Creation and dissemination of hospitality and tourism research outputs in the new millennium

Abstract

Purpose – This study aims to examine the current state of the research activities of scholars in the hospitality and tourism field by analyzing the first 20 years of the new millennium.

Design/methodology/approach – Longitudinal analyses using 14,229 journal articles as data source were realized by adopting BibExcel, Gephi, and VOSviewer network analysis software packages.

Findings – This study provides a comprehensive overview of the hospitality and tourism research based on authorship and social network analysis, with patterns of prolific authors compared over four distinct periods.

Research implications – The hospitality and tourism academic society is clearly illustrated by tracing academic publication activities across 20 years in the new millennium. In addition, this study provides a guide for scholars to search for multidisciplinary collaboration opportunities. Government agencies and NGOs can also benefit from this study by identifying appropriate review panel members when making decisions about hospitality- and tourism-related proposals.

Originality/value – This study is the first to use bibliometric analysis in assessing research published in leading hospitality and tourism journals across the four breakout periods in the new millennium.

Keywords: knowledge, millennium, bibliometric, dissemination, co-authorship

1. Introduction

The academic environment has changed since the 1990s through the introduction of electronic journals, which allow researchers to easily scrutinize publications, collect knowledge, and transfer it to others. Therefore, the speedy accumulation of knowledge and its transmission contribute to collaboration with other scholars and an increased rate of article publication (Mulet-Forteza *et al.*, 2019). It also contributes to alleviating the monopoly of knowledge articles, given that libraries cover the cost of certain journals' expensive subscription fees and make them accessible to their members. Another reason for the increasing research output in the hospitality and tourism field is rooted in the increase in the number of scholars and research schools that have been founded to investigate the increasing tourism demand (Mulet-Forteza *et al.*, 2019a). Another important factor is related to strict requirements for promotion, tenure, contract renewal, and bonus plans imposed by affiliated institutions (Delello *et al.*, 2015). The reality reflects the situation of competition among universities according to forceful university evaluation at the country, regional, or global levels. These compelling forces help foster creation of new knowledge and its dissemination.

In an attempt to understand the development of hospitality and tourism knowledge in the new millennium, identifying the growth of authorship collaboration and mapping the social networking of authors are important; research collaboration and social network are significant approaches in identifying and visualizing the evolution of discipline research direction and knowledge dissemination (Zupic and Čater, 2015). Bibliometric analysis has been used to identify authorship/co-authorship, collaboration, and centrality in co-authorship networks (Ali *et al.*, 2019; Benckendorff, 2010; Köseoglu, 2018; Köseoglu *et al.*, 2018a; Hu and Racherla, 2008; Paul-Hus *et al.*, 2017; Moosa and Li, 2019; Mulet-Forteza *et al.*, 2019b; Ye *et al.*, 2013).

However, these studies have not identified patterns of publication activities in the new millennium across the four breakout periods and the overall 20-year span. Obtaining a specific list of top scholars in terms of productivity, degree centrality, and betweenness centrality across the four breakout periods is important. The rationale is that an overall analysis fails to identify the current influential scholars and their social network because long-term scholars in the academia have more chances to obtain a strong position in the ranking. Therefore, identifying patterns of publication activities across the four breakout periods is important and helps showcase chronicle variations in authorships and prolific scholars.

In this study, we attempted to examine the authorship and co-authorship network structure in the hospitality and tourism field using bibliometric indicators. Some bibliometric and social network analyses were conducted to highlight the most productive authors and identify the authorship and collaboration network structure. Second, we explored the number of publications in four five-year periods in the first 20 years of the new millennium. A total of 14,229 articles were extracted from the top-12 hospitality and tourism journals that covered the 20-year time span from 2000 to 2019. Results are expected to show trends of authorship and academic network structure.

2. Literature review

Bibliometric analysis is one of the quantitative methods used to determine the evolution and intellectual structure of scientific fields of study (Liu, Yin, Liu, and Dunford, 2015). Generally, bibliometric analyses are widely accepted due to their objective nature (Garfield, 1979). Bibliometric analysis can investigate latent intellectual structure, research trends, and global networks among scholars (Benckendorff and Zehrer, 2013; Köseoglu *et al.*, 2016).

After keyword analysis was applied in tourism studies for the first time (Palmer *et al.*, 2005), bibliometric analysis became a widely accepted tool in analyzing the research network structure in various tourism- and hospitality-related fields, including sustainable tourism (Niñerola *et al.*, 2019; Ruhanen *et al.*, 2015), AirBnB (Andreu *et al.*, 2020), psychology (Barrios *et al.*, 2008), tourism crisis and disaster management (Jiang *et al.*, 2017), food and gastronomy (Okumus *et al.*, 2018), finances (Jiménez-Caballero and Polo Molina, 2017), wine tourism (Sánchez *et al.*, 2017), medical tourism (De La Hoz-Correa *et al.*, 2018), self-service technology (Shin and Perdue, 2019), social media (Leung *et al.*, 2017; Nusair *et al.*, 2019), and strategic management (Köseoglu *et al.*, 2019). These bibliometric studies have adopted a number of analysis approaches, such as co-authorship, co-citation, and co-word analyses.

Köseoglu *et al.* (2016) applied bibliometric analysis to 614 business ethics-related articles in the tourism/hospitality field published from 1995 to 2014 in 20 leading tourism/hospitality/business ethics journals. They analyzed the authorship and institutional contributions, research themes, and research methods. Leung *et al.* (2017) provided a systematic review of 406 social media-related academic articles published between 2007 and 2016 in 16 business and hospitality/tourism journals. They combined two bibliometric analysis methods: co-citation and co-word analyses. In the hospitality/tourism field, the result of co-citation analysis showed four clusters: online reviews and behavior, online reviews and eWOM, information technology and user-generated content, and methodology, indicating that the hospitality/tourism field has many diverse theoretical foundations.

Okumus *et al.* (2018) examined the evolution of food and gastronomy research in 16 leading hospitality and tourism journals from 1976 to 2016. They identified 462 food and gastronomy research articles and analyzed them using advanced bibliometric analysis. Food and

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culinary operation, food tourism, and food health and safety are the main topics of the study. Although an increasing number of gastronomy articles show collaboration with the area of finance and marketing, only a few articles have addressed food and gastronomy topics. In a similar vein, De La Hoz-Correa *et al.* (2018) applied co-word analysis to examine the evolution of medical tourism from 1931 to 2016. The result indicated major themes in medical tourism, including ethical implications; trust and accreditation; health, wellness, spa tourism, and service quality; health-related issues; medical treatments and tourism; sensitive practices; medical tourism destinations and marketing; and globalization, policies, and the effect on international patients.

Some studies have attempted to examine the co-occurrence of keywords and conducted co-authorship analysis (Jiang *et al.*, 2017; Niñerola *et al.*, 2019). Jiang *et al.* (2017) investigated 37 tourism- and hospitality-related journals from 1960 to 2016 to visualize research mapping in tourism crisis and disaster management. They found that the research pattern moves from broad topics to a specific topic; more specifically, resilience and economic crises are the recent research focus. The co-authorship analysis identified the major collaborative networks that are constrained by geographic proximity, with the United States, the United Kingdom, and Australia dominating co-authorship. Seven research clusters were identified through co-citation analysis, namely, tourism demand forecasting, effects on tourism, strategic management/planning, economic crises, response case study, consumer behavior, and post-disaster recovery. Niñerola *et al.* (2019) applied bibliometric analysis to identify the main research trend in sustainable tourism by examining 4,647 papers over the period 1987–2018. Co-occurrence analysis of keywords, authors, and citations indicated that sustainability was a prevalent and growing research topic and that the United States was the leader in sustainable tourism research.

Some studies have attempted to identify research trends and co-citation in certain regions (Köseoglu *et al.*, 2015, 2019; Shin and Perdue, 2019). Köseoglu *et al.* (2015) investigated citation and co-citation of 76 Turkish-related tourism and hospitality studies from 1992 to 2013. The results indicated that over half of the tourism and hospitality studies were influenced by other disciplines, such as marketing, management, and psychology. Interestingly, through cluster analysis, the authors found that hospitality-based journals focused on theory development, whereas tourism-oriented journals focused on practical approaches. Shin and Perdue (2019) examined self-service technology research from 2000 to 2017. They found 199 articles about self-service technology and identified leading co-citation authors, intellectual turning points, research clusters, and major research methodologies. Köseoglu *et al.* (2019) investigated strategic management studies in the hospitality industry using co-citation analysis. The researchers selected 1,536 articles and extracted 66,383 citations related to strategic management in the hospitality industry. The results revealed the intellectual structure of strategic management from 1971 to 2016, which indicated that marketing was the central subfield, and resource-based view was the major approach in strategic management research at the time.

Mulet-Forteza *et al.* (2018) first revealed the bibliometric ranking in the *Journal of Travel and Tourism Marketing* from 1992 to 2017 and analyzed a total of 1,037 articles. The result showed the following: annual number of publications; annual citation structure; 100 most cited articles; 50 most cited authors, universities, and countries; 50 most productive authors, universities, and countries; and co-citation network in journals cited in the *Journal of Travel and Tourism Marketing*. Mulet-Forteza *et al.* (2019a) conducted a similar study that examined the fundamental contributions in tourism, leisure, and hospitality fields from 1969 to 2016. A total of 13,302 articles were assessed using bibliometric analysis. The results showed a progressive

growth in the number of articles since 2008. The authors presented the 50 most cited papers, productive authors, institutions, and countries. They also conducted a keyword co-occurrence analysis to show the social network of the research themes. Ali *et al.* (2019) demonstrated the research trend from 1989 to 2018 in the *International Journal of Contemporary Hospitality Management (IJCHM).* A total of 1,573 articles were analyzed using metaknowledge and structural topic modeling. The results showed a continuous increase in the number of published papers. The co-authorship network between the countries revealed an increasing diversity. For example, Asian scholars showed a significant increase as the top researchers in *IJCHM*. Moreover, psychology and marketing were the most popular reference fields for *IJCHM*.

As discussed above, previous studies have adopted bibliometric analysis in different areas of tourism and hospitality. However, no study has focused on the authorship and social structure of literature on the overall tourism and hospitality industry, particularly across the four breakout periods in the new millennium. Thus, a study addressing authorship or social networking issues is highly needed (Köseoglu *et al.*, 2018a).

3. Methods

In this study, we adopted social network analysis to identify the network structure of hospitality and tourism research in the new millennium by using authorship structures and collaborative co-authorship networks. Collaborative co-authorship networks used bibliographic information, such as author name and institution, to indicate the interconnected collaboration of research outputs (Benckendorff, 2010). The results of social network structure analysis can help scholars understand the strength of connections within the research network and position the contribution of authors from the hospitality and tourism field. Citation and co-citation analyses

are not used because of possible event–data problems, such as influence not being cited, self-citation, biased citation, and different types of citation (MacRoberts and MacRoberts, 2010).

We adopted three steps to approach bibliometric and co-authorship analyses: (1) determination of proposed sample and applicable research tools, (2) data preparation and cleaning, and (3) data analysis and visualization.

3.1 Step 1: Study sample

Bibliometric analysis requires the determination of a proposed sample to be analyzed. For this study, we extracted the list of journals from the Web of Science (WoS), because it is one of the most influential databases (Merigó *et al.*, 2015). The hospitality and tourism field had 23 SSCI-listed journals in April 2020 (WoS Group, 2020). To ensure the quality and reliability of the result, we selected 12 journals that showed a five-year impact factor of 3.00 or higher and over a 10-year history of being listed in SSCI. Table 1 lists the selected journals.

[Insert Table 1 here]

Prior to the final selection of articles, the timeframe of the new millennium was decided upon for the purpose of this study. The articles were extracted between the years of 2000 and 2019; both years are inclusive. The year 2000 is noted as the beginning of a new era in hospitality and tourism research. In addition, the selected articles had to be peer-reviewed articles in English. Thus, other scholarly works, including commentaries, book reviews, readers' comments, and editorials' comments, were ruled out to ensure the consistency of the results. Therefore, a total of 14,229 articles were produced for further analysis. Table 2 shows the frequency of articles produced listed by journals and years. It also shows the increase in productivity by measuring the number of published articles.

[Insert Table 2 here]

3.2 Step 2: Data preparation and cleaning

Data preparation and cleaning was divided into three stages. First, author names and institutions of selected articles were manually copied and pasted from the original journal article to minimize the possibility of spelling errors. Second, the number of authors listed in an article was manually counted and inserted into the database to visualize the trend of research collaboration. Third, the articles were grouped into four categories based on their authorship collaboration structure. Fourth, a frequency analysis was conducted to identify the authors with the same/similar names and initials, with the aim of detecting any misspellings or spelling differences in their names (Kumar and Jan, 2013). All errors were corrected before further analysis, including typographical errors, misspelling, and duplication of authors' names.

3.3 Step 3: Data analysis and visualization

After the data had been coded and cleaned in a Microsoft Excel spreadsheet, a frequency and descriptive analysis was conducted to identify the general information of authorship structure and research collaboration. Second, social network analysis was used in this study because of its capability to identify the positions and linkages among key authors. To investigate the hospitality and tourism research field, the sample was divided into four equal and consecutive subperiods (2000–2004, 2005–2009, 2010–2014, and 2015–2019). We used BibExcel software program and VOSviewer to determine co-authorship, calculate related metrics, and visualize authorship networks.

4. Results

4.1. Descriptive analysis for authorship structure and research collaboration

This study adopted frequency and descriptive analysis to capture the authorship structure and research collaboration. The application of descriptive findings included the number of published articles (14,229), number of author appearances (34,284), number of authors (14,117), average article per author index (#Articles/#Authors), and average authors per article index (#Author appearances/#Articles). The index of average article per author was 1.00, and the index of average authors per article was 2.41. This finding implies that a certain number of authors only published one article. Table 3 shows the evolution of paper collaboration from 2000 to 2019 by journals, indicating that the most prevalent research team size was two to three authors, which corresponds to the finding of the index of average authors per article.

This study also showed the frequency of authors' contribution to the hospitality and tourism literature. The distribution of their contribution is as follows: single article (67.6%), 2–4 articles (22.5%), 5–9 articles (6.1%), 10–29 articles (3.3%), 3049 articles (0.3%), and 50 or more articles (0.2%). These percentages have an important implication. For example, a total of 14,117 scholars contributed to the extant hospitality and tourism literature in the new millennium, with 9,585 scholars contributing only one article and another group of 24 authors contributing 50 or more articles.

[Insert Table 3 here]

In this study, we also explored the level of collaboration by calculating the number of authors listed in the article, as well as respective national and international collaborations. The number of authors listed in the article was classified into five groups: single author, two authors,

three authors, four authors, and five or more authors. The result shows that 21.4% of the articles were single-authored, whereas 35.8% and 28.6% were by two authors and three authors, respectively. Only 10.5% and 3.6% articles were by four authors and five or more authors, respectively. Table 4 and Figures 1 and 2 show the evolution of paper collaboration by year. The results indicate that the collaboration between two authors had grown steadily, whereas that between three authors started to increase from 2009. Starting in 2014, articles by three authors had become the majority of the authorship structure. Although the highest number of papers in the new millennium was by two authors, a decreasing trend could be observed. By contrast, articles by three, four, and five or more authors showed an increasing trend, especially the former. Thus, collaboration between three or more authors is a foreseeable trend in the future hospitality and tourism research structure. The findings also correspond to those of other co-authorship studies in business research (Donthu *et al.*, 2020), business ethics (Köseoglu *et al.*, 2018b), accounting (Kılıç *et al.*, 2019), social science (Henriksen, 2016), and economics (Kuld and O'Hagan, 2018). The plausible reasons of the increasing trend of multi-authored articles included declining communication and travel costs, increasing number of academic conferences, mobility of researchers, monetary incentive per published articles, and pressure for international research collaboration (Fire and Guestrin, 2019; Kuld and O'Hagan, 2018).

To identify the extent of national and international collaboration among hospitality and tourism scholars in the new millennium, four types of collaboration structure were created: single author (21.4%), two or more authors affiliated with one institution and one country (28.5%), two or more authors affiliated with at least two different institutions within one country (22.5%), and two or more authors affiliated with at least two different institutions in two or more counties (27.6%). Figures 3 and 4 show the trend of national and international collaboration. Although

international collaboration had increased rapidly in recent years, the majority of paper collaboration still occurred at a national level (over 50% authorship collaboration within one country). Therefore, authors should attach greater priority to international collaboration to have higher influence through knowledge creation and dissemination.

[Insert Table 4, Figures 1, 2, 3 and 4 here]

4.2. Top-50 millennium scholars in the four subperiods

Table 5 presents the results of the 50 most productive authors in the four subperiods in the new millennium. In Period 1 (2000–2004), Rob Law was the most productive author in the hospitality and tourism field. Other influential authors were Bob McKercher, Chris Ryan, and Joseph Chen. All published over 15 articles. In Period 2 (2005–2009), Rob Law was constantly contributing to the field, whereas SooCheong (Shawn) Jang became the most productive author, followed by Woo Gon Kim, Bob McKercher, and Seongseop (Sam) Kim, all publishing over 20 articles. In Period 3 (2010–2014), Rob Law and SooCheong (Shawn) Jang were again the top-two most productive authors, followed by Heesup Han, Choong-Ki Lee, and Haiyan Song, who published over 30 articles.

In Period 4 (2015–2019), Rob Law and Heesup Han were the most prolific scholars with more than 70 publications, followed by Anna Mattila and SooCheong (Shawn) Jang with more than 40 publications. Among the authors who published between 30 and 40 papers, Dogan Gursory and Haiyan Song had been noticeable as constantly prolific scholars since Period 2. Several previous eminent prolific authors slowly vanished due to aging, retirement, or other reasons. Nevertheless, newly emerging researchers joined the prolific author group in Period 4, including Heesup Han, Songshan (Sam) Huang, Sunghyup (Sean) Hyun, Albert Assaf, Yang

Yang, Ipkin (Anthony) Wong, Sara Dolnicar, Jinsoo Hwang, Nathaniel Line, Kyle Woosnam, and Lydia Hanks. Given that the newly emerging scholars take a mainstream scholarship space, close attention must be paid to their academic achievements.

Notably, the total number of published articles rapidly increased for the top authors from Period 1 to Period 4. For instance, the number of publications by Rob Law increased from 25 in Period 1 to 97 in Period 4, whereas the number of publications by Anna Mattila increased from 15 in Period 1 to 48 in Period 4. These results are attributed to more opportunity caused by an increase in the number of papers on the listed journals, as well as academicians' individual efforts.

In the combined period (2000–2019), the ranking of the top-10 millennium scholars in the hospitality and tourism field is as follows: (1) Rob Law, (2) SooCheong (Shawn) Jang, (3) Heesup Han, (4) Anna Mattila, (5) Haiyan Song, (6) Bob McKercher, (7) Seongseop (Sam) Kim and Chris Ryan, (9) Choong-Ki Lee, and (10) Dogan Gursoy and Woo Gon Kim. All authors shown in Table 5 published over 40 articles in the combined period. In comparison with other authors who started their publication careers in Period 1, Heesup Han and his considerable number of publications was remarkable, given that he started his research career in Period 3.

[Insert Table 5 here]

4.3. Co-authorship networks in the four subperiods

To examine the attributes of hospitality and tourism co-authorship networks in the new millennium, all single-authored articles were removed from the database, leaving a total of 11,185 co-authored articles for the social network analysis. Heat maps were used to visualize the

dominant researchers in the co-authorship networks, where "warmer colors and bolded fonts [are utilized] 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 Cater, 2015, p. 447). Figures 5–8 present millennium co-authorship networks in the four subperiods. Figure 5 presents a heat map via VOSviewer to identify the main or predominant researchers of the network in Period 1. In this network, the three main parts in red show Rob Law, Hailin Qu, and Alastair Morrison as the key researchers in the community. Seongseop (Sam) Kim and Jo-Ann Foo were also positioned to be emerging researchers (light red in the network). Figure 6 presents a heat map of Period 2. In this network, two key researchers were identified: SooCheong (Shawn) Jang and Seongseop (Sam) Kim. Other important authors were Rob Law, Anna Mattila, and Chris Ryan. In Periods 3 and 4, Rob Law was the dominant researcher in the co-authorship community, whereas many authors occupied the yellow or green area, illustrating potential opportunities for the maturity of the academic community (Figures 7 and 8). Figure 9 presents the main component of the co-authorship network in the millennium. It shows that Rob Law occupied the dominant position in this co-authorship network, although some other representative authors were also noticeable. The findings suggest these authors to collaborate with the main authors and share knowledge transfer to increase productivity.

[Insert Figures 5, 6, 7, 8, and 9 here]

4.4 Degree and betweenness centrality measures of hospitality and tourism research

The degree and betweenness centrality of the network were calculated to identify the position of authors in the hospitality and tourism social network structure. The value of degree centrality shows the number of ties/collaborations that an author has, whereas the value of

betweenness centrality reveals the number of shortest paths that pass through the node/author. A high degree and/or betweenness centrality indicates important researchers in the collaborative network (Gallardo-Gallardo *et al.*, 2017). The top-50 authors with the highest centralization scores are shortlisted in Tables 6 and 7. This ranking corresponds with the result of the co-authorship network analysis. However, notably, Choong-Ki Lee ranked 4th in the degree centrality approach, whereas he ranked 38th in the betweenness centrality approach. This result indicates that Choong-Ki Lee has a large number of nodes in this collaboration network; however, the strength of his collaboration network was weakened by his collaborators, who may have already connected through others with relatively low degrees of strength.

[Insert Tables 6 & 7 here]

5. Discussion and conclusions

5.1 Conclusions

This study utilized bibliometric approach and social network analysis to assess the authorship structure, research collaboration, and co-authorship network in hospitality and tourism research in the new millennium. Data were derived from 14,227 articles published in 12 top-tier hospitality and tourism journals during the first 20 years of the new millennium. This study is one of the first in the hospitality and tourism literature that provides important implications for millennium scientific studies via co-authorship analysis. First, the authorship structure in hospitality and tourism research indicates that multi-authored studies occur more frequently than single-authored studies. Although the highest number of published articles was of those by two authors, the percentage of articles by two authors dropped from 44.3% in 2008 to 31.2% in 2019. However, a significant increase was observed in the percentage of articles by

three, four, and five or more authors. This result indicates a tendency in the evolution of the authorship structure in the millennium of more collaboration between researchers, because hospitality and tourism are a multidisciplinary industry (Jones, 2004). More collaboration between researchers from different disciplines helps increase the quality of knowledge creation and dissemination, and consequently improves the maturity level (Cartes-Velásquez and Manterola, 2017).

Since the year 2000, the percentage of single-authored articles decreased significantly from 39.4% in 2000 to 11.1% in 2019. By contrast, the number of articles involving international collaboration increased dramatically from 12.7% in 2000 to 38.7% in 2019. However, the largest percentage of collaboration remained at the national level (50.2% in 2019). The level of international collaboration was relatively low based on the long history of hospitality and tourism literature (Köseoglu and King, 2019). Therefore, the increasing trend of international collaboration should be continued to strengthen the maturity of hospitality and tourism literature because "the best science comes from international collaboration" (Adams, 2013, p. 557).

This study is one of the first attempts to identify the trend of co-authorship networks in four subperiods in the new millennium. The findings of this study demonstrate the progressive growth in research collaboration. In Period 1 (2000–2004), the co-authorship networks were fragmented and dispersed. Three main authors could be distinguished, whereas several potential authors appeared in the networks. In Period 2 (2005–2009), the structure of co-authorship networks was still relatively loose. Two main authors were identified, whereas more potential authors appeared. In Period 3 (2010–2014), the structure of the co-authorship networks began to consolidate. Rob Law was predominantly at the core of the network, although a few other potentially prolific authors began to emerge.

In Period 4 (2015–2019), the structure of the co-authorship networks gradually grew to be more cohesive and organized, although a large number of potential authors appeared due to the increasing number of publications. Therefore, the findings of this study indicate a different result from the those of previous studies, which concluded that the co-authorship network is less cohesive and less organized in lodging studies (Köseoglu *et al.*, 2018a), tourism studies (Racherla and Hu, 2010; Zhang, 2015), and tourism and hospitality studies (Ye *et al.*, 2013). The plausible explanation of this difference is that the coverage of the periods analyzed and the articles selected are different. Moreover, the most recent co-authorship studies only covered published articles until 2016 (e.g., Köseoglu *et al*. (2018a)), whereas the trend and number of papers in hospitality and tourism changed and increased dramatically from 2017 to 2019. Therefore, this study is important because it highlights the trend and current phenomenon of authorship structure and co-authorship networks in the new millennium.

Analysis of all four periods in the first 20 years of the new millennium clearly reveals a pattern of authorship. Tracing publication patterns showed that several of the top-50 researchers constantly conducted research activities over the four periods, whereas others had a declining number in publications, possibly due to aging, retirement, or reduced work requirement. A noticeable pattern was the emergence of new potential prolific authors.

5.2 Theoretical contributions

Analysis of the authorship structure and co-authorship network is important to identify the invisible dynamics of a collaboration network. Specifically, tracing the 20-years history of 12 top-tier hospitality and tourism journals is extremely difficult without the proper data analysis method. In the past, many studies have adopted a systematic literature review to summarize knowledge of the research context and suggest directions for future research. It would be an impossible task with the remarkable increasing research outputs in the hospitality and tourism field. However, advanced statistical methods using network analysis software have been introduced to facilitate data analysis of the large number of published articles.

The result of this study highlights that the number of multi-authored articles far exceeds the number of single-authored ones. However, the author collaboration structure occurred most frequently with two- or three-authored papers. Given that hospitality and tourism research is a multi-discipline, more interdisciplinary collaboration is required to strengthen the scientific development of the field (McKercher, 2018). In recent years (2015–2019), international collaborated research increased dramatically. This result corresponded to the more cohesive and organized co-authorship networks. To enhance the maturity of the hospitality and tourism field, an increasing trend of international collaborations should continue to strengthen the quality of research output in the hospitality and tourism field (Köseoglu, 2018).

5.3 Practical contributions

This study presents a useful performance analysis. The results of this study can guide young scholars to search for mentorship and/or collaboration opportunities. In addition, the results are helpful for researchers from hospitality and tourism and other fields to establish

multidisciplinary collaborations. The results of these studies can be used in decision making on researchers' promotion, contract renewal, or performance assessment. They facilitate educational institutions or universities to formulate research groups and promote collaborative academic works. Journal editors can also capitalize on the results to revise their editorial boards. The industrial management team similarly benefits from the results in pursuing professional consultants and advisors for their projects. Furthermore, this study can help government agencies and NGOs to identify appropriate review panel members when making decisions regarding which hospitality- and tourism-related proposals to finance.

5.4 Limitations and suggestions for future study

This study has several limitations. First, the results depend upon arithmetical methods to compute researchers' output without considering the quality of research, including unfavorable academic practices such as mass production or free-riding and collusion related to publications. Given that a single monograph can contribute to human development history and inspire other studies, quality in evaluating one academic research should be given importance rather than quantity. In this study, assessing the quality of 14,229 papers is practically difficult and is also an issue under the objective criteria. Thus, the present calculations did not consider the influence of future research needs in identifying the impact level of studies on society and the level of citations by other studies. For example, the frequency of citation (such as the studies of Garfield (1979) or Nunkoo *et al.* (2020)) should be carefully considered.

Second, this study only reviewed 12 top-tier hospitality and tourism journals with a five-year impact factor of 3.00 or higher and over a 10-year history of being listed in SSCI. Future

research needs to extend the coverage of the selected journals and apply the weighting score based on the impact factor to improve the visualization of the contributors in the field.

Third, this study calculated the number of authorships regardless of the role, such as corresponding author, number of authors, and order of authorship. Therefore, future study is required to analyze the number of authorships by considering different weights according to their features. Fourth, future research needs to assess authors according to research areas, because several authors are spotlighted in certain fields. Fifth, we did not consider authors characteristics, such as age, gender, or affiliation that were considered in previous studies (Nunkoo *et al.*, 2019, 2020). Therefore, future study may conduct a bibliometric analysis by certain groups.

Sixth, identifying the factors affecting the authorship number is needed to understand features of authors, journal, and publication time (Kuld and O'Hagan, 2018). Another limitation is pertinent to simple network structure for collaboration. Future studies should explore the definition of scholastic activities, reasons for collaboration, successful collaboration cases and strategies, research philosophy, work and life balance, approaches of capitalizing on research results for teaching, and community development. These diverse yet holistic approaches can be facilitated through qualitative analytical methods, such as in-depth interviews or focus group discussion with top-tier scholars.

References

Adams, J. (2013), "Collaborations: The fourth age of research", *Nature*, Vol. 497, No. 7451, pp. 557-560

Ali, F., Park, E., Kwon, J. and Chae, B. (2019), "30 years of contemporary hospitality management: Uncovering the bibliometrics and topical trends", *International Journal of Contemporary Hospitality Management*, Vol. 31 No. 7, pp. 2641-2665.

Andreu, L., Bigne, E., Amaro, S., & Palomo, J. (2020), "Airbnb research: an analysis in tourism and hospitality journals", *International Journal of Culture, Tourism and Hospitality Research,* Vol. 14, No. 1, pp., 2-20.

Barrios, M., Borrego, A., Vilaginés, A., Ollé, C., & Somoza, M. (2008), "A bibliometric study of psychological research on tourism", *Scientometrics,* Vol. 77, No. 3, pp. 453-467.

Benckendorff, P. (2010), "Exploring the Limits of Tourism Research Collaboration: A Social Network Analysis of Co-authorship Patterns in Australian and New Zealand Tourism Research", *CAUTHE 2010: Tourism and Hospitality: Challenge the Limits,* pp. 151-174.

Benckendorff, P., and Zehrer, A. (2013), "A network analysis of tourism research", *Annals of Tourism Research*, Vol. 43, pp. 121-149.

Cartes-Velásquez, R., & Manterola, C. (2017), "Impact of collaboration on research quality: A case analysis of dental research", *International Journal of Information Science and Management,* Vol. 15, No. 1, pp. 89-93.

De La Hoz-Correa, A., Muñoz-Leiva, F., & Bakucz, M. (2018), "Past themes and future trends in medical tourism research: A co-word analysis", *Tourism Management,* Vol. 65, pp. 200-211.

Delello, J. A., McWhorter, R. R., Marmion, S. L., Camp, K. M., Neel, J., Everling, K. M., & Marzilli, C. (2015), "The life of a professor: Stress and coping", *Polymath: An Interdisciplinary Journal of Arts & Sciences, V*ol. 4, No. 1, pp. 39-58.

Donthu, N., Kumar, S., & Pattnaik, D. (2020), "Forty-five years of journal of business research: a bibliometric analysis", *Journal of Business Research*, Vol. 109, pp. 1-14.

Fire, M., & Guestrin, C. (2019), "Over-optimization of academic publishing metrics: observing Goodhart's Law in action", *GigaScience*, Vol. 8, No. 6, pp. 1-20.

Gallardo-Gallardo, E., Moliner, L., & Gallo, P. (2017), "Mapping collaboration networks in talent management research", *Journal of Organizational Effectiveness: People and Performance*, Vol. 4, No. 4, pp. 332-358.

Garfield, E. (1979), "Is citation analysis a legitimate evaluation tool?", *Scientometrics*, Vol. 1, No. 4, pp. 359-375

Henriksen, D. (2016), "The rise in co-authorship in the social sciences (1980–2013)", *Scientometrics,* Vol. 107, No. 2, pp. 455-476.

Hu, C., & Racherla, P. (2008), "Visual representation of knowledge networks: A social network analysis of hospitality research domain", *International Journal of Hospitality Management*, Vol. 27, No. 2, pp. 302-312.

Jiang, Y., Ritchie, B. W., & Benckendorff, P. (2017), "Bibliometric visualisation: An application in tourism crisis and disaster management research", *Current Issues in Tourism*, Vol. 22, No. 16, pp. 1925-1957.

Jiménez-Caballero, J., & Polo Molina, S. (2017), "A bibliometric analysis of the presence of finances in high-impact tourism journals", *Current Issues in Tourism,* Vol. 20, No. 3, pp. 225-232.

Jones, P. (2004), "Finding the hospitality industry? Or finding hospitality schools of thought", *Journal of Hospitality, Leisure, Sport and Tourism Education*, Vol. 3, No. 1, pp. 33-45.

Kılıç, M., Uyar, A., & Köseoglu, M. A. (2019), "Co-authorship Network Analysis in the Accounting Discipline", *Australian Accounting Review*, Vol. 29, No. 1, pp. 235-251.

Köseoglu, M.A. (2018), "A new approach to journal ranking: social structure in hospitality and tourism journals", *International Journal of Contemporary Hospitality Management*, Vol. 32 No. 2, pp. 389-424

Köseoglu, M. A., & King, B. (2019), "Authorship structures and collaboration networks in tourism journals", *Journal of Hospitality & Tourism Education*, pp. 1-9.

Köseoglu, M. A., Okumus, F., Dogan, I. C., & Law, R. (2019), "Intellectual structure of strategic management research in the hospitality management field: A co-citation analysis", *International Journal of Hospitality Management*, Vol. 78, pp. 234-250.

Köseoglu, M. A., Okumus, F., Putra, E. D., Yildiz, M., & Dogan, I. C. (2018a), "Authorship trends, collaboration patterns, and co-authorship networks in lodging studies (1990–2016)", *Journal of Hospitality Marketing & Management*, Vol. 27, No. 5, pp. 561-582.

Köseoglu, M. A., Rahimi, R., Okumus, F., and Liu, J. (2016), "Bibliometric studies in tourism", *Annals of Tourism Research*, Vol. 61, pp. 180-198.

Köseoglu, M. A., Sehitoglu, Y., & Craft, J. (2015), "Academic foundations of hospitality management research with an emerging country focus: a citation and co-citation analysis", *International Journal of Hospitality Management*, Vol. 45, pp. 130-144.

Köseoglu, M. A., Yildiz, M., Putra, E. D., & Ciftci, T. (2018b), "Co-Authorship Networks in Business Ethics: A Longitudinal Study", *Journal of Scientometric Res*, Vol. 7, No. 3, pp. 201-209.

Kuld, L., & O'Hagan, J. (2018), "Rise of multi-authored papers in economics: Demise of the 'lone star' and why?", *Scientometrics*, Vol. 114, No. 3, pp. 1207-1225.

Kumar, S., & Jan, J. M. (2013). Mapping research collaborations in the business and management field in Malaysia, 1980–2010. *Scientometrics, 97*(3), 491-517.

Leung, X. Y., Sun, J., & Bai, B. (2017), "Bibliometrics of social media research: a co-citation and co-word analysis", *International Journal of Hospitality Management*, Vol. 66, pp. 35-45.

Liu, Z., Yin, Y., Liu, W., & Dunford, M. (2015), "Visualizing the intellectual structure and evolution of innovation systems research: a bibliometric analysis", *Scientometrics*, Vol. 103, No. 1, pp. 135-158.

MacRoberts, M.H, & MacRoberts, B.R. (2010), "Problems of citation analysis: A study of uncited and seldom-cited influences", *Journal of the American Society for Information Science and Technology,* Vol. 661, No. 1, pp. 1-12.

McKercher, B. (2018), "What is the state of hospitality and tourism research – 2018?", *International Journal of Contemporary Hospitality Management*, Vol. 30 No. 3, pp. 1234-1244.

Merigó, J. M., Mas-Tur, A., Roig-Tierno, N., & Ribeiro-Soriano, D. (2015), "A bibliometric overview of the Journal of Business Research between 1973 and 2014", *Journal of Business Research*, Vol. 68, No. 12, pp. 2645-2653.

Moosa, I., & Li, L. (2019), "Trends and Cycles in the Publication of Solo Papers in Business and Economics Journals", *Journal of Scholarly Publishing*, Vol. 51, No. 1, pp. 76-98.

Mulet-Forteza, C., Genovart-Balaguer, J., Mauleon-Mendez, E., & Merigó, J. M. (2019a), "A bibliometric research in the tourism, leisure and hospitality fields", *Journal of Business Research*, Vol.101, pp. 819-827.

Mulet-Forteza, C., Genovart-Balaguer, J., Merigó, J.M. and Mauleon-Mendez, E. (2019b), "Bibliometric structure of IJCHM in its 30 years", *International Journal of Contemporary Hospitality Management*, Vol. 31 No. 12, pp. 4574-4604.

Mulet-Forteza, C., Martorell-Cunill, O., Merigó, J. M., Genovart-Balaguer, J., & Mauleon-Mendez, E. (2018), "Twenty five years of the Journal of Travel & Tourism Marketing: a bibliometric ranking". *Journal of Travel & Tourism Marketing*, Vol. 35, No. 9, pp. 1201-1221.

Niñerola, A., Sánchez-Rebull, M. V., & Hernández-Lara, A. B. (2019), "Tourism research on sustainability: A Bibliometric Analysis", *Sustainability*, Vol. 11, No. 5, pp. 1377.

Nunkoo, R., Hall, C. M., Rughoobur-Seetah, S., & Teeroovengadum, V. (2019), "Citation practices in tourism research: Toward a gender conscientious engagement", *Annals of Tourism Research*, Vol. 79, 102755.

Nunkoo, R., Thelwall, M., Ladsawut, J., & Goolaup, S. (2020), "Three decades of tourism scholarship: Gender, collaboration and research methods", *Tourism Management*, Vol. 78, 104056.

Nusair, K., Butt, I., & Nikhashemi, S. R. (2019), "A bibliometric analysis of social media in hospitality and tourism research", *International Journal of Contemporary Hospitality Management,* Vol. 31, No. 7, pp. 2691-2719.

Okumus, B., Köseoglu, M. A., & Ma, F. (2018), "Food and gastronomy research in tourism and hospitality: A bibliometric analysis", *International Journal of Hospitality Management*, Vol. 73, pp. 64-74.

Palmer, A. L., Sesé, A., & Montaño, J. J. (2005), "Tourism and statistics: Bibliometric study 1998–2002", *Annals of Tourism Research*, Vol. 32, No. 1, pp. 167-178.

Paul-Hus, A., Mongeon, P., Sainte-Marie, M., & Larivière, V. (2017), "The sum of it all: Revealing collaboration patterns by combining authorship and acknowledgements", *Journal of Informetrics*, Vol. 11, No. 1, pp. 80-87.

Racherla, P., & Hu, C. (2010), "A social network perspective of tourism research collaborations", *Annals of Tourism Research*, Vol. 37, No. 4, pp. 1012-1034.

Ruhanen, L., Weiler, B., Moyle, B. D., & McLennan, C. L. J. (2015), "Trends and patterns in sustainable tourism research: a 25-year bibliometric analysis", *Journal of Sustainable Tourism*, Vol. 23, No. 4, pp. 517-535.

Sánchez, A. D., Del Río, M. D. L. C., & García, J. Á. (2017), "Bibliometric analysis of publications on wine tourism in the databases Scopus and WoS", *European Research on Management and Business Economics*, Vol. 23, No. 1, pp. 8-15.

Shin, H., & Perdue, R. R. (2019), "Self-Service Technology Research: A bibliometric co-citation visualization analysis", *International Journal of Hospitality Management*, Vol. 80, pp. 101-112.

Web of Science Group (2020), "2019 Journal Citation Reports Full journal list", available at: https://clarivate.com/webofsciencegroup/wp-content/uploads/sites/2/dlm_uploads/2019/08/JCR_Full_Journal_list140619.pdf (accessed 20 June 2020)

Ye, Q., Li, T., & Law, R. (2013), "A coauthorship network analysis of tourism and hospitality research collaboration", *Journal of Hospitality & Tourism Research*, Vo. 37, No.1, pp. 51-76.

Zhang, J. (2015), "Tourism research co-authorship networks in China", *Journal of China Tourism Research*, Vol. 11, No. 4, pp. 424-439.

Zupic, I., & Čater, T. (2015), "Bibliometric methods in management and organization", *Organizational Research Methods,* Vol. 18, No. 3, pp. 429-472.

Table 1. Selected journals

Acronym	Journal	Two-year impact factor	Five-year impact factor	Year when journal was SSCI-listed
TM	Tourism Management	6.012	7.581	1994
ATR	Annals of Tourism Research	5.493	6.569	1982
JTR	Journal of Travel Research	5.338	6.331	2008
IJHM	International Journal of Hospitality Management	4.465	5.470	2008
IJCHM	International Journal of Contemporary Hospitality Management	3.957	4.531	2009
JST	Journal of Sustainable Tourism	3.400	4.265	2008
CIT	Current Issues in Tourism	3.395	4.150	2008
JHTR	Journal of Hospitality and Tourism Research	2.849	4.117	2008
CHQ	Cornell Hospitality Quarterly	2.492	3.851	2008
JTTM	Journal of Travel and Tourism Marketing	2.988	3.533	2008
TG	Tourism Geographies	2.747	3.444	2007
IJTR	International Journal of Tourism Research	2.278	3.360	2008

Table 2. Evolution of journal publications (2000–2019)

Year	ATR	CHQ	CIT	IJCHM	IJHM	IJTR	JHTR	JST	JTR	JTTM	TG	TM	Total
2000	55	53	15	48	26	22	26	29	44	42	20	52	432
2001	63	55	21	40	24	30	25	30	48	18	19	55	428
2002	71	52	31	40	31	30	21	28	41	35	18	55	453
2003	54	50	21	43	31	29	27	26	42	30	17	57	427
2004	55	26	23	31	33	33	28	26	42	70	20	67	454
2005	65	27	27	36	34	25	22	29	42	46	20	78	451
2006	61	29	26	45	43	33	25	36	48	10	20	108	484
2007	57	29	24	48	67	35	24	34	40	61	21	116	556
2008	50	30	28	52	65	45	22	38	44	70	24	92	560
2009	41	35	29	54	70	40	27	39	39	53	22	81	530
2010	60	36	32	54	78	61	26	54	38	56	25	85	605
2011	82	45	44	47	111	40	31	50	51	53	24	139	717
2012	110	35	53	52	144	41	24	59	61	52	28	147	806
2013	94	33	45	55	169	44	24	64	58	54	31	146	817
2014	96	34	64	64	143	60	26	64	57	62	50	141	861
2015	76	34	72	83	131	58	22	72	54	75	41	176	894
2016	62	33	85	119	113	60	31	92	74	86	31	183	969
2017	93	29	111	153	147	66	41	106	73	85	44	239	1,187
2018	86	35	121	178	133	76	57	17	77	89	32	214	1,115
2019	153	30	162	225	253	72	60	102	87	75	37	227	1,483
Total	1,484	730	1,034	1,467	1,846	900	589	995	1,060	1,122	544	2,458	14,229

Table 3. Evolution of paper collaboration by journals (2000–2019)

Number of authors	ATR	CHQ	CIT	IJCHM	IJHM	IJTR	JHTR	JST	JTR	JTTM	TG	TM	Total
1	477	186	283	247	276	224	101	275	151	171	225	428	3,044
2	505	265	385	541	673	312	252	332	402	409	173	845	5,094
3	363	207	267	436	577	247	162	221	350	397	99	750	4,076
4	106	55	71	183	250	87	58	105	129	114	35	303	1,496
5	24	12	16	50	59	21	13	41	17	28	5	89	375
6	7	4	8	7	7	8	3	12	8	0	4	25	93
7	2	1	2	2	2	0	0	6	2	2	2	11	32
8	0	0	0	0	1	1	0	2	0	1	1	3	9
9	0	0	0	1	0	0	0	0	0	0	0	2	3
10	0	0	1	0	0	0	0	1	0	0	0	1	3
11	0	0	0	0	0	0	0	0	1	0	0	0	1
12	0	0	1	0	1	0	0	0	0	0	0	0	2
15	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	1,484	730	1,034	1,467	1,846	900	589	995	1,060	1,122	544	2,458	14,229

Table 4. Evolution of paper collaboration by years (2000–2019)

Year	1	2	3	4	5	6	7	8	9	10	11	12	15	Total
2000	170	180	62	17	3	0	0	0	0	0	0	0	0	432
2001	149	179	67	30	3	0	0	0	0	0	0	0	0	428
2002	188	171	85	6	3	0	0	0	0	0	0	0	0	453
2003	151	185	71	16	3	1	0	0	0	0	0	0	0	427
2004	158	179	96	18	1	1	0	0	0	0	1	0	0	454
2005	147	185	91	26	1	1	0	0	0	0	0	0	0	451
2006	147	204	102	21	7	2	0	0	1	0	0	0	0	484
2007	140	211	164	32	6	2	0	1	0	0	0	0	0	556
2008	144	248	127	30	9	1	1	0	0	0	0	0	0	560
2009	132	210	143	34	7	3	0	1	0	0	0	0	0	530
2010	139	239	162	51	11	2	0	1	0	0	0	0	0	605
2011	163	270	210	58	12	4	0	0	0	0	0	0	0	717
2012	189	298	216	83	12	5	2	0	0	0	0	0	1	806
2013	151	286	251	99	20	4	5	1	0	0	0	0	0	817
2014	142	285	292	104	27	10	1	0	0	0	0	0	0	861
2015	137	282	306	130	27	8	2	0	0	2	0	0	0	894
2016	150	305	334	125	45	7	3	0	0	0	0	0	0	969
2017	154	373	425	170	44	8	7	4	0	1	0	1	0	1,187
2018	129	341	371	201	47	19	5	1	0	0	0	1	0	1,115
2019	164	463	501	245	87	15	6	0	2	0	0	0	0	1,483
Total	3,044	5,094	4,076	1,496	375	93	32	9	3	3	1	2	1	14,229

Figure 1. Authorship patterns (number of papers)

Figure 2. Authorship patterns (percentages)

Figure 3. National versus international collaboration pattern (number of papers)

- Single author from single institution and country
- Two or more authors from one institution and from one country
- Two or more authors from at least two diffrent institutions from one country
- Two or more authors from two or more institutions and two or more countries

Figure 4. National versus international collaboration pattern (percentages)

Note: Explanation of lines is the same as those in Figure 3.

Table 5. Top-50 scholars in the millennium era

Period 1 (2000–2004)			Period 2 (2005–2009)			Period 3 (2010–2014)			Period 4 (2015–2019)			Overall (2000–2019)		
Rank	Author	TP	Rank	Author	TP	Rank	Author	TP	Rank	Author	TP	Rank	Author	TP
1	Rob Law	25	1	SooCheong (Shawn) Jang	40	1	Rob Law	69	1	Rob Law	97	1	Rob Law	225
2	Joseph Chen	17	2	Rob Law	34	2	SooCheong (Shawn) Jang	67	2	Heesup Han	72	2	SooCheong (Shawn) Jang	163
2	Bob McKercher	17	3	Woo Gon Kim	24	3	Heesup Han	34	3	Anna Mattila	48	3	Heesup Han	113
2	Chris Ryan	17	4	Seongseop (Sam) Kim	21	4	Choong-Ki Lee	32	4	SooCheong (Shawn) Jang	47	4	Anna Mattila	112
5	Cathy Enz	15	4	Bob McKercher	21	4	Haiyan Song	32	5	Songshan (Sam) Huang	36	5	Haiyan Song	84
5	Anna Mattila	15	6	Chris Ryan	20	6	Anna Mattila	30	6	Dogan Gursoy	34	6	Bob McKercher	81
5	Hailin Qu	15	7	Anna Mattila	19	7	Seoki Lee	27	6	Sunghyup (Sean) Hyun	34	7	Seongseop (Sam) Kim	79
8	Cathy Hsu	14	8	Alastair Morrison	17	8	Chris Ryan	26	8	Albert Assaf	33	7	Chris Ryan	79
9	Vincent Heung	13	9	Dogan Gursoy	16	9	Basak Guillet	25	8	Yang Yang	33	9	Choong-Ki Lee	77
9	Terry Lam	13	9	Geoffrey Wall	16	10	Albert Assaf	21	10	Haiyan Song	32	10	Dogan Gursoy	76
9	Alastair Morrison	13	11	Daniel Fesenmaier	15	10	Sunghyup (Sean) Hyun	21	10	Ipkin (Anthony) Wong	32	10	Woo Gon Kim	76
12	Daniel Fesenmaier	12	11	Cathy Hsu	15	10	Vincent Magnini	21	12	Sara Dolnicar	30	12	Seoki Lee	65
12	Dogan Gursoy	12	11	Clark Hu	15	10	Bob McKercher	21	13	Jinsoo Hwang	29	13	Sara Dolnicar	60
12	Joseph Leary	12	14	Carla Santos	14	14	Seongseop (Sam) Kim	19	14	Seongseop (Sam) Kim	28	13	Cathy Hsu	60
15	Seongseop (Sam) Kim	11	14	Haiyan Song	14	14	Xinran Lehto	19	14	Xiang (Robert) Li	28	15	Albert Assaf	58
15	Stephen Litvin	11	14	Kevin Wong	14	16	Jinsoo Lee	18	14	Nathaniel Line	28	15	Hailin Qu	58
15	Michael Lynn	11	17	Kijoon Back	13	17	Larry Dwyer	17	17	Seoki Lee	27	17	Xinran Lehto	57
15	Haemoon Oh	11	17	Wai-Hung (Wilco) Chan	13	17	Hanqin Qiu Zhang	17	17	Kyle Woosnam	27	18	Sunghyup (Sean) Hyun	56
15	Stephen Page	11	17	Osman Karatepe	13	19	Sara Dolnicar	16	19	Lydia Hanks	26	19	James Petrick	55
15	Bruce Prideaux	11	17	Douglas Pearce	13	19	Kevin Gorman	16	19	Woo Gon Kim	26	20	Xiang (Robert) Li	51
15	Michael Riley	11	17	James Petrick	13	19	Osman Karatepe	16	19	Choong-Ki Lee	26	20	Fevzi Okumus	51
22	Richard Butler	10	17	Beverley Sparks	13	19	Woo Gon Kim	16	19	Fevzi Okumus	26	22	Songshan (Sam) Huang	50
22	John Crotts	10	17	Youcheng (Raymond) Wang	13	19	Nancy Mcgehee	16	23	Xinran Lehto	25	22	Alastair Morrison	50
22	Joan Henderson	10	24	Minghsiang Chen	12	19	James Petrick	16	24	Brent Ritchie	23	22	Brent Ritchie	50
22	Woo Gon Kim	10	25	Choong-Ki Lee	11	19	Hailin Qu	16	25	Bob McKercher	22	25	Hanqin Qiu Zhang	49
22	Sheryl Kimes	10	25	Seoki Lee	11	26	Jeou-shyan Horng	15	25	Noel Scott	22	26	Larry Dwyer	48
22	Metin Kozak	10	25	Arie Reichel	11	26	Hee (Andy) Lee	15	27	Mark Bonn	21	27	Beverley Sparks	46
22	James Petrick	10	25	Stephen Smith	11	26	Bruce Prideaux	15	27	Kam Hung	21	28	Daniel Fesenmaier	45
29	Alison Mcintosh	9	29	Carlos Barros	10	26	Haywantee Ramkissoon	15	27	Juan Nicolau	21	29	Ipkin (Anthony) Wong	44
29	Arie Reichel	9	29	Bruce Prideaux	10	26	Brent Ritchie	15	27	Hailin Qu	21	30	David Weaver	43
29	Bill Faulkner	9	29	Duarte Morais	10	26	John O'neill	15	27	Markus Schuckert	21	30	Muzaffer Uysal	43
29	Chandana Jayawardena	9	29	Fevzi Okumus	10	26	Robin Nunkoo	15	32	Girish Prayag	20	32	Jin-Soo Lee	42
29	David Sherwyn	9	29	Hyun-Jeong Kim	10	26	Sheng-Hshiung Tsaur	15	32	Muzaffer Uysal	20	32	Noel Scott	42
29	Ercan Sirakaya-Turk	9	29	Jerome Agrusa	10	26	Xiang (Robert) Li	15	32	Stefan Gössling	20	32	Osman Karatepe	42
29	Graham Miller	9	29	John Crotts	10	35	Alice Hon	14	35	Cathy Hsu	19	32	Yang Yang	42
29	Hanqin Qiu Zhang	9	29	Kye-Sung (Kaye) Chon	10	35	Beverley Sparks	14	35	Lu Zhang	19	36	Colin Hall	41
29	Larry Dwyer	9	29	Xinran Lehto	10	35	Catherine Cheung	14	35	Mehmet Köseoglu	19	36	Susanne Becken	41
29	Ray Pine	9	38	Arch Woodside	9	35	David Weaver	14	35	Nan Hua	19	38	Bruce Prideaux	40
29	SooCheong (Shawn) Jang	9	38	Donald Getz	9	35	Dogan Gursoy	14	35	Sangwon Park	19	38	Kyle Woosnam	40
40	Choong-Ki Lee	8	38	Karin Weber	9	35	Li Miao	14	35	Wansoo Kim	19	40	Basak Guillet	39

R	Name	TP	R	Name	TP	R	Name	TP	R	Name	TP	R	Name	TP
40	David Airey	8	38	Li-Ping Cai	9	41	Colin Hall	13	35	Xavier Font	19	40	Li-Ping Cai	39
40	Deborah Kerstetter	8	38	Robert Harrington	9	41	Fevzi Okumus	13	42	Hanqin Qiu Zhang	18	40	Stefan Gössling	39
40	John Crompton	8	38	Stephen Page	9	41	Kwang-Min Park	13	42	Jin-Soo Lee	18	40	Wai-Hung (Wilco) Chan	39
40	John Tribe	8	38	Terry Lam	9	44	Amir Shani	12	42	Kam Fung (Kevin) So	18	44	Philip Pearce	38
40	John O'Neill	8	38	Yaniv Poria	9	44	Cathy Hsu	12	42	Ming-Ming Cheng	18	44	Stephen Page	38
40	Kevin Wong	8	46	Karin Weber	8	44	Eric Chan	12	46	Anil Bilgihan	17	44	Youcheng (Raymond) Wang	38
40	Richard Sharpley	8	46	Ken McCleary	8	44	Ipkin (Anthony) Wong	12	46	Babak Taheri	17	47	Juan Nicolau	37
40	Simon Hudson	8	46	Larry Dwyer	8	44	Kam Hung	12	46	Beverley Sparks	17	47	Levent Altinay	37
40	Stephen Witt	8	46	Sara Dolnicar	8	44	Kyle Woosnam	12	46	Chih-Hsing (Sam) Liu	17	47	Ming-Hsiang Chen	37
40	Tom Baum	8	46	Stephen Page	8	44	Levent Altinay	12	46	David Weaver	17	47	Sheng-Hshiung Tsaur	37
40	Wai-Hung (Wilco) Chan	8	46	Xiang (Robert) Li	8	44	Noel Scott	12	46	Dimitrios Buhalis	17			
40	Zheng Gu	8	46	Yvette Reisinger	8	44	Songshan (Sam) Huang	12	46	Honggang Xu	17			
			46	Zheng Gu	8	44	Susanne Becken	12	46	Liang (Rebecca) Tang	17			
						44	Jeonglyeol (Timothy) Lee	12	46	Philip Pearce	17			

Note: R = rank, TP = total papers

Figure 5. Critical authors in the largest component of the networks (2000–2004)

Figure 6. Critical authors in the largest component of the networks (2005–2009)

Figure 7. Critical authors in the largest component of the networks (2010–2014)

Figure 8. Critical authors in the largest component of the networks (2015–2019)

Figure 9. Critical authors in the largest component of the networks (2000–2019)

Table 6. Authors with the 50 highest scores in degree centrality measures

Period 1 (2000–2004)			Period 2 (2005–2009)			Period 3 (2010–2014)			Period 4 (2015–2019)			Overall		
Rank	Author	D	Rank	Author	D	Rank	Author	D	Rank	Author	D	Rank	Author	D
1	Hailin Qu	19	1	Rob Law	37	1	Rob Law	69	1	Rob Law	107	1	Rob Law	185
2	Arie Reichel	18	2	SooCheong (Shawn) Jang	33	2	Choong-Ki Lee	48	2	Heesup Han	55	2	Haiyan Song	96
3	Rob Law	16	3	Woo Gon Kim	30	3	Haiyan Song	44	3	Songshan (Sam) Huang	54	3	Anna Mattila	93
3	Bob McKercher	16	4	Alastair Morrison	23	4	Anna Mattila	41	4	Haiyan Song	53	4	Choong-Ki Lee	89
5	Alastair Morrison	15	5	Seongseop (Sam) Kim	22	5	SooCheong (Shawn) Jang	39	5	Dogan Gursoy	52	5	Dogan Gursoy	88
6	Abraham Pizam	14	6	Dogan Gursoy	21	5	Seoki Lee	39	5	Ipkin (Anthony) Wong	52	5	Woo Gon Kim	88
7	Woo Gon Kim	13	6	Anna Mattila	21	5	Woo Gon Kim	29	7	Xiang (Robert) Li	47	7	Fevzi Okumus	78
7	Joseph Leary	13	8	Choong-Ki Lee	20	8	Brent Ritchie	28	8	Fevzi Okumus	45	8	SooCheong (Shawn) Jang	77
9	Seongseop (Sam) Kim	12	8	Bob McKercher	20	9	Xinran Lehto	27	9	Anna Mattila	44	9	Seongseop (Sam) Kim	75
9	Michael Riley	12	8	Chris Ryan	20	9	Nancy Mcgehee	27	9	Yang Yang	44	10	Heesup Han	72
9	Chris Ryan	12	11	Haiyan Song	19	9	Fevzi Okumus	27	11	Kyle Woosnam	43	10	Bob McKercher	70
9	David Sherwyn	12	12	Kevin Wong	18	12	Chris Ryan	26	12	Seongseop (Sam) Kim	38	12	Chris Ryan	69
13	Daniel Fesenmaier	11	13	Fevzi Okumus	16	13	Kevin Gorman	25	12	Mehmet Ali Köseoglu	38	13	Brent Ritchie	67
13	Hadyn Ingram	11	14	Waihung (Wilco) Chan	15	14	Seongseop (Sam) Kim	23	14	Choong-Ki Lee	37	14	Xiang (Robert) Li	66
13	Terry Lam	11	14	Daniel Fesenmaier	15	14	Vincent Magnini	23	15	Dimitrios Buhalis	36	14	Hailin Qu	66
13	Hanqin Qiu Zhang	11	14	Clark Hu	15	14	Muzaffer Uysal	23	15	Noel Scott	36	16	Alastair Morrison	65
17	Hermann van Boemmel	10	14	Geoffrey Wall	15	14	Hanqin Qiu Zhang	23	17	Woo Gon Kim	35	17	Noel Scott	64
17	Joseph Chen	10	14	Youcheng (Raymond) Wang	15	18	Heesup Han	22	18	Babak Taheri	34	17	Muzaffer Uysal	64
17	Chekitan Dev	10	14	Kyesung (Kaye) Chon	15	18	Bob McKercher	22	19	Kam Hung	33	19	Seoki Lee	63
17	Ganghoan Jeong	10	20	Jerome Agrusa	14	18	Hailin Qu	22	19	Scott McCabe	33	20	Hanqin Qiu Zhang	62
17	Deborah Kerstetter	10	20	Geoffrey Crouch	14	18	Noel Scott	22	21	Muzaffer Uysal	32	21	Dimitrios Buhalis	61
17	Claudia Kroesbacher	10	20	Cathy Hsu	14	22	Dimitrios Buhalis	21	21	Hanqin Qiu Zhang	32	22	Ipkin (Anthony) Wong	60
17	Jana Kucerova	10	20	Xinran Lehto	14	23	Levent Altinay	20	23	Levent Altinay	31	23	Songshan (Sam) Huang	59
17	Jean-marc Lusson	10	20	Ken McCleary	14	23	Sara Dolnicar	20	23	Seoki Lee	31	24	Xinran Lehto	55
17	Nuria Montmany	10	20	Thea Sinclair	14	23	Basak Guillet	20	25	Anil Bilgihan	30	25	Yang Yang	51
17	Ray Pine	10	26	Liping Cai	13	23	Xiang (Robert) Li	20	25	Scott Cohen	30	26	Levent Altinay	50
17	Olimpia State	10	26	John Crotts	13	27	Dogan Gursoy	19	27	Pearl MC Lin	29	26	Kyle Woosnam	50
17	Lizl Steynberg	10	26	Joseph Leary	13	27	William Norman	19	27	Girish Prayag	29	28	Colin Hall	49
17	Ercan Turk	10	26	HG Parsa	13	29	Colin Hall	18	27	Brent Ritchie	29	28	James Petrick	49
17	Serena Yolo	10	26	Noel Scott	13	30	Jeou-shyan Horng	17	30	Alastair Morrison	28	30	Sara Dolnicar	46
31	Cathy Enz	9	31	Adam Blake	12	30	Taegoo (Terry) Kim	17	30	Hailin Qu	28	30	Brian King	46
31	Dogan Gursoy	9	31	Barry Mak	12	30	Larry Dwyer	17	32	Sunghyup (Sean) Hyun	27	30	Scott McCabe	46
31	Stephen john Page	9	31	Denver Severt	12	30	Li Miao	17	32	Stefan Gössling	27	33	Stefan Gössling	45
31	Larry Dwyer	9	31	Duarte Morais	12	30	Jin-Soo Lee	17	32	Jin-Soo Lee	27	34	Cathy Hsu	43
31	Juline Mills	9	31	James Petrick	12	30	Tien Duc Pham	17	32	Susanne Becken	27	34	You-Cheng (Raymond) Wang	43
31	Muzaffer Uysal	9	31	Karin Weber	12	30	You-Cheng (Raymond) Wang	17	32	Xavier Font	27	34	Xavier Font	43
31	Jamie Murphy	9	31	Osman Karatepe	12	30	Janet Dickinson	17	37	Mark Bonn	26	34	Susanne Becken	43
31	Bill Faulkner	9	38	Beverley Sparks	11	30	Bihu Wu	17	37	Daniel Scott	26	38	Larry Dwyer	42
31	Graham Miller	9	38	Dallen Timothy	11	39	Albert Assaf	16	37	Xinyuan (Roy) Zhao	26	38	Stephen Page	42
31	Stephen Litvin	9	38	David Airey	11	39	Alison Mcintosh	16	37	Chris Ryan	26	40	Nancy Mcgehee	41
31	John c. Crotts	9	38	Donald Getz	11	39	Terry Delacy	16	41	Albert Assaf	25	41	Mehmet Köseoglu	40
42	David Airey	8	38	Hailin Qu	11	39	Jeonglyeol (Timothy) Lee	16	41	Nan Hua	25	41	Daniel Scott	40
42	SooCheong (Shawn) Jang	8	38	Hyun-Jeong Kim	11	39	Enrique Navarro-Jurado	16	41	Xiaoxiao Fu	25	41	Babak Taheri	40
42	Alan Fyall	8	38	Ian Yeoman	11	44	Gang Li	15	41	Xinran Lehto	25	44	Kam Hung	39
42	Anna Mattila	8	38	Sheryl Kline	11	44	James Petrick	15	41	Colin Hall	25	45	Albert Assaf	38

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R	Name	D	R	Name	D	R	Name	D	R	Name	D	R	Name	D
42	Yuksel Ekinci	8	38	Stefan Gössling	11	44	David Solnet	15	41	James Petrick	25	45	Honggang Xu	38
42	Choong-Ki Lee	8	38	Vincent Heung	11	44	Richard Robinson	15	41	Sara Dolnicar	25	47	Geoffrey Wall	37
42	Tom Baum	8	48	Arch Woodside	10	44	Kyriaki Kaplanidou	15	41	Dan Wang	25	47	Jin-Soo Lee	37
42	Brian King	8	48	Bing Pan	10	44	Heather Gibson	15	41	Honggang Xu	25	47	Jeonglyeol (Timothy) Lee	37
42	Ken McCleary	8	48	Brent Ritchie	10	44	Bynum Boley	15	41	James Higham	25	50	Sheng-Hshiung Tsaur	36
42	Slex Susskind	8	48	Graham Miller	10	44	Qu Xiao	15				50	Betty Weiler	36
42	Gong-Soog Hong	8	48	John O'neill	10	44	Amir Shani	15				50	William Norman	36
42	Allan Williams	8	48	Larry Dwyer	10	44	Beverley Sparks	15						
42	Billy Bai	8	48	Metin Kozak	10	44	Juan Gabriel Brida	15						
42	Colin Hall	8	48	Muzaffer Uysal	10	44	Alastair Morrison	15						
			48	Nancy Mcgehee	10	44	Carol Kline	15						
			48	Sara Dolnicar	10									
			48	Yong-Ki Lee	10									

Note: R = rank, D = degree centrality

Table 7. Authors with the 50 highest scores in betweenness centrality measures

Period 1 (2000–2004)			Period 2 (2005–2009)			Period 3 (2010–2014)			Period 4 (2015–2019)			Overall		
Rank	Author	B	Rank	Author	B	Rank	Author	B	Rank	Author	B	Rank	Author	B
1	Hailin Qu	114	1	Rob Law	1,129.5	1	Rob Law	3,368.2	1	Rob Law	10,316.7	1	Rob Law	74,473.9
2	Bob McKercher	97	2	Woo Gon Kim	913.0	2	Soocheong (Shawn) Jang	1,785.1	2	Ipkin (Anthony) Wong	5,767.1	2	Haiyan Song	40,509.7
3	Ray Pine	93	3	SooCheong (Shawn) Jang	760.0	3	Haiyan Song	1,720.8	3	Haiyan Song	5,527.2	3	Bob McKercher	33,101.5
4	Rob Law	84	4	Kevin Wong	550.5	4	Prakash Chathoth	1,148.5	4	Heesup Han	5,018.6	4	Muzaffer Uysal	23,417.7
5	Hanqin Qiu Zhang	80	5	Liping Cai	501.5	5	Bob McKercher	1,073.8	5	Dogan Gursoy	4,406.6	5	Jinsoo Lee	21,973.8
6	Dogan Gursoy	76	6	Bob McKercher	416.5	6	Catherine Cheung	996.6	6	Mehmet Ali Köseoglu	4,343.9	6	Seoki Lee	21,955.3
7	Joseph Leary	70	7	Metin Kozak	400.0	7	Fevzi Okumus	960.8	7	Songshan (Sam) Huang	4,176.3	7	Woo Gon Kim	20,787.1
8	Terry Lam	63	8	Taegoo (Terry) Kim	395.5	8	Xinran Lehto	927.4	8	Xiang (Robert) Li	4,100.9	8	SooCheong (Shawn) Jang	19,941.5
9	Kyesung (Kaye) Chon	60	9	Kyesung (Kaye) chon	377.2	9	Seoki Lee	897.0	9	Kam Hung	3,955.1	9	Dogan Gursoy	19,585.8
10	SooCheong (Shawn) Jang	51	10	Joseph Leary	356.7	10	Dogan Gursoy	820.0	10	Lydia Hanks	3,544.3	10	Xiang (Robert) Li	19,532.6
10	Seongseop (Sam) Kim	51	10	Haiyan Song	345.3	10	Muzaffer Uysal	813.5	10	Jinsoo Lee	3,471.3	10	Ercan Turk	17,280.9
12	Joseph Chen	50.5	12	John Crotts	344.0	12	Gu Xiao	789.3	12	Seoki Lee	3,424.6	12	James Petrick	16,857.6
13	Woo Gon Kim	50	13	Fevzi Okumus	323.5	13	Hanqin Qiu Zhang	772.3	13	Honggen Xiao	3,221.8	13	Fevzi Okumus	16,701.8
14	Michael Riley	46	14	Muzaffer Uysal	295.5	14	Kam Hung	723.8	14	Li Miao	3,142.8	14	Noel Scott	16,209.5
15	Sunny Ham	42	15	Choong-Ki Lee	272.5	15	Basak Guillet	702.7	15	Girish Prayag	3,012.9	15	Heesup Han	16,124.0
16	Kevin Wong	40	16	Sandro Formica	272.3	16	Kyesung (Kaye) Chon	670.5	16	Hanqin Qiu Zhang	2,951.1	16	Liping Cai	15,654.2
16	Brian King	40	17	Hyounggon Kim	228.5	17	Jinsoo Lee	617.6	17	Laurie Wu	2,727.8	17	Dimitrios Buhalis	15,513.0
18	Ercan Turk	35.5	18	Daniel Fesenmaier	224.8	18	Nan Hua	616.5	18	Pearl M. C. Lin	2,712.2	18	Hanqin Qiu Zhang	15,473.6
19	Deborah Kerstetter	34	19	Chris Ryan	212.0	19	Heesup Han	586.7	19	Jun (Justin) Li	2,642.9	19	Kyesung (Kaye) Chon	15,352.2
20	Gongsoog Hong	29.5	20	Jerome Agrusa	202.8	20	Xiang (Robert) Li	581.0	20	Sean Mcginley	2,595.6	20	Geoffrey Crouch	14,958.7
21	Ken McCleary	29	21	David Scott	200.0	21	Hailin Qu	568.0	21	Cathy Hsu	2,538.7	21	Deborah Kerstetter	14,649.1
21	David Sherwyn	29	22	Ulrike Gretzel	198.8	22	Daniel Leung	535.7	22	Muzaffer Uysal	2,508.6	22	Ipkin (Anthony) Wong	14,396.5
23	Chris Ryan	26	23	Cathy Hsu	175.7	23	Soyon Paek	531.5	23	Markus Schuckert	2,504.3	23	Bruce Prideaux	13,672.3
23	Claudia Jurowski	26	24	Dogan Gursoy	159.5	24	Seongseop (Sam) Kim	526.0	24	Hengyun Li	2,486.8	24	Kam Hung	12,918.8
23	Nick Johns	26	25	Karin Weber	153.0	25	Bruce Prideaux	522.5	25	Mimi Li	2,416.3	25	Anna Mattila	12,863.9
23	Stephen Hiemstra	26	26	Bo Bernhard	148.0	26	Choong-Ki Lee	481.0	26	Nathaniel Line	2,379.5	26	Basak Guillet	12,741.1
27	Hadyn Ingram	25	27	Yongki Lee	145.7	27	Kisang Ryu	474.9	27	Juan Nicolau	2,353.9	27	Songshan (Sam) Huang	12,708.2
28	Arie Reichel	22	28	Luisa Andreu	144.0	28	Ulrike Gretzel	474.0	28	Noel Scott	2,269.9	28	Hailin Qu	12,573.0
28	Jamie Murphy	22	29	Clark Hu	137.5	29	Taegoo (Terry) Kim	468.5	29	Kamfung (Kevin) So	2,056.2	29	Metin Kozak	12,505.2
28	John Crotts	22	30	Billy Bai	128.0	30	Noel Scott	451.5	30	Yang Yang	2,052.0	30	Kamfung (Kevin) So	12,323.3
28	Colin Hall	22	31	Henry Tsai	115.0	31	James Petrick	435.0	31	Kisang Ryu	1907.83	31	Levent Altinay	12305.2
28	Denney Rutherford	22	32	James Petrick	99.0	32	Svetlana Stepchenkova	432.0	32	Honggang Xu	1876.86	32	Mimi Li	12202.8
33	Juline Mills	20	33	Seongseop (Sam) Kim	95.2	33	Khaldoon Nusair	429.2	33	Eric Chan	1829.16	33	Seongseop (Sam) Kim	11741.0
33	Bruce Tracey	20	34	Anna Mattila	91.0	34	Dimitrios Buhalis	420.2	34	Fevzi Okumus	1780.03	34	Dallen Timothy	11705.4
33	Liping Cai	20	35	Ken McCleary	86.2	35	Rich Harrill	401.8	35	Bob McKercher	1700.19	35	Ulrike Gretzel	11508.2
33	Heidi Sung	20	36	Anthony Lucas	78.5	36	Levent Altinay	399.2	36	Hak-Jun Song	1626.38	36	Cathy Hsu	11501.7
37	Larry Dwyer	18.5	37	Noel Scott	78.0	37	Sheryl Kline	361.1	37	Giacomo Del Chiappa	1589.25	37	Honggen Xiao	11411.7
38	James Petrick	17	38	Peiyi Ding	77.0	38	Brent Ritchie	344.2	38	Kyle Woosnam	1544.00	38	Choong-Ki Lee	10821.5
39	Dallen Timothy	16	39	Terry Lam	75.0	39	Jingyan Liu	332.3	39	Faizan Ali	1538.92	39	Mehmet Köseoglu	10360.4
39	Sheryl Kimes	16	40	Sze Ming (Tony) Tse	73.0	40	Sunghyup (Sean) Hyun	326.8	40	Seul Ki Lee	1511.73	40	Kevin Wong	10225.7
41	Graham Miller	15.5	41	Kyuho Lee	64.0	41	Honggang Xu	316.0	41	Makarand Mody	1380.15	41	Taegoo (Terry) Kim	10069.0
42	Muzaffer Uysal	14	42	Gyan Nyaupane	63.0	42	Nancy Mcgehee	311.7	42	Seongseop (Sam) Kim	1371.55	42	Karen Xie	10024.0
42	Timothy Hinkin	14	43	Duarte Morais	62.0	43	Anna Mattila	310.5	43	Geoffrey Crouch	1367.98	43	Colin Hall	9887.4

R		B	R		B	R		B	R		B	R		B
44	Philip Pearce	13	43	Geoffrey Wall	62.0	44	Li Miao	305.5	44	Brent Ritchie	1365.17	44	Prakash Chathoth	9639.9
45	John Crompton	12	45	Randall Upchurch	60.0	45	Myung-Ja Kim	303.7	45	Gerardo Joel Anaya	1325.67	45	Li Miao	9521.4
	Haiyan Song			Melih Mmadanoglu			Chris Ryan			Hoc Nang (Lawrence)		46	Girish Prayag	
45		12	45		60.0	46		290.0	46	Fong	1316.44			9375.1
45	Karthik Namasivayam	12	47	Giri Jogaratnam	56.0	47	Joseph Chen	287.2	47	Dimitrios Buhalis	1283.58	47	Joseph O'Leary	9223.0
45	Heather Gibson	12	47	Honggang Xu	56.0	48	Hee (Andy) Lee	271.3	48	Hyoungeun Moon	1272.90	48	Henry Tsai	9169.7
45	Clark Hu	12	49	Seoki Lee	55.0	49	Deniz Kucukusta	249.0	49	Philipp Qassler	1258.78	49	Brent Ritchie	8938.8
45	David Fennell	12	50	Robert Ford	54.0	50	Neelu Seetaram	247.0	50	Wan Yang	1254.37	50	Kisang Ryu	8545.2
			50	Jin Lin Zhao	54.0									

Note: R = rank, B = betweenness centrality