Authorship structures and collaboration networks in tourism journals

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Abstract

This study examines authorship structures and authors' collaborative networks across the tourism scholarly domain. To this end, the informal social structure of tourism knowledge was analyzed using data from 12,896 articles published in 13 leading tourism journals. The results show that collaborations typically consist of dual authorship. It is also noted that there is a low incidence of international collaborations. Based on the identified co-authorship networks, it was found that the informal social structure of the tourism knowledge domain is broad in scope, has a diversity of actors, and is characterized by a powerful elite group. The present researchers have ranked the contributors based on centralities of degree and of betweenness and in the formation of cliques involving at least ten authors. The paper proposes prospective research opportunities based on the analysis of networks.

Keywords: tourism; social structure; co-authorship; networks

Introduction

Social structure plays a prominent role within competitive scholarly environment, since it results in formal and informal collaboration networks that facilitate the creation and dissemination of knowledge. or Many authors have conducted co-authorship analyses to understand the phenomenon citing previous studies, testing hypotheses and building theories (Abbasi, Altmann, & Hossain, 2011; Acedo, Barroso, Casanueva, & Galán, 2006; Ahmed, Ahmed, Ali, & Kamran, 2017; Bandyopadhyay, 2001; Corrêa Jr, Silva, da F. Costa, & Amancio, 2017; Dehdarirad and Nasini, 2017; Elango and Rajendran, 2012; Glanzel and Schubert, 2004; Koseoglu, 2016; Koseoglu, et al., 2016; Kretschmer, 2004; Newman, 2004; Yan and Ding, 2009; Ye, Li, & Law, 2013).

A number of studies have examined the social structures which prevail within the tourism and hospitality field. Contributors have undertaken various descriptive analyses of authorship patterns (Jogaratnam, Chon, McCleary, Mena, & Yoo, 2005; McKercher, 2007; Roberts, 1998; Youn, Johanson, & Woods, 2011; Zhao and Ritchie, 2007), though few (Benckendorff, 2010; Hu and Racherla, 2008; Racherla and Hu, 2010; Stewart, Liggett, & Dawson, 2017; Ye, et al., 2013; Ye, Song, & Li, 2012) have used a social network analysis approach to examine the prevailing structures. The scope of the previous studies of network structure has commonly been characterized by small sample sizes, confined time spans, and narrow regional emphases. Benckendorff (2010), for example, focussed exclusively on co-authorship patterns in his work on tourism research in Australia and New Zealand. Hu and Racherla (2009) provided a visualization of social networks for the hospitality knowledge domain. Racherla and Hu (2010) used social network analysis to show collaborative research patterns within the tourism research community. They considered the published articles in three leading journals between 1996-2000 -*Annals of*

Tourism Research, *Journal of Travel Research*, and *Tourism Management*. Finally Ye et al (2013), used social network analysis to demonstrate research collaborations among tourism and hospitality scholars in articles published in six leading tourism and hospitality journals -*Annals of Tourism Research, Cornell Hospitality Quarterly, Journal of Hospitality & Tourism Research, Journal of Travel Research, International Journal of Hospitality Management, and Tourism Management* from 1991 to 2010. However, the current authors wished to investigate the social structure of the tourism literature, taking account of 13 journals that cover a 49-year time span. The investigation had the following purposes.

- To identify authorship and collaboration structures in tourism;
- To determine the attributes of co-authorship networks in tourism; and
- To determine influential authors within co-authorship networks.

The study further elaborates on the role of social structures within disciplines generally and particularly within tourism. The authors then proceed to outline the research methodology and to explain their findings. Finally, the main purposes of the study are discussed, along with the potential for future extension.

LITERATURE REVIEW

Social structure within disciplines

Social structure is defined here as a ‘‘persisting and bounded pattern of social relationships (or pattern of behavioral interaction) among the units (that is, persons or positions) in a social system’’ (House, 1981, p. 542). The social structure of organizations consists of two components – formal and informal (Boorman and White, 1976; Casciaro, 1998). Such structures may impact on information flows or resource allocations within organizations (Burt, 2009; Tsai, 2001, 2002).

Collaborations and/or citations within the scholarship of given disciplines or fields generate networks that are constructed by social structures (Acedo, et al., 2006). Such structuring has been described as an 'invisible college' (Crane, 1969; Wagner, 2009). It is defined here as:

> a set of interacting scholars or scientists who share similar research interests concerning a subject specialty, who often produce publications relevant to this subject and who communicate both formally and informally with one another to work towards important goals in the subject, even though they may belong to geographically distant research affiliates (Zuccala, 2006, p. 155).

Researchers have used analyses of co-authorships or co-citations to explore the dynamics of the invisible college within particular disciplines (Abbasi, Altmann, et al., 2011; Abbasi, Chung, & Hossain, 2012; Ahmed, et al., 2017; Batistič, Černe, & Vogel, 2017; Dehdarirad and Nasini, 2017; García-Lillo, Úbeda-García, & Marco-Lajara, 2017; Yu and Xu, 2017). Co-authorship analyses have contributed to more in-depth understanding of disciplines at the operational, tactical and strategic levels (Glanzel, & Abdulhayoğlu, 2018). Most co-authorship analyses have addressed questions such as the following: (Zupic and Čater, 2015, p. 439): i) are authors from different disciplinary backgrounds working together on a new research field, or do they remain within disciplinary boundaries? ii) which factors determine co-authorship? iii) what is the effect of collaboration on the impact? iv) are co-authored articles more cited? v) do more prolific authors collaborate more frequently? vi) are internationally co-authored papers more cited? and vii) what is the social structure of the field?

Social network approaches are commonly used to conduct analyses of co-authorship. Their use and acceptance has increased through recent decades as a means of understanding networks of organizations and of phenomena (Hollenbeck and Jamieson 2015). A social network may be defined as "a collection of people, 'each of whom is acquainted with some subset of the

others. Such a network can be represented as a set of points (or vertices) denoting people, joined in pairs by lines (or edges) denoting acquaintance'" (Newman, 2001, p. 404). Such networks incorporate vertices (actors) and edges (linkages amongst them) (Hollenbeck and Jamieson 2015). The social network analysis method provides a medium for investigating collaborative networks by analyzing and visualizing the relationships which existing amongst various entities (Borgman and Furner 2002). Social network analysis identifies the individuals, teams, and units that play central roles; discerns information breakdowns, bottlenecks, structural holes, and isolated individuals, teams, and units; creates opportunities to accelerate knowledge flows across functional and organizational boundaries; strengthens the efficiency and effectiveness of existing formal communication channels; raises awareness of and enable reflection on the importance of informal networks and ways to enhance their organizational performance; leverages peer support; improves innovation and learning, and refines strategy (Serrat, 2017).

Social structures in the Tourism Knowledge Domain

There have been two main investigations of the social structure of the tourism knowledge domain. Based on Racherla and Hu's (2010) study of three leading journals- *Annals of Tourism Research*, *Journal of Travel Research*, and *Tourism Management* - the tourism knowledge domain consists primarily of single paper collaborations. Their findings showed that the research community has few large scale components. Researchers appear to collaborate closely within specific clusters but restrict such collaborations to specific interest groups. They provided three explanations for this phenomenon. The first relates to the relative immaturity of the field when compared with other more established domains such as sociology and management studies. Second is the multidisciplinary character of tourism research. Last is the limited scope of international collaborations. Hence, the social network is characterized by fragmentation with

clearly defined and isolated clusters showing minimal evidence of collaboration. The authors also demonstrated that the neighborhood size of the most prominent and productive researchers is relatively limited (Racherla and Hu, 2010; 1030). Ye et al (2013)'s study of leading tourism and hospitality journals concluded that the network contains many participants and a wide range of collaborations, indicative of the interdisciplinary nature of tourism research, a relatively loose structure and few close relations, indicative of the relatively low maturity of the research community.

METHODOLOGY

The current researchers have adopted a social network analysis approach to identify the social structure of the tourism knowledge domain, drawing upon authorship structures and an analysis of collaborative co-authorship networks. A co-authorship network analysis draws upon bibliographic information about outputs as secondary data to show how actors or authors who have undertaken collaborative outputs are interconnected (Benckendorff, 2010). This presentation of networks can help researchers to identify the strength of ties within the whole network and the positioning of authors within the given community (Koseoglu, 2016; Van Eck and Waltman, 2010).

The first step in the analysis is to determine the proposed sample and applicable research tools. Secondly, data should be extracted and prepared for analysis. Lastly, appropriate analytical tools should be deployed. The details of these steps are provided below.

First step: study sample

As data for the analysis of co-authorships, the researchers used the names of contributing authors as reported in the various publications. They defined "publications" or "outputs" as the articles or research notes that have been published in peer-reviewed scholar journals since these

constitute a certified type of knowledge (Ramos-Rodríguez and Ruíz-Navarro, 2004). Through such means, the present study conducts a co-authorship analysis via social network analysis using tourism-focused journals indexed in both the Social Science Citation Index (SSCI) and Scopus Index. The list of selected journals and the scope of the data are presented in Table 1. Thirteen tourism journals were chosen for purposes of analysis. The main criterion for selecting the final journal list was high impact. This was ensured by focusing on top tier journals that are SSCI and Scopus Index listed. It is widely accepted that the listings are the most cited and influential scholarly outputs, including in the tourism field. Some journals were excluded from coverage because they were assessed by the authors as having a hospitality orientation. In some cases, the journal title includes the word tourism and in others it does not (e.g. only "hospitality management" is mentioned). Of the 13 that were ultimately selected, only one – Scandinavian Journal of Hospitality and Tourism – contains the word hospitality in its title. All of the others mention only tourism. Some journals were excluded from the list because they were assessed as having a greater hospitality orientation (e.g. they mentioned only hospitality in the title or covered both hospitality and tourism but had a stronger orientation to the former). Some had a focus on fields that have a tangential relationship with tourism (e.g. recreation, sport, leisure or events) and hence were excluded from consideration. In other words, the authors intended to have a scoping that would align closely with the tourism domain.

A total of 12,896 articles was extracted between the years 1968 and 2016 inclusive. The The year 1968 is noted as the earliest since this marked the first appearance of *Journal of Travel Research* and the researchers did not apply a particular starting year for the study. Figure 1 demonstrates the frequency of articles produced by year. As the figure shows, productivity in the applicable journals when measured by the number of articles published. The authors used various

regression models (linear, logarithmic, exponential, and power law approaches) to draw up a polynomial trendline that would illustrate the trend over time. The displayed variance is based on the best fit of the data with dependent (published articles) and independent (article's year of publication) variables (Barrios, Borrego, Vilaginés, Ollé, & Somoza, 2008). It was found that all four models were significant. However, the proportion of variance explained was greater in the case of the polynomial model ($R^2 = 0.9832$) than for the power law ($R^2 = 0.9369$), exponential ($R^2 = 0.8949$), linear ($R^2 = 0.8748$), and logarithmic models ($R^2 = 0.5572$).

Insert table 1 & figure 1 about here

Second step: Data Preparation

The data were prepared in two stages. The researchers firstly manually inserted the author names and affiliations of the articles into a spreadsheet to minimize or eliminate prospective spelling errors in the database. In the second step, the researchers used a frequency analysis to identify authors with the same names or initials, to detect any misspellings that may have occurred during the insertions, and to check for any spelling differences between the authors' names or combinations of authors' names with different initials or initial variations (Kumar and Jan, 2013). All errors were corrected manually in the data file, including misspellings, duplications of authors' names, and writing errors identified in the data set.

Third step: Analysis

The researchers initially inserted contributors in their capacity as authors in the selected journals into a spreadsheet that was created in the Microsoft Excel software package. Secondly, and following the cleaning of data, the researchers conducted a social network analysis. This involved usinge of the Bibexcel software program to determine co-authorship. The researchers

made use of the Pajek, VOSviewer, and Ucinet 6 network analysis software packages to calculate related metrics and visualize networks.

RESULTS

Authorship structure - Descriptive Analysis

The researchers investigate descriptive metrics which capture the informal structure of the tourism knowledge domain. The applicable descriptive metrics are; number of articles (12,896), number of author appearances (26,597), number of authors (11,663), and the results of articles per author (#Articles / #Authors) and authors per article (#Authors / #Articles). The researchers explored ratios for Articles per Author and Authors per Article to gain insights into research collaborations in the field and author productivity. The number of articles per author is 1.11 and the number of authors per article is 0.90. This finding indicates that a number of authors produce only a single article, that many research teams extend to only two authors, and that there is a group of authors who engage continuously in the field. The researchers also shows the percentage of authors and the frequency of their contributions to the literature. This classification consists of the percentage of authors who have contributed a single article (68.02%), 2-4 articles (23.25%), 5-9 articles (5.46%), 10-29 articles (2.81%), 30-49 articles (0.29%), and 50-more articles (0.16%). These numbers have important implications. For example, the tourism informal social community has 11,663 members, of whom 7,933 authors (68%) have contributed only once to the field. Another grouping of 19 authors contributed to the field on at least 50 occasions.

The researchers explore the level of collaboration based on the number of authors in an article, and respective national and international collaborations. The number of authors in a single article was classified using five types of author structure: single, two authors, three

authors, four authors, and five or more authors. While 35% of the articles were found to be single authored, 65% were multi-authored papers. However, 55% of the multi-author papers have two authors, 32% of them have three, 10% have four, and only 3% recorded five or more contributors.

To assess the incidence of international and national collaborations amongst tourism scholars, the researchers created four groups - single authors from single institutions and countries (35%); two or more authors from one institution and one country (27%); two or more authors from at least two different institutions within one country (19%); and two or more authors from two or more institutions in two or more countries (19%). If studies are to be more impactful and contribute effectively to knowledge creation and dissemination, it is suggested that authors may attach greater priority to international collaborations.

Co-Authorships - Assessment of tourism-wide networks

In progressing the examination of attributes of tourism co-authorship networks, the researchers proceeded to eliminate sole authored articles from the data set. This reduction generated a total of 8,421 co-authored articles for the subsequent social network analysis. It was found that there were 10,598 authors in the network with 35,324 ties. The authors considered four network metrics to delve into the informal structures in the field. First is the clustering coefficient (C), which quantifies "how close one node's neighbors are to being a clique. Put simply, it describes the probability that one's friend's friend is also a friend of oneself. C = 0 means that all the nodes are isolated, whereas C = 1 means that all the nodes are directly connected" (Ye, et al., 2013, p. 58). The overall clustering coefficient of the field is 0.779 calculated via Ucinet6, which shows that the networks of the field are closely clustered, and that the relationship between authors is close.

The second metric is *average distance*. Average distance indicates the maturity level of collaboration within a network by reflecting that the shorter the distance within a network, the greater its maturity (Koseoglu, 2016). This is so because the measure identifies the average geodesic distance amongst reachable pairs (Hanneman and Riddle, 2005). When calculated via Unicet6, the average distance for tourism is 6.389, which indicates that information only needs to flow an average distance of six people to transfer from one author to another (Ye, et al., 2013, p. 58).

The third metric is *betweenness centrality*. This identifies the extent to which a particular point lies "between" the various other points in a network. A higher score is indicative of a hierarchical network structure, whereas a single or small number of nodes in the network tends to be more central than others (Ying and Xiao, 2012, p. 460). The reported score in the present study was 2.6%, indicative of a high level of diversity within the network. This means that if the dominant group in the network allows or supports the single or small number nodes to enter into the largest network components, there is a greater prospect of extending and strengthening the knowledge domain of the field by drawing upon different approaches. Hence, the field may generate high impacts into other fields.

The *density of network* metric is the final indicator of the cohesion of the network. To calculate this indicator, the researchers considered means of the ratio of the number of ties to the maximum possible numbers of ties. These ranged from 0 to 1 and showed the level of connectedness amongst authors. Higher levels are indicative of more interactions with other authors (Koseoglu, 2016). The network density was found to be 0.0%. when calculated using Ucinet 6. This does not necessarily imply a low tendency to collaborate, since network density is inversely related to network size. As can be seen from other indicators (Number of authors and

Ties in the network) the network is large in size. This explains the decreasing level of density (Gallardo-Gallardo et al. 2017).

Assessment of components of the network

Another metric is the *size of largest components* in the network. This typically includes the most productive authors (Kretschmer, 2004). The metric provides a potential illustration of extensive and intimate collaborations within the network (Ye, et al., 2013). In the present case 1,522 components were identified within the network by using the Pajek software package program. Based on the visualization of the network, although scholarly tourism community has many components, the knowledge domain is characterized by single paper collaborations. There is also high degree of fragmentation across the social network.

The largest component in the network includes 5,907 authors and that there are 17 components as second largest component, with each including 20 authors. This may act as both a strategic advantage and a barrier to progression within the field. Strong interrelationships may result where this grouping helps researchers to create or disseminate knowledge by linking tourism with other fields. However, any factionalization of this grouping may hinder cross-fertilizations with other fields.

Lastly, the researchers examined the structure of the main network components. Heat maps identified predominant researchers using "warmer colors and bolded fonts to emphasize concepts that are frequently used, while words that are used only sporadically are shown in colder colors and subdued smaller fonts" (Zupic and Čater, 2015, p. 447). The software tool VOSviewer (Van Eck and Waltman, 2010) was used to create the heat maps. Figure 2 presents a heat map of the main component network. There is a big (red coloured) component in the map

that includes key researchers. There are also areas of light red or yellow, or light green that show potential opportunities for further maturation of the network.

Insert Figure 2 about here

Co-Authorship Network - identification of critical authors in the tourism network

To identify the importance of authors across the complete network, the researchers consider two network indicators: degree centrality and betweenness centrality. *Degree centrality* shows the importance of authors by identifying an author's number of collaborations in the network. The arithmetic sum of the arches is calculated, either coming to or going from each author (Gallardo-Gallardo et al. 2017). Betweenness centrality explains the extent to which a particular point lies "between" the various other points in a network. A high score reflects a hierarchical network structure, in which a single or a small number of nodes in the network tends to be more central than other nodes. Authors who have high degree or betweenness are usually key researchers within the network (Gallardo-Gallardo et al. 2017). The researchers used Ucinet 6 to examine the authors' degree and betweenness centralities in the network. Table 2 lists the top authors based on these two indicators.

Insert Table 2 about here

Additionally, to show research groupings that operate within the network we identified cliques that include a minimum of ten authors. A clique may be described as ''a subgroup in which all of its nodes are directly interconnected (while a cluster is a group of the same or

similar elements gathered or occurring closely together)'' (Abbasi, Hossain, Uddin, & Rasmussen, 2011, p. 698). Cliques identify exclusive collaborations within a main group in the network and provides a key for linking nodes to one another (Hu and Racherla, 2008). Table 3 presents the observation of cliques that include at least ten authors.

Insert Table 3 about here

Conclusions

This study set out to examine the authorship structures and collaboration networks of tourism generally and from the positioning of scholars. To this end, the informal social structure of the tourism knowledge domain was analyzed using data from 12,896 articles published in 13 leading tourism journals. The results show that collaborations in the field are generally confined to two authors. Also, it is evident that there is a low incidence of international collaborations. Based on the co-authorship network, it has been found that the informal social structure of the tourism knowledge domain is broadly based, exhibits diversity, and shows evidence of a strong elite group. Additionally, authors were ranked based on degree and betweenness centralities. Cliques that include at least ten authors were identified. Some of the resulting implications are discussed below.

This study has shown that the tourism knowledge domain consists of a broad informal academic community. As an invisible college, members share common research interests in "tourism". However, there is a high level of diversity within the college. This may lead to a weakening of the ties that connect researchers and reluctance by participants to embrace the social identity of the tourism knowledge domain.

The findings have shown that many researchers contribute to the literature on only a single occasion. be If one-time contributors were encouraged to persist with their research activities, this might have the effect of strengthening. the invisible college. Journal editors might offer encouragement with a view to strengthening ties between researchers. Finally, researchers who have contributed to the tourism literature have been ranked via degree centrality, and betweenness centrality. Additionally, cliques including at least ten researchers and clusters have been identified. Many of these are amongst the most productive scholars and can play a critical role in generating stronger networks across the field.

From a practitioner perspective, this study has identified critical contributors to scholarship in the field who may considered as prospective collaborators. Thus, tourism managers who are in pursuit of advisors and consultants may gain potential benefit from the research findings. The results may assist agencies or institutions that are making decisions about grants by guiding the identification of appropriate panel members, reviewers, and directions for tourism related project proposals. Researchers, professors, or researchers from other fields may use the study findings to elaborate on research trends and find collaborators from within the tourism field.

Limitations and opportunities for future research

This study has a number of limitations. First, the researchers examined 13 tourism English language journals to identify the informal social structure of the tourism knowledge domain. Future studies may consider a larger number of journals and extend the coverage to publications from other knowledge domains in other languages as well as in English. Second, the implications of the study focus on informal social structures. Future research might extend examination of this

issue by focusing on the practices of institutions or countries in promoting and advancing the tourism knowledge domain.

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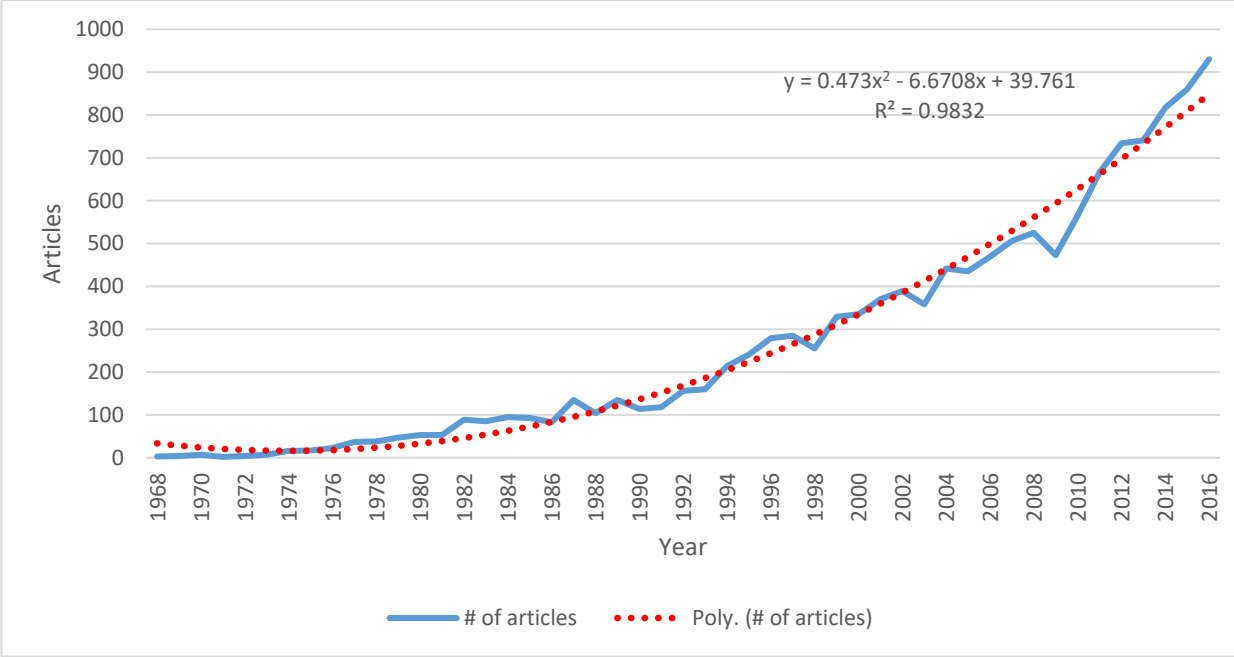

Figure 1. Frequency of articles by year

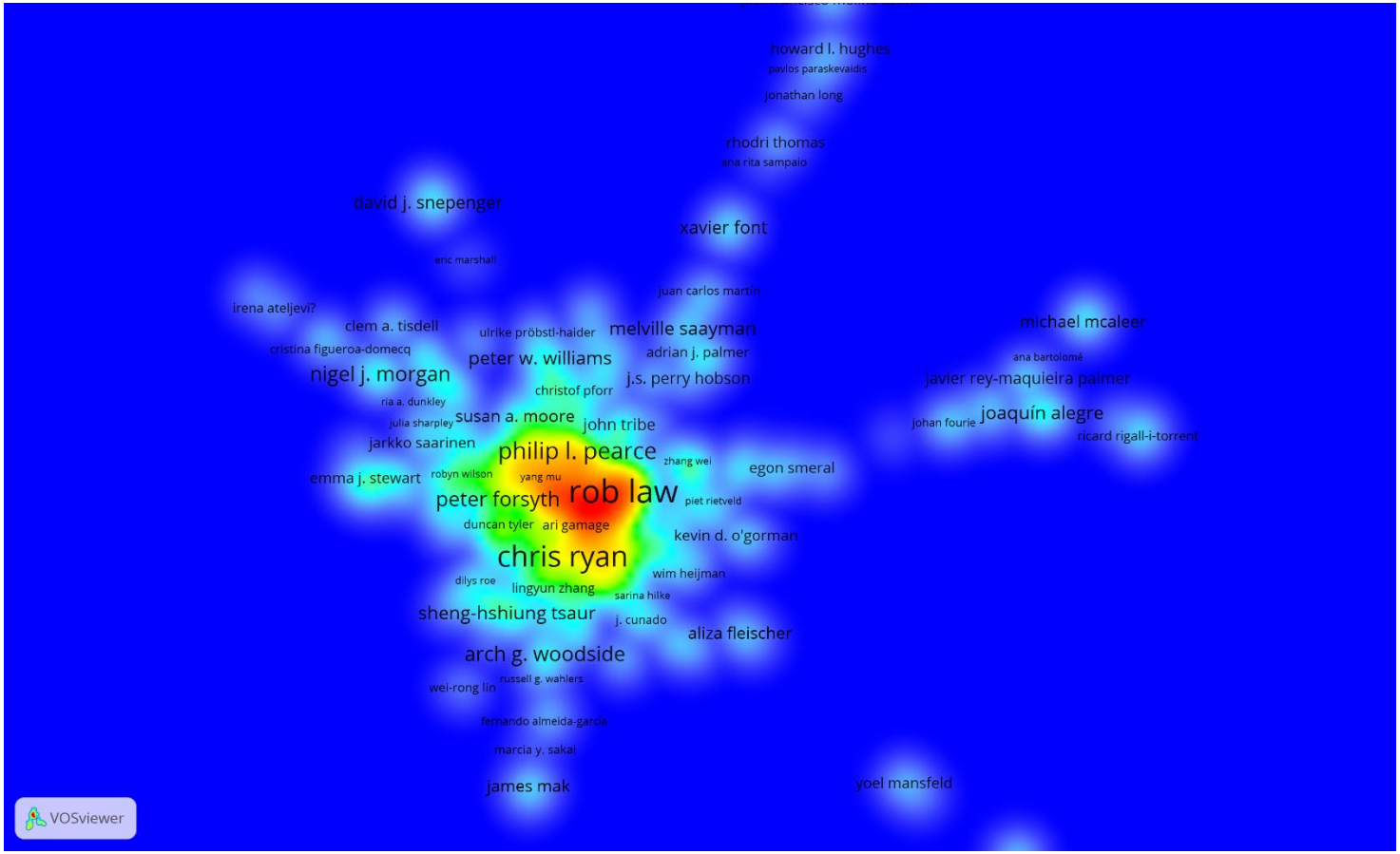

Figure 2. Density visualization of the largest components in the network (5,907 authors)

Table 1. Scope of the contributing data

Selected Journals	Earliest issue	Latest issue	# of articles	Impact Factor by SSCI	SCR Scopus
Asia Pacific Journal of Tourism Research (APJTR)	1996-v1(1)	2016-v21(12)	650	1.051	0.726
Annals of Tourism Research (ATR)	1973-v1(1)	2016-6-v61	2,297	3.194	2.205
Current Issues in Tourism (CIT)	1998-v1(1)	2016-v19(14)	666	2.451	1.232
International Journal of Tourism Research (IJTR)	1999-v1(1)	2016-v18(6)	714	1.857	1.144
Journal of Sustainable Tourism (JST)	1993-v1(1)	2016-v24(12)	879	2.978	1.687
Journal of Travel and Tourism Marketing (JTTM)	1992-v1(1)	2016-v33(9)	1,598	1.453	3.04
Journal of Travel Research (JTR)	1968-v7(1)	2016-v55(8)	1,053	4.564	1.179
Journal of Vacation Marketing (JVM)	1994-v1(1)	2016-v22(4)	591	1.148	0.76
Scandinavian Journal of Hospitality and Tourism (SJHT)	2001-v1(1)	2016-v16(4)	315	1.091	0.484
Tourism Economics (TE)	1995-v1(1)	2016-v22(6)	979	0.826	0.624
Tourism Geographies (TG)	1999-v1(1)	2016-v18(5)	453	1.663	1.112
Tourism Management (TM)	1999-v3(1)	2016-v57	2,463	4.707	2.580
Tourist Studies (TS)	2001-v1(1)	2016-v16(4)	238	1.147	0.827

Table 2. Top Authors In The Co-Authorship Network By Degree And Betweenness

Author	Degree	Author	Betweenness
Rob Law	98	Samuel Seongseop Kim	1412266
Choong-Ki Lee	90	Muzaffer S. Uysal	1307491
Alastair M. Morrison	80	Rob Law	1126867
Muzaffer S. Uysal	78	Haiyan Song	1072814
Chris Ryan	72	Brian E. M. King	1001263
Bob Mckercher	71	Bruce R. Prideaux	993542
Haiyan Song	64	Colin Michael Hall	987810
Samuel Seongseop Kim	61	Choong-Ki Lee	906574
Colin Michael Hall	55	Honggen Xiao	887255
Geoffrey Wall	53	Dallen J. Timothy	858917
Brian E. M. King	53	Bob Mckercher	840855
Noel Scott	51	Brent W. Ritchie	767878
Daniel R. Fesenmaier	49	John C. Crotts	731459
Bruce R. Prideaux	49	Richard W. Butler	685486
Turgut Var	48	Larry Michael Dwyer	677523
Brent W. Ritchie	48	Chris Ryan	659785
Hailin Qu	44	Jaume Rossell Nadal	658369
Dogan Gursoy	44	Turgut Var	646653
Larry Michael Dwyer \	42	Dogan Gursoy	630972
Joseph T. O'leary	40	Geoffrey Wall	624681
Philip L. Pearce	40	Daniel R. Fesenmaier	619631
Xinran You Lehto	40	Alastair M. Morrison	588394
Liping A. Cai	40	Abraham Pizam	578391
Sara Dolnicar	40	Noel Scott	567257
Fevzi Okumus	39	James F. Petrick	533236
John L. Crompton	38	Donald Getz	531104
John C. Crotts	38	Cathy H.C. Hsu	499952
Woo Gon Kim	38	Chris Cooper	468939
James F. Petrick	37	John Tribe	460464
Arch G. Woodside	37	Fevzi Okumus	446255
Soocheong Shawn Jang	36	John L. Crompton	445824
Stephen F. Witt	35	Stephen John Page	431566
William C. Norman	35	Philip L. Pearce	429109
Timothy Jeonglyeol Lee	35	Kaye Kye-Sung Chon	420055
Nancy Gard Mcgehee	35	Dimitrios Buhalis	416019
Bihu Wu	34	Simon Hudson	405293
David Airey	34	Metin Kozak	391350
Xiang Robert Li	34	David Airey	385483
Abraham Pizam	34	Daniel Scott	383105
J.R. Brent Ritchie	34	Xiang Robert Li	376647

Deborah L. Kerstetter	34	Stephen F. Witt	376291
Dimitrios Buhalis	33	Xavier Font	375409
Stefan Gössling	32	Deborah L. Kerstetter	373902
James E.S. Higham	32	Susanne Becken	371457
Youcheng Raymond Wang	31	Joseph T. OLeary	365983
Kaye Kye-Sung Chon	31	Betty Weiler	365409
Dallen J. Timothy	31	Richard R. Perdue	362359
Jie Zhang	31	Bing Pan	340608
David J. Snepenger	30	Scott Mccabe	330523
Richard W. Butler	30	Graham A. Miller	326546
Juan Gabriel Brida	30		

Table 3. Cliques in the Network including at least ten authors

No	Authors
1	Arie Reichel, Abraham Pizam, Gang-Hoan Jeong, Olimpia State-Costache, Jana Kucerova, Claudia Kroesbacher, Serena Volo, Nuria Montmany, Lizl Steynberg, Jean Marc Lusson, Hermann Van Boemmel
2	Stefan Gossling, Paul M. Peeters, Colin Michael Hall, Daniel Scott, Scott Allen Cohen, James E.S. Higham, Eke Eijgelaar, Bas Amelung, Yael Ram, R. Leemans
3	Pavol Rybar, Bartolomej Balaz, Jarmila Ferencikova, Dana Tometzova, Branislav Krsak, Marian Lukac, Lenka Muchova, Ladislav Hvizdak, Mario Molokac, L'ubomir Strba
4	O. Marcenaro Gutierrez, J. Ruiz Sinoga, F. Solis Becerra, F. Ruiz De La Rua, F. Navas Concha, M. Tejada, R. Cortes Macias, G. Malvarez Garcia, G. Gutierrez Fernandez, Fernando Almeida-Garcia, J. Cabello Gonzalez, M. Luque Gallego, J. Delgado Pena, F. Fernandez Gutierrez, Enrique Navarro Jurado