JSPR	0	14	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0

Table 3 continued

	AAC	CM	CR	CT	CSM	CB	DSO	DS	EJC	HIJ	HC	HCR	ITP	IJC	IJP	JA	JAR	JAC	JBE	JBT	JOC	JCM
JP	0	0	4	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	6	0
JMCQ	0	0	33	0	0	0	0	0	0	0	0	7	0	0	12	19	0	0	12	0	42	0
LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
MCS	0	0	0	0	0	0	5	0	13	0	0	0	0	0	0	0	0	0	0	0	11	0
MP	0	13	147	10	0	12	0	0	0	0	0	59	0	0	0	17	12	0	108	0	98	14
NI	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NMS	0	0	25	0	0	17	0	0	9	0	0	12	0	0	0	0	0	0	8	0	14	12
PC	0	0	0	0	0	0	0	0	4	7	0	0	0	0	3	0	0	0	0	0	22	0
PCUL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POQ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0
PRR	0	10	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	11	0
PUS	0	0	7	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	10	0
QJS	0	7	0	6	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
RLSI	0	0	0	0	0	0	9	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC	0	0	5	0	0	0	0	0	0	0	5	4	0	0	0	0	0	0	8	0	14	0
TC	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	9	0	3
TP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TEXT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TT	0	0	0	0	0	0	14	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	0	0	0	0	0

	JHC	JME	JSP	JP	JMC	LC	MCS	MP	NI	NMS	PC	PCU	POQ	PRR	PUS	QJS	RLS	SC	TC	TP	TEX	TT	WC
AAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CM	5	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CR	18	0	0	0	15	0	0	14	0	0	8	0	18	0	0	0	0	0	0	0	0	0	0

Table 3 continued

	JHC	JME	JSP	JP	JMC	LC	MCS	MP	NI	NMS	PC	PCU	POQ	PRR	PUS	QJS	RLS	SC	TC	TP	TEX	TT	WC
CT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0
CSMC	0	0	0	0	0	0	4	0	0	0	5	0	0	0	0	5	0	0	0	0	0	0	0
CB	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSOC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	15	0	0
DS	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	22	0	0	0	20	0	0
EJC	0	0	0	7	3	0	14	0	0	0	10	0	5	0	0	0	0	0	0	0	0	0	0
HIJPP	0	0	0	0	10	0	5	0	0	0	35	0	24	0	0	0	0	0	0	0	0	0	0
HC	48	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HCR	0	0	5	0	0	0	0	10	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0
ITPC	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	62	0	0	0	0
IJCM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IJPOR	0	0	0	0	8	0	0	0	0	0	11	0	63	0	4	0	0	0	0	0	0	0	0
JA	7	0	0	0	7	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
JAR	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0
JACR	7	0	5	0	8	0	0	0	0	0	0	0	9	7	0	7	0	0	0	0	0	0	0
JBEM	0	0	0	0	28	0	6	23	0	0	15	0	21	0	0	0	0	0	0	0	0	0	0
JBTC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	19	0	0	0	21
JOC	10	0	0	0	31	0	0	12	0	0	37	0	44	0	0	0	0	0	0	0	0	0	0
JCMC	0	0	0	0	27	0	0	0	0	19	0	0	9	0	0	0	0	0	0	0	0	0	0
JHC	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JME	0	53	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
JSPR	0	0	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JP	0	0	0	5	0	0	14	0	0	8	8	0	10	0	0	0	0	0	0	0	0	0	0
JMCQ	0	8	0	0	58	0	0	0	0	0	20	0	11	11	0	0	0	0	0	0	0	0	0
LC	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	3	0	0	0	0	4	0	0

Table 3 continued

	JHC	JME	JSP	JP	JMC	LC	MCS	MP	NI	NMS	PC	PCU	POQ	PRR	PUS	QJS	RLS	SC	TC	TP	TEX	TT	WC
MCS	0	0	0	0	9	0	37	0	0	5	7	0	5	0	0	0	0	0	0	0	0	0	0
MP	0	0	0	0	21	0	0	56	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0
NI	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	3	0	0	0	2	0	0
NMS	0	0	0	0	11	0	8	0	0	51	0	0	0	0	0	0	0	0	0	7	0	0	0
PC	0	0	0	0	3	0	0	0	0	6	30	0	15	0	0	0	0	0	0	0	0	0	0
PCUL	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0
POQ	0	0	0	0	0	0	0	0	0	0	0	0	156	0	0	0	0	0	0	0	0	0	0
PRR	0	0	0	0	12	0	4	0	0	0	0	0	0	109	0	4	0	0	0	0	0	0	0
PUS	0	0	0	0	0	0	4	0	0	0	4	0	4	0	101	0	0	12	0	0	0	0	0
QJS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0
RLSI	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	67	0	0	0	7	0	0
SC	0	0	0	0	11	0	0	0	0	0	4	0	5	0	29	0	0	32	0	0	0	0	0
TC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111	0	0	0	0
TP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	0	0	0
TEXT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TT	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	18	0	0	0	20	0	0
WC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16

Table 4 Centrality of communication journals

	Out degree centrality (rank)	In degree centrality (rank)	Between centrality (rank)	Eigenvector centrality (rank)
AAC	0.023 (13)	0.023 (16)	0 (26)	0 (42)
CM	0.205 (5)	0.295 (6)	0.049 (7)	18.306 (10)
CR	0.295 (2)	0.5 (2)	0.045 (8)	**64.64 (1)**
CT	0.182 (6)	0.25 (7)	0.023 (13)	12.504 (15)
CSMC	0.114 (9)	0.023 (16)	0 (26)	1.256 (29)
CB	0.159 (7)	0.068 (14)	0 (26)	23.99 (8)
DSOC	0.114 (9)	0.136 (11)	0.102 (3)	0.404 (33)
DS	0.136 (8)	0.091 (13)	0.02 (14)	0.4 (34)
EJC	0.227 (4)	0.205 (8)	0.031 (10)	6.05 (21)
HIJPP	0.205 (5)	0.114 (12)	0.004 (22)	13.133 (14)
HC	0.227 (4)	0.182 (9)	0.016 (16)	17.696 (11)
HCR	0.25 (3)	0.432 (4)	0.096 (5)	33.323 (5)
ITPC	0.091 (10)	0.068 (14)	0.005 (21)	1.056 (30)
IJCM	0.023 (13)	0.023 (16)	0 (26)	0 (42)
IJPOR	0.205 (5)	0.182 (9)	0.02 (14)	11.717 (17)
JA	0.182 (6)	0.136 (11)	0.019 (15)	22.128 (9)
JAR	0.114 (9)	0.091 (13)	0.006 (20)	13.25 (13)
JACR	**0.318 (1)**	0.091 (13)	0.009 (18)	7.704 (20)
JBEM	0.295 (2)	0.455 (3)	**0.115 (1)**	50.608 (4)
JBTC	0.114 (9)	0.045 (15)	0.003 (23)	0.046 (38)
JOC	**0.318 (1)**	**0.636 (1)**	0.106 (2)	62.166 (2)
JCMC	0.182 (6)	0.136 (11)	0.029 (11)	17.138 (12)
JHC	0.159 (7)	0.159 (10)	0.002 (24)	10.142 (19)
JME	0.159 (7)	0.045 (15)	0.007 (19)	3.804 (25)
JSPR	0.068 (11)	0.091 (13)	0 (26)	1.903 (28)
JP	0.182 (6)	0.045 (15)	0.001 (25)	2.603 (27)
JMCQ	0.25 (3)	0.409 (5)	0.056 (6)	24.095 (7)
LC	0.091 (10)	0.045 (15)	0.009 (18)	0.417 (32)
MCS	0.182 (6)	0.205 (8)	0.098 (4)	4.008 (24)
MP	0.295 (3)	0.136 (11)	0.034 (9)	61.508 (3)
NI	0.091 (10)	0.068 (14)	0 (26)	0.012 (41)
NMS	0.25 (3)	0.114 (12)	0.027 (12)	10.692 (18)
PC	0.182 (6)	0.295 (6)	0.02 (14)	11.988 (16)
PCUL	0.023 (13)	0.023 (16)	0 (26)	0 (42)
POQ	0.045 (12)	0.455 (3)	0.005 (21)	26.654 (6)
PRR	0.159 (7)	0.068 (14)	0.006 (20)	3.784 (26)
PUS	0.182 (6)	0.045 (15)	0.002 (24)	4.034 (23)
QJS	0.091 (10)	0.159 (10)	0.01 (17)	0.896 (31)
RLS	0.114 (9)	0.114 (12)	0.01 (17)	0.037 (39)
SC	0.227 (4)	0.045 (15)	0.001 (25)	5.452 (22)
TC	0.091 (10)	0.068 (14)	0.006 (20)	0.329 (36)
TP	0.023 (13)	0.068 (14)	0 (26)	0.257 (37)

Table 4 continued

	Out degree centrality (rank)	In degree centrality (rank)	Between centrality (rank)	Eigenvector centrality (rank)
TEXT	0 (14)	0.136 (11)	0 (26)	0.036 (40)
TT	0.114 (9)	0 (17)	0 (26)	0.037 (39)
WC	0.068 (11)	0.045 (15)	0.004 (22)	0.334 (35)

The most central journal on each individual measure is bold

more citations from other Communication journals and are more influential within the field linking the various substantive components of the discipline. However, while they are more central on the out-degree and eigenvalue measures, the results are not statistically significant ($t = 0.709$, $p < 0.241$ for out-degree, and $t = 0.675$, $p < .251$ for eigenvalue). Thus, while they cited other communication journals more and were overall more central within the field, the results were not significant. Communication journals are indicated as circles and inter-disciplinary journals as squares in Fig. 1.

To examine the influence of other academic disciplines upon Communication, non-Communication journals cited in Communication journals were analyzed at the discipline level. Figure 2 presents the result of hierarchical clustering analysis. Three clusters were found. First, a psychology cluster included Psychology, Social Psychology, Clinical Psychology, Linguistics, and Information Science. Second, a socio-political cluster included Political Science, Sociology, general Social Sciences, Health Science, Experimental Psychology, Applied Psychology, and Business. Third, a women's study cluster included Women's Studies and Developmental Psychology.

Figure 3 presents the results of the multidimensional scaling of the two-mode citation network of Communication journals with other academic disciplines. The network represents the model of influence, resulting from the links among Communication journals and other disciplines and their relative strengths of connections. As Fig. 3 shows, disciplines included in the psychology cluster and the socio-political cluster influenced different journals. The disciplines from the psychological cluster were cited by the interpersonal and text journals, as well as those journals that were cross-indexed with those other fields. The journals from the socio-political cluster of disciplines were cited by those journals that focused on social issues such as *New Media and Society* and *Health Communication*. The disciplines included in the women's study cluster were relatively peripheral.

Communication journals tend to have distinctive patterns of connections with the discipline clusters. While most of journals were tied to a single cluster, the central journals were linked to more than one cluster, having multiple influences. For instance, *Communication Monographs* cited only Social Psychology, *and Discourse & Society* cited only Linguistics, members of the psychological cluster and *Public Opinion Quarterly* only cited those journals from the socio-political clusters. However, *Communication Research* cited both the psychology and socio-political clusters. *The Journal of Communication* was connected to all three clusters: psychology, social and political science, and women's study clusters. In terms of betweenness centrality, those journals that were linked to multiple clusters, *Communication Research, Communication Research, JCMC and Journal of Communication* were four of the five most central journals in the two-mode analysis, i.e., when the citations to the other disciplines were consider as the links. Thus, the interdisciplinary journals are more central in the citation network (Leydesdorff 2007). The betweenness centralities from the two-mode analysis are presented in Table 5.

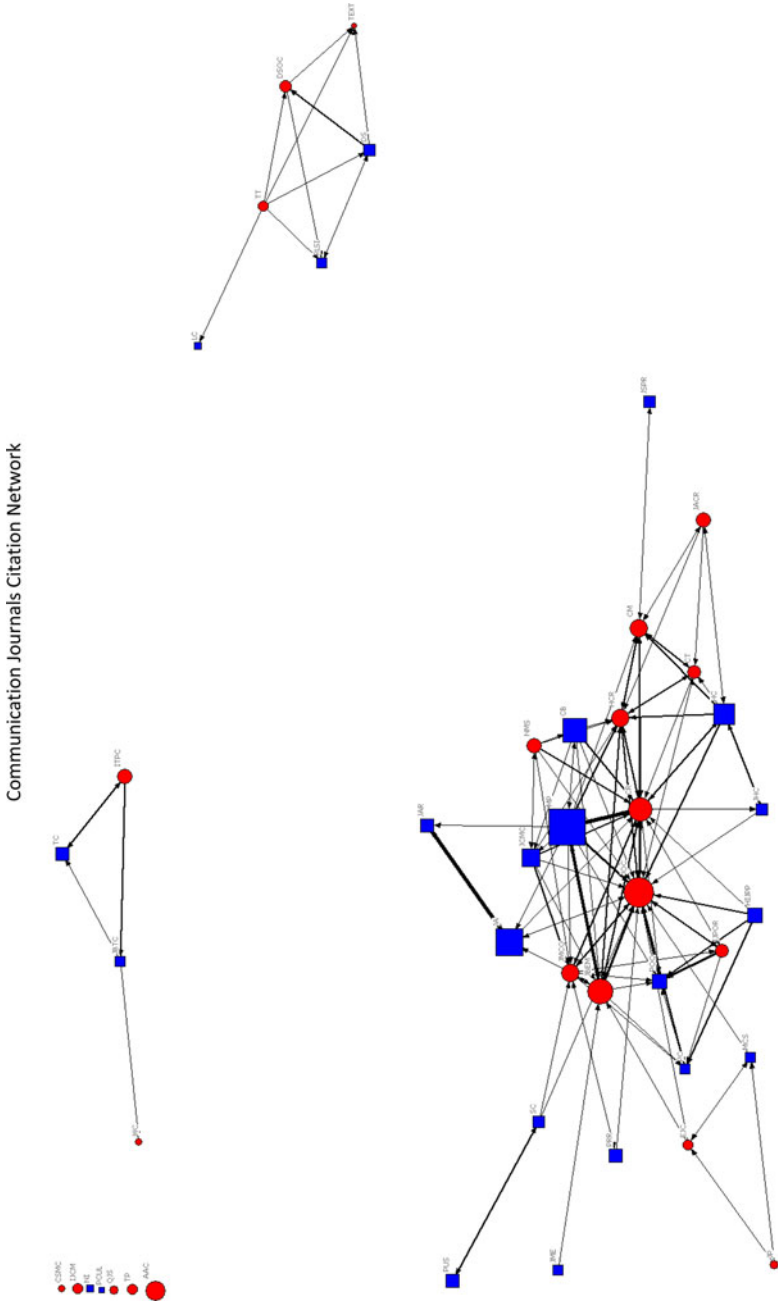
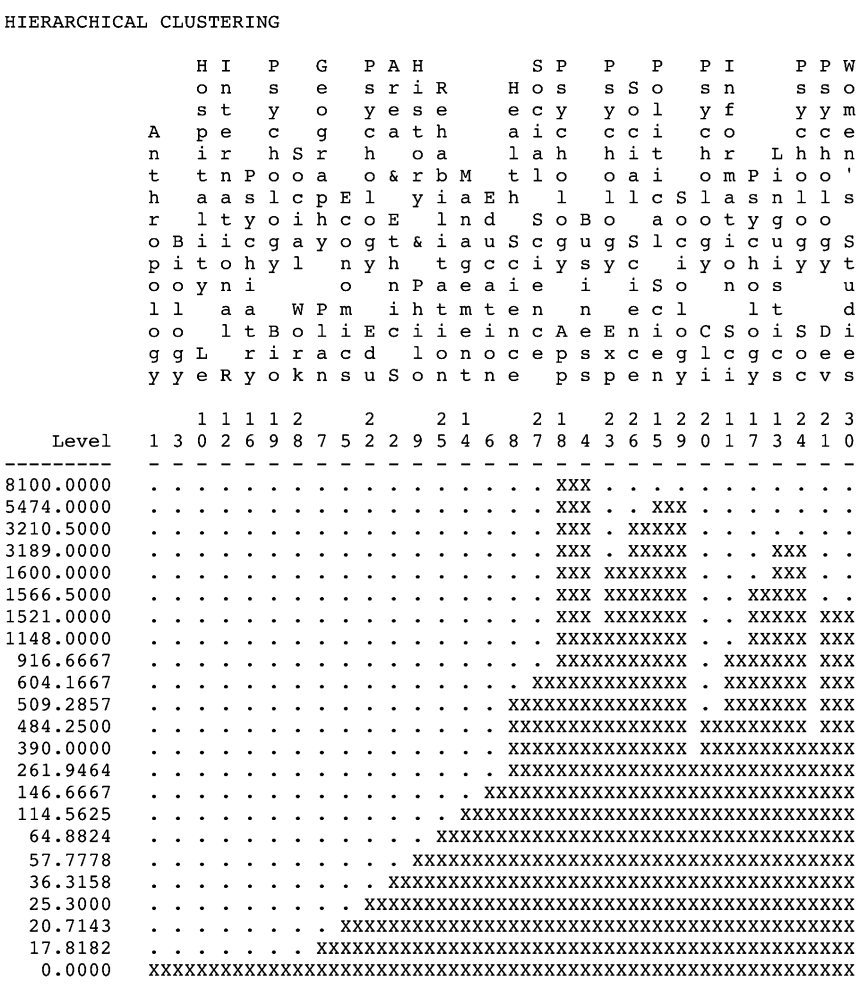


Fig. 1 Communication journals citation network. The thickness of the *line* indicates the number of citations between journals. Ten (10) citations are required for a *line* to be drawn. *Circles* represent those journals that are listed only as communication journals. *Squares* indicate those journals that are listed as communication and as another discipline. The *size* of the object indicates the number of citations from other communication journals


HIERARCHICAL CLUSTERING
Anthropology
Biology
Hospitality
Interpersonal
Psychology
Geography
Psychology
Psychology
Psychology

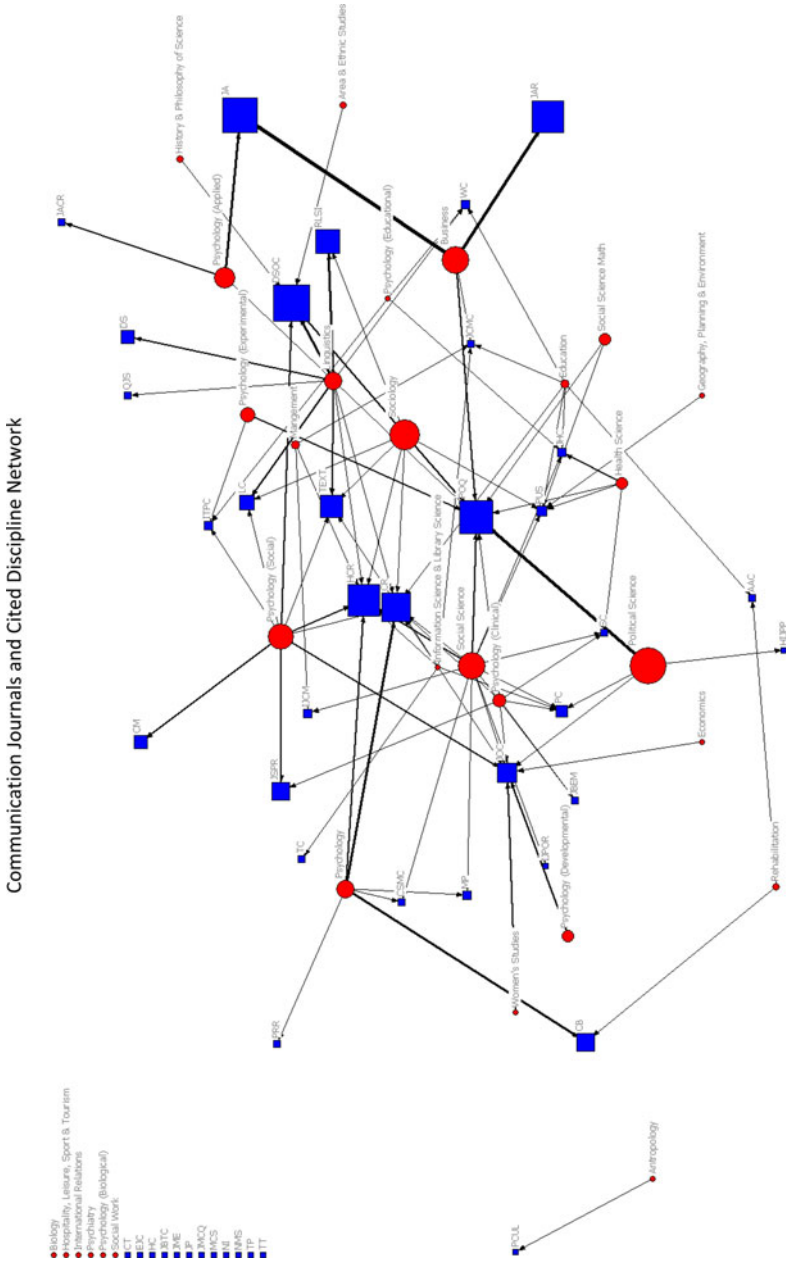


Fig. 3 Communication journals and cited discipline network. The thickness of the *line* indicates the number of citations between various disciplines and journals. Ten (10) citations are required for a *line* to be drawn. *Squares* represent communication journals. *Circles* indicate the various disciplines that are cited by communication journals. The *size* of the object indicates the number of citations communication journals receive from other disciplines or journals

Table 5 Communication journals' betweenness centrality in two-mode analysis

POQ	8.739
CR	6.214
HCR	5.294
JOC	2.463
JCMC	2.406
PUS	1.417
TEXT	1.288
PC	1.211
JHC	0.808
WC	0.675
MP	0.636
CSMC	0.636
DSOC	0.564
LC	0.564
JSPR	0.299
ITPC	0.201
RLSI	0.182
JA	0.152
AAC	0.143
CB	0.123
JBEM	0.084
SC	0.084
IJCM	0.066
CT	0.000
JBTC	0.000
EJC	0.000
JMCQ	0.000
JP	0.000
CM	0.000
DS	0.000
NI	0.000
HIJPP	0.000
HC	0.000
MCS	0.000
JME	0.000
PRR	0.000
IJPOR	0.000
QJS	0.000
JAR	0.000
JACR	0.000
TC	0.000
TP	0.000
NMS	0.000
TT	0.000
PCUL	0.000
Mean	0.761
Std Dev	1.743

Table 6 Discipline share of citations by communication journals

Disciplines	Share
Political Science	0.143
Sociology	0.114
Social Science	0.101
Business	0.097
Psychology (Social)	0.091
Psychology (Applied)	0.069
Psychology	0.06
Linguistics	0.059
Psychology (Experimental)	0.041
Psychology (Clinical)	0.038
Health Science	0.027
Information Science & Library Science	0.027
Psychology (Developmental)	0.026
Women's Studies	0.026
Social Science Math	0.026
Education	0.016
Management	0.011
Rehabilitation	0.007
History & Philosophy of Science	0.007
Area & Ethnic Studies	0.004
Psychology (Educational)	0.003
Economics	0.003
Geography, Planning & Environment	0.002
Biology	0
Hospitality, Leisure, Sport & Tourism	0
Psychology (Biological)	0
International Relations	0
Social Work	0
Anthropology	0
Psychiatry	0

influence. As seen in Table 7, the results indicate that Sociology (25.986), Social Science (25.419), and Social Psychology (24.012) were cited most by Communication journals.

Discussion

To provide a better understanding of the status of Communication as an academic discipline, bibliographic citations were analyzed for 1998–2007. Overall, network analysis showed that *Communication Research* and *Journal of Communication* are the two most central journals within the field. Studies have emphasized the duality and disparate nature of mass and interpersonal communication studies (Rogers and Chaffee 1983; Delia 1987). However, Barnett and Danowski (1992) found a more complex structure. The present study supports their findings. An analysis of citation patterns found three clusters, text analysis, technical writing and mainstream communication. Based on the intradisciplinary citations,

Table 7 Disciplines betweenness centrality in two-mode network

Disciplines	Betweenness
Sociology	25.986
Social Science	25.419
Psychology (Social)	24.012
Education	19.608
Psychology (Clinical)	13.194
Psychology	7.176
Linguistics	6.875
Information Science & Library Science	6.812
Political Science	6.435
Health Science	3.588
Business	2.796
Psychology (Experimental)	2.051
Social Science Math	1.838
Psychology (Educational)	0.751
Management	0.458
Biology	0
Area & Ethnic Studies	0
Psychology (Applied)	0
Hospitality, Leisure, Sport & Tourism	0
Economics	0
Psychology (Developmental)	0
Anthropology	0
Psychiatry	0
History & Philosophy of Science	0
Rehabilitation	0
Psychology (Biological)	0
International Relations	0
Social Work	0
Geography, Planning & Environment	0
Women's Studies	0

the results showed no conspicuous distinction between mass and interpersonal communication. This suggests that the dichotomized view is invalid for understanding the nature of the discipline. Instead, Communication's structure may be considered multi-faceted and complex.

The analysis of the citations of non-Communication journals at the discipline level, found that the most references come from the psychological, socio-political and women's studies clusters. All three constituted major influences on the field of Communication. These clusters appear to have specific influences on different Communication journals. However, the most central journals, *Communication Research* and *Journal of Communication* are influenced by multiple perspectives—macro socio-political, micro psychological and feminist.

Park and Leydesdorff (2009) argue that Communication scholars do not tend to reach out to literature beyond psychology. They assumed that social and experimental

psychology journals are major sources of theories and methods for the authors in communication journals. This may have been the case during a certain period of time when the field focused on such topics as persuasion and propaganda and primarily used experimental methods. Or as shown in this research, it is the case for a limited set of journals., The current findings, however, show that Political Science and Sociology also have a great influence on Communication. These two disciplines were referenced more than Social and Experimental Psychology. As an "interdisciplinary clearinghouse," Communication references not only Psychology but also the other Social Sciences as well, allowing a broader contextual understanding of message production, distribution and processing.

Compared to Communication's peripheral journals, those identified as core journals tended to have influence from more than one discipline. The most central journals have network ties with both the macro and micro perspectives. Over the past few decades, the psychological bias has been one of the major concerns among Communication scholars. The focus on psychological effects of communication on individuals, rather than on the social effects and the relationships among individuals is likely to lead scholars to ignore the context of human communication (Rogers and Kincaid 1981). The present research shows that Communication's focus has become diversified, and central journals have unified the field.

There are several limitations of this research. This study may be criticized for its simplicity because it does not consider a specific time frame. It did not consider the changes in citation patterns as editors of journals changed. It is possible that editors' intellectual inclinations affect publications. Also, this study did not look at how the field has changed over time. For instance, developments in communication technology is a fairly recent phenomenon. This study, however, did not consider how the field has changed in order to accommodate its study. In fact, *Journal of Computer-mediated Communication* was one of the top-10 percent journals in 2009 SSCI Journal Citation Reports. In this research, it didn't show up as a highly cited journal, because this study used historical data rather than data limited to a recent period and this journal does not have a long history. Thus, it is not central in this network. The changes in the citation patterns of non-Communication disciplines were not considered either, although they also go through major changes over time.

Another limitation is this study only focused on 45 journals identified as Communication journals in the Web of Knowledge. As a result, other publications that reflect the field were not considered. This study did not look at regional journals, non-English journals or books. Thus, the selected data in this study is somewhat limited compared to Stephen and Geel's (2007) which were drawn from a universe of bibliographic information on 46,259 scholarly articles published in 87 communication serials and annuals in print between 1915 and 2005.

Academic trends change over time. Communication has experienced rapid development, and the popularity of theories and areas of study have changed. Communication journals will accommodate intellectual exchanges with other disciplines. There will be changes in the discipline in the future. Therefore, future research should replicate this study in order to understand the development of the field.

References

Barnett, G. A., & Danowski, J. A. (1992). The structure of communication: A network analysis of the International Communication Association. *Human Communication Research, 19*, 264–285.

Barnett, G. A., Danowski, J. A., Feeley, T. H., & Stalker, J. (2010). Measuring quality in communication doctoral education using network analysis of faculty-hiring patterns. *Journal of Communication, 60*, 388–411.

Berger, C. R., & Chaffee, S. (1988). Bridging the communication gap. *Human Communication Research, 15*(2), 311–318.

Berger, C. R., Roloff, M. E., & Roskos-Ewoldsen, D. R. (2009). What is communication science. In C. R. Berger, M. E. Roloff, & D. R. Roskos-Ewoldsen (Eds.), *The handbook of communication science* (2nd ed., pp. 3–20). Thousand Oaks, CA: Sage.

Bonacich, P. (1972). Factoring and weighting approaches to status scores and clique identification. *Journal of Mathematical Sociology, 2*, 113–120.

Borgatti, S. P. (2005). *Netdraw network visualization*. Harvard, MA: Analytic Technologies.

Borgatti, S. P., Everett, M. G., & Freeman, L. C. (2002). *UCINET for Windows: Software for social network analysis*. Harvard, MA: Analytic Technologies.

Chung, C. J., Lee, S., Barnett, G. A., & Kim, J. H. (2009). A comparative network analysis of the Korean Society of Journalism and Communication Studies (KSJCS) and the International Communication Association (ICA) in the era of hybridization. *Asian Journal of Communication, 19*(2), 170–191.

Craig, R. T. (1993). Why are there so many communication theories? *Journal of Communication, 43*(3), 26–33.

Craig, R. T. (1999). Communication theory as a field. *Communication Theory, 9*(2), 119–161.

Delia, J. G. (1987). Communication research: A history. In S. H. Chaffee & C. R. Berger (Eds.), *The handbook of communication science* (pp. 20–98). Bevery Hills, CA: Sage.

Freeman, L. C. (1979). Centrality in social networks: Conceptual clarification. *Social Networks, 1*, 215–239.

Freeman, I. (2004). *The developmental of social network analysis: A study of the sociology of science*. Vancouver: Empirical Press.

Garfield, E. (1979). *Citation indexing: Its theory and application in science, technology and humanities*. New York: Wiley.

Garfield, E. (2006). Citation indexes for science. A new dimension in documentation through association of ideas. *International Journal of Epidemiology, 35*, 1123–1127.

Johnson, S. C. (1967). Hierarchical clustering schemes. *Psychometrika, 32*, 241–254.

Leydesdorff, L. (1998). Theories of citation. *Scientometrics, 43*, 5–25.

Leydesdorff, L. (2007). "Betweenness centrality" as an indicator of the "interdisciplinarity" of scientific journals. *Journal of the American Society for Information Science and Technology, 58*(9), 1303–1309.

Lievrouw, L. A., Rogers, E. M., Lowe, C. U., & Nadel, E. (1987). Triangulation as a research strategy for identifying invisible colleges among biomedical scientists. *Social Networks, 9*, 217–248.

Monge, P. R., & Contractor, N. S. (2003). *Theories of communication networks*. New York: Oxford University Press.

Park, H. W., & Leydesdorff, L. (2009). Knowledge linkage structures in communication studies using citation analysis among communication journals. *Scientometrics, 81*(1), 157–175.

Parker, E. B., Paisley, W., & Garrett, R. (1967). *Bibliographic citations as unobtrusive measures of scientific communication*. Stanford, CA: Institute for Communication Research, Stanford University.

Reeves, B., & Borgman, C. L. (1983). A bibliometric evaluation of core journals in communication research. *Human Communication Research, 10*, 119–136.

Rice, R. E., Borgman, C. L., & Reeves, R. (1988). Citation networks of communication journals, 1977–1985: Cliques and positions, citations made and citations received. *Human Communication Research, 15*(2), 256–283.

Rogers, E. M. (1994). *A history of communication study: A biographical approach*. New York: Free Press.

Rogers, E. M., & Chaffee, S. H. (1983). Communication as an academic discipline: Dialogue. *Journal of Communication, 33*, 18–30.

Rogers, E. M., & Kincaid, D. L. (1981). *Communication networks: Toward a new paradigm for research*. New York: Free Press.

So, C. Y. K. (1988). Citation patterns of core communication journals: An assessment of the developmental status of communication. *Human Communication Research, 15*(2), 236–255.

Stephen, T., & Geel, R. (2007). Normative publication productivity of communication scholars at selected career milestones. *Human Communication Research, 33*, 103–118.

Wiemann, J. M., Hawkins, R. P., & Pingree, S. (1988). Fragmentation in the field—and the movement toward integration in communication science. *Human Communication Research, 15*, 304–310.

Woelfel, J. & Fink, E. L. (1980). *The measurement of communication process: Galileo theory and methods*. New York: Academic.