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Evaluating Scholarly Influence Through Social Network Analysis: the Next Step in Evaluating Scholarly Influence

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ABSTRACT

Following previous research findings, this paper argues that the current method of evaluating scholar performance, publication counts in “quality” journals is flawed by subjectivity in generating the list of approved journals and the definition of quality. Truex, Cuellar and Takeda (2009) sought to improve on this method by substituting the measurement of “influence” using the Hirsch statistics to measure ideational influence. Since the h-family statistics are a measure of productivity and the uptake of a scholar’s ideas this methodology privileges the uptake of a scholar’s ideas over the venue of publication. But influence is built through other means than by having one’s papers read and cited. This paper argues that interaction between scholars resulting in co-authored papers is another way to build academic influence. This academic influence, which we term social influence, can be assessed by Social Network Analysis (SNA) metrics which examine the nature and strength of coauthoring networks among IS Scholars. The paper demonstrates the method of assessing social influence by analysis of the social network of AMCIS scholars and compares the results of this analysis with other co-authorship networks from the ECIS and ICIS community.

Keywords

Scholarly contribution, social network analysis, scholarly influence

INTRODUCTION

How does one evaluate the “worth” and the influence of a scholar? This is an important question for all academic stakeholders. Promotion and tenure committees need broadly applicable evaluation criteria allowing them to compare the work and influence of scholars across multiple disciplines. One commonly used evaluative criterion is the number of publications achieved in venues considered to publish only the best quality scholarship over a given period of time – the publication count. Publication counting provides simple-to-compute metrics, but the technique requires making value assumptions that are problematic and citation counting has been extensively criticized as biased. The choice, the ranking and the weighting of the publication (journal) venue is considered problematic for many reasons (Chua et al. 2002; Walstrom et al. 1995). Five critiques of the concept are discussed more fully in the following literature review. Moreover, the presumption that top journals always identify and publish “top” articles or that influential and important articles do not appear in other non premier publication venues has been challenged (Singh et al. 2007).

Recent research argues that rather than relying on a single simplistic metric-a raw publication count-, a scholar’s ability is better measured in terms of a profile of metrics that assess the uptake of the scholar’s ideas in a field. The Hirsch family of statistics is argued to provide a fairer and more balanced way of assessing scholarly ability (Truex III et al. 2009). Use of these metrics allows comparisons across different fields of study and provides a measure of both productive output and impact. In effect, these metrics measure the *ideational* impact of the scholar, i.e. the impact of their ideas on the field.

This paper extends the aforementioned research program by proposing the addition of another profile of statistics to the composite basket of scholarly evaluation tools. This approach is one that assesses the networks of a scholar's *social* influence in the field. We argue that as a scholar interacts with other scholars, his/her ideas are shared with others and molded by these interactions. Thus his/her influence grows through the sharing and joint development of ideas in networks of discursive exchanges, interactions and transactions called co-authoring. For this we propose to use Social Network Analysis (SNA) on a co-author network.

By adding SNA we are now examining the degree and frequency of connectedness between persons with whom a scholar works, creates, and publishes her scholarly work. In combining the H-family bibliometrics with SNA we are providing ways to examine two parts of an *extended discourse* we call scholarship. That is, if one considers the inclusion of citations as an indication of '*listening*', or acknowledging that a party to the discourse as having been heard, and one also considers the patterns, strength, and centrality measures of the networks in which ideas are created and published to be an indication of '*who is talking with whom*' in that discourse, then we have a fuller picture of the nature of the construct called 'scholarly influence' we are trying to access.

The objective of this research is to examine how SNA may be used to evaluate scholars. The research questions that we are investigating are therefore:

RQ1: How can social networks and network components be meaningfully compared to evaluate scholars?

RQ1:1 If such differences exist what are their key structural characteristics?

RQ2: How do the SNA and H-family metrics provide a clearer picture of the construct 'scholarly influence'?

The paper proceeds as follows. First, we review the research to date in evaluating scholarly contribution including our first contribution: ideational influence. Then we discuss how SNA can be used to measure the scholar's social influence. As an illustration, we present an SNA analysis of the AMCIS conference publications from 1998 to 2005, along with the analysis of the ECIS conference from 1993 to 2005 (Vidgen et al. 2007b) and the ICIS conference from 1980 to 2005 (Xu et al. 2006). Using these analyses, we propose centrality metrics to evaluate scholarly social contribution.

LITERATURE REVIEW

Typically, the research contribution of a scholar has been assessed by whether the scholar publishes articles in journals of appropriate quality. This leads to the question as to which journals are "high quality". This has been resolved by two different methods: survey methods and scientometric methods. The criticisms against those methods and how they have been applied have been reviewed extensively elsewhere (Chua et al. 2002; Singh et al. 2007; Truex III et al. 2009; Walstrom et al. 1995) and therefore we simply summarize the arguments here to conserve space. There are five general criticisms against survey methods (Truex III et al. 2009): 1) they are subjective and reflect a North American bias, (Gallivan et al. 2007; Lyytinen et al. 2007; Willcocks et al. 2008), 2) the studies are self-reinforcing and reifying by repetition, (Galliers et al. 2007; Gallivan et al. 2007; Whitley et al. 2007), 3) certain venues are more recognizable leading to a familiarity bias, 4) these types of studies privilege older generalist journals over newer 'niche' journals (Gallivan et al. 2007) and, 5) a ranking study is reflective of an inherently political process and the results received are a result of the power distribution.

Likewise, scientometric studies have also been criticized for three general reasons: 1) varying citation practices by disciplines and result in varying norm in the number and types of citations, 2) citation 'rigging' can occur when authors are compelled to include specific references in a paper, as in to those journals wherein the paper is under review or to author's who might be reviewers of the manuscript. The practice inflates citation counts, and finally 3) older journals and papers that have been in circulation longer will have had more time to garner more citations, resulting in a skewing toward these articles and publications (Lowry et al. 2007).

Our review of concerns expressed in the literature suggests that the methods to assess journal quality and therefore support the use of publication counts in "quality" journals are suspect due to bias in the methods of selecting which journals are "quality" journals, an implicit and therefore subjective definition of quality, and the inability of editorial boards to consistently identify and publish "quality" articles. This position may be best summarized by Singh, et al. (2007) when they say:

Taking the preceding results as a whole, the conclusion is inescapable that using journal ranking (specifically, distinguishing between the top five and non-top five) can lead to substantial misclassification

of individual articles and, by extension, the performance of the faculty members who authored them. (Singh et al. 2007, p. 327)

The Hirsch Indices

Since the existing method of using counts of publications in “quality” journals has been challenged as being inadequate, it has been recently proposed that our discipline might better use the notion of “influence” to assess the scholarly ability of a faculty member (Truex III et al. 2009). The theory being that the uptake of a scholar’s ideas by members of the research community is a better indicator of the quality of a scholar’s work than publication in a journal. Publication in a journal indicates only the ability to survive the review process and to appeal to the opinions of less than five or six people. When a scholar’s ideas are adopted by a section of the research community by way of citations, this is a sign that their research has struck a chord as a true, original piece of work that deserves notice. Thus the influence that a scholar’s ideas encompasses not only takes into account the “quality” of his/her research but also the originality and impact of those ideas.

In the same paper, the authors proposed that a method of assessing the influence of scholarly publications: the Hirsch indices. The use of the indices allows us to assess both productivity and influence. The native “h” index provides an overall assessment of influence (Hirsch 2005). The “hc” index puts more weight on current articles and thus allows us to evaluate if the scholar is becoming more influential in more recent articles (Sidiropoulos et al. 2006). The “g” index allows us to assess whether the scholar is influential as a result of “mega” articles, ones that are very highly cited (Egghe 2006). Finally, the “hm” index allows the assessment of influence on a per paper basis, taking out the bias that comes from publication productivity (Molinari et al. 2008).

These indices allow us to assess is the “uptake” of the ideas proposed by the scholar which we term, his *ideational* influence. However they do not allow us to assess the influence that the scholar achieves by their personal interaction with other scholars. For that, we need to have a different set of measures. For that we need to examine how influence is spread through personal interaction.

Social Influence

Unsurprisingly, we take the position that knowledge creation and dissemination is a social act. This notion has been well developed in our own field, and the literature review in Xu and Chau (2006) and Vidgen, et al (2007a) each provide an excellent description and survey of the research. Xu and Chau (p.570) remind us that the social identity of the IS discipline is tightly bound to the question of who conducts IS research. They cite Nahapiet and Ghoshal (1998) and remind us that as a field builds “social capital” (c.f., Bourdieu, 1985, 1993) it builds disciplinary strength. We accept the logics as to why social networks are important to any field. But, in this research, we are attending to the particular way those networks are built, maintained, strengthened and more importantly spread as an indication of scholarly influence.

We are focusing on the influence that the scholar achieves through their personal scholarly interaction with other scholars. We liken this to a network of social transactions where in engaging in a bounded task, for instance conducting research and preparing papers, social actors have the opportunity to jointly sense-make, negotiate understanding, build work languages and so on such that intellectual and social bonds of varying strength are forged. These bonds are reinforced and strengthened by further co-creation of research and papers and via sharing cohort activities such as conferences and research workshops. As a scholar interacts with other scholars, his/her ideas are shared with others, they are challenged, tested and further shaped by these interactions. Some ideas survive this crucible and are adopted by others who further develop or refine them. This process is well described by Latour (1987) in which he illustrates how scientific thought may be generally accepted and become “black boxed” and how important scientific advances or engineering ideas are rarely the output of a single person. They are all the product of social shaping.

We take as a given that a scholar’s influence grows through the spreading of his/her ideas via the publication process. But that is the tip of an iceberg; publication is an outcome of previous social interactions in the creation and dissemination of scholarly work and ideas. The scholar therefore gains influence through *social* means and publications are an outcome of the social activity. This social influence is also built in the way we inhabit social cohorts. Vidgen et al (2007a) describe three settings, the conference, the working setting in a university department, and via the PhD student mentoring process. These informal and formal relationships ultimately result in co-authoring relationships, where the scholar joins with others to create articles that spread a combining of their ideas with others, often in jointly written papers. Thus it is that co-author

relationships can be used as a proxy for the larger concept of *social influence*. To analyze the nature of social influence in co-authoring we, like others before us, use SNA.

In SNA, one maps the informal organization of relationships between researchers (Vidgen et al. 2007b). We look at the network of co-authoring relationships between authors making the assumption that co-authoring is indicative of relationship between the authors that includes the sharing and acceptance of ideas between them. By examining the *centrality* measures of the various members of the community we can arrive at a profile of measures that assess the social influence of the members of a research community. Proper comparison of these profiles would allow evaluators to assess the social influence of the scholar and along with the *ideational* measures provided by the Hirsch indices create an assessment of the scholar's capabilities. Such an assessment we argue would be superior to that provided by the simple publication count metric.

REVIEW OF METHODS TO STUDY SOCIAL CONNECTIONS VIA SNA

The use of network analysis has stretched from neurobiology and statistical physics, to the notion of 'six degrees of separation', and games such as 'six degrees of Kevin Bacon' that try to link different actors to the famous actor (Guare 1992; Liben-Nowell et al. 2005; Strogatz 2001). The term 'six degrees of separation' coined by Guare (1992) is really a phrase for the 'Small World Problem' by Travers and Milgram (1969), where they found that everyone in a large society were connected in some way by about 5.5 linkages (Travers et al. 1969). In the information systems (IS) literature SNA has been applied several times (Nerur et al. 2005; Polites et al. 2008; Takeda 2010). With the advent of social networking sites such as myspace.com and friendster.com, SNA has been applied to these sites as well (Howard 2008; Kleinberg 2008). Social network analysis has its advantages. "... one of SNA's advantages is that it can in fact uncover subtle, unrecognized relationships between journals, and thus can aid in the development of more accurate classification schemes in the future" (Polites et al. 2008).

There are also two major ways in which SNA can be utilized for analyzing social connection in academic publishing. The first connection type is that seen in co-authorship networks. Connections are made when two or more people collaborate on a project. During co-authorship network analysis, all co-authors are assumed to know each other. Characteristics of co-authorship connectedness are that co-authors may have stronger bonds, with fewer connections. But the strength of the connections may not be apparent. A second way to use SNA to measure connectedness, is via co-citation analysis. In co-citation analysis a social connection is considered to have been made when one author makes a citation to another author. In comparing co-citation analysis to co-author analysis, we note that in co-citation analysis the connections are weaker, and there are more connections. But in both the co-author analysis and in co-citation analysis, the strength of connections cannot be measured. For the current research, we chose co-author analysis to assess social influence because co-authoring is a more direct and personal linkage between authors and because co-authorship requires two-way communication and social interaction whereas co-citation analysis is one-way and more passive.

When performing a SNA, several aspects of a network – nodes, edges, connectivity, distance, and components (or clusters) – are identified and examined. A **node** is defined as a point on the network (Barbasi et al. 1999; Coleman 1988; Kleinberg 2000; Travers et al. 1969). An edge of a network is defined as a line connecting two nodes (Barbasi et al. 1999; Coleman 1988; Kleinberg 2000; Travers et al. 1969). In co-authorship networks, the authors are the units (nodes). A co-authorship is represented as a connection (line/edge) made between the author/nodes.

An **edge** can be non-directional, directional, or bidirectional. For example co-authorship will be shown as a non-directional edge. Citations can be shown as a directional edge. If author A cites author B, and author B cites author A, a bidirectional edge would be used. 'Distance' is the length of the shortest path, measured in links, between two distinct nodes (Travers et al. 1969). In some previous SNA studies, the tendency of co-authors to continue to co-author together or the tendency of the same co-authors to publish to the same venue have been analyzed (Acedo et al. 2006; Barbasi et al. 2002; Eaton et al. 1999).

In layman's terms, **distance** is measured by counting the minimal number of edges it takes to go from one node to another node. Traversing edges can take into account the direction of the edge or not. **Connectivity** is a notion of how a researcher (node) in the network is connected to others via an edge. Depending on the research question, connectivity can be measured by the pure number of edges coming out of any given node. The researcher may want to discover how a researcher is connected so a weight and distance measure to other nodes may be incorporated. Strength of edges and nodes may also be included in the measure. Connectivity may be shown on the network by proximity of nodes –how authors form **clusters**. Using proximity measures can show how many authors are closely related to one author, or how many authors are within a given cluster (Albert et al. 2002; Barbasi et al. 1999; Barbasi et al. 2002; Henry et al. 2007; Vidgen et al. 2007a).

In this research the social network is defined by the set of authors who have co-authored papers accepted in this conference. The network takes the set of all papers submitted to the conference *in which there is co-authorship*. The social network is therefore defined by the set of authors who have co-authored papers accepted in this conference. Sole-authored papers are NOT part of the network. SNA's fundamental metric is distance: how many co-author connections does it take to reach another author. For example, if A and B co-author and B and C co-author and C and D co-author, the distance between A and B is zero, between A and C is one (via B) and between A and D is two (via B and C).

SNA' **centrality measures** –*degree, betweenness* and *closeness* –analyze the aggregate distances between one author and the rest of the network.

Degree centrality of a node is defined as: $Degree\ Centrality = \frac{degree}{n - 1}$

where degree is the number of edges coming out of the node, and n is the number of nodes. Degree centrality indicates how many co-authors this particular author had indicating that this author has a wide number of social contacts and that his social influence is higher.

Between centrality of a node n is defined as: $Betweenness\ Centrality = \sum_{\substack{s \neq n \neq t \in N \\ s \neq t}} \frac{\sigma_{st}(n)}{\sigma_{st}}$

Where σ_{st} is the number of shortest paths from node s to node t, and $\sigma_{st}(n)$ is the number of shortest paths from node s to node t that go through node n. Betweenness centrality indicates how many paths between authors travel through him/her indicating that he is a "hub" for social influence, many ideas either originate or develop through him/her. If this measure is higher then this author has a higher social influence. Transnational scholars should have the highest between centrality.

Closeness centrality of node n is defined as: $Closeness\ Centrality = \frac{\sum_{t \in N \setminus n} d_G(n, t)}{v - 1}$

Where v is the total number of nodes in the graph. This is essentially the geodesic mean distance (shortest path) between n and all other nodes it can reach. Closeness centrality indicates the average number of links when connecting to other people in the network (Freeman, 1977). A smaller number here indicates that this person has a shorter distance in terms of co-authors. This means that the author is more central to the flow of ideas and hence a higher amount of social influence.

In summary: *Degree* indicates how many co-authors this particular author had indicating that this author has a wide number of social contacts and that his social influence is higher. *Betweenness* indicates how many paths between authors travel through an author-node indicating suggesting that authors to be a "hub" of social influence. Many ideas either originate or develop through that core node. *Closeness* describes the average length of paths from this author to other authors. It also measures how many authors this author is close to and thus an indication of the author's social network.

RESEARCH DESIGN AND METHOD

To explore the use of SNA to measure social influence, this paper has chosen to analyze the AMCIS proceedings from the years 1998-2005 to define a co-authorship network. These dates were chosen in large measure to allow a comparison of the AMCIS network to two previous SNA studies of the ECIS and ICIS conferences.

DATA

The data source was the AIS Electronic Library's conference section (<http://aisel.aisnet.org/amcis/>). Data was only available beginning in 1998. Data was not available for import into a bibliometric tool, like Endnote, thus copying and pasting to excel was required. Because authorship data was excluded from heading information at the library's website further analysis of data was needed, Data cleansing was required because some author information was duplicated with differing variations of the same name. An example of this was the use of initials and last name in some papers by one author and then the use of full names by the same author in another paper. Once the data was cleansed the connections between authors, such that all directional edges were represented, needed to be created and manually input. An example of this is seen using a three-author paper. Given the three authors A, B, and C then seven edges – AB, AC, BA, BC, CA, and CB – need to be created. Four, five, six, and seven author papers require 12, 20, 30, and 42 edges respectively. Finally the spreadsheet data was output to a .txt file for import into the analysis tool.

ANALYSIS, TOOLS, AND FINDINGS

The analysis tool, UCINET (<http://www.analytictech.com/ucinet/help.htm>), was used to generate component, degree, betweenness, closeness, and structural holes analysis.

We started by examining the AMCIS 1998-2005 author co-authorship data (tables 1 & 2). We then compared the AMCIS, ICIS and ECIS co-authorship networks for the same period. The table 1 data is broken down between single authored papers and multi-author papers. The majority of papers are multi-authored. The data, noting a shift from 60% growing to > 70%, suggests a trend toward more multi-authored papers over an 8-year period.

Year	Total Papers	Single Authors Papers	Multi-Author Papers	Percent Single Authored	Percent Multi-authored
1998	423	163	260	39%	61%
1999	358	148	210	41%	59%
2000	440	142	298	32%	68%
2001	440	118	322	27%	73%
2002	360	107	253	30%	70%
2003	467	149	318	32%	68%
2004	577	131	446	23%	77%
2005	520	135	385	26%	74%

Table 1. AMCIS single vs. multi authored papers 1998 - 2005

Table 2 presents the AMCIS co-author network data in years 1998 to 2005. The size of the network is the number of authors that have co-authored in given conference – called Actors. The number of actors in the main component shows the size of the largest co-author cluster. One can see that the number of co-authors has grown through the years from around 500 in the late 90's to around 1000 in the mid 2000's. The largest cluster has also doubled from around 15 to 30. Single authors can be seen as nodes on their own in the social network. Single authors are networks with a component size of one. With the SNA we are interested in the interactions between the authors, so the remaining evaluation will not take into account the single authors.

Year	AMCIS			ECIS		
	No. of Actors in Network	No. of Actors in Main Component	% of Actors in Main Component	No. of Actors in Network	No. of Actors in Main Component	% of Actors in Main Component
1998	526	14	2.7%	688	48	7.0%
1999	443	16	3.6%	768	64	8.3%
2000	637	14	2.2%	1052	74	7.0%
2001	681	17	2.5%	1188	95	8.0%
2002	574	15	2.6%	1390	174	12.5%
2003	717	16	2.2%	1602	237	14.8%
2004	1019	37	3.6%	1796	416	23.2%

2005	868	36	4.1%	2009	588	29.3%
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Table 2. Development of ECIS/AMCIS Conference over time (ECIS data from Vidgen et al. 2007)

When comparing the ECIS and AMCIS networks several interesting observations can be made (table 2). On average the ECIS conference is 25% the size of the average AMCIS conference. Despite the gross size difference between the two conferences, as measured by the total number of submitted/accepted papers to either conference, the ECIS network, those co-authored papers, is much larger in the AMCIS network.

In table 3 we compare network measures for the AMCIS, ECIS and ICIS conferences, with the ECIS and ICIS data was taken from the Vidgen et al. (2007) and Xu et al. (2006) papers respectively. Using the degree, betweenness, and closeness centrality measures for all researchers in the AMCIS network, the researchers were rank ordered. The top 10 of each measure are presented in table 3. Each researcher's h-index was calculated and is shown in parenthesis. We can see that the measures of centrality also indicates that the ECIS community is more engaged than is suggested by the centrality measures for the AMCIS network. In simple terms, the ECIS community is tighter and more cohesive than the AMCIS community.

Rank	AMCIS			ECIS			ICIS		
	Degree	Betweenness	Closeness	Degree	Betweenness	Closeness	Degree	Betweenness	Closeness
1	Zahir Irani (23)	Diane Strong (17)	David Salisbury (16)	PowellP (13)	GalliersRD (25)	GalliersRD (25)	Andrew Whinston (42)	M. Lynne Markus (38)	M. Lynne Markus (38)
2	StarrRoxanne Hiltz (41)	Ed Watson (18)	Alexander Hars (11)	GalliersRD (25)	FinneganP (15)	PowellP (13)	Richard Watson (29)	Richard Watson (29)	Richard Watson (29)
3	Keng Siau (23)	M.Lynne Markus (38)	Wynne Chin (28)	FinneganP (15)	PowellP (13)	FinneganP (15)	M. Lynne Markus (38)	Krishnamurthy Raman (6)	Krishnamurthy Raman (6)
4	Glenn Stewart (10)	Jane Fedorowicz (11)	Matthew Stollak (3)	NewellS (19)	DoukidisGI (14)	Mylonopoulos NA (7)	Jay Nunamaker, Jr. (37)	Tridas Mukhopadhyay (24)	Gordon Davis (27)
5	Raghav Rao (20)	Judy Scott (10)	Joseph Peyrefitte (7)	VidgenRT (14)	LightB (15)	DoukidisGI (14)	Vijay Gurbaxani (15)	Benn Konsynski (24)	John King (32)
6	Marinos Themistocleous (16)	John Gorgone (15)	Rodney Pearson (15)	PanSL (13)	DamsgaardJ (11)	PanSL (13)	Raghav Rao (20)	Gordon Davis (27)	Cynthia Beath (14)
7	Diane Strong (17)	Dawn Gregg (14)	Mark Huber (10)	LevyM (10)	Mylonopoulos NA (7)	LybereasP (4)	Kalle Lyytinen (30)	Vijay Gurbaxani (15)	Kenneth Kraemer (35)
8	Michael Rosemann	Paul Pavlou	Craig	Martakos D (12)	Constantino ID (5)	WhitleyEA (15)	John King (32)	Andrew Whinston	Gerardine DeSanctis

	(30)	(22)	Piercy (4)					(42)	(36)
9	James Courtney (10)	Lester Singletary (5)	Allison Harrison (10)	Loebbeck eC (17)	FerneleyE (7)	LevyM (10)	Niels Bjørn-Andersen (12)	Jay Nunamaker, Jr. (37)	V. Sambamurthy (22)
10	Huaiqing Wang (18)	T. Raghu (10)	Jiangfan Zhong (2)	MurphyC (10)	PanSL (13)	BallantineJ A (20)	Izak Benbasat (41)	John King (32)	Vijay Gurbaxani (15)

Table 3. AMCIS (1998-2005)/ECIS (1993-2005)/ICIS (1980-2005) Top Centrality Authors along with h-index numbers in parentheses. Bold numbers are researchers identified as cross cultural, italic are European Researchers, and normal font is North American (ECIS data from Vidgen et al. 2007, ICIS data from Xu et al. 2006)

RQ1 Findings. We learn from table 3 that the social influence of scholars is not uniformly demonstrated by presence at a single conference, even at ICIS, the premier conference. Rather it shows that each conference has a unique network of coauthors that lends itself to building social influence. This finding supports the finding of Truex, et. al (2009) that publishing is geographically parochial. That is that the author communities tend to associate based on geography. Here we see that there is distinct social network for each conference. Additionally, we find that the average h-index for the AMCIS and ECIS conferences is about the same (15.8 vs. 13.6) but we find that the average ICIS h-index in the table is 27.3 a significant difference. We find that in all three conferences, the most socially influential people tend to be ideationally influential and significantly more so at ICIS. Third, we find that there is a lack of transnationality in social influence as only Lynne Markus appears in both the AMCIS and ICIS highly central authors. There is no commonality with the ECIS conference. This indicates that social influence as expressed by co-authoring does not transcend the geographic boundaries of conferences. The implications of this are that meaning assessments of social influence useful for evaluating scholarly influence should be assessed on a field basis that would incorporate both the conferences and the major journals of a field.

RQ2 Findings. How do the SNA and H-family metrics provide a clearer picture of the construct ‘scholarly influence’? In table 3 the h-index of the European researchers is in italic type. Those authors ‘transcending’ Europe and North America are shown in bold. In comparing we see that there are stronger h-index numbers for the key players in the ICIS conference author network than in the other conferences. This indicates that the social network power is more diffuse in the ICIS conference core than in the other two conferences. The authors in the co-author network in ICIS are more established in the publication world and have more research paper history. With ECIS and AMCIS we see lower h-indices in the top 10 indicating that younger less established authors are in power positions in the co-author social network.

For the ECIS and ICIS conference the top players using one measure are also top players using the other two measures. For example for the ECIS conference, Galliers, Finnegan, and Powell take the top three spots in the centrality measure, no matter which measure is analyzed. With the ICIS conference Markus, Watson, and Raman are in the top three positions (with Whinston the only exceptions here). While the AMCIS co-author social network we don’t see such a convergence. In contrast to ECIS and ICIS the top three centrality measures positions are held by three different people in the AMCIS network with little overlap, even when looking at the top ten. This indicates that the top social network power players in the ECIS and ICIS conference are easily identified while for AMCIS the person that works frequently with others is different from the person that is a ‘hub’, who is also different from someone that is central in the network.

CONCLUSION- Contributions, Limitations and Future research

This paper illustrates how co-authoring papers is a means of building academic influence and how this influence can be measured using assessed by Social Network Analysis (SNA). The paper compares the co-authorship networks in AMCIS, ICIS and ECIS illustrating that, when combined, these measures of ideational influence and social influence provide us a better picture of the concept of scholarly influence. Ideational influence, as measured by the Hirsch indices, tells us how the field views the intellectual contributions of a scholar. The network centrality measures illustrates the social relationships between authors, expressed in co-authorship relationships, through which we see how authors mold and shape each other in terms of interactions. Both perspectives are needed to gain a complete view of scholarly influence in the field.

This study has six limitations. First, this study is a preliminary attempt at mapping the social network of co-authorship of the AMCIS conference and comparing that network to the ECIS and ICIS conferences social networks. Coauthoring relationships are an incomplete surrogate measure of social influence, because scholarly ideas are communicated even when researchers do not coauthor in their work. This kind of influence is not measured in this methodology. Second, compared to journal authorship the authorship network of a conference is possibly dependent on location. We would expect that journals authorship demographics (such as where they are working) would not change much from year to year. But in conferences such as spanning two continents, we can expect some differential in the networks between conferences held in North America as opposed to South America. Third the dataset is also small compared to the IS field as a whole. When looking at only one year of one conference, networks of smaller components can appear more readily. The different areas of research are harder to identify. This problem is less of a problem as we include more sets of data in the network. Fourth, our comparison across conferences was dependent on data retrieved from research papers, which didn't necessarily compare the same years when looking at the network (table 3). Fifth, we did not address any author order issues, nor did the network include single authored papers. We recognize that the order author's names are listed on a paper may reflect different cultural practices. It may be an implicit indication of the contribution to the article. It may reflect a simple alphabetical listing or in research teams developing many papers together first author position may be assigned on a rotating or pre-agreed basis and may NOT be an implicit indication of the degree of contribution to the research. But since we were looking at connections between authors in the paper and did not take into account the author order. Whereas in micro-level analysis single authored papers have no bearing on the data, when analyzing the whole network, or macro-level data, one must include single authored papers. Sixth, the research does not take into account geographic factors that might inhibit publishing in a conference. One stipulation that is common for inclusion into the proceeding of most conferences is that at least one of the authors would attend the conference. This means that our dataset excludes those that cannot afford to attend a conference, or at least don't have the ability to find a person to co-author with that has the means to attend the conference. Therefore the dataset in the current study is skewed towards those that have the economic means to travel to, pay the conference fee, and attend the conference.

Future research

We continue to identify and collect data on an ever-growing set of co-authorship networks by adding other IS conferences and journal publications to the data set. In continuing research we are comparing these networks and their components to one another. We are examining and comparing the characteristics of these networks to other measures of productivity and scholarly influence. We plan to run correlation analysis on the data and properties of the conference networks to see if there are any measures of SNA, h-index, or conference properties that might correlate. We are building and testing models to better understand relationships between scholarly networks and publication productivity and strength. In so doing we will build a cumulative profile of these interactions. Finally whereas the current study included only micro-level (researcher) data in future work we plan to include macro-level (network as a whole) SNA properties.

REFERENCES

1. Acedo, F.J., Barroso, C., Casanueva, C., and Galan, J.L. "Co-Authorship in Management and Organizational Studies: An Empirical and Network Analysis," *Journal of Management Studies* (43:5), July 2006.
2. Albert, R., and Barabasi, A.-L. "Statistical Mechanics of Complex Networks," *Reviews of Modern Physics* (74), January 2002.
3. Barabasi, A.-L., and Albert, R. "Emergence of Scaling in Random Networks," *Science* (286:5439), October 15 1999, pp 509-512.
4. Barabasi, A.L., Jeong, H., Neda, Z., Ravasz, E., Schubert, A., and Vicsek, T. "Evolution of the social network of scientific collaborations," *Physics A*. (311) 2002, pp 590-614.
5. Chua, C., Cao, L., Cousins, K., and Straub, D. "Measuring Researcher-Production in Information Systems," *Journal of the Association of Information Systems* (3) 2002, pp 145-215.
6. Coleman, J.S. "Social Capital in the Creation of Human Capital," *The American Journal of Sociology* (94) 1988, pp S95-S120.
7. Eaton, J.P., Ward, J.C., Kumar, A., and Reingen, P.H. "Structural Analysis of Co-Author Relationships and Author Productivity in Selected Outlets for Consumer Behavior Research," *Journal of Consumer Psychology* (8:1) 1999, pp 39-59.
8. Egghe, L. "Theory and practice of the g-index," *Scientometrics* (69:1) 2006, pp 131-152.
9. Galliers, R.D., and Whitley, E.A. "Vive les differences? Developing a profile of European information systems research as a basis for international comparisons," *European Journal of Information Systems* (16) 2007, pp 20-35.

10. Gallivan, M.J., and Benbunan-Fich, R. "Analyzing IS research productivity: an inclusive approach to global IS scholarship," *Eur J Inf Syst* (16:1) 2007, pp 36-53.
11. Guare, J. *Six Degrees of Separation: A Screenplay* Dramatists Play Service, 1992.
12. Henry, N., Goodell, H., Elmqvist, N., and Fekete, J.-D. "20 Years of Four HCI Conferences: A Visual Exploration," *International Journal of Human-Computer Interaction* (23:3) 2007, pp 239-285.
13. Hirsch, J.E. "An index to quantify an individual's scientific research output," *Proceedings of the National Academy of Sciences of the United States of America* (102:46) 2005, pp 16569-16572.
14. Howard, B. "Analyzing Online Social Networks," *Communications of the ACM* (51:11), November 2008, pp 14-16.
15. Kleinberg, J. "The Small-World Phenomenon: An Algorithmic Perspective," Annual ACM Symposium on Theory of Computing, 2000, pp. 163-170.
16. Kleinberg, J. "The Convergence of Social and Technological Networks," *Communications of the ACM* (51:11), November 2008.
17. Liben-Nowell, D., Novak, J., Kumar, R., Raghavan, P., Tomkins, A., and Graham, R.L. "Geographic Routing in Social Networks," *Proceedings of the National Academy of Sciences of the United States of America* (102:33) 2005, pp 11623-11628.
18. Locke, J., and Lowe, A. "Problematising the construction of journal quality: an engagement with the mainstream," *Accounting Forum* (26:1) 2002.
19. Lowry, P.B., Karuga, G.G., and Richardson, V.J. "Assessing Leading Institutions, Faculty, And Articles in Premier Information Systems Research Journals," *Communications of the Association for Information Systems* (20) 2007, pp 142-203.
20. Lyytinen, K., Baskerville, R., Iivari, J., and Te'eni, D. "Why the old world cannot publish? Overcoming challenges in publishing high-impact IS research," *European Journal of Information Systems* (16) 2007, pp 317-326.
21. Molinari, J.-F., and Molinari, A. "A new methodology for ranking scientific institutions," *Scientometrics* (75:1) 2008, pp 163-174.
22. Nerur, S., Sikora, R., Mangalaraj, G., and Balijepally, V. "Assessing the Relative Influence of Journals in a Citation Network," *Communications of the ACM* (48:11) 2005, pp 71-74.
23. Polites, G.L., and Watson, R.T. "The Centrality and Prestige of CACM," *Communications of the ACM* (51:1), January 2008, pp 95-100.
24. Sidiropoulos, A., Katsaros, D., and Manolopoulos, Y. "Generalized h-index for Disclosing Latent Facts in Citation Networks," *arXiv:cs.DL/0606066* (1), 07/13/2006 2006.
25. Singh, G., Haddad, K.M., and Chow, C.W. "Are Articles in "Top" management Journals Necessarily of Higher Quality," *Journal of Management Inquiry* (16:4), December 2007, pp 319-331.
26. Stewart, P. "Concurring Opinion in *Jacobellis vs. Oregon*," in: 378, U.S. 184 (ed.), 1964.
27. Straub, D., and Anderson, C. "Editor's Comments: Journal Quality and Citations: Common Metrics and Considerations for Their Use," *MIS Quarterly* (34:1), March 2010, pp iii-x88.
28. Strogatz, S.H. "Exploring complex networks," *Nature* (410), March 8 2001.
29. Takeda, H. "A Social Network Analysis of the IS Field: A Co-Authorship Network Study," Southern AIS, AIS, Atlanta, 2010.
30. Travers, J., and Milgram, S. "An Experimental Study of the Small World Problem," *Sociometry* (32:4), December 1969, pp 425-443.
31. Truex III, D.P., Cuellar, M.J., and Takeda, H. "Assessing Scholarly Influence: Using the Hirsch Indices to Reframe the Discourse," *Journal of the Association of Information Systems* (10:7) 2009, pp 560-594.
32. Vidgen, R., Henneberg, S., and Naude, P. "What sort of community is the European Conference on Information Systems? A social network analysis 1993-2005," *European Journal of Information Systems* (16) 2007a, pp 5-19.
33. Vidgen, R., Henneberg, S., and Naude, P. "What sort of community is the European Conference on Information Systems? A social network analysis 1993-2005," *European Journal of Information Systems* (16) 2007b, pp 5-19.
34. Walstrom, K.A., Hardgrave, B.C., and Wilson, R.L. "Forums For Management Information Systems Scholars," *Communications of the ACM* (38:3) 1995, pp 93-107.
35. Whitley, E.A., and Galliers, R.D. "An alternative perspective on citation classics: Evidence from the first 10 years of the European Conference on Information Systems," *Information & Management* (10:2) 2007, pp 99-109.
36. Willcocks, L., Whitley, E.A., and Avgerou, C. "The ranking of top IS journals: a perspective from the London School of Economics," *European Journal of Information Systems* (17) 2008, pp 161-168.
37. Xu, J., and Chau, M. "The Social Identity of IS: Analyzing the collaboration Network of the ICIS Conferences (1980-2005)," Twenty-Sevth International Conference on Information Systems, Milwaukee, WI, 2006, pp. 569-590.