A co-authorship network-based method for understanding the evolution of a research area: A case of information systems research

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ABSTRACT

A baseline assessment research output is beneficial for policy decision makers to promote research. This paper presents a co-authorship network-based method to quantify and describe the scholarly publishing of a certain research field. To make our analysis more precise, we firstly generalized the measures used in previous literatures into formulas and analyzed the significance of the measures. We then classified our study into overall, individual, institutional and international levels to make our analysis clearer and more reasonable. Finally, we conduct a research of the structure, characteristics and development trend of co-authorship network based on publication output in top three journals in the field of information systems from 1993 to 2012. By synthetical analysis, our research results are helpful to know the productivity patterns, trends of the published research and status of international collaboration in this field.

Keywords: Social network; Co-authorship network; Publication output; Information systems research

INTRODUCTION

To evaluate publication productivity of scientific researches, scholars in the field of library and information science tend to build co-authorship network of the corresponding fields (Abbasi et al. 2011; Larivière, Gingras and Archambault 2006; Zhai et al. 2014). In a co-authorship network, scientists are connected when they publish papers together, where nodes represent scientists while edges represent co-authorship relations (Newman 2001a).

In recent years, there has been a sharp increase in the number of articles addressing the topic of collaborations of publication among scholars (Chen, Börner and Fang 2013; Larivière, Gingras and Archambault 2006). Researches on co-authorship network have essential functions that combine distributed knowledge and method together to create novel knowledge (Heinze and Kuhlmann, 2008). Through collaboration behaviors, researchers have the opportunities to share their knowledge which are crucial for knowledge creation and research output (Abbasi et al. 2011).

In recent years, a large number of scholars have conducted empirical studies to investigate the productivity patterns, trends of the publication, etc. (Ronda-Pupo and Guerras-Martín 2010; Zhai et al. 2014). Though previous studies have proceeded with plenty of empirical analysis of the characteristics of collaboration networks in a wide range of disciplines (Ronda-Pupo and Guerras-Martín 2010; Yazit and Zainab 2007; Zhai et al. 2014) by synthetical analysis, we find out that most of them have not provided the formulas used in their paper, which may confuse readers. This paper focused on this issue and generalized the measures used in previous literatures into formulas and analyzed the significance of the measures to make our analysis more precise. This is the first objective of this paper.

To make our analysis clearer and more reasonable, we classified our study from overall, individual, institutional and international perspectives. From the overall perspective, we can obtain the overall structural characteristics of a certain field as a whole (Liu et al. 2005). From the individual perspective, we can discover the different opportunities and constraints that shape individuals' publishing behaviors (Yin et al. 2006). From the institutional perspective, we can capture the distribution of high-publication institutions from the location of them (Liu, Chang and Chen 2012). From the international perspective, we can explore the rules of collaboration publication between countries all over the world (Zhai et al. 2014). This is the second objective of this paper.

Although a wide range of disciplines have been studied (Tang and Shapira 2011; Uddin et al., 2012), little attention has been paid to the scholarly publishing in the field of information systems. We carried out a detailed analysis of the IS field in the last twenty years so as to know the productivity patterns, trends of the published research and status of international collaboration in this field. This is the third objective of this paper.

This study has a significant practical contribution for international scholars since this paper not only provides a more profound understanding about the publication productivity and evolutionary trend of collaboration network in the field of information systems but also offers a comprehensive analysis method applied to other fields to analyze the state of scholarly publication.

ANALYTICAL METHOD

To provide an applicable method to analyze publication productivity, drawing upon the abundant previous literatures (Uddin et al. 2012; Zhai et al. 2014), we abstracted and generalized the measures used in their papers into formulas and analyzed the significance of the measures which make our analysis more precise. The details of analysis are shown in Table 1 to 4.

Table 1: Details of Analysis from the Overall Perspective

Measures	Formula	Significance
Statistical analysis of collaboration of articles published in the top three journals	$P_{ij} = \frac{a_{ij}}{A_i}$; $P_j = \frac{\sum_{i=1}^{3} a_{ij}}{\sum_{i=1}^{3} A_i}$ a_{ij}: the number of papers which have j authors published in journal i; A_i: the number of papers published in journal i; P_{ij}: the percentage of papers which have j authors published in journal i; P_j; the percentage of papers which have j authors published in top three journals	From this measure we can learn the distribution of the number of authors in single article (Zhai et al. 2014) and the tendency of collaboration among researchers in producing scientific publications (Uddin et al. 2012)
Evolution of collaboration degree of articles published in the top three journals	$D_{ik} = \frac{\sum_{j=1}^{n} j*a_{ijk}}{A_{ik}}$; $D_k = \frac{\sum_{i=1}^{3}\sum_{j=1}^{n} j*a_{ijk}}{\sum_{i=1}^{3} A_{ik}}$ a_{ijk}: the number of papers which have j authors of journal i in the year of k; D_{ik}: the collaboration degree of journal i in the year of k; D_k: the collaboration degree of the top three journals in the year of k;	This measure refers to the average number of co-authors of these articles in a certain period (Zhai et al. 2014) and the tendency of scientific collaboration of publication with the passage of time.
Evolution of the average distance in the whole co-authorship network	$L = \frac{1}{N^2} \sum_{j=1}^{N} \sum_{i}^{N} d_{ij}$ N: the number of nodes in the whole network; d_{ij}: the distance between the node v_i and v_j;	This measure implies that one scholar in the network needs how many steps to reach another one in average which means scientific information can be obtained easily or not by peoples who demand them (Newman 2001b)
Evolution of network density of whole co-authorship network	$Density = \frac{2M}{N(N-1)}$ M: the number of ties in the whole network; N: the number of nodes in the whole network;	This measure shows the ratio of the actual and the maximum possible number of edges which describes network's general level of scholarly collaboration relationship close or not (Abbasi et al. 2011).

Table 2: Details of Analysis from the Individual Perspective

Measures	Formula	Significance
Distribution of number of scholars publishing articles in the top three journals	$T_i = \sum_{j=1}^{2298} t_j$ T_i: the number of scholars publishing the number of i articles in the top three journals t_j: if author j published the number of i articles, $t_j = 1$; otherwise $t_j = 0$	The distribution of the number of scholars publishing articles in the top journals displays some phenomenon, such as long tail, exponent form, etc., and we can analyze and find out the reason behind this (Zhai et al. 2014)
Ten top authors ranked by the number of articles published in the top three journals	$U_i = \max u_j$ U_i: the ten top authors ranked by the number of articles published in the top three journals u_j: the number of articles published in the top three journals by author j	This measure reveals which authors occupy key roles in the co-authorship network (Chen, Börner and Fang 2013) and the change of the elite scholars in the field of the information systems with the passage of time.
Evolution of the yearly increased and the accumulated number of scholars in the whole co-authorship network	$A_i = \sum_{j=1}^{i} a_j$ A_i: total number of scholars from the first year to the year of i a_j: the number of scholars in the year of j	This measure reflects the growth of the number of scholars whose papers were absorbed in the top journals as the time goes on (Chen, Börner and Fang 2013) and the corresponding changing rules.

Table 3: Details of Analysis from the Institutional Perspective

Measures	Formula	Significance
Distribution of number of institutions publishing articles in the top three journals	$$M_i = \sum_{j=1}^{733} m_j$$ M_i: the number of institutions publishing the number of i articles in the top three journals m_j: if institution j published the number of i articles, $m_j = 1$; otherwise $m_j = 0$	To some extent, this measure reflects the reputation of research institutions which can attract high qualified students from all over the world, introduce outstanding scholars, and obtain government funding and social donation (Abbasi et al. 2011)
Evolution of the yearly increased and the accumulated number of institutions in the whole co-authorship network	$$B_i = \sum_{j=1}^{i} b_j$$ B_i: total number of institutions from the first year to the year of i b_j: the number of institutions in the year of j	This measure reflects the growth of the number of institutions whose papers were absorbed in the top journals as the time goes on (Chen, Börner and Fang 2013) and indicates how many institutions is achieving and has achieved international advanced level and their distribution in the world.
Top ten institutions ranked by the number of articles published in the top three journals	$$V_i = \max v_j$$ V_i: the ten top institutions ranked by the number of articles v_j: the number of articles published in the top three journals by institution j	This measure can give us a help when analyzing which institutions occupy key roles in the institutions collaboration network, (Chen, Börner and Fang 2013) the evolution law and the reason behind this.

Table 4: Details of Analysis from the International Perspective

Measures	Formula	Significance
Distribution of number of countries publishing articles in the top three journals	$$N_i = \sum_{j=1}^{40} n_j$$ M_i: the number of countries publishing the number of i articles in the top three journals n_j: if country j published the number of i articles, $t_j = 1$; otherwise $t_j = 0$	This measure is useful when analyzing the evolution law of countries publishing articles in the top journals and the results can give the visiting scholars a hand when making a decision which country to visit.
Evolution of the yearly increased and the accumulated number of countries in the whole co-authorship network	$$C_i = \sum_{j=1}^{i} c_j$$ C_i: total number of countries from the first year to the year of i c_j: the number of countries in the year of j	This measure reflects the growth of the number of countries whose papers were absorbed in the top journals as the time goes on (Chen, Börner and Fang 2013) and reveals how many countries is achieving and has achieved international advanced level.
Top ten countries or territories ranked by the number of articles published in the top three journals	$$W_i = \max w_j$$ W_i: the ten top countries ranked by the number of articles published in the top three journals w_j: the number of articles published in the top three journals by country j	From this measure, we can learn which countries or territories occupy key roles in the countries collaboration network, (Chen, Börner and Fang 2013) the evolution law and the scope of collaboration in the world.

DATA COLLECTION AND UNIFICATION

According to Peffers and Ya (2003), Rainer and Miller (2005), and Dennis et al. (2006), *Management Information Systems Quarterly* (MISQ), *Information Systems Research* (ISR) and *Journal of Management Information Systems* (JMIS) are recognized as the three elite journals in the field of information systems. We chose the top three academic journals as the data sources to extract the information of articles and construct the co-authorship networks to analyze the status and evolutionary trend of collaboration network in the field of information systems.

The data was retrieved from the EBSCO's Business Source Premier during December 2012 and articles were downloaded from the top three journals from January 1, 1993 to December 31, 2012. Then we extracted the bibliographic information such as article titles, authors, author institutions and countries for further analysis. After cleaning the publication data, there are totally 1745 articles contributed by 2298 unique authors, 733 unique institutions and 40 unique countries or regions. During the procedure of data collection, papers written by editors and papers with only one author were excluded from our dataset, since an article is considered as the result of a collaborative activity when it is written by more than one author (Larivière, Gingras and Archambault 2006).

RESULTS

Overall Analysis of Co-authorship Network

The distribution of the number of authors in a single article published in the top three journals in the last two decades is shown in Table 5. We can see that most articles (72.6% ~ 75.3%) are completed by two or three authors while only a small number of articles (2.7% ~ 4.0%) are written by more than five authors. These results indicate that papers written by two or three authors are the most effective cooperation pattern.

Table 5: Statistical Analysis of Collaborative Papers Published in the Top Three Journals

Number of authors		Distribution of number of authors a in single article				
		1	2	3	4	>=5
Number of articles (percent)	Total	254(12.7%)	791(39.6%)	684(34.2%)	205(10.3%)	65(3.3%)
	MISQ	98(15.4%)	282(44.2%)	181(28.4%)	59(9.2%)	18(2.8%)
	ISR	57(10.1%)	227(40.2%)	198(35.1%)	67(11.9%)	15(2.7%)
	JMIS	99(12.4%)	282(35.4%)	305(38.3%)	79(9.9%)	32(4.0%)

The average collaboration degree of articles refers to the average number of co-authors of these published articles in a certain period (Zhai et al. 2014). To understand the historical changing rules of collaboration degree, we drew the evolution chart of collaboration degree of articles published in the top three journals from 1993 to 2012. From Figure 1 we can see that collaboration degree of articles published in the three elite journals fluctuated from 1.89 to 3.04. The whole curve rises as a whole which means collaboration behaviors are popular among scholars in the field of IS. Through collaboration behaviors, researchers could share their knowledge (Abbasi et al. 2011). Combining distributed knowledge and method together, collaboration among scholars has an irreplaceable role in the process of knowledge creation and publication output (Heinze and Kuhlmann 2008).

To learn the evolution of average distance in the whole co-authorship network of the top three journals, we present Figure 2. The average distance is affected by two kinds of newly added links: the external links and internal links (Elmacioglu and Lee 2009). By establishing new paths between new vertices and the existing ones, the external links have a significant impact on increasing the average distance, while by cresting new paths between the existing vertices, the internal links play a key role in decreasing the average distance. Affected by the two fundamentally different types of newly added links, the average distance presents a series of changes. As is shown in Figure 2, by the year of 2012, the average distance achieves 5.85 with 2298 authors. This implies that one scholar in the network only needs five or six steps to reach another one, which means scientific information can be obtained easily by researchers who demand them (Newman 2001a).
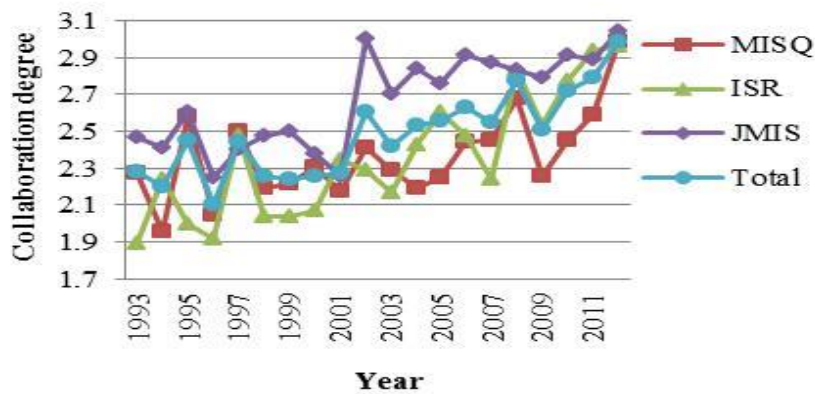

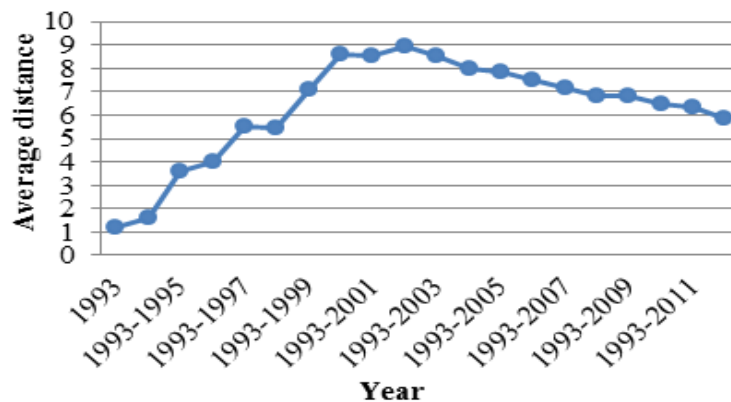Figure 1: Evolution of Collaboration Degree of Articles Published in the Top Three Journals

Figure 2: Evolution of the Average Distance in the Whole Co-authorship Network

The density of a graph is defined as the ratio of the actual number of edges and the maximum possible number of edges. Table 6 illustrates the evolution of the network density of the whole co-authorship network. As Table 6 shows, the whole co-authorship network density in information systems faces a tendency of decline, from 0.0043 to 0.0016. After analysis, we found that the primary cause is the number of scholars joining the collaboration network has been increased, from 576 to 2298, which leads the maximum possible number of edges goes up rapidly. Nevertheless, since the growth rate of the number of collaboration among scholars in the network is relatively limited, the network density goes down. Since network

density describes the general level of connection among vertices in the network (Liu, Shan and Yu 2011), this result means that in the field of information systems, the scholarly publication relationship among authors is not so close. This phenomenon may be related to the diversification of the research topics in the field of information systems and scholars with the same research topic tend to produce more research cooperation.

Table 6: Evolution of Network Density of Whole Co-authorship Network

Years	1993-1997	1993-2002	1993-2007	1993-2012
Network density	0.0043	0.0028	0.0020	0.0016

Analysis at the Individual Level

As is well known, in the field of scientometrics, one of the key indexes to evaluate a scholar's contribution is his or her number of published articles (Zhai et al. 2014). Figure 3 indicates that about 65 percent of scholars published only one article while only 2 of percent scholars published more than ten articles in the three elite journals. Most scholars (about 94%) published no more than five articles. The distribution of the number of articles published in the three elite journals displays "long tail" phenomenon. One of the reasons is that the publication frequency of the premier journals is too long and top journals in the field of information systems need to publish bimonthly (Valacich et al. 2006). In this situation, the competition of publishing an article in elite journals is very fierce.

In order to observe the changing rules of the number of scholars who published articles in the top three journals in the last two decades, we calculated the related numerical values and illustrated them in Figure 4. As displayed in Figure 4, the yearly increased scholars fluctuate but keep stable, which are approximately 100. The accumulated number of scholars increases year after year. By the year of 2012, the number of total authors reaches to 2298. This means that the field of information systems has a stable development in the number of total scholars.
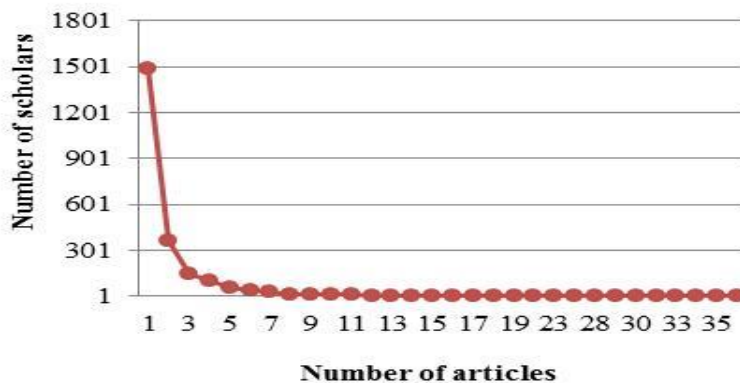

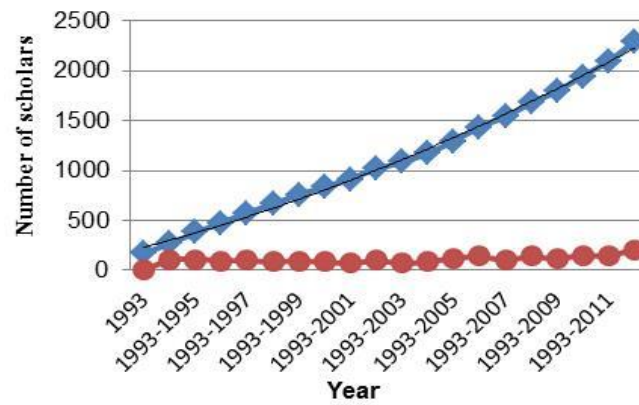Figure 3: Distribution of Number of Scholars Publishing Articles in the Top Three Journals

Figure 4: Evolution of the Yearly Increased and the Accumulated Number of Scholars

Table 7 shows the top ten authors ranked by the published number of articles, degree centrality and betweenness centrality in the three elite journals in the last two decades. The lists of authors ranked by the published number of articles, betweenness centrality and degree centrality are quite different from each other. The reasons behind the differences are described as follows. Authors' published number of articles identifies the amount of the outcome of researchers. Degree centrality features the number of attachments of vertices in the network. Whereas betweenness centrality measures the importance of a vertex corresponding to the number of paths in which the vertex participates in the network. The selection of the indicators depends on the purpose of the researchers' study.

Table 7: Top Ten Authors Publishing in the Top Three Journals between 1993 and 2012

Number of published articles		Degree centrality		Betweenness centrality	
Izak Benbasat	49	Izak Benbasat	55	Izak Benbasat	261152
Robert J. Kauffman	35	Alan R. Dennis	50	Alan R. Dennis	243793
Andrew B. Whinston	33	Jay F. Nunamaker	49	Alok Gupta	179185
Varun Grover	33	Detmar W. Straub	40	Jay F. Nunamaker	163599
Jay F. Nunamaker	32	Varun Grover	39	Detmar W. Straub	143044
Alan R. Dennis	30	Andrew B. Whinston	39	Ritu Agarwal	114728
Ritu Agarwal	29	Robert J. Kauffman	38	Robert J. Kauffman	108495
Detmar W. Straub	28	Ritu Agarwal	38	Vallabh Sambamurthy	103915
Eric K. Clemons	26	Alok Gupta	34	Rajiv D. Banker	94471
Robert O. Briggs	23	Vallabh Sambamurthy	29	Andrew B. Whinston	90371

Analysis at the Institutional level

Performance evaluation is an inevitable function of management at institutional level. All the research institutions pursue good reputation since good reputation can attract high qualified students from all over the world, introduce outstanding scholars, and obtain government funding and social donation (Abbasi, Altmann and Hossain 2011). The number of high-level papers published in the elite journals is one of the key indicators that reflects the research capability of the research institutions. From Figure 5, we observe that 401 institutions (55%) publish only one paper. Specifically, Georgia State University is the most productive institution that published 103 papers. A total of 92 institutions (12%) published more than ten papers in the three elite journals while most institutions (80%) published less than six articles. As is explained later, this phenomenon demonstrates that there are many excellent

scholars in some institutions who contribute greatly to the reputation of the institutions.

Increasing the number of publications in the top three journals is extremely beneficial to enhance the reputation of the institutions in the field of information systems all over the world. For this reason, we illustrate the changing rules of the number of institutions published articles in the top three journals from 1993 to 2012 in Figure 6. As is shown in Figure 6, by the year of 2012, the accumulated number of institutions reaches to 733. In addition, the number of yearly increased institutions is around 30 each year, except for the last two years of 2011 and 2012, which are 51 and 58 respectively. This result indicates that more and more institutions have increased research abilities and achieved international advanced level. And the growth trend is relatively stable.
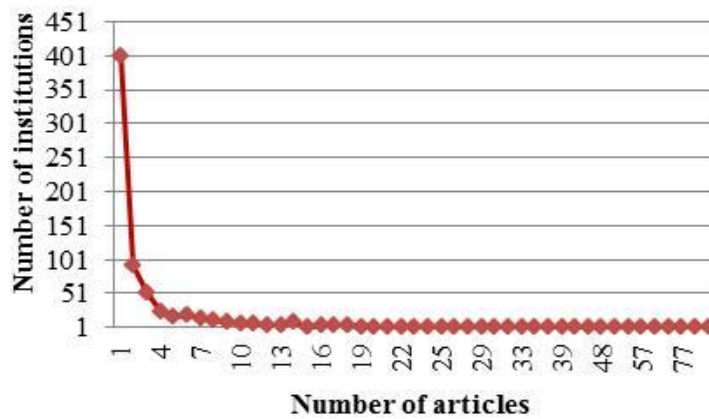

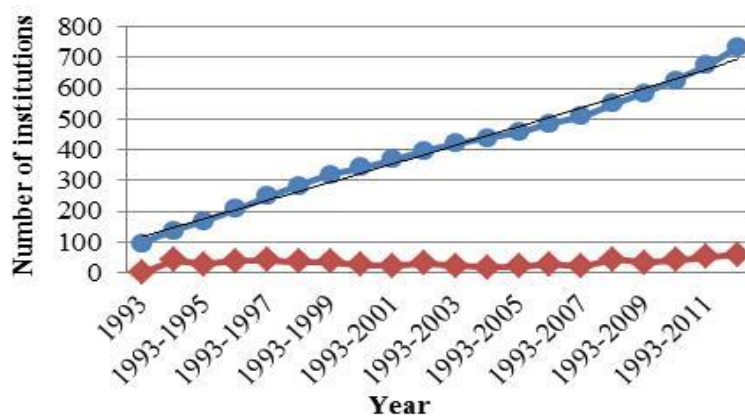Figure 5: Distribution of Number of Institutions Publishing Articles in the Top Three Journals

Figure 6: Evolution of the Yearly Increased and the Accumulated Number of Institutions

When analyzing the evolution law of institution collaboration networks, we found that a few famous institutions maintain their leading position in the top ten lists. Since the scholarly outcomes of institutions come from scholars, these institutions may occupy more human resources. Besides, the ranking of an entire institution can be influenced by even one or two authors (Chen, Börner and Fang 2013). For example, Professor Ritu Agarwal published 26 articles which occupy about 34 percent of University of Maryland. University of British Columbia has totally published 71 articles. Among all the 71 articles, there are 49 articles (69%) written by Professor Izak Benbasat.

Table 8: Institution Ranking of Number of Articles Published in the Top Three Journals

1993-1997		1993-2002		1993-2007		1993-2012	
New York University	23	University of Arizona	37	Georgia State University	60	Georgia State University	103
University of Arizona	20	University of Georgia	35	University of Arizona	54	University of Arizona	85
University of Georgia	18	Georgia State University	33	University of Minnesota	50	University of Minnesota	77
University of South Carolina	16	New York University	29	University of British Columbia	45	University of Maryland	77
University of Colorado	14	University of Minnesota	26	New York University	42	University of British Columbia	71
Carnegie Mellon University	12	University of Pennsylvania	24	University of Georgia	42	Carnegie Mellon University	66
University of Minnesota	12	University of California	24	University of California	40	University of California	57
University of California	11	Indiana University	24	Indiana University	40	University of Georgia	56
University of Pennsylvania	11	University of British Columbia	23	University of Maryland	38	New York University	56
National University of Singapore	11	University of Colorado	23	University of Texas	36	National University of Singapore	55

Analysis at the National level

In order to know the distribution of number of countries publishing articles in the top three journals in the last two decades, we illustrate the details in Figure 7. The most fertile countries or regions are USA, Canada and Hong Kong, with 1495, 198 and 104 papers respectively. These three countries and regions obtain 82 percent of the total papers, while some other countries just have one paper. This result means that quite a lot of outstanding scholars and educational resources concentrate upon USA, Canada and Hong Kong, especially USA, which holds eight institutions of the top ten. As a result, these three countries and regions may be the first choice for visiting scholars in the information systems discipline.

We draw Figure 8 to explore the changing rules of the number of countries publishing articles in the top three journals from 1993 to 2012. As is illustrated in Figure 8, the accumulated number of countries is stable in some years, such as the year of 1996 and 1997, which are both 20 countries in total. Besides, there are all 27 countries in the year of 2001, 2002 and 2003, suggesting that the corresponding yearly increased countries are all 0. In addition, the yearly increased countries are in a low range, from 0 to 4. From this result we observe that, the growth of the number of countries is slow compared with authors and institutions. This phenomenon may result from the small scale of the number of countries and regions.
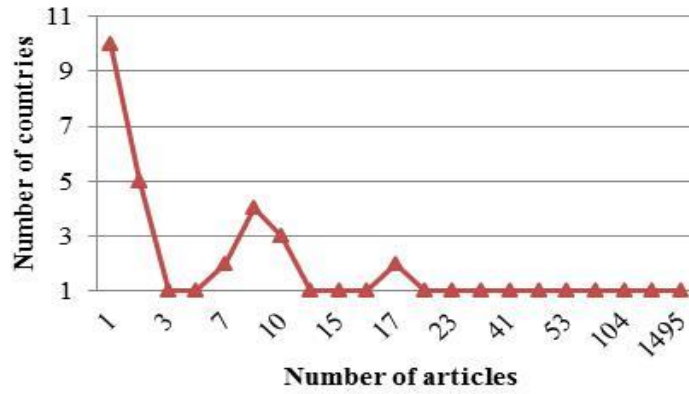
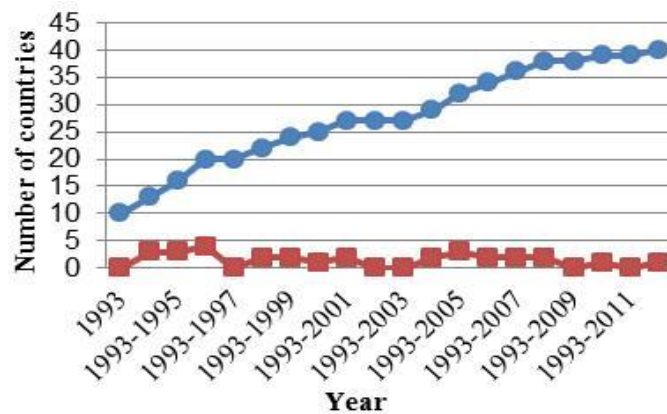Figure 7. Distribution of Number of Countries Publishing Articles in the Top Three Journals

Figure 8. Evolution of the Yearly Increased and the Accumulated Number of Countries

As illustrated in Table 9, eight of the top ten countries, which are USA, Canada, Hong Kong, Singapore, Korea, UK, Australia, and Netherlands, maintain their leading position throughout the twenty years. In the four time periods, USA has 280, 571, 953 and 1495 articles, respectively, which are far beyond than that of any other countries. China (mainland) and Germany, join the list of top ten countries, and this indicates that the level of scientific research of the two countries have gained considerable development in recent years.

Table 9: Top Countries Ranked by the Number of Articles Published in the Top Three Journals

1993-1997		1993-2002		1993-2007		1993-2012	
USA	280	USA	571	USA	953	USA	1495
Canada	41	Canada	75	Canada	124	Canada	198
UK	17	Singapore	26	Singapore	46	Hong Kong	104
Singapore	14	UK	24	Hong Kong	43	Singapore	86
Hong Kong	8	Hong Kong	24	UK	29	Korea	53
Netherlands	6	Netherlands	16	Korea	26	UK	43
New Zealand	5	Australia	15	Australia	24	Australia	41
Korea	5	Korea	14	Netherlands	22	Netherlands	34
Australia	5	France	8	Taiwan	11	China(mainland)	23
Israel	4	New Zealand	8	New Zealand	10	Germany	22

DISCUSSION AND CONCLUSION

In this study, we present a co-authorship network-based method to quantify and describe the scholarly publication of a certain field. First, we generalized the measures used in previous literatures into formulas and analyzed the significance of the measures to make our analysis more precise. Secondly, to make our analysis clearer and more reasonable, we classified our study into four levels of overall, individual, institutional and international perspective. From these four perspectives, we can obtain the state of scholarly publication comprehensively, for example, obtaining the overall structural features of a certain field, discovering the differential opportunities and constraints that shape individuals' publishing behaviors, capturing the distribution of high-producing institutions from the location of them, and exploring the rules of collaboration publication between countries all over the world.

Based on all 1745 papers published in the international journals of *MIS Quarterly, Information Systems Research* and *Journal of Management Information Systems* from 1993 to 2012, this paper analyzed the state of scholarly publication in the field of information systems in the last two decades. A baseline assessment of the research out is beneficial for policy decisions maker to promote research. We carried out a detailed analysis such as productivity patterns, trends of the published research and status of international collaboration in this field and we conclude the findings as follows.

A total of 90 percent of papers were written by two or more authors, which mean that scholarly publication cooperation is a universal phenomenon in the field of IS. The details range of the collaboration degree of MISQ, ISR, JMIS and the total are respectively [1.96, 2.99], [1.89, 2.96], [2.25, 3.04] and [2.1, 2.99], implying that each article has two to three authors on average. The average collaboration degrees of the three elite journals are increasing slowly over the years with a few exceptions. This result indicates that the collaboration behavior of researchers in the field of information systems is augmenting with time. Most scholars (94%) published no more than five articles while only 2 percent scholars published at least ten articles in the three elite journals. The number of articles published by scholars and institutions in the three elite journals all display a "long tail" phenomenon.

The number of yearly increased scholars fluctuates but generally keeps stable, which is approximately 100. By the year of 2012, the accumulated number of authors reaches to 2298. This means that the IS field has a stable development in this aspect. The yearly increased institutions are around 30 each year. This result indicates that the research abilities of more and more institutions have been increasing and achieved international advanced level, and the growth trend is relatively stable. In the last two decades, the whole co-authorship network density in information systems faces a tendency of decline, from 0.0043 to 0.0016. We found that the main reason is the number of scholars joining the collaboration network has increased, from 576 to 2298, which leads the maximum possible number of edges rocketing. Nevertheless, since the growth rate of the number of collaboration among scholars in the network is relatively limited, the network density shrinks.

By the year of 2012, the average distance achieves 5.85 in the collaboration authors' network, which means scientific information can be obtained easily by researchers who demand them. Through analyzing publishing outcomes of excellent scholars in famous institutions, we demonstrate that the ranking of an entire institution can be influenced by even one or two authors and the similar conclusion can be found in Chen et al (2013). We found that USA, Canada and Hong Kong are the three dominate countries in terms of outstanding scholars

and educational resources concentrate, especially USA, which holds eight institutions of the top ten. Visiting scholars in the information systems discipline may select these countries and regions as the first choice for research visits and collaboration.

ACKNOWLEDGEMENT

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