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A Study of MIS Scholar Community Development Via a Collaboration Network Structures Analysis

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ABSTRACT

The objective of this study is to apply collaborative networks to understanding the development process of the Management Information System (MIS) journals' knowledge community. This research explores four phenomena: whether a co-author network depends on star collaborators, whether this network is a small world, the structural cohesion within the co-author network, and central scholars. We found that the MIS community has a small-world structure and high structural cohesion, so the MIS network is a dense cluster. Another finding was that a small number of researchers receive disproportionate recognition in MIS communities, indicating the presence of preferential attachment. This means that the MIS network contains clear star authors. Furthermore, we infer how a structural network affects knowledge diffusion and information diffusion. In addition, this study discusses changes in each journal's central scholars to observe patterns of publication for each journal published by a private for-profit organization or sponsored by academic societies.

Keywords

Management Information System (MIS), social network analysis (SNA), collaboration network structure, knowledge community.

INTRODUCTION

There is an increasing tendency for researchers to use the social network method when approaching collaborative relationships in scholarly networks. Powell, White, Koput, and Owen-Smith (2005), Moody (2004), and Newman (2001, 2004) used the social network method to observe the structure of collaboration networks. In the Management Information System (MIS), some papers (Culnan, 1987; Grover, Ayyagari, Gokhale, Lim and Coffey, 2006; Wade, Biehl and Kim, 2006) have discussed issues of publication patterns. These studies used only citation analysis to explain the underlying MIS structure. However, they did not focus on collaborative networks and the influence of social networks among authors. To evaluate the structure of a discipline, it is important to understand the social dynamics of the research community. In a research community, members interact with each other, share common research interests, use similar methods and techniques, pick up each other's ideas, and influence each other's work (Culnan, 1987; Moody, 2004). These social interactions interweave researchers into a complex social network in which knowledge is generated, diffused, and updated. The objective of this study is to understand the underlying structures and the process of development of knowledge communities from the most popular and respected MIS research journals from the perspective of social network analysis (SNA).

In this paper, we examine the development of co-author networks: whether a co-author network depends on star collaborators, whether it is a sociological small world, and the degree of its structural cohesion. According to some papers (Hansen, 2002; Hargadon, 1998; Kim and Park, 2008; Reagans and McEvily, 2003), the structure of collaboration networks can explain the knowledge and information diffusion processes of MIS communities. Therefore, through SNA methodologies, research tends to uncover the phenomenon of author collaboration in the MIS domain. Moreover, we further infer how a structural network affects knowledge diffusion and information diffusion. In addition, this study also proposes some different indicators of social networks to describe the development process of MIS communities. For example, centrality is an important concept when measuring individual structural place and evaluating individual importance, so this study uses the indicators to look for central scholars in MIS communities. Finally, this study discusses changes in each journal's central scholars to observe publication patterns for each journal.

MIS ISSUES AND COLLABORATIVE NETWORKS

Collaborative networks are an important issue because collaboration has many advantages, such as sharing information and working together. Consequently, the current trend in scholarship is towards collaboration. The relationships of collaborative networks are important, so some of the most influential papers have used SNA to discuss the collaborative structures of research communities. For example, Powell et al. (2005) used the social network method to analyze network dynamics and the field evolution of inter-organizational collaboration in the life sciences. Moreover, Moody (2004) used indicators of social networks to observe the structure of a social science collaboration network. Newman (2001, 2004) also used the social network method to analyze the structure of scientific collaboration networks.

Some papers have also examined patterns among MIS research communities. Culnan (1987) attempted to develop an intellectual mapping of MIS based on citation patterns by using MIS research citations published between 1972 and 1982. The results suggested that MIS has made significant progress toward a tradition in cumulative research. Grover et al. (2006) applied citation analysis to investigate the evolution and the state of information systems within a constellation of reference disciplines. They also considered the movement of IS towards building a cumulative tradition and the positive development of providing information to other disciplines This is because they strive toward being part of an intellectual network and establishing centrality in the areas that matter the most to them. However, Wade et al. (2006) expressed a different opinion. Their citation analysis results suggested that the IS field has left a modest imprint on other sub-fields of management. Based on this evidence, the study concludes that IS is not yet a reference discipline.

Although the studies mentioned above have discussed some of the issues and used some of the methods for the study of MIS patterns, they have not focused on collaborative networks or on the influence of social networks among authors. We believe that social networks add a conceptual formality to collaborative relationships in research networks. Consequently, this study uses the social network method to elucidate the collaborative structure of MIS knowledge communities, which is where this approach differs from that employed by prior research. For example, Moody (2004) also observed the structure of a social science collaboration network. The issues of this paper include whether a co-author network depends on star collaborators, whether it is a sociological small world, and the nature of structural cohesion within a co-author network. In addition to entire network structures, we also consider individual indicators because they can illustrate the importance of individuals in collaborative networks. For example, centrality is an important concept in measuring an individual place in a structure and evaluating individual importance, so this study uses this indicator to look for central scholars in MIS communities.

EFFECTS OF NETWORK STRUCTURE ON KNOWLEDGE AND INFORMATION DIFFUSION

This study focuses on how collaboration networks influence patterns of knowledge and information diffusion, a topic to which previous literature has contributed. Singh (2005) provided the view that observing interpersonal networks is important in determining patterns of knowledge diffusion. Therefore, the structure of the collaboration network can be used to explain knowledge and information diffusion processes within MIS communities.

Forming links is costly and constrained, so there appears to be a tradeoff between forming dense clusters to facilitate rapid exchange and integration of knowledge and forming links to a wider range of people to tap more diverse knowledge and information. The properties of small world networks help to resolve this tradeoff by enabling the existence of both dense clustering and wide reach. By forming links that provide bridges between clusters, networks can retain a high degree of clustering while achieving a short path length to diverse knowledge sources (Hansen, 2002; Hargadon, 1998). The combination of clustering and short average path lengths enables a wide range of information to be exchanged and integrated rapidly, leading to greater knowledge creation. Kim and Park (2008) studied the performance of networks of knowledge diffusion in the context of R&D collaboration. They also proved that a small world network is clearly the most efficient structure for achieving knowledge diffusion. Our study follows this stream and uses small world effects to explain whether MIS communities can encourage new knowledge.

Reagans and McEvily (2003) proposed that social cohesion should have a positive effect on knowledge transfer. They investigated the network effect on knowledge transfer using data from a contract R&D firm, and this study uses data on collaboration from MIS journals. Thus, we think that this research can also use structure cohesion to visualize the patterns of knowledge transfer of MIS communities.

Crane (1972) showed that a small number of very famous scientists formed the core of each specialty's collaboration network and that most others were connected to the rest of the community through these highly active individuals. This central position helps to explain why core scientists were able to rapidly diffuse their ideas through the community. Newman (2001) turned collaboration itself into a status marker and asked who the best-connected scientist is. The large inequality in numbers of collaborators can be understood in the context of processes of preferential attachment. A preferential attachment model can be used to find whether MIS communities depend on star authors to diffuse knowledge and information.

THEORETICAL PROPOSITIONS

Network structure can be measured and explained by three properties: a small world effect, structural cohesion, and preferential attachment. These properties represent the characteristics of network and facilitate the diffusion of information and knowledge (Hansen, 2002; Hargadon, 1998; Kim and Park, 2008; Reagans and McEvily, 2003). Degree centrality is considered an individual indicator. Consequently, variation of central scholars in each journal will be discussed; this study then explains how this variation affects patterns of publication.

The Small World Effect

First, most networks have the so-called small world property (Watts, 1999), which means that the average separation between the nodes is fairly small. For example, one can find a short path along the links between most pairs of nodes. In addition, real networks display a degree of clustering that is higher than expected for random networks (Watts and Strogatz, 1998). This study can test the observed graph properties relative to a random graph with a similar joint distribution of authors and papers. Formally, one measures local clustering with the clustering coefficient, which is the proportion of all two-step contacts that are also directly connected and relative to distance. The distance is the average path length between connected nodes. A small world network has clustering that is higher than expected and average distances roughly equivalent to the length expected in a random network of similar size and distribution of the number of partners.

According to previous literature (Hansen, 2002; Hargadon, 1998; Kim and Park, 2008), a small world structure enables a wide range of information to be exchanged and integrated rapidly, leading to greater knowledge creation. Thus, we can know whether an observed network can encourage new knowledge.

Structural Cohesion

The minimum requirement for cohesion is connectivity, so an increase in the size of the largest connected component is a basic requirement for structural cohesion. This study needs a benchmark to meaningfully judge the size of a component in empirical networks. This study constructs comparison networks by randomly assigning the observed set of authors to the observed set of papers, retaining the observed publication volume distributions, and then constructing a random collaboration network from these randomized authorships. Reagans and McEvily (2003) proved that cohesion has a positive effect on knowledge transfer, so this study assumes that the condition of knowledge transfer of an observed network can be inferred. To do so may be easy or difficult.

Preferential Attachment

Classical network models assume complete randomness, of which an example is the fact that the nodes are connected to each other independent of the number of links. The discovery of the power-law connectivity distribution required the development of new modeling paradigms. A much-used assumption is that in scale-free networks, nodes link with higher probability to those nodes that already have a larger number of links, a phenomenon labeled as preferential attachment (Barabasi, Albert and Jeong, 1999; Barabasi, Jeong, Neda, Ravasz, Schubert and Vicsek, 2002). Preferential attachment is part of all network models that aim to explain the emergence of the inhomogeneous network structure and power-law connectivity distribution (Dorogovtsev and Mendes, 2000). The availability of dynamic data on network development allows researchers to investigate its presence in the collaboration network.

If the observed network were generated through a preferential attachment process, the distribution of the number of co-authors would follow a power-law distribution, which can be seen as a straight line when plotted on a log-log scale. Thus this study uses a power-law distribution to judge whether the observed network depends on star collaborators. After that, we further infer whether the observed network depends on star authors to diffuse information.

Degree Centrality

The centrality of a node in a network is a measure of its structural importance. The centrality of a person in a social network affects the opportunities and constraints that he or she faces (Hanneman, 1998). There are three important aspects of centrality: degree, closeness, and betweenness. In this study we want to identify actors with central positions and show that degree centrality (Rogers, 1981) is an important concept when measuring individual structural place and evaluating individual importance. Therefore, we chose degree centrality scores to observe changes in each journal's central figures. The degree of a point is shown by the number of arrows coming in or going out of that point in a graph (Freeman, 1979). Intuitively, we think that the degree of centrality with authors is very high because central authors are very important in networks.

Dennis, Valacich, Fuller, and Schneider (2006) utilize an informal survey given to senior Information Systems faculty members to understand research performance of IS. They pointed out that some journals are published by a private for-profit organization, as opposed to other elite journals that are traditionally sponsored by academic societies. Finally, this study discusses changes in each journal's central figures to observe the patterns of publication of each journal that is published by a private for-profit organization or sponsored by academic societies.

DATA COLLECTION AND DATA CONSTRUCTION

There are an increasing number of papers using SNA to discuss the pattern and the development process of communities. This paper explores the collaborative structure of MIS communities, so we assume that this study can use the analysis method of the literature listed above to accomplish the research objectives of this study.

Data Collection

Previous researchers (Gillenson and Stutz, 1991; Katerattanakul, Han and Hong, 2003; Lowry, Romans and Curtis, 2004; Peffers and Ya, 2003; Saunders, 2005) identified a vast range of journals in MIS fields. This research selected a sample of journals from this range, including MIS Quarterly (MISQ), the Journal of Management Information Systems (JMIS), Information and Management (IM), Information Systems Research (ISR), Decision Support Systems (DSS), and the Journal of the Association of Information Systems (JAIS). Although this data set did not provide an exhaustive coverage of all publications in the area of MIS, it constituted a fairly comprehensive basis for assessing patterns in the literature.

Co-author information from five of the six journals is taken from ProQuest. For MISQ, JMIS and, ISR, we also consult another premium research database, EBSCOhost BSP, to obtain complete coverage of journal information. We extract co-author data from the database, matching each journal title to construct the collaboration network. The one exception to these sources are the articles in JAIS, which are taken directly from the journal's official website. The data comes from six journal articles that are shown in Table 1. The journal titles and years of first issue are listed in Table 2.

Journals	Data Collection Period	Data Source
MISQ	1977-2006	ProQuest and EBSCOhost BSP
JMIS	1984-2006	ProQuest and EBSCOhost BSP
IM	1981-2006	ProQuest
ISR	1990-2006	ProQuest and EBSCOhost BSP
DSS	1985-2006	ProQuest
JAIS	2000-2006	JAIS website

Table 1. Journals, Data Collection Period and Data Source

Journals	First Issue published
MISQ	1977
JMIS	1984
IM	1978
ISR	1990
DSS	1985
JAIS	2000

Table 2. Journals and First Issue Published

Constructing a Network of Research

This study constructs a collaboration network by assigning an edge between any two people who wrote a paper together, regardless of how often they have co-authored. The networks are constructed from the authorship data. First, we show that the image is a schematic representation of data as given in our journals, with authors connected to the papers they have written. Then, from individual publications data, we can construct a collaboration network.

Authors are identified by name, which can lead to problems when names are inconsistent over time. Errors usually occur due to inconsistent use of middle initials or when two people have the same name. If two names differed only because the initials are omitted, they were coded as being the same person. In addition, if two people have the same name, they were coded as being the same person.

RESEARCH RESULTS

This study analyzed collaboration networks, and the data came from six journals. In these networks, two authors are considered connected if they have co-authored one or more papers together. Many properties of these networks have been studied. These properties include the clustering coefficient, average path distance, size of giant component, and preferential attachment, and these properties are used to explain collaboration network structure. Furthermore, this study discusses collaboration network structure, which influences the knowledge diffusion process. In the second section, variation in central scholars in each journal will be discussed. Then we explain how variation affects publication patterns.

Collaboration Network Structure

This section presented three different properties: the small world effect; structural cohesion, a broad overarching connectivity among a large portion of the network; and preferential attachment, suggesting a structure reliant on star authors.

The Small World Effect

In this study, two parameters, cluster coefficient and average path distance, are used to measure whether a collaboration network has the small world effect. In Table 3, the small world parameters of each observed network and synthesized data from six journals are shown.

The values of the clustering coefficient are given for each observed network. It can be seen that there is a very strong clustering effect in each MIS community. Two authors typically have a 70% or greater probability of collaborating if both of them have collaborated with a third author. The average distances of these observed networks are all quite small. They vary from 1.177 for JAIS to 6.743 for MISQ. The results support the hypothesis that these networks all have a small world effect. According to the explanations above, it can also be shown that the same effects exist in different MIS communities.

For the condition of synthesizing the data from six journals, clustering is larger than with a random graph, and distances are smaller than those from the random graph. This means that the graph has a small world structure.

	MISQ	JMIS	IM	ISR	DSS	JAIS	ALL
Nodes	985	1079	1729	529	1954	177	5511
Small world Parameters							
Cluster coefficient	0.764	0.811	0.801	0.785	0.874	0.939	0.784
(Random expected)	0.003	0.002	0.000	0.004	0.001	0.007	0.000
Average Path Length	6.743	3.942	5.684	3.492	3.385	1.177	7.254
(Random expected)	8.927	8.268	10.250	7.469	9.749	6.555	14.137

Table 3. Small World

Structural Cohesion

This section discusses the structurally cohesive collaboration network. In Table 4, the size of the largest component of each observed network and synthesized data from six journals are shown.

The ratio of observed to random is given for each of the observed networks, and it can be seen that there is a very low ratio in each MIS community. The ratios of the observed networks vary from 0.066 for JAIS to 0.5218 for MISQ. The results show that these networks all have a small cohesion effect. According to the explanations above, it can be said that the same effects exist in different MIS communities.

It can be found that for the synthesized data from the six journals, nearly half of all collaborating authors are members of a single connected component. This means that these collaboration networks have high structural cohesion.

	MISQ	JMIS	IM	ISR	DSS	JAIS	ALL
Nodes	985	1079	1729	529	1954	177	5511
Size of largest component							
Observed	311	126	167	61	119	7	2338
Random paper assignment	596	759	1049	347	1291	106	3962
Ratio of observed to random	0.5218	0.166	0.1592	0.1758	0.0922	0.066	0.5901
Percentage	52.18	16.6	15.92	17.58	9.22	6.6	59.01

Table 4. Structural Cohesion

Preferential Attachment

A log-log scale is shown in Figure 1. The observed distribution almost fits a power law, suggesting that the network was generated by a preferential attachment process. Therefore, information diffusion through the network depends on clear star authors while the network contains them. Nevertheless, JAIS may not have this pattern. The observed distribution, which has a curve, does not fit a power law, suggesting that the network was not generated using a preferential attachment process. Therefore, information diffusion through the network does not depend on such actors while the network contains clear star authors. Because this journal is new, the finite time of seven years used in this study prevents the complete development of a community.

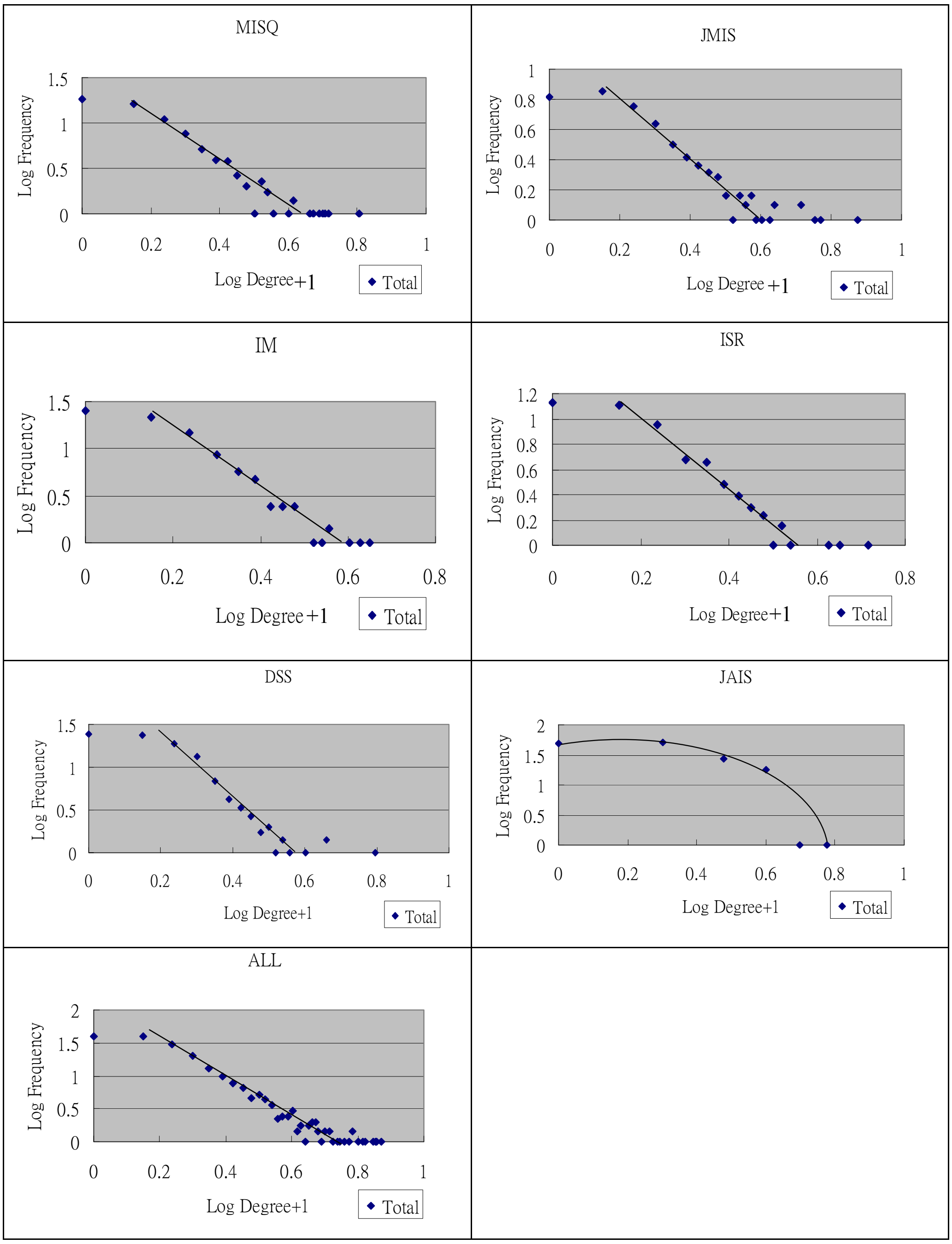


Figure 1. The Number of Collaborators of Authors

Central Scholars in Communities

In order to identify centrality scholars in each journal, we begin by examining degree centrality for each author. The authors with the largest degree are identified as central scholars. Therefore, we show the authors with the largest degree in each period. We divided the data based on the whole data collection period. If the whole data collection period is over 20 years, we divided the data into five-year periods. If the whole data collection period is between 10 to 20 years, we divided the data into three-year periods. If the whole data collection period is under 10 years, we divided the data into two-year periods. The illustrations are shown in Tables 5 to 10.

From the results, we find that the central authors of MISQ, IM, ISR, and DSS vary with time. For example, in MISQ, in the indicator between 1977-1982, the central author is not explicit because at the time MISQ was a new journal. However, in 1987, we find that the central author is Benbasat, Izak. Nevertheless, in 2006, the central author became Zmud, Robert W. In addition, we also understand that central JMIS authors do not vary with time. For example, at JMIS, from 1984 to 1988, the central authors are Konsynski, Benn R. and Nunamaker, Jay F., Jr., but during another period, the central author is only Nunamaker, Jay F., Jr. Therefore, the central author's status has not changed over time. Finally, we find that the number of central authors at JAIS is high during the first period. Until the last few years, there has only been one person as central author. That is because JAIS is a new journal and the status of its development is not explicit.

MISQ	Degree	Serial numbers
1977-1982	Benbasat, Izak	1
	Halloran, Dennis	2
	Manchester, Susan	3
	Moriarty, John	4
	Riley, Robert	5
	Rohrman, James	6
	Skramstad, Thomas	7
1977-1987	Benbasat, Izak	1
1977-1992	Benbasat, Izak	1
	Dickson, Gary W.	8
	Ives, Blake	9
1977-1997	Robey, Daniel	10
1977-2002	Benbasat, Izak	1
	Watson, Hugh J.	11
1977-2006	Zmud, Robert W.	12

Table 5. Central scholars each period-MISQ

JMIS	Degree	Serial numbers
1984-1988	Konsynski, Benn R.	1
	Nunamaker Jr., Jay F.	2
1984-1993	Nunamaker Jr., Jay F.	2
1984-1998	Nunamaker Jr., Jay F.	2
1984-2003	Nunamaker Jr., Jay F.	2
1984-2006	Nunamaker Jr., Jay F.	2

Table 6. Central scholars each period-JMIS

IM	Degree	Serial numbers
1981-1986	Wetherbe, James C.	1
1981-1991	Wetherbe, James C.	1
1981-1996	Igbaria, Magid	2
1981-2001	Igbaria, Magid	2
1981-2006	Igbaria, Magid	2

Table 7. Central scholars each period-IM

ISR	Degree	Serial numbers
1990-1994	Ang, Soon	1
	Cummings, Larry L.	2
	Dos Santos, Brian L.	3
	Earley, P. Christopher	4
	Easton, George K.	5
	George, Joey F.	6
	Northcraft, Gregory B.	7
	Nunamaker Jr., J.F.	8
	Prietula, Michael J.	9
	Straub, Detmar W.	10
1990-1997	Benbasat, Izak	11
	Valacich, Joseph S.	12
1990-2000	Mukhopadhyay, Tridas	13
1990-2003	Benbasat, Izak	11
	Whinston, Andrew B.	14
1990-2006	Whinston, Andrew B.	14

Table 8. Central scholars each period-ISR

DSS	Degree	Serial numbers
1985-1990	Jarke, Matthias	1
	Nunamaker, Jay F., Jr.	2
	Vogel, Douglas R.	3
1985-1995	Nunamaker, Jay F., Jr.	2
1985-2000	Chen, Hsinchun	4
1985-2006	Chen, Hsinchun	4

Table 9. Central scholars each period-DSS

JAIS	Degree	Serial numbers
2000-2002	Detmar W. Straub	1
	Erling Havn	2
	Jacob Thommesen	3
	Jan Damsgaard	4
	Jørgen P. Bansler	5
	Larry Press	6
	Peter Wolcott	7
	Rens Scheepers	8
	Seymour Goodman	9
	Kalle Lyytinen	10
	William Foster	11
	William McHenry	12
2000-2004	Varun Grover	13
2000-2006	Varun Grover	13

Table 10. Central scholars each period-JAIS

Graphs of the dynamic network are shown to reinforce the explanation. We further use dynamic network visualizations to present a series of discrete-time images of the evolution process of the co-author network. To simplify the presentation, we include only the components of those central scholars and thereby remove the samples from this large network. In Figures 2 to 7, the shape of nodes reflects their form, with a square denoting a centrality scholar and a circle denoting a non-centrality scholar. Looking at specific nodes (squares nodes), we observe changes in the composition of the nodes, which illustrate the overall trends in the field and make the detailed visualizations of this large database more interpretable to readers not familiar with graphical representations of network dynamics. Figures 2 to 7 present images of the dynamic change.

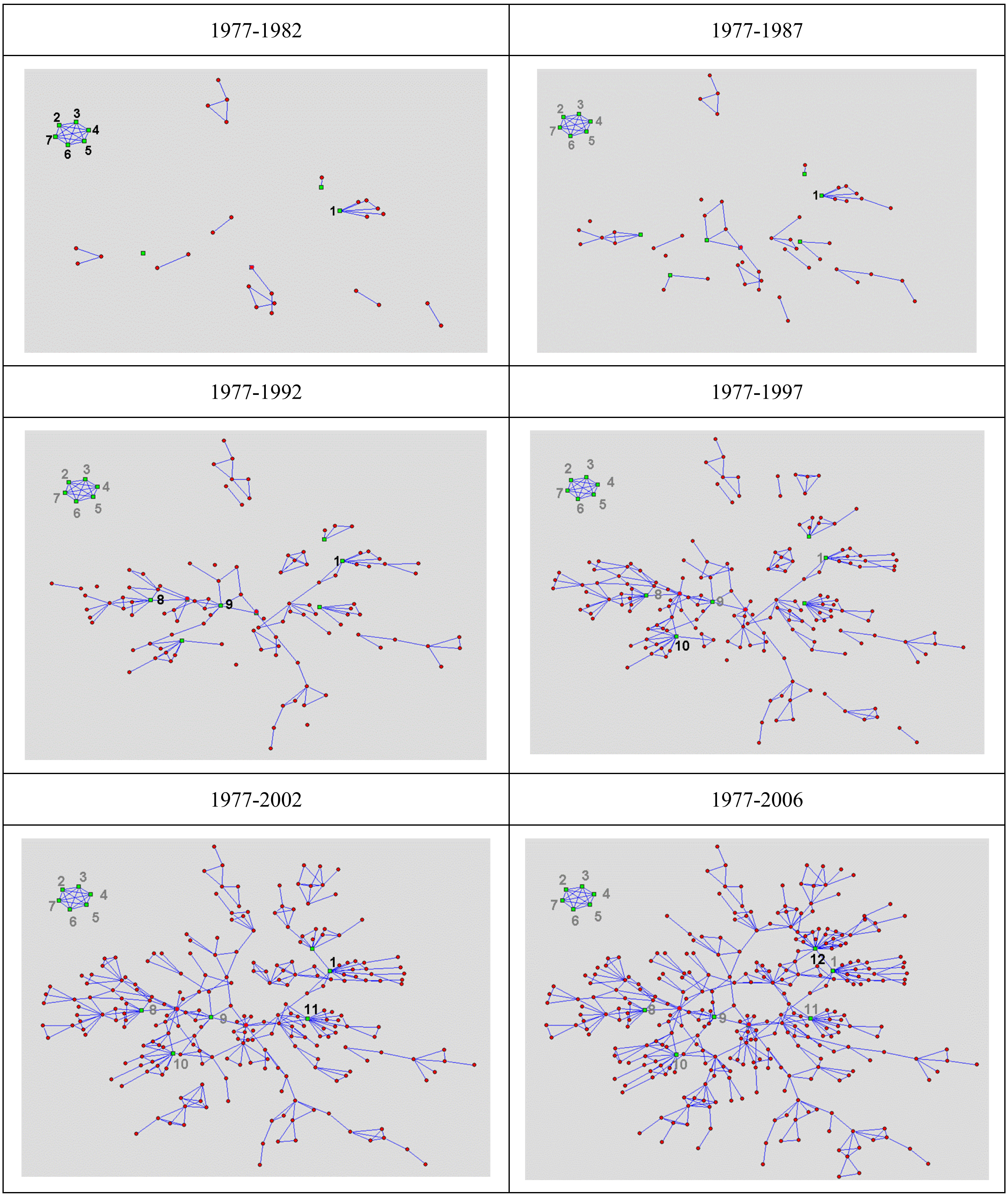


Figure 2. Dynamic change of central scholars-MISQ

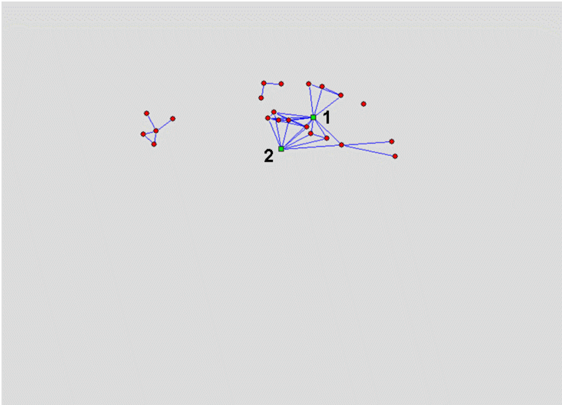
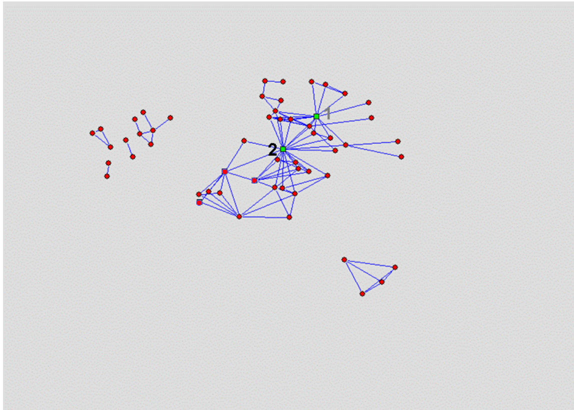
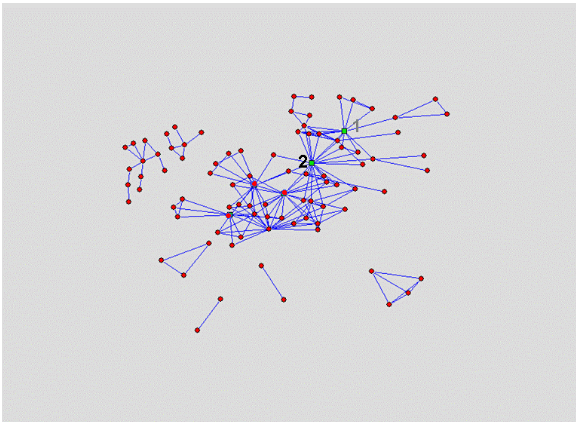
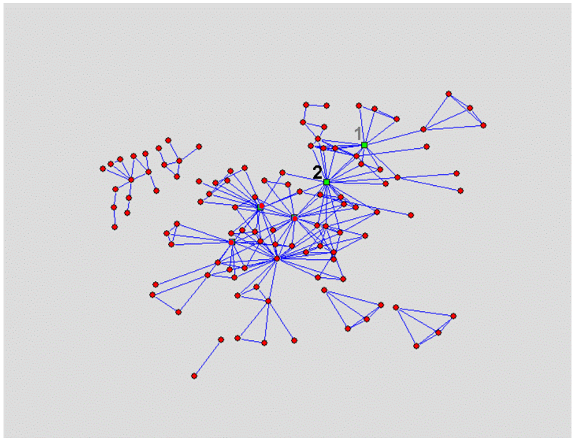
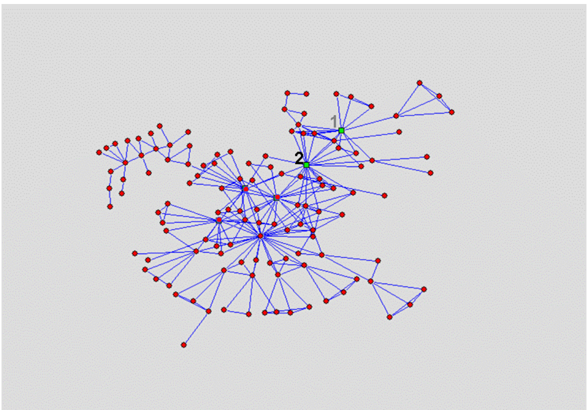
1984-1988	1984-1993
	
1984-1998	1984-2003
	
1984-2006	
	

Figure 3. Dynamic change of central scholars-JMIS

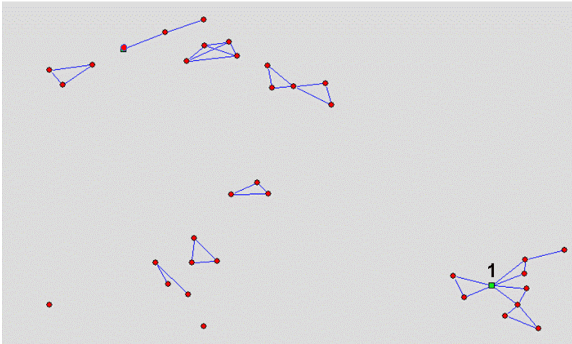
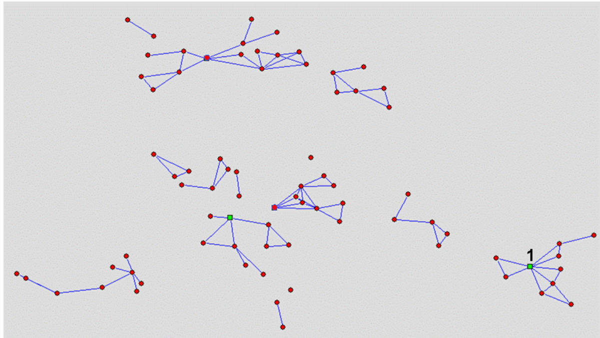
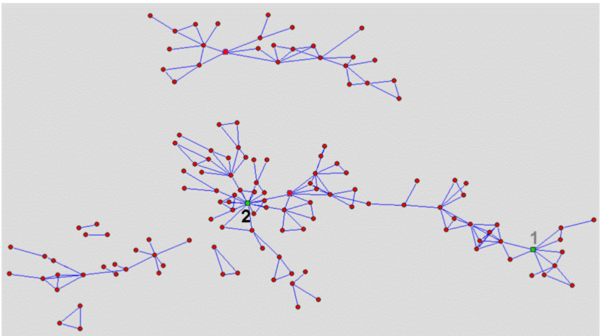
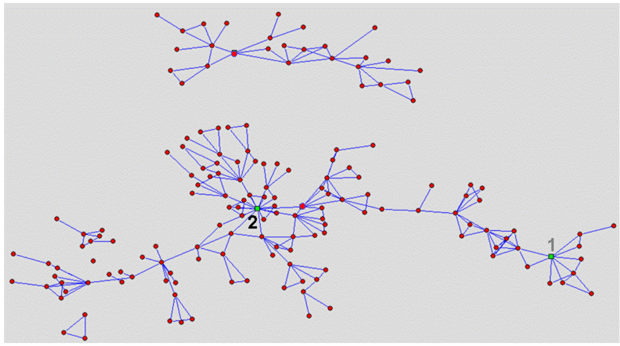
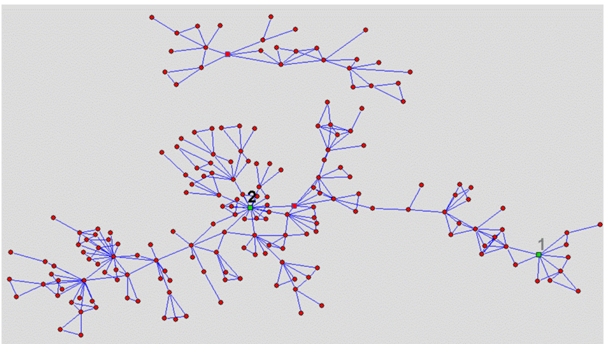
1981-1986	1981-1991
	
1981-1996	1981-2001
	
1981-2006	
	

Figure 4. Dynamic change of central scholars-IM

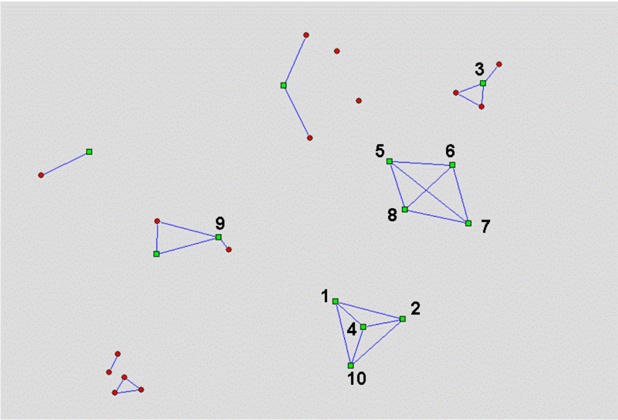
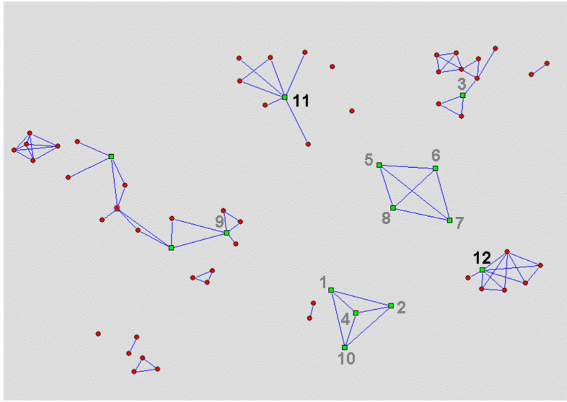
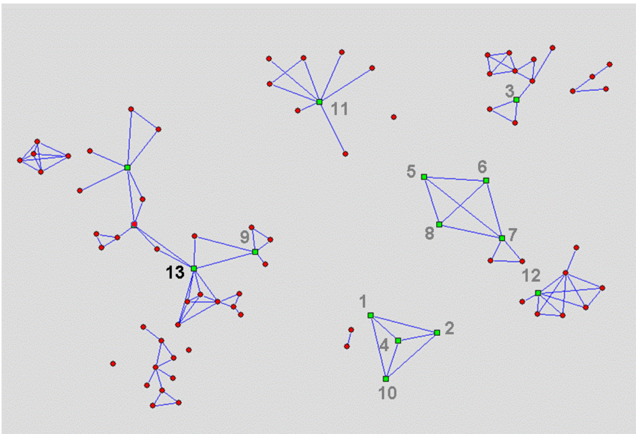
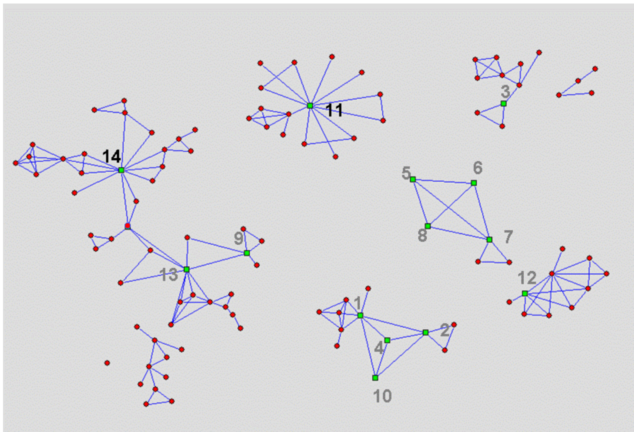
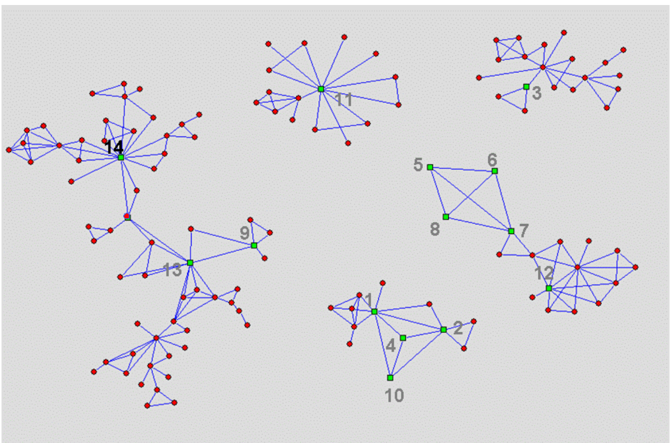
1990-1994	1990-1997
	
1990-2000	**1990-2003**
	
1990-2006	
	

Figure 5. Dynamic change of central scholars-ISR

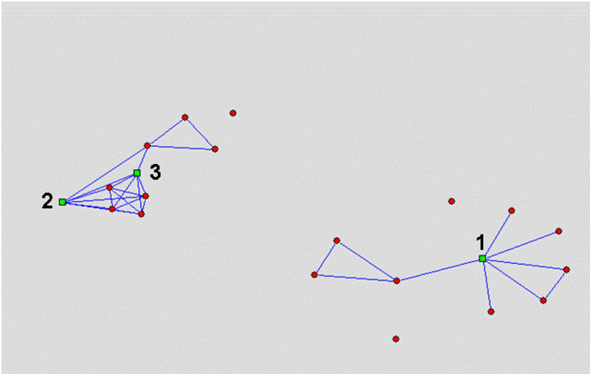
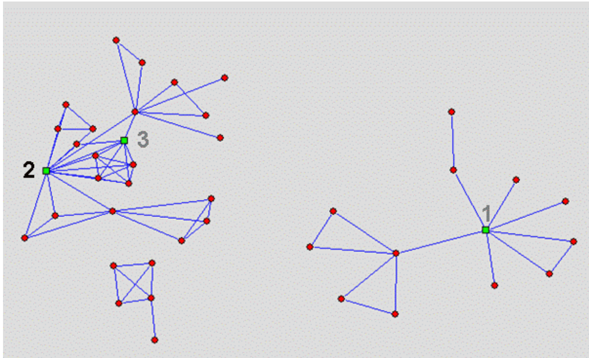
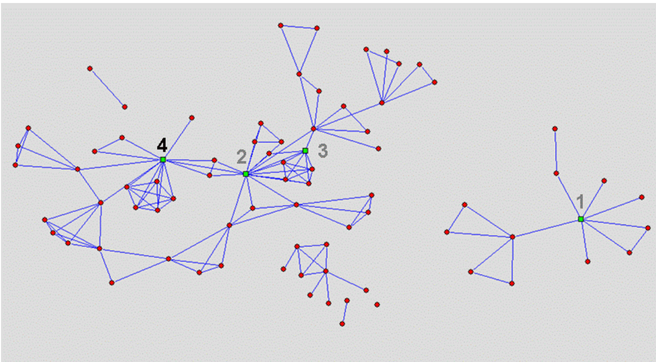
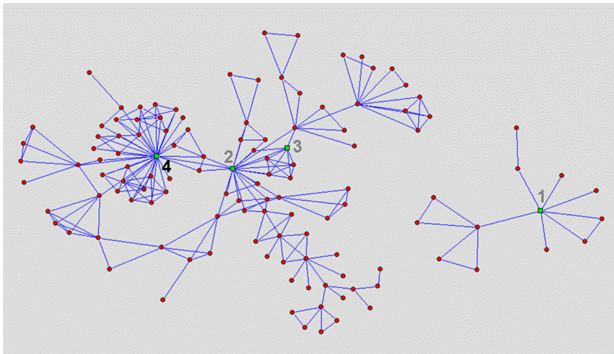
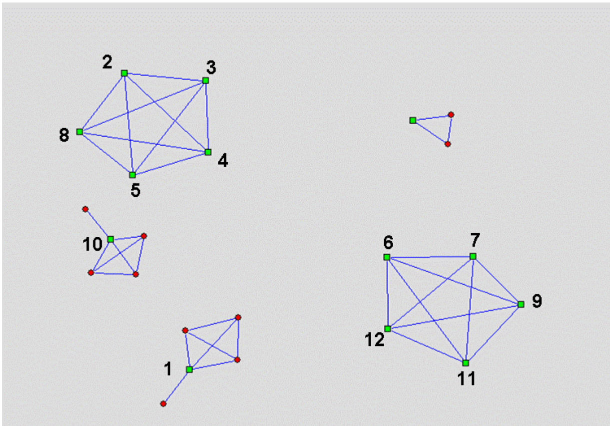
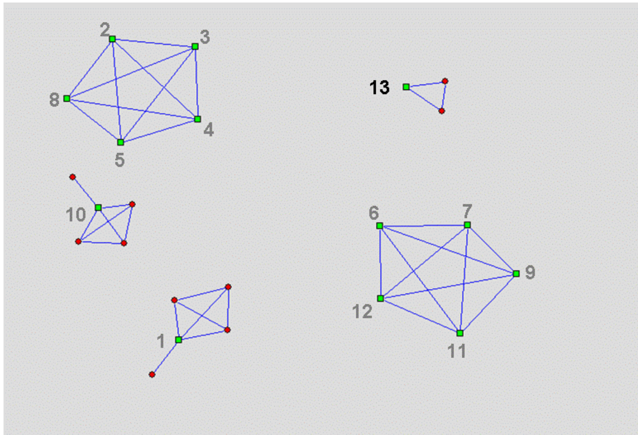
1985-1990	1985-1995
	
1985-2000	**1985-2006**
	

Figure 6. Dynamic change of central scholars-DSS

2000-2002



2000-2004



2000-2006

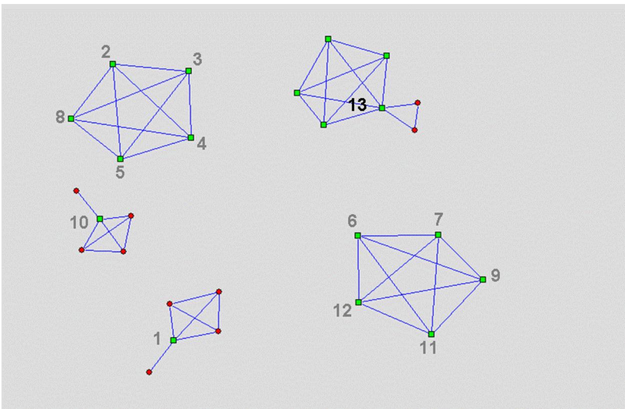


Figure 7. Dynamic change of central scholars-JAIS

DISCUSSION

This study uses network structure to explain co-author relationships. We also use network structure to infer the status of knowledge creation, knowledge transfer, information diffusion, and publication patterns of MIS communities.

First, since MISQ has a small world structure, its knowledge creation is relatively easy, and it can produce research that is more diverse. Its structural cohesion is low, so knowledge transfer is difficult. Furthermore, the distribution of the number of MISQ community co-authors fits a power law, suggesting that the network was generated through a preferential attachment process. Therefore, information diffusion through the network depends on star actors while the network contains clear star authors. The statuses of JMIS, IM, ISR, and DSS are similar to the results of MISQ. For JAIS, which also has a small world structure, its knowledge creation is relatively easy and it produces research that is more diverse. Its structural cohesion is low; therefore, its knowledge transfer is difficult. However, the status of its information diffusion is not explicit. That is because the distribution of the number of co-authors of JAIS community does not fit a power law; it is curved, suggesting that the network was not generated by a preferential attachment process. Therefore, information diffusion through the network does not depend on these actors while the network contains clear star authors. We make assumptions because this journal is new and this study has a finite time of seven years, which prevents complete community development.

We subsequently summarize the condition of the whole MIS community. It has a small world structure. We also find that structural cohesion of the whole MIS community is high. The distribution of the number of co-authors of the whole MIS community fits a power law, suggesting that the network was generated by a preferential attachment process. The network contains clear star authors. Therefore, we understand that the knowledge transfer of the whole MIS community is easy, as is knowledge creation by the whole MIS community. The whole MIS community depends on star collaborators to diffuse information.

Although knowledge transfer of each MIS community is difficult, we understand that communication among authors of the whole MIS community is good because its knowledge transfer is easy and knowledge creation can be achieved. The MIS community has a large inequality in the number of collaborators, which indicates clear star authors in the community. This network is held together by a small number of network stars. Therefore, those authors with many collaborators may have much more influence shaping ideas than others. Therefore, we consider that the MIS community can quickly diffuse information and ideas through such authors.

Second, we discuss changes in the central scholars of each journal, which can be used to observe the publication patterns of each journal. For MISQ, IM, ISR, and DSS, the central scholars who have the largest degree vary over time. We also discover that the central scholars of JMIS do not vary over time. They have some fixed central authors. That is because JAIS is a new journal and its status is not explicit. The results are close to the viewpoint put forth by Dennis et al. (2006), who state that JMIS is published by a private for-profit organization, as opposed to other elite journals that are traditionally sponsored by academic societies. Since this study finds that JMIS is published by a private organization, we believe this organization's status to be controversial. This kind of status may exclude papers of other authors who do not have relationships with the central people. Therefore, their editorial board is relatively static. We propose that JMIS should develop a more traditional editorial structure.

CONCLUSIONS

According to the properties used in this paper, the MIS community can look at new issues with a diverse perspective, the field can have copious ideas, and knowledge sharing can be facilitated. Nonetheless, the study reported in this paper represents only a first look at the collaboration networks described. We hope that academic collaboration networks will prove a reliable and copious source of data for testing theories about such measures.

One of the study's limitations is our reliance on popular and respected MIS research journals to generate the sample of the MIS community. The key question is to what extent these journals truly represent the MIS community. Although these journals constituted a fairly comprehensive basis for assessing patterns in the literature, our sample by no means guarantees the most complete coverage of the membership of the MIS community. In addition, the calculation and interpretation of measures also have some limitations. First, there is the question of using an actor's degree centrality as a measure of importance for the MIS community. For example, an author who published many important papers as a single author has a degree centrality of zero and is supposed to have no relevance in the field of IS. Contrarily, a research assistant who published only one paper together with many other research assistants will have a high degree centrality and is supposed to have a high relevance in the field of IS. This is apparently another limitation of this study. In addition, we use a power-law distribution to judge whether the observed network has the preferential attachment property. In future research, we can use another preferential attachment property.

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