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REVIEW ARTICLE

Bibliometric visualisation: an application in tourism crisis and disaster management research

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A limited number of studies have applied bibliometric visualisation to explore the network structure of scholarly tourism knowledge. This study uses *CiteSpace* to analyse and visualise the intellectual structure of the tourism crisis and disaster management (TCDM) field. The use of new bibliometric visualisation techniques makes a methodological contribution to the mapping and presentation of bibliometric data in tourism research. Potentials for using these methods to provide new insights into research patterns and gaps are illustrated with an analysis of the TCDM literature. The study demonstrates how bibliometric visualisation can provide new insights into an area of literature by better communicating key findings, facilitating the exploration of data, and providing rich information to readers. Findings indicate that TCDM research has moved from broader topics to more specific issues, with a more recent focus on resilience and economic crises. The visualisation of co-authorship networks reveals that major collaborative networks are based on geographic and institutional proximity, dominated by scholars in the United States, United Kingdom, and Australia. Seven major research clusters are identified from the visualisation of a co-citation network. The identification of structural holes and bridging papers draws attention to research gaps and future research opportunities in the TCDM field.

Keywords: bibliometrics; visualisation; co-citation analysis; crisis and disaster management; *CiteSpace*

Introduction

Tourism research is a relatively recent research field and is heavily influenced by other disciplines and research traditions (Belhassen & Caton, 2009). Regular reviews of the literature are important for understanding the diversity of knowledge for a specific academic field (Tranfield, Denyer, & Smart, 2003). Such reviews play an important role in consolidating extant research and establishing connections between disparate bodies of literature (Crossan & Apaydin, 2010). The tourism research corpus has grown considerably over the last two decades, resulting in the fragmentation of the knowledge domain and the emergence of new sub-fields (McKercher & Tung, 2015). These developments make it difficult for researchers to keep up with new trends and increase the likelihood that researchers may become overwhelmed by the volume of relevant research in their subject areas (Yuan, Gretzel, & Tseng, 2015). A systematic and comprehensive review of scientific progress in a field is becoming an important tool to inform future research. Many review techniques have been used to

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understand the development of a scientific field. Broadly speaking, these techniques can be categorised as either ‘evaluative’ or ‘relational’ in nature (Borgman & Furner, 2002; Thelwall, 2008).

Evaluative reviews focus on research productivity and impact, with an emphasis on the scientific contributions of an individual publication, author, institution, or country (Jamal, Smith, & Watson, 2008; McKercher, 2012; Park, Phillips, Canter, & Abbott, 2011; Zhao & Ritchie, 2007). Both qualitative and quantitative methods are used for evaluative reviews, which typically seek to make expert judgements on the ranking and contribution of journals, institutions, and authors in a field (Benckendorff, 2009a). In contrast, relational techniques explore relationships within research, such as the structure of research fields, the emergence of new research themes and methods, or co-citation and co-authorship patterns (Benckendorff & Zehrer, 2013). Relational techniques have been applied much less frequently to understand tourism research activity. To date such studies have tended to focus on co-authorship analysis and collaboration networks (Baggio, Scott, & Arcodia, 2008; Becken, 2013; Racherla & Hu, 2009; Ye, Li, & Law, 2013), while only a limited number of studies have applied co-citation analysis to explore the network structure of the tourism knowledge domain (Benckendorff, 2009a; Benckendorff & Zehrer, 2013). This paper will explore both co-authorship and co-citation networks by analysing and visualising the intellectual structure of tourism crisis and disaster management (TCDM) research.

Bibliometric studies are useful in providing an assessment of research or scientific production in a specific area over a period of time (van Raan, 2005). Yuan et al. (2015) identified five foci in bibliometric studies of tourism research: (1) the research productivity of individual scholars and institutions (McKercher, 2008; Park et al., 2011; Zhao & Ritchie, 2007); (2) knowledge flow and social networks (Howey, Savage, Verbeeten, & Van Hoof, 1999; Ying & Xiao, 2012); (3) topics and long-term development trends (Ballantyne, Packer, & Axelsen, 2009; Benckendorff, 2009a); (4) journal rankings and journal development (Cheng, Li, Petrick, & O’Leary, 2011; Jamal et al., 2008; McKercher, Law, & Lam, 2006); and (5) most frequently cited scholars and works (McKercher, 2008).

Visual analysis and presentation is a recent tool to detect and display bibliometric results (Chen, 2006; Wheeldon & Ahlberg, 2011). Some scholars have tried to visualise the results of bibliometric analyses using network analysis (Benckendorff & Zehrer, 2013) or visual presentations using a combination of qualitative text analysis software such as ATLAS.ti (Davi et al., 2005) or the statistical software BiPlot to identify tourism trends (Pan, Chon, & Song, 2008). Visualisation can benefit researchers in better communicating their data as well as facilitating exploration of the data (Brandes, Kenis, Raab, Schneider, & Wagner, 1999; Scott, Baggio, & Cooper, 2008). However, the number of studies are small and typically limited to the assessment of specific journals (e.g. Hall, 2011; Koc & Boz, 2014), geographic areas (e.g. Evren & Kozak, 2014), or short time periods (e.g. Li, Ma, & Qu, 2017; Palmer, Sesé, & Montaña, 2005). Tourism research has experienced tremendous expansion and diversification since the new millennium (Jogaratnam, Chon, McCleary, Mena, & Eun Yoo, 2005; Park et al., 2011). Advances in technology have provided new visual analysis tools that can be further applied in tourism to help investigate research patterns, emerging topics, and collaboration networks.

Therefore, the purpose of this paper is to examine the collaboration networks, topic evolution, and research gaps in an applied tourism research field – TCDM, using a bibliometric visualisation analysis method. This field has seen a significant increase in research but lacks a clear and objective review of knowledge development (Pforr & Hosie, 2008). Given the need to understand the broad structure of a research field, this paper focuses

on relational analysis by using a quantitative bibliometric visualisation tool called CiteSpace. Co-authorship analysis, co-occurrence analysis, and co-citation analysis are conducted to examine networks and provide a detailed understanding of the development of this research field. The methodology and findings have implications for understanding the production of knowledge beyond TCDM and will be of interest to tourism researchers more generally.

Literature review

Analysing research documents and journals

Denyer and Tranfield (2006) argue that it is critical to conduct periodic reviews of existing research fields in order to identify contributions to knowledge and to construct substantiated arguments about the development of a field. Tranfield et al. (2003) have argued that the literature review process is a key tool to manage diverse knowledge for a specific academic inquiry and can help assess the relevant intellectual territory for further knowledge base development. It can also provide newcomers, early career scholars, or researchers from outside a field with insights into important authors and works (Benckendorff & Zehrer, 2013). The following discussion presents an overview of the techniques commonly used to conduct these reviews before turning to the visualisation of such data and the field examined in this paper – TCDM.

Various methods have been used to summarise the research themes and identify fields of knowledge (Buhalis & Law, 2008; Hallin & Marnburg, 2008; Hjalager, 2010; Law, Qi, & Buhalis, 2010; Williams & Baláz, 2015), or to statistically quantify relevant research information such as authors, institutions, journals (Evren & Kozak, 2014; Hall, 2011; Koc & Boz, 2014; Palmer et al., 2005; Ruhanen, Weiler, Moyle, & McLennan, 2015; Yuan et al., 2015). Narrative techniques are frequently used but have been criticised for being singular descriptive accounts of contributions (Fink, 1998; Hart, 1998), and for lacking thoroughness and rigour (Tranfield et al., 2003). To overcome these limitations, many studies have applied more systematic techniques.

Systematic reviews are concerned with synthesis (Mays, Pope, & Popay, 2005) and are regarded as the most reliable form of research review due to their explicit and rigorous method (Mulrow, 1994). The aim of a systematic review is to produce results that are generalisable to other contexts and can be used to make reasonable predictions of future events (Denyer & Tranfield, 2006). Systematic reviews adopt a replicable, scientific, and transparent process to minimise bias and create consensus among scholars (Cooper, 1998; Tranfield et al., 2003). Meta-analysis is an example of a systematic technique that uses statistical methods to combine the results of two or more studies (Cook, Mulrow, & Haynes, 1997, p. 377). However, this method is not without criticism. Hammersley (2001) argues that systematic review methods developed in the natural sciences are not transferable to the social sciences due to the diversity of research methods and statistical approaches used in social sciences. Crossan and Apaydin (2010) further highlight the difficulty of systematic reviews, as they require data synthesis from a range of disciplines and thus create a large amount of material to review. Both of which are issues for tourism research reviews.

As a result of these problems, new methods have been developed for evaluating bodies of literature. For example, Weed (2009) used a meta-review to explore progress in sports tourism research and to identify research gaps. A meta-review is understood as ‘a review of reviews’ (Ruddy & House, 2005; Serenko & Bontis, 2004). It is a qualitative research method that retains some of the attributes of the narrative technique. Mair, Ritchie, and

Walters (2016) move from a simple narrative approach to a more in-depth approach by using a narrative synthesis technique to synthesise evidence from both qualitative and quantitative research. This method of analysis involves the systematic review and synthesis of findings from multiple studies that rely primarily on the use of words and text to summarise and explain the findings of the synthesis (Popay et al., 2006, p. 5). Despite the ability to draw conclusions across heterogeneous studies (quantitative & qualitative), this approach can also be criticised as it can mask the shortcomings of the individual studies that make up the review (Lucas, Baird, Arai, Law, & Roberts, 2007), and can, therefore, be perceived as less objective.

In summary, both qualitative and quantitative review methods have limitations, either in synthesising materials or retaining contextual information which are vital for making clear conclusions and outlining future research directions. Some scholars have tried to deal with these issues by integrating qualitative and quantitative data using Bayesian meta-analysis (Roberts, Dixon-Woods, Fitzpatrick, Abrams, & Jones, 2002), but this approach still favours quantitative data and is difficult for qualitative researchers to apply (Denyer & Tranfield, 2006). Bibliometric techniques have recently gained favour because they are able to reduce the effects of objectivity and potential bias.

Bibliometric analysis

Commencing with the first concept of ‘evaluative bibliometrics’ (Narin, 1976), bibliometric analysis has developed into a systematic quantitative analysis of academic literature to measure scientific progress and production in a specific area over a period of time (van Raan, 2005). Bibliometric analysis is suggested as a complementary method to traditional structured literature reviews, as it provides a more objective approach for exploring research trends and performance (Ye, Song, & Li, 2012; Zupic & Čater, 2015). Most bibliometric techniques are concerned with identifying the structural aspects of scientific research (Börner, Chen, & Boyack, 2003), or with analysing how disciplines evolve based on intellectual, social, and conceptual structures (Zupic & Čater, 2015).

The growth of tourism research has been accompanied by the publication of several bibliometric studies of the literature (Barrios, Borrego, Vilagínés, Ollé, & Somoza, 2008; Evren & Kozak, 2014; Hall, 2005, 2011; Jamal et al., 2008; Ma & Law, 2009; McKercher, 2007, 2008). Different from narrative and systematic review, bibliometric analysis focuses on evaluating the research performance and contribution of individuals, publishing outlets, and institutions (Hall, 2011). Examples in tourism research include scientific production, co-authorship, and institutional collaboration in tourism psychology (Barrios et al., 2008), journal rankings and tourism research quality assessments (Hall, 2011), research in top tourism journals (Koc & Boz, 2014), statistical methods in tourism research (Palmer et al., 2005), sustainable tourism research trends and patterns (Ruhanen et al., 2015), tourism common subject areas (Yuan et al., 2015) and hospitality research over a seven-year-period (Li et al., 2017).

Bibliometric techniques can generally be divided into evaluative and relational approaches. Evaluative techniques measure the impacts of academic studies by assessing scientific performance and contributions using productivity measures, impact metrics, and hybrid metrics (Hall, 2011); while relational techniques measure the relationships and patterns within research fields. Cobo, López-Herrera, Herrera-Viedma, and Herrera (2011) summarise four different relational approaches in bibliometric research (see Table 1). These approaches are used for different purposes, including profiling scholars and research communities (who), temporal analysis (when), geospatial analysis (where),

Table 1. Different approaches for bibliometric mapping.

Bibliometric approaches	Authors	Function
Co-word analysis	Callon, Courtial, Turner, and Bauin (1983)	Study the conceptual structure of a research field using the most important words or keywords
Co-author analysis	Glänzel (2001); Peters and van Raan (1991)	Analyse authors and their affiliations to study the social structure and collaboration network
Bibliographic coupling	Kessler (1963)	Analyse citing documents
Co-citation analysis	Small (1973)	Analyse the relationships between documents cited together

Source: Cobo et al. (2011).

topical analysis (what), and network analysis (with whom). Most approaches are also suitable for different scales of analysis ranging from micro (i.e. individual researchers) to meso (i.e. regional, groups, journals) to macro (i.e. entire fields).

Co-authorship and co-citation analyses are the most frequently used relational techniques (Evren & Kozak, 2014; Ramos-Rodríguez & Ruiz-Navarro, 2004). Co-authorship analysis reveals the collaboration networks that drive knowledge development in a field. Several studies of collaboration have been conducted using co-authorship analysis. For example, Baggio et al. (2008) found that geography is an important indicator of co-authorship in the events literature. Co-authorship analysis has also proved to be an effective method for exploring relationships between authors and the exchange of knowledge resources (Hu & Racherla, 2008). Co-citation analysis is an extension of citation analysis and its basis is that pairs of documents that often appear together in reference lists (co-cited) are likely to be related (Garfield & Merton, 1979; Small, 1973). Co-citation analysis has proved to be a valid tool for understanding the intellectual structure of a scientific discipline (Ramos-Rodríguez & Ruiz-Navarro, 2004). Furthermore, co-citation data can also be used to create network visualisations of the relationships between influential publications, potentially highlighting disciplinary contributions in an inter-disciplinary field (White & McCain, 1998). Benckendorff and Zehrer (2013), and Benckendorff (2009a) used co-citation analysis and network analysis to gain insights into the founding scholars of tourism research.

Both co-authorship and co-citation analysis have proved to be useful empirical techniques for (1) objectively describing the intellectual structure of disciplines and fields (White & Griffith, 1981), (2) identifying potential 'research fronts' (de Solla Price, 1965), and (3) detecting existing scientific schools and academic networks (Crane, 1972). These techniques are considered relatively new methods for dealing with a diverse and growing academic literature (Denyer & Tranfield, 2006) and have some useful applications in tourism research as an applied inter-disciplinary field.

Visualisation of bibliometric data

Bibliographic databases (e.g. *WoS* and *Scopus*) and academic search engines (e.g. Google Scholar) have increased the coverage of tourism journals and enabled more comprehensive access to citation data. The increasing number and complexity of research papers have created a need for visualisation tools that can assist in understanding a field, its contributions, and research gaps. A number of visualisation techniques, processes, and tools

have been developed to understand, present, and frame research. These techniques typically produce maps, graphs, and diagrams to illuminate patterns, trends, and processes (Wheelodon & Ahlberg, 2011). Bibliometric visualisations typically present relevant authors or articles in a network to identify relationships, clusters, and structural features (Brandes et al., 1999). However, this method is underutilised in tourism research and could be further developed to examine the structure of tourism networks in a range of contexts (Scott et al., 2008).

Several software tools have been developed to generate visualisations of co-authorship and co-citation networks from bibliometric data (Cobo et al., 2011). Examples include VOSViewer (van Eck & Waltman, 2010), the Science to Sciece (Sci²) Tool (Sci² Team, 2009), BibExcel (Persson, Danell, & Wiborg Schneider, 2009), CoPalRed (Bailón-Moreno, Jurado-Alameda, Ruíz-Baños, & Courtial, 2005, 2006), Network Workbench (Börner et al., 2010; Herr, Huang, Penumarthy, & Börner, 2007), VantagePoint (Porter & Cunningham, 2004), and *CiteSpace* (Chen, 2004, 2006). VOSviewer can be used for viewing bibliometric maps of authors and journals based on co-citation data and can construct maps of keywords based on co-occurrence data (van Eck & Waltman, 2007, 2010). The Network Workbench Tool is a general network analysis, modelling, and visualisation toolkit for physics, biomedical, and social science researchers (Börner et al., 2010; Herr et al., 2007). The Sci² Tool evolved from Network Workbench and offers temporal, geospatial, topical, and network analysis and the visualisation of science datasets at the micro (individual), meso (local), and macro (global) levels (Sci² Team, 2009). BibExcel can extract multiple bibliometric networks but needs external software to create data visualisations (Cobo et al., 2011). Finally, *HistCite*TM focuses on generating chronological maps of bibliographic collections resulting from subject, author, institutional, or source journal (Garfield, 2009).

This paper uses *CiteSpace*, which is a Java application designed specifically for analysing and visualising co-citation networks (Chen, 2004). It allows the user to take time series snapshots of a knowledge domain and merges these into a visual map (Chen, 2006). Different types of bibliometric networks can be constructed, including co-authorship, co-occurrence subject categories, co-citation networks of authors and journals, and bibliographic coupling (Cobo et al., 2011). Several studies have been conducted to demonstrate how *CiteSpace* can detect and visualise emerging trends and patterns in research areas such as terrorism (Chen, 2006), regenerative medicine (Chen, Dubin, & Kim, 2014a), orphan drugs, and rare diseases (Chen, Dubin, & Kim, 2014b). Although *CiteSpace* has been used recently to investigate hospitality research over a seven-year-period (Li et al., 2017), to the best of our knowledge this tool has not been used to study any fields in the tourism literature. The aim of this research is to demonstrate the value of bibliometric visualisation by using *CiteSpace* to conduct a bibliometric visualisation of a specific field of tourism research – TCDM.

The TCDM literature

Tourism is highly vulnerable to internal and external shocks as diverse as economic downturns, natural disasters, health epidemics, terrorism, and international conflicts (Sönmez, Apostolopoulos, & Tarlow, 1999). Given the vulnerability of the tourism industry and destructive impacts of crises and disasters, tourism crisis and disaster research has experienced a significant surge over the last two decades. The research has followed a number of lines of inquiry, including: (1) understanding crises and disasters by clarifying the typologies and distinguishing crisis/disaster into sub-categories (de Sausmarez, 2007; Laws &

Prideaux, 2005; Racherla & Hu, 2009; Santana, 2004; Yu, Stafford, & Armoo, 2005), (2) understanding the impacts of crisis and disaster management strategies (Chien & Law, 2003; Durocher, 1994; Mansfeld, 1999; Pottorff & Neal, 1994; Prideaux, 1999), and (3) developing management approaches and frameworks (Evans & Elphick, 2005; Faulkner, 2001; Henderson, 2003a, 2003b; Huang, Tseng, & Petrick, 2008; Mansfeld, 1999; Ritchie, 2004). While Ritchie (2008) has called for more multi-disciplinary knowledge to be integrated into TCDM research, most of these studies have drawn on strategic management concepts (e.g. strategic planning, response, recovery and resolution) (Leslie & Black, 2005; Pforr & Hosie, 2008; Ritchie, 2008; Sheldon & Dwyer, 2010; Tsai & Chen, 2011).

Despite the increasing number of publications in this field, the TCDM literature is fragmented and disjointed, with no clear indication of the research nature and future directions (Pforr & Hosie, 2008). A systematic and objective analysis of the field is required to understand current research patterns and identify future research directions. Although Mair et al. (2016) have recently conducted a narrative review of post-disaster and post-crisis recovery strategies for tourist destinations, there has been no progress on a broader review of research patterns and trends in TCDM. An overall outlook and macro or 'big picture' view of this rapidly growing research field is therefore timely. Such a review can also bring together a fragmented field by consolidating the extant research and establishing connections in the disparate literature (Crossan & Apaydin, 2010).

This paper provides a comprehensive analysis of the intellectual structure of the TCDM field by applying bibliometric visualisation methods. Specifically, the three objectives of this paper are to: (1) investigate the temporal evolution of research themes in the TCDM field; (2) identify major scholarly communities and collaborative networks; and (3) map the intellectual structure of the field by analysing the most influential works. These objectives seek to develop an understanding of research gaps and future research opportunities in TCDM.

Methodology

Data collection

This paper uses *CiteSpace 4.0* to visualise research patterns and trends in the TCDM field. The review sought to create a comprehensive database of TCDM articles published between 1960 and May 2016 in tourism and hospitality journals. This timeframe covers a much longer period than Li et al.'s (2017) analysis, which was based on a seven-year-timeframe (2007–2014) and focussed on the hospitality literature. The raw data used in this study were extracted from Elsevier's Scopus database, which includes over 21,500 peer-reviewed journals (including more than 4200 open-access journals) (Elsevier, 2016). Scopus was used because its coverage of tourism journals is more comprehensive than the *Web of Science* (*WoS*) database (McKercher, 2008). While the tourism field and the social sciences have not historically been well represented in *WoS*, the ongoing expansion of the Scopus database has provided a good alternative for citation analysis (Benckendorff & Zehrer, 2013). The Scopus database provides detailed information about each source article, including the title, abstract, keywords, authors, institutional and country affiliations, and references cited in the article. These data can be used to conduct temporal and spatial analysis, analysis of word co-occurrence, co-authorship analysis, and co-citation analysis.

The Scopus database was used to find tourism journal articles or reviews on tourism disaster and crisis management from 1960 to May 2016. The search was based on the keywords 'tourism crisis' and 'tourism disaster'. 'Management' was not included in the search

query because many papers do not include this term but do discuss TCDM from the perspective of ‘planning’, ‘recovery’, and ‘impact’. The initial sample extracted from Scopus included a total of 1133 documents (1031 articles and 102 reviews). Conference papers, book chapters, and books were excluded from the analysis. The scope of the initial sample was further refined by retaining documents published in 37 tourism and hospitality-related journals (see Appendix 1). This was necessary to limit the analysis to research patterns and trends within the tourism field. After further screening, a total of 398 documents were extracted from Scopus database. The final sample of source papers were written by 159 different authors from 61 countries. Figure 1 shows the number of TCDM publications per year from 1960 to May 2016.

The first paper published in this area was in 1976, and the field did not experience much growth until 1999. It has been suggested that external events can influence the progress of scientific literature (Chen, 2006). The publication trends reflect the impact of external events, with several research summits producing bursts of papers after particular incidents. For example, TCDM research started to grow in the late 1990s as a result of the 1997 Asian Financial Crisis (Henderson, 1999a, 1999b; Prideaux, 1999), and political instabilities in some regions, such as war (Ioannides & Apostolopoulos, 1999). From 2004, the volume of research gradually increased to 30 due to major incidents such as the 2002 Bali Bombing (Hitchcock & Darma Putra, 2005), the outbreak of SARS in 2003 (Zeng, Carter, & De Lacy, 2005), and the 2004 Indian Ocean Tsunami (Carlsen & Hughes, 2008; Henderson, 2007). The 2008 Global Financial Crisis (Papatheodorou, Rosselló, & Xiao, 2010; Sheldon & Dwyer, 2010) and other crises around the world (e.g. earthquakes, bushfires) contributed to a rapid growth of research after 2009. The growth in papers also mirrors the international growth of the research community in general.

The top 10 source journals accounted for 67.5% of TCDM papers as shown in Table 2. The remaining 27 source journals contributed a combined total of 129 source papers. The United States, Australia, and the United Kingdom were the top three source countries contributing nearly 53% of all publications. The source papers included citations to 6264

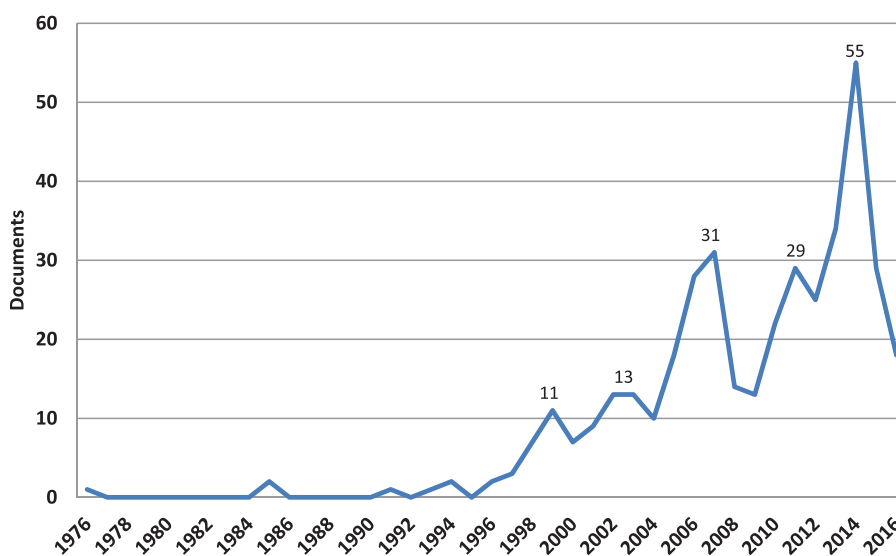


Figure 1. Publications per year of the source paper.

Table 2. Top 10 tourism journals publishing TCDM papers (1960–2016).

Journals	Papers	Percentage (%)
Tourism Management	64	16.1
Current Issues in Tourism	39	9.8
Journal of Travel and Tourism Marketing	36	9.0
Journal of Travel Research	27	6.8
Annals of Tourism Research	26	6.5
Tourism Analysis	17	4.3
Worldwide Tourism and Hospitality Themes	16	4.0
Journal of Vacation Marketing	15	3.8
Tourism Economics	15	3.8
Asia Pacific Journal of Tourism Research	14	3.5
Total	269	67.5

different works, which form the basis for the citation analysis presented later in this paper. A total of 375 records were successfully converted to the *Web of Science (WoS)* format for further analysis using the *CiteSpace* Java Application (Chen, 2014). The conversion rate of references in the source papers was very good at 88% after removing data irregularities, which is close to 95% which is described by Chen (2004) as excellent.

Data analysis

Cobo et al. (2011) compared nine bibliometric analysis tools and concluded that no single tool was able to provide a fully comprehensive suite of bibliometric analysis. However, *CiteSpace*, developed by Chen (2004–2006) at Drexel University (USA), stands out because it offers the most comprehensive suite of tools for generating multiple bibliometric networks and conducting multiple methods of analysis. Different types of bibliometric networks can be constructed in *CiteSpace* (Cobo et al., 2011) and the following analyses were used in the current study: (i) co-occurrence analysis of keywords, (ii) co-authorship analysis of authors and affiliated countries; and (iii) co-citation analysis based on cited references.

Co-occurrence analysis is a content analysis method that considers the co-occurrence of paired words (i.e. keywords) in a text corpus to identify relationships between these terms (He, 1999). Based on this analysis, terms can be grouped into clusters and displayed using a network map to gain insights into the central themes in a field and the connections between these themes. *CiteSpace* uses a cluster detection algorithm to divide the network into sub-groups and labels each cluster with common terms extracted from the text. *CiteSpace* also detects the most frequently occurring keywords for each year, providing insights into how research themes have changed over time. Burst detection is conducted to identify hot or emerging research topics/trends in the past.

Co-authorship analysis identifies the underlying patterns of collaboration between researchers working in a field. Authors, institutions, or countries are connected to each other when they share authorship of a paper included in the sample of source papers. *CiteSpace* uses this data to construct a network map to reveal the social structure of a research field. Authors who publish together tend to form clusters in the network.

Co-citation analysis provides insights into the intellectual structure and emergent patterns in a field because they allow for citations to be grouped based on how frequently individual works have been co-cited in the source papers that make up the sample (Chen, Ibekwe-SanJuan, & Hou, 2010). Document co-citation networks are built on the

methods pioneered by Small (1973), but extended from a single-slice equivalent to multiple-slice network analysis. In other words, a time series of networks in order to detect critical transitions over time more effectively (Chen, 2014). *CiteSpace* filters the items to select the most important networks from each time slice by setting threshold levels. Visualised networks can be displayed in three different modes for different purposes: cluster/theme view, timeline view, and time zone view (Chen, 2006; Cobo et al., 2011). Furthermore, *CiteSpace* can use ‘burst detection’ (Kleinberg, 2003) to identify keywords and sources that receive a high ‘burst’ of citations during specific time periods (Cobo et al., 2011). A number of metrics can be calculated to accompany the visualisations (see Table 3).

The input data for *CiteSpace* were retrieved from Scopus as discussed above. In order to generate an individual network, threshold settings are required to enable article selection. The two most used node selection criteria for *CiteSpace* are called ‘Top N per slice’ and ‘Threshold interpolation’. ‘Top N per slice’ is a top-down approach that selects the ‘N’ most highly cited or occurring items from each slice to construct a network. ‘Threshold interpolation’ is a bottom-up approach that selects articles by setting a minimum number for citations (c), co-citations (cc), and co-citation coefficient (ccv). Only those papers that meet the requirements of these thresholds can be selected to the final network.

Many studies that have used *CiteSpace* as a tool do not clearly outline their thresholds settings or steps for cleaning the data (e.g. Li et al., 2017) making it difficult for researchers to replicate the network. In this research, ‘Top N per slice’ was used for the co-occurrence analysis and co-authorship analysis. A value of 50 (Top 50) was selected based on past research and network testing by authors in the specific field of TCDM. For co-citation analysis, the ‘threshold interpolation’ technique was used in order to construct a more comprehensive network. Since TCDM research is a new field and some articles are not well cited, the authors chose to use a standard threshold level (c, cc, ccv) to ensure a comprehensive analysis of this research area. After testing with different thresholds, the same threshold levels were set for all three research time slices (c = 2, cc = 1, ccv = 10). These thresholds meant that papers published before 1996 did not meet the threshold levels and were excluded from further analysis, limiting the time period of the analysis from 1996 to 2016. This 20-year time span was further divided into 10 two-year time slices to ensure a more detailed understanding of the network. Furthermore, the citation data were

Table 3. Key metrics explanation.

Key metrics	Description
Betweenness centrality	The extent to which the node is part of paths that connect an arbitrary pair of nodes in the network (Chen, 2006; Freeman, 1977).
Network modularity	The extent to which a network can be decomposed to multiple components, or modules. This metric provides a reference of the overall clarity of a given decomposition of the network (Chen et al., 2010).
Silhouette	The quality of a clustering configuration. Its value ranges between -1 and 1 . The highest value represents a perfect solution.
Citation burst	A specific duration in which an abrupt change in the frequency of an entity (e.g. a source or keyword) takes place (Kleinberg, 2003).
Sigma	The combined strength of structural and temporal properties of a node, namely, its betweenness centrality and citation burst (Chen et al., 2009).
Strength	The level of abrupt change of the frequency over time. A higher strength represents a more drastic change.

Source: Chen (2014).

checked for errors and duplicates and data cleansing was undertaken by checking key papers in the network and removing citations to non-TCDM references such as research methods and statistics manuals, and health disease references.

Results and discussion

The results and discussion are structured around the research objectives presented earlier in this paper. The first section presents the results of the co-occurrence analysis of keywords to provide insights into the major TCDM research themes and their evolution. The second section uses co-authorship analysis to examine the social structure by identifying major scholarly communities and collaborative networks. The final section provides a co-citation network map that offers insights into the intellectual structure of the field.

Research themes

Table 4 shows the evolution of key research-front terms between 1996 and 2016.

The growth of research topics started from 1998, when three main keywords occurred: *tourism*, *tourism destination*, and *tourism development*. Additional broad terms appeared from 1999: *tourism management*, *tourism market*, which indicated a growing focus on the management of tourism, especially tourist source markets. *Crisis and financial crisis* were mostly researched at the end of last century. Interestingly, several keywords related to disaster started to occur together in 2001, for example: *natural disaster*, *disaster management*, along with the emergence of *tourism economics* in the following years. From 2010, tourism economics was again popular, although new trends appeared focusing on specific aspects, such as *risk perception*, *climate change*, *vulnerability/resilience*, and *mass media/social media*. This illustrates that detailed issues related to TCDM were being examined through a broader range of disciplinary backgrounds as the field matured. This includes shift away broad management-related topics to more specific topics using theory and concepts from economics, geography, communication, and psychology. Burst detection can identify bursts of keywords as indicators of emerging trends (Chen et al., 2014b). Table 5 shows the top 14 keywords with the strongest bursts from 1996 to 2016.

Geographic keywords such as *Eurasia*, *Asia*, and *Portugal* are evident in the results because the tourism industry is largely based on physical locations and resources, thus keywords are likely to reflect research exploring major events and case studies in specific locations. Previous research on crises and disasters has noted that research is dominated by case study work (Mair et al., 2016; Wang & Ritchie, 2010). For instance, *Asia* was the hottest topic from 2004 to 2009 due to the 2003 outbreak of SARS, the 2004 Indian Ocean Tsunami and 2007–2008 Financial Crisis. The most recent burst of keywords are *economic crisis* and *Portugal*, which reflects recent financial issues in Southern Europe. *Climate change* is also a hot topic from 2012 to 2014. This indicates that recent hot topics have focussed more on economic crises and climate change, attracting researchers with a non-management background.

Scholarly communities and collaboration

A co-authorship network aims to demonstrate the collaboration relationship between authors in a research area. The co-authorship network for the TCDM field was fragmented, with a number of isolated nodes (authors) and five small disconnected clusters. These five clusters are displayed in Figure 2 after adjusting visibility. The colour of links between















Table 4. Keywords with high frequencies between 1996 and 2016.

Terms	Freq.	Terms	Freq.	Terms	Freq.
1996		2002		2010	
International tourism	27	Tourism economics	58	Global economy	9
Tourism demand	10	Risk assessment	14	Theoretical study	6
Spain	9	Sustainability	13	Numerical model	6
Demand analysis	8	Travel behaviour	13		
		Forecasting method	9	2011	
1998				Economic growth	5
Tourism	93	2003		Governance approach	4
		Eurasia	33		
Tourism destination	56	Canada	10	2012	
Tourism development	51			Economic crisis	14
Crisis	38	2004		Climate change	11
Terrorism	21	SARS	12	Natural hazard	4
Decision-making	10	Far east	9		
1999		Crisis communication	8	2013	
Tourism management	69			Risk perception	11
Tourism market	62	2005		Vulnerability	9
Crisis management	58	China	19	Leisure industry	9
Financial crisis	56	Hotel	14	Strategic approach	8
Economic impact	25	Economic condition	8		
Tourist behaviour	21	Severe Acute Respiratory Syndrome	8	2014	
				Portugal	11
2000				Resilience	8
Asia	26	2006			
United State	20	Travel demand	12	2015	
Thailand	17	Dark tourism	10	Tourism crisis	6
		Destination image	9	Social Media	4
2001				Mass Media	3
Natural disaster	23	2007			
Disaster	23	Destination	4	2016	
Disaster management	23	Marketing strategy	3	Politics	4
Destination marketing	9			Community resilience	2
Foot and mouth disease	8	2009			
		Demand elasticity	5		

authors demonstrates the first year of co-authorship, with warmer colours indicating more recent collaboration. The size of rings indicate the number of citations papers receive each year while the colour of the rings demonstrate the year of citation, with warmer colours meaning more recent citations. Lori Pennington-Gray published the most TCDM papers in our data set (13 papers), followed by Brent W. Ritchie (11 papers), Joan Henderson (10 papers), and Bruce Prideaux (9 papers). The authors who published the most papers are typically located in the centre of the collaboration networks (refer to [Figure 2](#)).

Collaboration is strongly determined by geographic and spatial constraints, with several clusters based on the three major source countries identified in the methodology. These

Table 5. Top 14 keywords with the strongest citation bursts.

Keywords	Citation burst			
	Strength	Begin	End	Duration (1996–2016)
War	3.2767	1998	1999	
Tourism market	5.0875	1999	2000	
Foot and mouth disease	3.5845	2001	2006	
Eurasia	11.7527	2003	2009	
SARS	3.9536	2004	2009	
Asia	7.3531	2004	2009	
Far east	3.4824	2004	2009	
World	4.7893	2004	2005	
Eastern hemisphere	4.7893	2004	2005	
Southeast Asia	3.2505	2006	2009	
Leisure industry	3.1607	2012	2014	
Economic crisis	3.5499	2012	2016	
Climate change	4.0235	2012	2014	
Portugal	5.1396	2014	2016	

include the US (Figure 2(A)), Australia (Figure 2(B)), and the UK (Figure 2(C)). This is not unexpected, as the influence of geographic proximity is evident in many bibliometric studies (Katz, 1994; Ponds, Van Oort, & Frenken, 2007). Institutional proximity also has a major influence on research collaboration. Most collaboration appears between (1) researchers and their PhD students, (2) colleagues in the same university or institution, and (3) researchers with past working relationships. The US-based network is the most recent network and is also the most active when compared to the Australian and UK networks. The other two networks are more international in nature as shown in Figure 2(D), although parts of the network are not currently active as indicated by the blue and green links and nodes.

Figure 3 presents the collaboration network between author countries and territories. The top ranked country by centrality is the USA, with a centrality score of 0.65. The second most central country is Australia (0.39) followed by the UK (0.25), and Spain (0.24). A higher centrality score indicates that a country plays a more important role in this research field (Wu, Wang, & Song, 2014). Collaboration between countries highlights some interesting patterns. Collaboration is strong between the US and Spain, China and Taiwan. Australia collaborates closely with New Zealand, Malaysia, and Austria, while the UK collaborates with Australia, Indonesia, Israel, and New Zealand.

The development of TCDM research collaboration in different countries is presented along a time axis in Figure 4. The figure shows how the UK, US, and Australia have acted as the foundation for collaboration with other countries in later years. The figure highlights that the foundation researchers are active collaborators with researchers across many countries. *CiteSpace* allows researchers to select countries and examine collaboration patterns. Australia has less collaboration with other countries but is more active between 2002 and 2008. Spain is connected to research in Germany, Greece, and Thailand. The US collaborates with researchers from Turkey, Taiwan, South Africa, and New Zealand, and is especially active from 2006 onwards. More recent work from Malaysia and China from 2015 to 2016 are linked back to the US and Australia. These recent works are often related to PhD students who return to their home countries and institutions but maintain their research networks in the US and Australia.

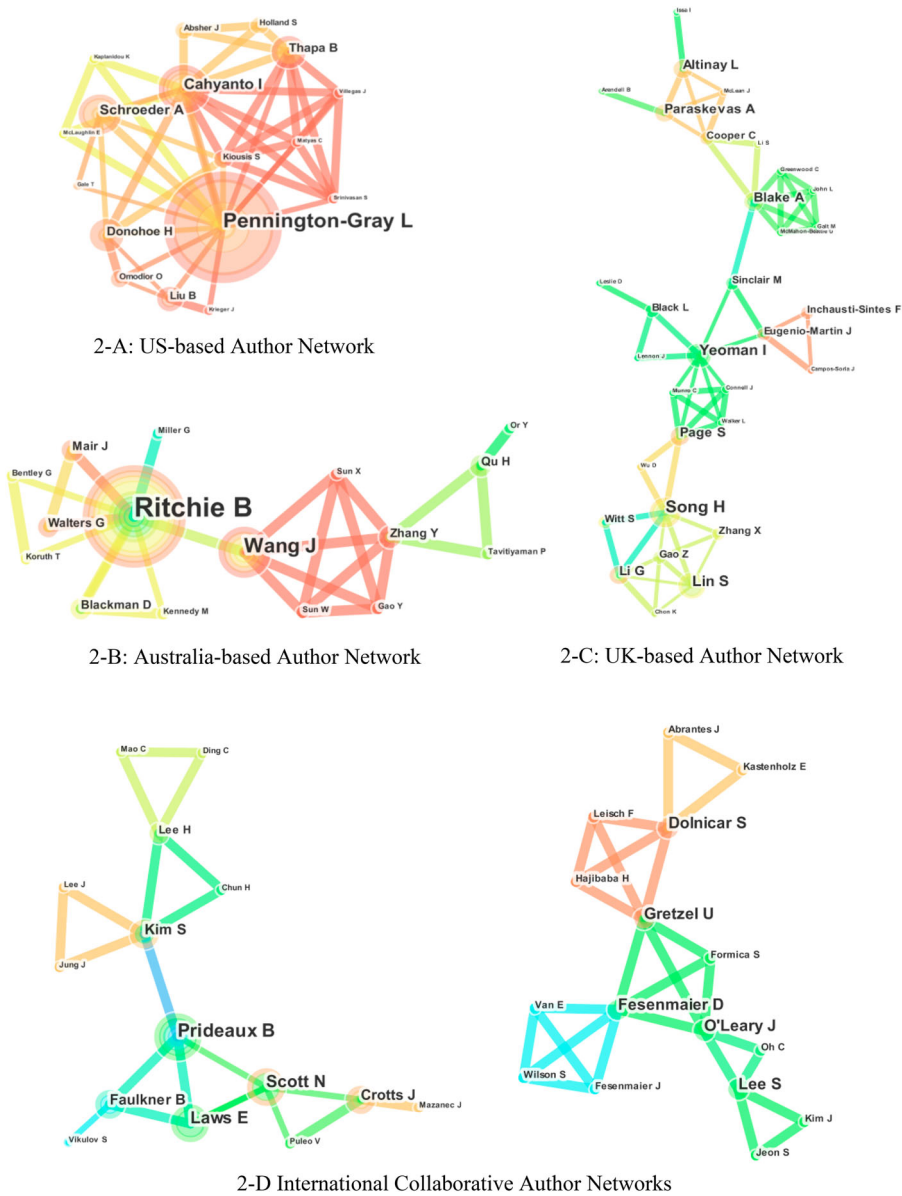


Figure 2. Major clusters in co-authorship network. (A) US-based Author Network, (B) Australia-based Author Network, (C) UK-based Author Network, and (D) International Collaborative Author Networks.

Co-citation analysis

Figure 5 shows a document co-citation network derived from the citations included in the Scopus data set. The network represents the collective pattern of citations in the research field from 1996 to 2016. The network can be interpreted by examining the size, colour, and proximity of nodes and links (edges). Nodes in the network represent cited references. The size of a node in the visualised network is proportional to the number of citations received by the cited reference (Chen et al., 2014b). Links between nodes represent

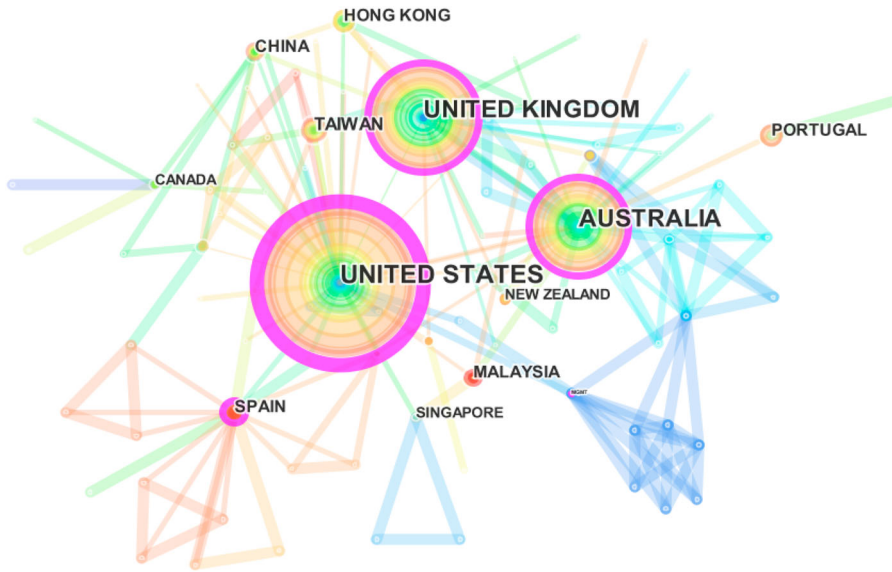


Figure 3. Collaborative country/territory network.

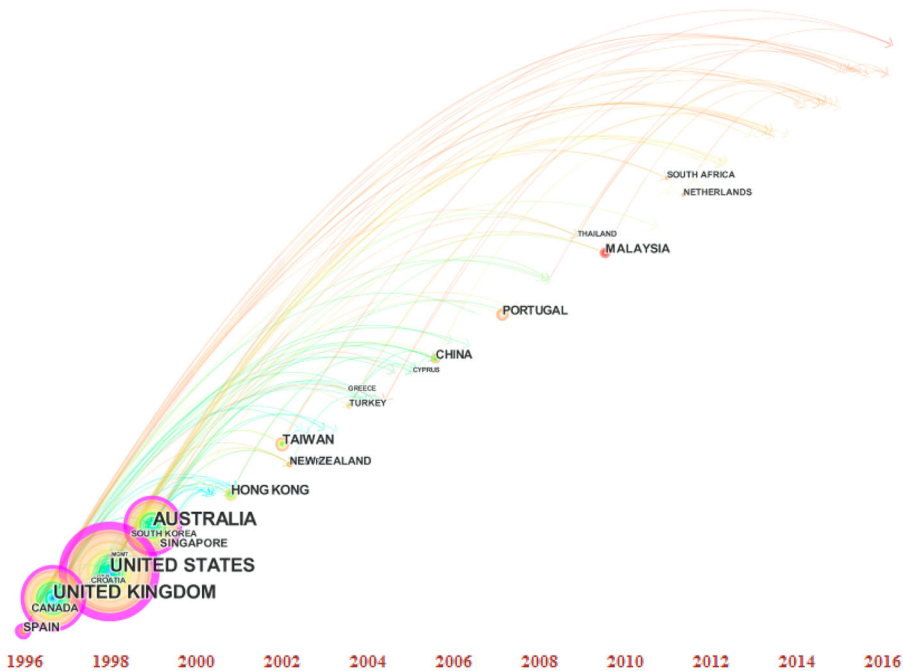


Figure 4. Time-slice view of country co-authorship network.

co-citation links, or the number of times citations appeared together in the source documents included in the data set. The colours of links denote the time a particular connection was made, based on the publication year of the source papers. Blue colours indicate older connections, whereas orange colours indicate more recent connections (Chen et al., 2014b).

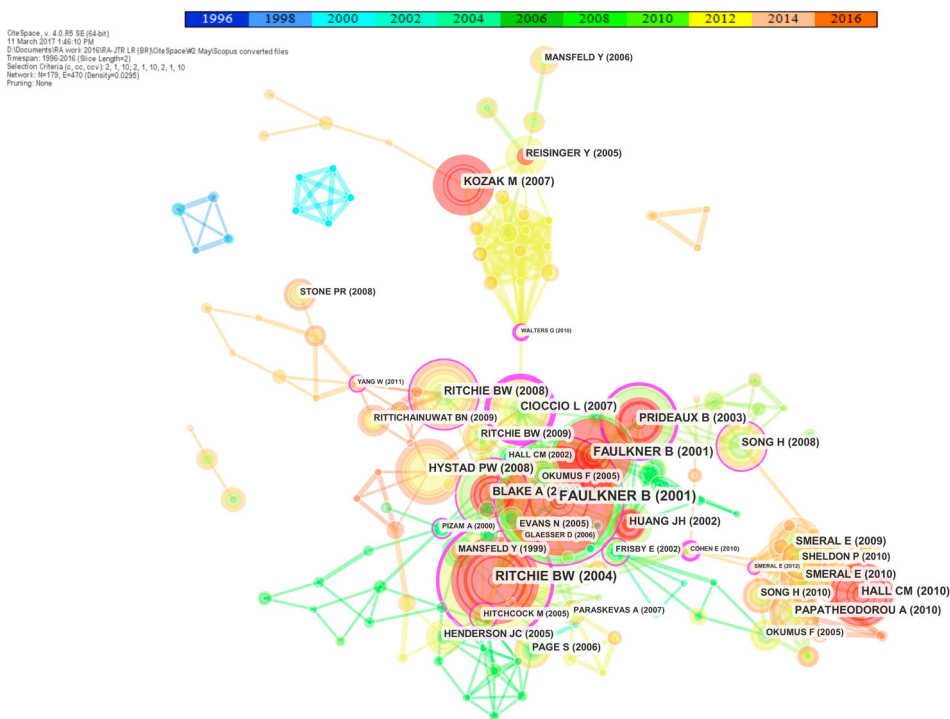


Figure 5. Co-citation network of tourism crisis and disaster research.

The figure identifies that the most active research period started from 2001. The citation network shows a focus on foundation papers produced from 2001 to 2004.

A number of meaningful insights can be gained from examining the proximity and location of various nodes in Figure 5. *CiteSpace* uses an algorithm to cluster nodes based on *homophily* or similarity. Nodes that are closer together exhibit higher levels of *homophily*. In bibliometric networks homophily is often determined by underlying disciplinary or thematic similarity. Nodes that have high levels of *connectivity* are also likely to cluster together, while nodes that are dissimilar or poorly connected to other nodes drift further apart. Major foundation papers are likely to be located towards the centre of the network because they are often cited together in the same source documents, thereby increasing connectivity and *centrality*. The absence of links between different clusters in the network creates *structural holes*, which are identified by the white space between nodes and clusters (Burt, 1992). Structural holes indicate an opportunity for researchers to fill an information gap by producing a paper that links two nodes or clusters together (Haythornthwaite, 1996). Some structural holes are occupied by papers that serve as a *bridge* by providing the only link between otherwise disconnected clusters. These bridges play an important strategic role in connecting two disparate areas of the literature and are, therefore, likely to receive citations from authors working in both areas. Table 6 illustrates the 10 papers with the highest citation counts. The Google Scholar citations have also been included for these articles to provide a more comprehensive evaluation of their academic impact.

Table 6 shows that the two most cited articles are papers which provide conceptual frameworks in the early stages of the field and are central to the network. Hall's (2010) more

recent contribution provides a review of the TCDM literature and although it has been well cited recently it is not positioned at the centre of the primary network. Further, Kozak et al.'s (2007) study of the impact of risk perception on international travellers has also been well cited in recent years but is also not central to the primary network. The time slices in the network indicate that the two clusters surrounding these papers are significant areas of emerging research activity.

A number of structural holes are evident between the primary network and the clusters around Hall (2010) and Kozak et al. (2007) where more recent work has been co-cited. Song and Li's (2008) review of tourism demand modelling and forecasting forms an important bridge between the primary cluster and the secondary cluster dominated by Hall (2010). Cohen and Neal's (2010) more recent paper on coinciding crises and effects on tourism provides another important bridge between these clusters. Walters and Clulow's (2010) analysis of the market's response to the 2009 Black Saturday Bushfires in Australia provides the

Table 6. Top 10 articles with the most citation counts.

Authors	Title	Journal	Scopus citations	Google Scholar citations
Faulkner (2001)	Towards a framework for tourism disaster management	Tourism Management	34	777
Ritchie (2004)	Chaos, crises and disasters: a strategic approach to crisis management in the tourism industry	Tourism Management	30	582
Faulkner and Vikulov (2001)	Katherine, washed out one day, back on track the next: a post-mortem of a tourism disaster	Tourism Management	22	236
Blake and Sinclair (2003)	Tourism crisis management: US response to September 11	Annals of Tourism Research	19	387
Prideaux, Laws, and Faulkner (2003)	Events in Indonesia: exploring the limits to formal tourism trends forecasting methods in complex crisis situations	Tourism Management	19	221
Ritchie (2008)	Tourism disaster planning and management: From response and recovery to reduction and readiness	Current Issues in Tourism	19	93
Hall (2010)	Crisis events in tourism: subjects of crisis in tourism	Current Issues in Tourism	18	196
Hystad and Keller (2008)	Towards a destination tourism disaster management framework: Long-term lessons from a forest fire disaster	Tourism Management	18	156
Cioccio and Michael (2007)	Hazard or disaster: Tourism management for the inevitable in Northeast Victoria	Tourism Management	17	135
Kozak, Crotts, and Law (2007)	The impact of the perception of risk on international travellers	International Journal of Tourism Research	16	282

only bridge between the primary cluster and the cluster dominated by Kozak et al.'s (2007) work. Other structural holes and disconnected clusters may indicate developing areas, such as the cluster of nodes connected to Stone and Sharpley's (2008) analysis of dark tourism, which is linked to the main network by the work of Yang, Wang, and Chen (2011) on reconstruction strategies following the 2008 Wenchuan Earthquake.

Thematic clusters

Having explored the role of various papers (nodes) in the network, attention now shifts to the analysis of clusters. Nine major clusters were initially identified by the analysis. Chen (2014) recommends that the number of clusters should be between 7 and 10, with 10 or more members in each cluster. Furthermore, it is recommended that each of the clusters should have high silhouette values (>0.70). The silhouette value (-1 to 1) measures the quality of the clustering configuration, with the highest value representing a perfect solution (Chen, 2014). Only the first 7 clusters that were detected contained more than 10 members and have a silhouette value larger than 0.70 . These clusters are shown in Figure 6.

CiteSpace can label clusters by extracting noun phrases from the titles (T), keyword lists (K), or abstracts (A) of articles that cited the particular cluster based on three different tools: $tf*idf$ (term frequency by inversed document frequency), log-likelihood ratio, or mutual information. However, after investigation of the cited papers in each cluster some adjustments were made to these labels. One of the authors, who is an expert in the TCDM field, reviewed the abstracts of the top 15 key papers with highest citations in each cluster and provided new labels to represent the main content in each cluster. The modularity Q is another important metric that demonstrates the overall structural properties of the network (Chen, 2014). A modularity Q between 0.4 and 0.8 is considered to be good. In this analysis, the modularity rate was 0.76 , indicating an excellent fit. If a cluster contains numerous nodes with strong citation bursts, then the cluster as a whole captures an active area of research, or an emerging trend. As noted in Figure 6, some clusters appear to overlap, especially those in the centre of the network, but it is important to note that the figure is a two-dimensional representation of a three-dimensional space.

Three large clusters are evident in the centre of the network with mean year of papers being from 2001 (Cluster #1) and 2002 (Cluster #0 and #4). Cluster #0 (silhouette value = 0.857) is the largest area with 22 papers. This cluster is labelled 'Tourism Demand Forecasting' as it comprises papers focusing on demand fluctuations as a result of crisis events. In particular, papers in this cluster focus on arrival data and the forecasting of future demand after economic and financial crises. Papers by tourism economists using econometric models are also highly cited in this cluster.

Cluster #1 (silhouette value = 0.799) is the next largest cluster and comprises 21 papers. This cluster is labelled 'Impacts on Tourism' as papers here focus on describing the impacts of crises and disasters on the tourism industry and raise management challenges. A range of case studies are provided such as SARS, Foot, and Mouth disease, natural disaster management and terrorist activity – mirroring the keywords and citation bursts outlined earlier.

Cluster #4 (silhouette value = 0.762) includes 20 papers focused on natural or human induced disasters such as influenza, the Indian Ocean Tsunami and SARS. As these papers go beyond describing impacts and include responses at a destination and organisational level this cluster is labelled 'Response Case Studies'.

Cluster #2 (silhouette value = 0.787) comprises 20 papers with a mean year of 2006. These papers are related to the 'strategic management and planning' for crises and disasters. This work provides frameworks or models, while some papers also provide multiple case

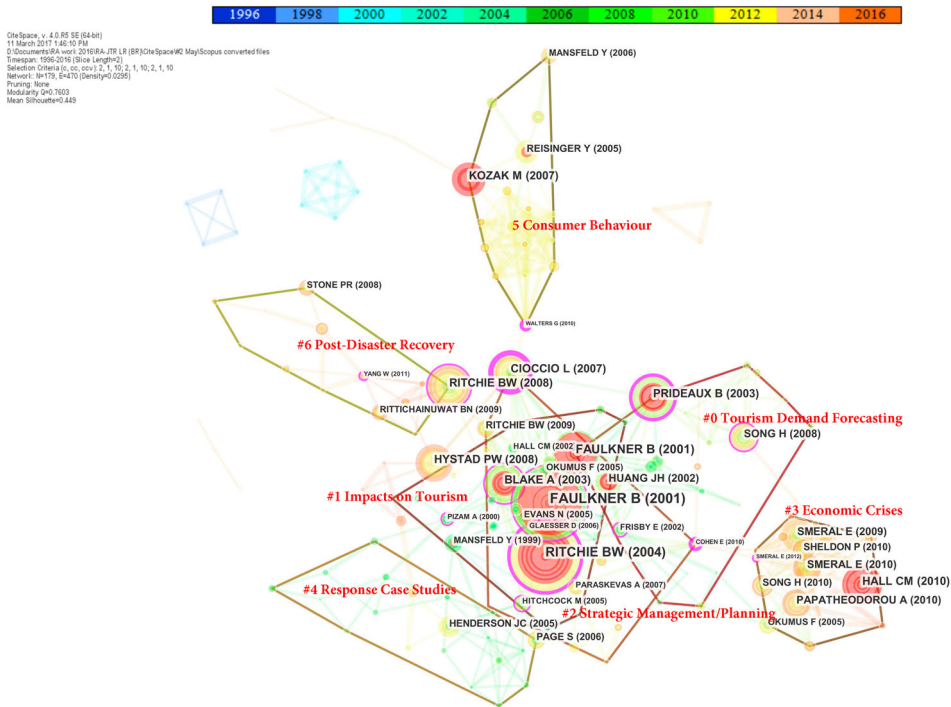


Figure 6. Cluster view of co-citation network (with node names for key papers).

study locations on the impacts of incidents and strategic responses. This cluster contains the most highly cited papers in the network.

Most interesting is the development of more recent clusters (#5, #6, #3) which are located on the periphery and further from the centre of the network. Cluster #3 (silhouette value = 0.963) is most recent and has been labelled ‘Economic Crises’ as it comprises work that is related to the financial crisis of 2009–2010 and the economic implications for tourism at a global and regional level. Cluster #6 (silhouette value = 0.932) originates around 2009 and has a focus on recovery well after the initial response to a crisis or disaster, thus it is labelled ‘Post-Disaster Recovery’. Papers here focus on tourists and motives for visiting destinations after a disaster. This cluster network is quite distinct to other clusters, with a particular focus on the Sichuan Earthquake in 2008 as well as Stone’s work on dark tourism. It also considers future planning as a result of lessons learnt from recovery.

Finally, Cluster #5 (silhouette value = 0.948) is labelled ‘Consumer Behaviour’ as the 18 papers here focus on the influence of psychological factors on travel decision-making (anxiety, risk perceptions, sensation seeking). More recent work also focuses on consumer responses to risk communication and recovery marketing to reduce risk perceptions and encourage travel.

In *CiteSpace*, betweenness centrality scores indicate the role of a paper in connecting other papers to each other. It is possible to trace a path between any two papers in the network. Betweenness centrality is calculated based on the number of shortest paths between two papers that pass through each paper in the network. Papers with high betweenness centrality play a more important role in connecting different parts of the network together (Freeman, 1977). A node of high betweenness centrality is usually one that connects two or more large groups of nodes with the node itself in-between (Chen, 2014).

Papers with high betweenness centrality scores are marked with purple trims by *CiteSpace* (see Figure 5). The top 10 articles with highest centrality scores are summarised in Table 7, and their locations in the network and cluster# can be found in Figure 5.

Cioccio and Michael (2007) connects Cluster #2 (*Strategic Planning/Management*) with that of Cluster #5 (*Consumer Behaviour*) through Walters and Clulow (2010), while Smeral (2012) connects the more recent Cluster #3 (*Economic Crises*) with Cluster #0 (*Tourism Demand Forecasting*). As noted in the earlier analysis, these papers play a critical role in filling structural holes in the network.

Temporal analysis

A citation burst can be used to detect the most active areas of research. A citation burst provides evidence that a particular publication is associated with a surge in citations, which means the publication has attracted an extraordinary degree of attention from the scientific community (Chen, 2014). Red rings in some of the nodes in Figure 6 indicate citation bursts over particular time periods (Chen et al., 2014b). Table 8 shows the top 10 references with the strongest citation bursts in the data set.

Table 7. Top 10 articles with the highest centrality scores.

Authors	Title	Journal	Centrality	Cluster#
Cioccio and Michael (2007)	Hazard or disaster: Tourism management for the inevitable in Northeast Victoria	Tourism Management	0.50	2
Walters and Clulow (2010)	The tourism market's response to the 2009 Black Saturday bushfires: the case of Gippsland	Journal of Travel and Tourism Marketing	0.33	5
Ritchie (2004)	Chaos, crises and disasters: a strategic approach to crisis management in the tourism industry	Tourism Management	0.28	2
Cohen and Neal (2010)	Coinciding crises and tourism in contemporary Thailand	Current Issues in Tourism	0.23	2
Prideaux et al. (2003)	Events in Indonesia: exploring the limits to formal tourism trends forecasting methods in complex crisis situations	Tourism Management	0.20	0
Ritchie (2008)	Tourism disaster planning and management: From response and recovery to reduction and readiness	Current Issues in Tourism	0.19	6
Hitchcock and Darma Putra (2005)	The Bali bombings: Tourism crisis management and conflict avoidance	Current Issues in Tourism	0.16	2
Faulkner (2001)	Towards a framework for tourism disaster management	Tourism Management	0.15	1
Smeral (2012)	International tourism demand and the business cycle	Annals of Tourism Research	0.15	3
Blake and Sinclair (2003)	Tourism crisis management: US response to September 11	Annals of Tourism Research	0.14	1

Note: Cluster# for each paper was provided by *CiteSpace* as the primary cluster it locates; even some papers appear to be in multiple clusters.

Table 8. Top 10 references with the strongest citation bursts.











Author	Title	Citation burst			
		Strength	Begin	End	Duration (1996–2016)
Faulkner (2001)	Towards a framework for tourism disaster management	12.8386	2003	2009	
Faulkner and Vikulov (2001)	Katherine, washed out one day, back on track the next: a post-mortem of a tourism disaster	9.1066	2002	2008	
Ritchie (2004)	Chaos, crises and disasters: a strategic approach to crisis management in the tourism industry	4.9981	2006	2012	
Prideaux et al. (2003)	Events in Indonesia: exploring the limits to formal tourism trends forecasting methods in complex crisis situations	4.7586	2005	2010	
Kozak et al. (2007)	The impact of the perception of risk on international travellers	4.5233	2013	2016	
Blake and Sinclair (2003)	Tourism crisis management: US response to September 11	4.1058	2005	2011	
Mansfeld (1999)	Cycles of war, terror, and peace: Determinants and management of crisis and recovery of the Israeli tourism industry	3.9552	2002	2007	
Hall (2010)	Crisis events in tourism: subjects of crisis in tourism	3.7708	2012	2016	
Huang and Min (2002)	Earthquake devastation and recovery in tourism: the Taiwan case	3.4404	2003	2010	
Reisinger and Mavondo (2005)	Travel anxiety and intentions to travel internationally: Implications of travel risk perception	3.2465	2011	2013	

Table 9. Top 10 articles with the highest sigma scores.

Authors	Title	Journal	Sigma	Cluster#
Faulkner (2001)	Towards a framework for tourism disaster management	Tourism Management	5.88	1
Ritchie (2004)	Chaos, crises and disasters: a strategic approach to crisis management in the tourism industry	Tourism Management	3.37	2
Prideaux et al. (2003)	Events in Indonesia: exploring the limits to formal tourism trends forecasting methods in complex crisis situations	Tourism Management	2.39	0
Blake and Sinclair (2003)	Tourism crisis management: US response to September 11	Annals of Tourism Research	1.70	1
Faulkner and Vikulov (2001)	Katherine, washed out one day, back on track the next: a post-mortem of a tourism disaster	Tourism Management	1.57	0
Mansfeld (1999)	Cycles of war, terror, and peace: Determinants and management of crisis and recovery of the Israeli tourism industry	Journal of Travel Research	1.39	1
Kozak et al. (2007)	The impact of the perception of risk on international travellers	International Journal of Tourism Research	1.36	5
Reisinger and Mavondo (2005)	Travel anxiety and intentions to travel internationally: Implications of travel risk perception	Journal of Travel Research	1.19	5
Huang and Min (2002)	Earthquake devastation and recovery in tourism: the Taiwan case	Tourism Management	1.12	0
Cioccio and Michael (2007)	Hazard or disaster: Tourism management for the inevitable in Northeast Victoria	Tourism Management	1.00	2

References that started to burst at the same time will be discussed in groups (Chen et al., 2014b). The first two articles that were detected are Faulkner (2001) and Faulkner and Vikulov (2001) from years 2002 and 2003. The focus of these two articles was on the development of a comprehensive disaster management model. Faulkner's (2001) article published in 2001 has the strongest citation burst in the entire data set (strength = 12.836). This conceptual paper produced a generic model for analysing tourism disaster management and put forward six phases in disaster process along with key elements of disaster management responses and recovery strategies. Faulkner and Vikulov's (2001) article (ranked the second with strength of 9.1066) was a follow-up empirical study aimed to refine the tourism disaster management framework by conducting a case study in Australia. Citation bursts for both articles occurred within two years of their publication.

The second group of papers registered sharp increases from 2005 to 2006. Ritchie (2004) and Prideaux et al. (2003) were the third- and fourth-ranked papers based on burst strength. These papers all focused on the strategic management of tourism crises and disasters. Ritchie's (2004) study first applied a strategic management approach to crisis and disaster management. It provided a strategic and holistic approach to crisis and disaster management for the tourism industry, from proactive pre-crisis planning, strategic implementation, and evaluation and feedback. Prideaux et al.'s (2003) research explored

strategies that can be employed to improve the effectiveness of forecasting in circumstances where there were few pre-existing indicators of factors. It suggested a direction that may offer an alternative to supplement current forecasting methods.

The last group of papers registered a sharp citation increase from 2012 to 2013. Hall (2010) reviewed literature on tourism and crisis and found that economic and financial crises received the most research attention in this area, which explains its rapid increased citations in Cluster #3 *Economic Crises*. Kozak et al.'s (2007) article outlined the impact of perceived risk on international travellers and further explored differences in the perceptions of risky places among different segments based on the Hofstede's uncertainty avoidance index. Thus, risk perceptions and economic crises can be identified as current active research areas.

From the above data it appears that takes two to three years for work to be cited, which is consistent with McKercher and Tung's (2015) study. However, Kozak et al. (2007) and Reisinger and Mavondo (2005) have a slow uptake with citations bursting nearly six years after publication, yet these articles are part of the most recent Cluster #5 *Consumer Behaviour*. These papers are sometimes referred to as 'sleeping beauties' (van Raan, 2004) or 'sleepers' (Benckendorff, 2009b). These are works that are not cited for several years following publication but then suddenly attract a lot of attention. The slow uptake could be related to the growing importance of consumer perceptions of risk and what that means for crisis and disaster management, especially recovery marketing (Mair et al., 2016).

The sigma score measures the combined strength of structural and temporal properties of a node, which is a combination of betweenness centrality and citation burst (Chen et al., 2009). Such papers are extremely important and are likely to be highly cited in the future. Table 9 lists the 10 papers with the highest sigma scores. Although earlier foundation papers have high sigma scores, more recent work of Kozak et al. (2007) and Reisinger and Mavondo (2005) from the *Consumer Behaviour* Cluster (#5) are becoming more important.

Conclusion and future research agenda

The purpose of this paper was to investigate the research evolution of TCDM using a quantitative bibliometric visualisation method – *CiteSpace*. The results extend past bibliometric studies of tourism research by making contributions to methodology innovation and understanding the intellectual structure of the TCDM field. The study demonstrates that a new methodology that can be utilised to better understand a research field. It is to the best knowledge of the authors, the first attempt to apply *CiteSpace* to explore and visualise tourism knowledge. The paper is one of the few studies to combine co-occurrence, co-authorship, and co-citation analyses to understand the development of a sub-field in tourism from different perspectives.

The findings of this study demonstrate the potential of bibliometric visualisation techniques to study the tourism literature. These techniques offer several advantages to complement more traditional approaches to analysing the literature. First, co-citation analysis is noted as a useful method for providing insights into a field based on a larger sample of papers (García-Lillo, Úbeda-García, Marco-Lajara, 2016). Traditional methods such as narrative analysis, meta-analysis, and systematic reviews are labour intensive and, therefore, are not practical for analysing larger bodies of literature. These methods are also somewhat subjective, whereas bibliometric analysis and visualisation tends to be more objective and evidence based. Bibliometric methods are scalable and can be applied to larger data sets of citing authors and articles (García-Lillo, Úbeda-García, Marco-Lajara, 2016). Multiple metrics are provided to understand and explore relationships between authors, articles,

and citations. For example, betweenness centrality is a ‘graph-theoretical property’ that quantifies the importance of the node’s position in the network (Chen, 2006, p. 362) and can reflect the potential pivotal point of the studying field (Freeman, 1978). Other metrics such as the burst strength of an article over time, modularity and silhouette scores can provide a more objective, quantitative analysis of network, and clusters.

Second, by visualising the relational analysis of key authors and articles, the study provides insights into patterns of interaction and clusters of research focus. Relationships and interactions among authors and papers can provide insights into a knowledge domain (Hu & Racherla, 2008). The clustering technique used in this paper highlights key papers that share similarities in topics (Chen, 2006) and identifies structural holes between individual clusters to inform potential research directions. Papers that serve as an important bridge between two clusters are also detected in the network.

Third, the bibliometric visualisations used in this study provide rich temporal data by displaying data in different colours. A longitudinal view of country co-authorship, keywords co-occurrence, and the citation bursts of key papers adds another dimension to the analysis and provides insights into the ebb and flow of major trends and collaborations. More importantly, these temporal data allow researchers to identify research frontiers by highlighting recent hot topics, authors, and articles (Chen, 2006).

The paper also makes a contribution by providing insights into the intellectual structure of the TCDM field. The authors would like to highlight the study’s outcomes with regard to the research objectives posed earlier in this paper. The first research objective was to investigate the temporal evolution of research themes in the TCDM field. Co-occurrence analysis was used to detect the most frequently occurring keywords and to identify trends and emerging research topics. The results indicate that research on TCDM moved from broader topics (e.g. tourism, tourism management, tourism market) to more specific issues (e.g. risk perception, resilience, destination image) as the field has matured. Topics such as natural disaster and disaster management research occurred in 2001. More recently, resilience, vulnerability, and economic crises have become important research topics.

The second research objective was to identify the major scholarly communities and collaborative networks to better understand the social structure of the field. Collaboration between authors appears to be based on geographic and institutional proximity (Baggio et al., 2008). Country collaboration mirrors author networks and are dominated by the US, UK, and Australia, although the initial research in the field originated from Spain.

The third research objective was to map the intellectual structure of the field by analysing the most influential works cited by researchers. Several research trends and future opportunities have been identified. The analysis not only reveals the most cited works, but also those that play an important bridging role in filling structural holes in the network. It is likely that these bridging papers will continue to be well cited in future studies. Structural holes that have not yet been filled represent opportunities for future research. The network map of influential works illuminates ‘invisible colleges’, tribes, and territories in TCDM research (Becher & Trowler, 2001; Tribe, 2010). Seven major research clusters were presented with detailed information on their size, temporal development, and cluster labels. The more recent clusters are focused on consumer behaviour and economic crises and are located at the periphery of the network. These clusters signify research frontiers that are likely to be the focus of future research activity.

Although there are some early conceptual and theoretical papers which remain well cited, the majority of papers comprise case studies of specific crises or disasters. However, as argued by Ritchie, Mair, and Walters (2014), these case studies are usually descriptive and do not consider the case study context in detail. These papers are more

prevalent in the early stages of the field (1999–2006), while more recent papers are concerned with economic crises across geographical boundaries, as well as climate and disaster-related issues including concepts such as vulnerability and resilience. Previous bibliometric studies of disasters also identified research on resilience and vulnerability as a notable recent development (Gall, Nguyen, & Cutter, 2015). Such studies usually take a much broader perspective and scale of analysis and are likely to increase in the future. Consumer behaviour with respect to crises and disasters is also a growing area, especially concerning tourist risk perceptions and travel decision-making. These papers have developed a distinct cluster and are being well cited but are not well connected to other clusters, signifying an important opportunity for bridging studies that connect different sub-fields by promoting the ‘cross-pollination’ of ideas.

The findings have implications for TCDM research as well as the study of knowledge development in tourism more generally. For the tourism field, bibliometric visualisation software such as *CiteSpace* provides a suite of useful tools that can be used for understanding specific tourism research areas. They can provide a more objective and comprehensive view of the intellectual structure, progress, and knowledge production in a field (Denyer & Tranfield, 2006), and can provide early career scholars or researchers from outside the field with insights into important authors and works (Benckendorff & Zehrer, 2013).

The trends and insights uncovered by the analysis also identify several opportunities for future research in the TCDM field. First, it is suggested that future research should follow a more theoretical approach to investigate crises and disasters in the tourism industry (Leslie & Black, 2005; Sheldon & Dwyer, 2010; Tsai & Chen, 2011) rather than simply describing crisis or disaster impacts and response strategies. Future research that undertake descriptive case studies require in depth discussion of the case study context and should design multiple or embedded case studies to allow deeper comparison and insights to be generated. Second, current hot topics are associated with consumer behaviour and risk perceptions (Kozak et al., 2007), and it appears that there is considerable scope for this research focus to develop further. Examples include identifying market segments for risky or recovering destinations (Fuchs, Uriely, Reichel, & Maoz, 2013; Ritchie, Chien, & Sharifpour, 2017; Yang, Sharif, & Khoo-Lattimore, 2015), and the use of social media in crisis-marketing to mitigate risk and promote tourism after crises and disasters (Schroeder & Pennington-Gray, 2015). Third, destination and organisational resilience may provide a useful focus for future research (Becken, Scott, & Ritchie, 2015; Orchiston, Prayag, & Brown, 2016), as indicated by the keywords and developing cluster of work on post-disaster recovery. Fourth, although research in the field tends to follow specific crises and disasters (such as economic crises) few studies have been published or cited on political instability including terrorism (Goldman & Neubauer-Shani, 2017). It is likely that interest in this topic area will increase in the future.

Despite these contributions, several limitations of this paper should be noted. First, the greatest limitation of this study is its exclusive focus on specialist journals at the exclusion of tourism-related work published elsewhere (non-tourism journals, books, book chapters, conference papers). Due to time and resource constraints, it was necessary to clearly delineate the scope of the analysis. However, as McKercher (2008) notes, focusing on tourism journals may under-value the contributions made by scholars who focus on writing books. To some extent the co-citation analysis mitigates this limitation by including a range of cited sources in the analysis. Further, this work is restricted to work in English-language journals only, which is a weakness identified by Gall et al. (2015). Given the initial work in Spain, it seems likely that some of the literature may be published in Spanish. Likewise, other sizeable tourism research communities working in the field are likely published in Portuguese,

German, Japanese, and Mandarin language journals. The analysis was also limited to tourism journals and may not fully reflect contributions in other fields. Although this paper is the first step in understanding TCDM research progress in tourism journals, future research could also explore the connections and ‘cross-pollination’ between tourism journals and other disciplines studying crisis and disaster management (Ritchie, 2008) and collaboration patterns between authors across disciplines.

Second, the use of software *CiteSpace* provides some limitations. For example, there is no clear standard on database selection, length of time-slice, threshold selection and adjustment, and suitable number of network nodes and links for analysis. Researchers need to select these parameters based on past paper experience and network layout, which may result in slightly different networks due to different settings. However, *CiteSpace* has very high stability in running data, which means very similar results will occur based on the same data and parameters. This can increase the reliability of the research outcomes, but not all researchers provide this information. Furthermore, presenting static images from the *CiteSpace* program (such as in this journal paper) has its limitations. Readers of this paper are unable to explore the data and relationships in more detail by zooming in on network maps, or exploring connections between authors or papers. In future, it may be possible for journals to include supplementary material such as videos or provide other means to enhance the use of visualisation software such as *CiteSpace*. Exploring these relationships in a three-dimensional space is a key strength of visualisation software programs.

Finally, some limitations may be associated with the interpretation of the results. Expert panel discussion can assist in interpreting the results; for example, Chen (2006) verified his findings from *CiteSpace* by contacting the domain experts to have their verification of the network. However, the time period covered by the TCDM literature makes it challenging to contact the authors represented in the analysis. Some authors are no longer alive and others have moved out of the field and as a result significant amount of time and resources would be required to create an expert panel. The authors, who are also active researchers within the TCDM field, have provided their own interpretation but also welcome more discussion of the results.

In conclusion, research in the TCDM field has grown and matured since the first paper was published in 1976. Studies have transitioned from broad topic areas to a more specific topic area. The quality of research is relatively high based on publication in high-quality journals. Future collaboration between TCDM researchers across countries and with researchers from other disciplines has the potential to fill identified gaps in the research network. It is hoped that this paper has made a small contribution to understanding the development of the field and its future direction.

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References

- Baggio, R., Scott, N., & Arcodia, C. (2008). *Collaboration in the events literature: A co-authorship network study*. Nottingham: Proceedings of the EUTO.

- Bailón-Moreno, R., Jurado-Alameda, E., Ruíz-Baños, R., & Courtial, J. P. (2005). Analysis of the scientific field of physical chemistry of surfactants with the unified scientometric model: Fit of relational and activity indicators. *Scientometrics*, 63(2), 259–276.
- Bailón-Moreno, R., Jurado-Alameda, E., & Ruíz-Baños, R. (2006). The scientific network of surfactants: Structural analysis. *Journal of the American Society for Information Science and Technology*, 57(7), 949–960.
- Ballantyne, R., Packer, J., & Axelsen, M. (2009). Trends in tourism research. *Annals of Tourism Research*, 36, 149–152.
- Barrios, M., Borrego, A., Vilaginés, A., Ollé, C., & Somoza, M. (2008). A bibliometric study of psychological research on tourism. *Scientometrics*, 77(3), 453–467.
- Becher, T., & Trowler, P. (2001). *Academic tribes and territories* (2nd ed.). Buckingham: Open University Press.
- Becken, S. (2013). A review of tourism and climate change as an evolving knowledge domain. *Tourism Management Perspectives*, 6, 53–62.
- Becken, S., Scott, N., & Ritchie, B. (2015). The development of new tourism networks to respond to, and recover from the 2011 christchurch earthquake. In B. Ritchie & K. Campiranon (Eds.), *Tourism crisis and disaster management in the Asia-pacific* (pp. 190–205). Wallingford: CABI.
- Belhassen, Y., & Caton, K. (2009). Advancing understandings: A linguistic approach to tourism epistemology. *Annals of Tourism Research*, 36(2), 335–352.
- Benckendorff, P. (2009a). Themes and trends in Australian and New Zealand tourism research: A social network analysis of citations in two leading journals (1994–2007). *Journal of Hospitality and Tourism Management*, 16(1), 1–15.
- Benckendorff, P. (2009b). *Themes, relationships and trends in North American tourism research: A co-citation analysis of three leading journals (1996–2007)*. 2009 TTRA Conference: ‘Catch the Wave: Tourism Research!’, University of Hawaii, Honolulu.
- Benckendorff, P., & Zehrer, A. (2013). A network analysis of tourism research. *Annals of Tourism Research*, 43, 121–149.
- Blake, A., & Sinclair, M. T. (2003). Tourism crisis management: US response to September 11. *Annals of Tourism Research*, 30(4), 813–832.
- Borgman, C. L., & Furner, J. (2002). Scholarly communication and bibliometrics. *Annual Review of Information Science and Technology*, 36, 3–72.
- Börner, K., Chen, C., & Boyack, K. (2003). Visualizing knowledge domains. *Annual Review of Information Science and Technology*, 37, 179–255.
- Börner, K., Huang, W., Linnemeier, M., Duhon, R., Phillips, P., Ma, N., ... Price, M. (2010). Rete-netzwerk-red: Analyzing and visualizing scholarly networks using the network workbench tool. *Scientometrics*, 83(3), 863–876.
- Brandes, U., Kenis, P., Raab, J., Schneider, V., & Wagner, D. (1999). Explorations into the visualization of policy networks. *Journal of Theoretical Politics*, 11(1), 75–106.
- Buhalis, D., & Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet – the state of e-tourism research. *Tourism Management*, 29(4), 609–623.
- Burt, R. S. (1992). *Structural holes*. Cambridge, MA: Harvard University Press.
- Callon, M., Courtial, J. P., Turner, W. A., & Bauin, S. (1983). From translations to problematic networks: An introduction to co-word analysis. *Social Science Information*, 22(2), 191–235.
- Carlsen, J. C., & Hughes, M. (2008). Tourism market recovery in the Maldives after the 2004 Indian Ocean Tsunami. *Journal of Travel & Tourism Marketing*, 23(2–4), 139–149.
- Chen, C. (2004). Searching for intellectual turning points: Progressive knowledge domain visualisation. *Proceedings of the National Academy of Sciences of the United States of America*, 101, 5303–5310.
- Chen, C. (2006). *Citespace II: Detecting and visualizing emerging trends and transient patterns in scientific literature*. *Journal of the American Society for Information Science and Technology*, 57(3), 359–377.
- Chen, C. (2014). *The CiteSpace manual*. Retrieved from <http://cluster.ischool.drexel.edu/~cchen/CiteSpace/CiteSpaceManual.pdf>
- Chen, C., Chen, Y., Horowitz, M., Hou, H., Liu, Z., & Pellegrino, D. (2009). Towards an explanatory and computational theory of scientific discovery. *Journal of Informetrics*, 3(3), 191–209.

- Chen, C., Dubin, R., & Kim, M. C. (2014a). Emerging trends and new developments in regenerative medicine: A scientometric update (2000–2014). *Expert Opinion on Biological Therapy*, 14(9), 1295–1317.
- Chen, C., Dubin, R., & Kim, M. C. (2014b). Orphan drugs and rare diseases: A scientometric review (2000–2014). *Expert Opinion on Orphan Drugs*, 2(7), 709–724.
- Chen, C., Ibekwe-SanJuan, F., & Hou, J. (2010). The structure and dynamics of co-citation clusters: A multiple-perspective co-citation analysis. *Journal of the American Society for Information Science and Technology*, 61(7), 1386–1409.
- Cheng, C. K., Li, X., Petrick, J. F., & O’Leary, J. T. (2011). An examination of tourism journal development. *Tourism Management*, 32(1), 53–61.
- Chien, G. C., & Law, R. (2003). The impact of the severe acute respiratory syndrome on hotels: A case study of Hong Kong. *International Journal of Hospitality Management*, 22(3), 327–332.
- Cioccio, L., & Michael, E. J. (2007). Hazard or disaster: Tourism management for the inevitable in Northeast Victoria. *Tourism Management*, 28(1), 1–11.
- Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). Science mapping software tools: Review, analysis, and cooperative study among tools. *Journal of the American Society for Information Science and Technology*, 62(7), 1382–1402.
- Cohen, E., & Neal, M. (2010). Coinciding crises and tourism in contemporary Thailand. *Current Issues in Tourism*, 13(5), 455–475.
- Cook, D. J., Mulrow, C. D., & Haynes, R. B. (1997). Systematic reviews: Synthesis of best evidence for clinical decisions. *Annals of Internal Medicine*, 126(5), 376–380.
- Cooper, H. M. (1998). *Synthesizing research: A guide for literature reviews* (3rd ed.). Thousand Oaks, CA: Sage.
- Crane, D. (1972). *Invisible colleges: Diffusion of knowledge in scientific communication*. Chicago, IL: The University of Chicago Press.
- Crossan, M. M., & Apaydin, M. (2010). A multi-dimensional framework of organizational innovation: A systematic review of the literature. *Journal of Management Studies*, 47(6), 1154–1191.
- Davi, A., Haughton, D., Nasr, N., Shah, G., Skaletsky, M., & Spack, R. (2005). A review of two text-mining packages: SAS TextMining and WordStat. *American Statistician*, 59(1), 89–103.
- Denyer, D., & Tranfield, D. (2006). Using qualitative research synthesis to build an actionable knowledge base. *Management Decision*, 44(2), 213–227.
- de Sausmarez, N. (2007). Crisis management, tourism and sustainability: The role of indicators. *Journal of Sustainable Tourism*, 15(6), 700–714.
- de Solla Price, D. J. (1965). Networks of scientific papers. *Science*, 149, 510–515.
- Durocher, J. (1994). Recovery marketing what to do after a natural disaster. *Cornell Hotel and Restaurant Administration Quarterly*, 35(2), 66–70.
- Elsevier. (2016). *What content is included in Scopus?* Retrieved from <https://www.elsevier.com/solutions/scopus/content>
- Evans, N., & Elphick, S. (2005). Models of crisis management: An evaluation of their value for strategic planning in the international travel industry. *International Journal of Tourism Research*, 7(3), 135–150.
- Evren, S., & Kozak, N. (2014). Bibliometric analysis of tourism and hospitality related articles published in Turkey. *Anatolia*, 25(1), 61–80.
- Faulkner, B. (2001). Towards a framework for tourism disaster management. *Tourism Management*, 22(2), 135–147.
- Faulkner, B., & Vikulov, S. (2001). Katherine, washed out one day, back on track the next: A post-mortem of a tourism disaster. *Tourism Management*, 22(4), 331–344.
- Fink, A. (1998). *Conducting research literature reviews: From paper to the internet*. Thousand Oaks, CA: Sage.
- Freeman, L. C. (1977). A set of measures of centrality based on betweenness. *Sociometry*, 40(1), 35–41.
- Freeman, L. C. (1978). Centrality in social networks: Conceptual clarification. *Social Networks*, 1, 215–239.
- Fuchs, G., Uriely, N., Reichel, A., & Maoz, D. (2013). Vacationing in a terror-stricken destination tourists’ risk perceptions and rationalizations. *Journal of Travel Research*, 52(2), 182–191.
- Gall, M., Nguyen, K. H., & Cutter, S. L. (2015). Integrated research on disaster risk: Is it really integrated? *International Journal of Disaster Risk Reduction*, 12, 255–267.

- García-Lillo, F., Úbeda-García, M., & Marco-Lajara, B. (2016). The intellectual structure of research in hospitality management: A literature review using bibliometric methods of the journal. *International Journal of Hospitality Management*, 52, 121–130.
- Garfield, E. (2009). From the science of science to scientometrics visualizing the history of science with HistCite software. *Journal of Informetrics*, 3(3), 173–179.
- Garfield, E., & Merton, R. K. (1979). *Citation indexing: Its theory and application in science, technology, and humanities (information sciences series)*. New York, NY: Wiley.
- Glänzel, W. (2001). National characteristics in international scientific co-authorship relations. *Scientometrics*, 51(1), 69–115.
- Goldman, O. S., & Neubauer-Shani, M. (2017). Does international tourism affect transnational terrorism? *Journal of Travel Research*, 56(4), 451–467.
- Hall, C. M. (2005). Systems of surveillance and control: Commentary on ‘an analysis of institutional contributors to three major academic tourism journals: 1992–2001’. *Tourism Management*, 26, 653–656.
- Hall, C. M. (2010). Crisis events in tourism: Subjects of crisis in tourism. *Current Issues in Tourism*, 13(5), 401–417.
- Hall, C. M. (2011). Publish and perish? Bibliometric analysis, journal ranking and the assessment of research quality in tourism. *Tourism Management*, 32(1), 16–27.
- Hallin, C. A., & Marnburg, E. (2008). Knowledge management in the hospitality industry: A review of empirical research. *Tourism Management*, 29(2), 366–381.
- Hammersley, M. (2001). On ‘systematic’ reviews of research literatures: A ‘narrative’ response to Evans & Benefield. *British Educational Research Journal*, 27(5), 543–554.
- Hart, C. (1998). *Doing a literature review: Releasing the social science research imagination*. London: Sage.
- Haythornthwaite, C. (1996). Social network analysis: An approach and technique for the study of information exchange. *Library & Information Science Research*, 18(4), 323–342.
- He, Q. (1999). Knowledge discovery through co-word analysis. *Library Trends*, 48(1), 133–159.
- Henderson, J. C. (1999a). Asian tourism and the financial Indonesia and Thailand compared. *Current Issues in Tourism*, 2(4), 294–303.
- Henderson, J. C. (1999b). Tourism management and the Southeast Asian economic and environmental crisis: A Singapore perspective. *Managing Leisure*, 4(2), 107–120.
- Henderson, J. C. (2003a). Communicating in a crisis: Flight SQ 006. *Tourism Management*, 24, 279–287.
- Henderson, J. C. (2003b). Terrorism and tourism: Managing the consequences of the Bali bombings. *Journal of Travel & Tourism Marketing*, 15(1), 41–58.
- Henderson, J. C. (2007). Corporate social responsibility and tourism: Hotel companies in Phuket, Thailand, after the Indian Ocean tsunami. *International Journal of Hospitality Management*, 26(1), 228–239.
- Herr, B., Huang, W., Penumarthy, S., & Börner, K. (2007). Designing highly flexible and usable cyberinfrastructures for convergence. In W. S. Bainbridge & M. C. Roco (Eds.), *Progress in convergence: Technologies for human wellbeing* (pp. 161–179). Boston, MA: Annals of the New York Academy of Sciences.
- Hitchcock, M., & Darma Putra, I. N. (2005). The Bali bombings: Tourism crisis management and conflict avoidance. *Current Issues in Tourism*, 8(1), 62–76.
- Hjalager, A. M. (2010). A review of innovation research in tourism. *Tourism Management*, 31(1), 1–12.
- Howey, R. M., Savage, K. S., Verbeeten, M. J., & Van Hoof, H. B. (1999). Tourism and hospitality research journals: Cross-citations among research communities. *Tourism Management*, 20, 133–139.
- Hu, C., & Racherla, P. (2008). Visual representation of knowledge networks: A social network analysis of hospitality research domain. *International Journal of Hospitality Management*, 27, 302–312.
- Huang, J. H., & Min, J. C. (2002). Earthquake devastation and recovery in tourism: The Taiwan case. *Tourism Management*, 23(2), 145–154.
- Huang, Y. C., Tseng, Y. P., & Petrick, J. F. (2008). Crisis management planning to restore tourism after disasters: A case study from Taiwan. *Journal of Travel & Tourism Marketing*, 23(2–4), 203–221.
- Hystad, P. W., & Keller, P. C. (2008). Towards a destination tourism disaster management framework: Long-term lessons from a forest fire disaster. *Tourism Management*, 29(1), 151–162.

- Ioannides, D., & Apostolopoulos, Y. (1999). Political instability, war, and tourism in Cyprus: Effects, management, and prospects for recovery. *Journal of Travel Research*, 38(1), 51–56.
- Jamal, T., Smith, B., & Watson, E. (2008). Ranking, rating and scoring of tourism journals: Interdisciplinary challenges and innovations. *Tourism Management*, 29(1), 66–78. doi:10.1016/j.tourman.2007.04.001
- Jogarathnam, G., Chon, K., McCleary, K. W., Mena, M. M., & Eun Yoo, J. J. (2005). An analysis of institutional contributors to three major academic tourism journals: 1992–2001. *Tourism Management*, 26, 641–648.
- Katz, J. (1994). Geographical proximity and scientific collaboration. *Scientometrics*, 31(1), 31–43.
- Kessler, M. M. (1963). Bibliographic coupling between scientific papers. *American Documentation*, 14(1), 10–25.
- Kleinberg, J. (2003). Bursty and hierarchical structure in streams. *Data Mining and Knowledge Discovery*, 7(4), 373–397.
- Koc, E., & Boz, H. (2014). Triangulation in tourism research: A bibliometric study of top three tourism journals. *Tourism Management Perspectives*, 12, 9–14.
- Kozak, M., Crofts, J. C., & Law, R. (2007). The impact of the perception of risk on international travellers. *International Journal of Tourism Research*, 9(4), 233–242.
- Law, R., Qi, S., & Buhalis, D. (2010). Progress in tourism management: A review of website evaluation in tourism research. *Tourism Management*, 31(3), 297–313.
- Laws, E., & Prideaux, B. (2005). Crisis management: A suggested typology. *Journal of Travel & Tourism Marketing*, 19(2–3), 1–8.
- Leslie, D., & Black, L. (2005). Tourism and the impact of the foot and mouth epidemic in the UK: Reactions, responses and realities with particular reference to Scotland. *Journal of Travel & Tourism Marketing*, 19(2–3), 35–46.
- Li, X., Ma, E., & Qu, H. (2017). Knowledge mapping of hospitality research: A visual analysis using CiteSpace. *International Journal of Hospitality Management*, 60, 77–93.
- Lucas, P. J., Baird, J., Arai, L., Law, C., & Roberts, H. M. (2007). Worked examples of alternative methods for the synthesis of qualitative and quantitative research in systematic reviews. *BMC Medical Research Methodology*, 7(1), 15.
- Ma, J., & Law, R. (2009). Components of tourism research: Evidence from annals of tourism research. *Anatolia: An International Journal of Tourism and Hospitality Research*, 20, 62–74.
- Mair, J., Ritchie, B. W., & Walters, G. (2016). Towards a research agenda for post-disaster and post-crisis recovery strategies for tourist destinations: A narrative review. *Current Issues in Tourism*, 19(1), 1–26.
- Mansfeld, Y. (1999). Cycles of war, terror, and peace: Determinants and management of crisis and recovery of the Israeli tourism industry. *Journal of Travel Research*, 38(1), 30–36.
- Mays, N., Pope, C., & Popay, J. (2005). Systematically reviewing qualitative and quantitative evidence to inform management and policy-making in the health field. *Journal of Health Services Research and Policy*, 10(1), 6–20. doi:10.1258/1355819054308576
- McKercher, B. (2007). A study of prolific authors in 25 tourism and hospitality journals. *Journal of Hospitality & Tourism Education*, 19(2), 23–30.
- McKercher, B. (2008). A citation analysis of tourism scholars. *Tourism Management*, 29, 1226–1232.
- McKercher, B. (2012). Influence ratio: An alternate means to assess the relative influence of hospitality and tourism journals on research. *International Journal of Hospitality Management*, 31(3), 962–971.
- McKercher, B., Law, R., & Lam, T. (2006). Rating tourism and hospitality journals. *Tourism Management*, 27(6), 1235–1252.
- McKercher, B., & Tung, V. (2015). Publishing in tourism and hospitality journals: Is the past a prelude to the future? *Tourism Management*, 50, 306–315.
- Mulrow, C. (1994). Systematic reviews: Rationale for systematic reviews. *British Medical Journal*, 309(6954), 597–599.
- Narin, F. (1976). *Evaluative bibliometrics: The use of publication and citation analysis in the evaluation of scientific activity*. Washington, DC: National Science Foundation.
- Orchiston, C., Prayag, G., & Brown, C. (2016). Organizational resilience in the tourism sector. *Annals of Tourism Research*, 56, 145–148.
- Palmer, A. L., Sesé, A., & Montaña, J. J. (2005). Tourism and statistics: Bibliometric study 1998–2002. *Annals of Tourism Research*, 32(1), 167–178.
- Pan, S., Chon, K., & Song, H. (2008). Visualizing tourism trends: A combination of ATLAS.ti and BiPlot. *Journal of Travel Research*, 46, 339–348.

- Papatheodorou, A., Rosselló, J., & Xiao, H. (2010). Global economic crisis and tourism: Consequences and perspectives. *Journal of Travel Research*, 49(1), 39–45.
- Park, K., Phillips, W. J., Canter, D. D., & Abbott, J. (2011). Hospitality and tourism research rankings by author, university, and country using six major journals: The first decade of the new millennium. *Journal of Hospitality & Tourism Research*, 35(3), 381–416. doi:10.1177/1096348011400743
- Persson, O., Danell, R., & Wiborg Schneider, J. (2009). How to use bibexcel for various types of bibliometric analysis. In F. Åström, R. Danell, B. Larsen, & J. Wiborg Schneider (Eds.), *Celebrating scholarly communication studies: A festschrift for Olle Persson at his 60th birthday* (pp. 9–24). Leuven: International Society for Scientometrics and Informetrics.
- Peters, H. P. F., & van Raan, A. F. J. (1991). Structuring scientific activities by co-author analysis an exercise on a university faculty level. *Scientometrics*, 20(1), 235–255.
- Pforr, C., & Hosie, P. J. (2008). Crisis management in tourism: Preparing for recovery. *Journal of Travel & Tourism Marketing*, 23(2–4), 249–264.
- Ponds, R., Van Oort, F., & Frenken, K. (2007). The geographical and institutional proximity of research collaboration. *Papers in Regional Science*, 86(3), 423–443.
- Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., & Duffy, S. (2006). Guidance on the conduct of narrative synthesis in systematic reviews: A product from the ESRC methods programme. Version 1, b92.
- Porter, A. L., & Cunningham, S. W. (2004). *Tech mining: Exploiting new technologies for competitive advantage*. Hoboken, NJ: JohnWiley & Sons.
- Pottorff, S. M., & Neal, D. D. M. (1994). Marketing implications for post-disaster tourism destinations. *Journal of Travel & Tourism Marketing*, 3(1), 115–122.
- Prideaux, B. (1999). Tourism perspectives of the Asian financial crisis: Lessons for the future. *Current Issues in Tourism*, 2(4), 279–293.
- Prideaux, B., Laws, E., & Faulkner, B. (2003). Events in Indonesia: Exploring the limits to formal tourism trends forecasting methods in complex crisis situations. *Tourism Management*, 24(4), 475–487.
- Racherla, P., & Hu, C. (2009). A framework for knowledge-based crisis management in the hospitality and tourism industry. *Cornell Hospitality Quarterly*, 50(4), 561–577.
- Ramos-Rodríguez, A. R., & Ruiz-Navarro, J. (2004). Changes in the intellectual structure of strategic management research: A bibliometric study of the Strategic Management Journal, 1980–2000. *Strategic Management Journal*, 25(10), 981–1004.
- Reisinger, Y., & Mavondo, F. (2005). Travel anxiety and intentions to travel internationally: Implications of travel risk perception. *Journal of Travel Research*, 43(3), 212–225.
- Ritchie, B. (2004). Chaos, crises and disasters: A strategic approach to crisis management in the tourism industry. *Tourism Management*, 25(6), 669–683.
- Ritchie, B. (2008). Tourism disaster planning and management: From response and recovery to reduction and readiness. *Current Issues in Tourism*, 11(4), 315–348.
- Ritchie, B., Chien, M., & Sharifpour, R. (2017). Segmentation by travel related risks: An integrated approach. *Journal of Travel and Tourism Marketing*, 34(1), 274–289.
- Ritchie, B., Mair, J., & Walters, G. (2014). Tourism crises and disasters: Moving the research agenda forward. In A. Lew, C. M. Hall, & A. Williams (Eds.), *Wiley-Blackwell companion to tourism* (pp. 611–622). London: Wiley.
- Roberts, K. A., Dixon-Woods, M., Fitzpatrick, R., Abrams, K. R., & Jones, D. R. (2002). Factors affecting uptake of childhood immunisation: A Bayesian synthesis of qualitative and quantitative evidence. *The Lancet*, 360(9345), 1596–1599.
- Ruddy, R., & House, A. (2005). Meta-review of high quality systematic reviews of interventions in key areas of liaison psychiatry. *British Journal of Psychiatry*, 187, 109–120.
- 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*, 23(4), 517–535.
- Santana, G. (2004). Crisis management and tourism: Beyond the rhetoric. *Journal of Travel & Tourism Marketing*, 15(4), 299–321.
- Schroeder, A., & Pennington-Gray, L. (2015). The role of social media in international tourist's decision making. *Journal of Travel Research*, 54(5), 584–595.
- Sci² Team. (2009). *Science of science (Sci²) tool*. Indiana University and SciTech Strategies. Retrieved from <http://sci.slis.indiana.edu>

- Scott, N., Baggio, R., & Cooper, C. (2008). *Network analysis and tourism: From theory to practice* (Vol. 35). Clevedon England, Buffalo: Channel View Publications.
- Serenko, A., & Bontis, N. (2004). Meta-review of knowledge management and intellectual capital literature: Citation impact and research productivity rankings. *Knowledge and Process Management*, 11(3), 185–198.
- Sheldon, P., & Dwyer, L. (2010). The global financial crisis and tourism: Perspectives of the academy. *Journal of Travel Research*, 49(1), 3–4.
- Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for Information Science*, 24(4), 265–269.
- Smeral, E. (2012). International tourism demand and the business cycle. *Annals of Tourism Research*, 39(1), 379–400.
- Song, H., & Li, G. (2008). Tourism demand modelling and forecasting – a review of recent research. *Tourism Management*, 29(2), 203–220.
- Sönmez, S. F., Apostolopoulos, Y., & Tarlow, P. (1999). Tourism in crisis: Managing the effects of terrorism. *Journal of Travel Research*, 38(1), 13–18.
- Stone, P., & Sharpley, R. (2008). Consuming dark tourism: A thanatological perspective. *Annals of Tourism Research*, 35(2), 574–595.
- Thelwall, M. (2008). Bibliometrics to webometrics. *Journal of Information Science*, 34(4), 605–621.
- Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), 207–222.
- Tribe, J. (2010). Tribes, territories and networks in the tourism academy. *Annals of Tourism Research*, 37(1), 7–33.
- Tsai, C. H., & Chen, C. W. (2011). The establishment of a rapid natural disaster risk assessment model for the tourism industry. *Tourism Management*, 32(1), 158–171.
- van Eck, N. J., & Waltman, L. (2007). VOS: A new method for visualizing similarities between objects. In H. J. Lenz & R. Decker (Eds.), *Advances in data analysis: Proceedings of the 30th annual conference of the German classification society* (pp. 299–306). Heidelberg: Springer.
- van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538.
- van Raan, A. F. J. (2004). Sleeping beauties in science. *Scientometrics*, 59(3), 467–472.
- van Raan, A. F. J. (2005). For your citations only? Hot topics in bibliometric analysis. *Measurement: Interdisciplinary Research and Perspectives*, 3(1), 50–62.
- Walters, G., & Clulow, V. (2010). The tourism market's response to the 2009 Black Saturday bushfires: The case of Gippsland. *Journal of Travel & Tourism Marketing*, 27(8), 844–857.
- Wang, J., & Ritchie, B. W. (2010). A theoretical model for strategic crisis planning: Factors influencing crisis planning in the hotel industry. *International Journal of Tourism Policy*, 3(4), 297–317.
- Weed, M. (2009). Progress in sports tourism research? A meta-review and exploration of futures. *Tourism Management*, 30(5), 615–628.
- Wheeldon, J., & Ahlberg, M. (2011). *Visualizing social science research: Maps, methods, & meaning*. Thousand Oaks, CA: SAGE.
- White, H. D., & Griffith, B. C. (1981). Author co-citation: A literature measure of intellectual structure. *Journal of the American Society for Information Science*, 32(3), 163–171.
- White, H., & McCain, K. (1998). Visualizing a discipline: An author co-citation analysis of information science, 1972–1995. *Journal of the American Society for Information Science*, 49(4), 327–355.
- Williams, A. M., & Baláž, V. (2015). Tourism risk and uncertainty theoretical reflections. *Journal of Travel Research*, 54(3), 271–287.
- Wu, B. B., Wang, J., & Song, H. T. (2014). Knowledge maps of complex network visualization based on CiteSpace. *Computer Systems and Applications*, 23(2), 7–17.
- Yang, E. C. L., Sharif, S. P., & Khoo-Lattimore, C. (2015). Tourists' risk perception of risky destinations: The case of Sabah's eastern coast. *Tourism and Hospitality Research*, 15(3), 206–221. doi:10.1177/1467358415576085
- Yang, W., Wang, D., & Chen, G. (2011). Reconstruction strategies after the Wenchuan earthquake in Sichuan, China. *Tourism Management*, 32(4), 949–956.
- Ye, Q., Li, T., & Law, R. (2013). A co-authorship network analysis of tourism and hospitality research collaboration. *Journal of Hospitality & Tourism Research*, 37(1), 51–76.

- Ye, Q., Song, H., & Li, T. (2012). Cross-institutional collaboration networks in tourism and hospitality research. *Tourism Management Perspectives*, 2–3, 55–64.
- Ying, T., & Xiao, H. (2012). Knowledge linkage: A social network analysis of tourism dissertation subjects. *Journal of Hospitality & Tourism Research*, 36(4), 450–477.
- Yu, L., Stafford, G., & Armoo, A. K. (2005). A study of crisis management strategies of hotel managers in the Washington, D.C. Metro area. *Journal of Travel and Tourism Marketing*, 19(2–3), 91–105. doi:10.1300/J073v19n02_08
- Yuan, Y., Gretzel, U., & Tseng, Y. H. (2015). Revealing the nature of contemporary tourism research: Extracting common subject areas through bibliographic coupling. *International Journal of Tourism Research*, 17(5), 417–431.
- Zeng, B., Carter, R. W., & De Lacy, T. (2005). Short-term perturbations and tourism effects: The case of SARS in China. *Current Issues in Tourism*, 8(4), 306–322. doi:10.1080/13683500508668220
- Zhao, W., & Ritchie, J. B. (2007). An investigation of academic leadership in tourism research: 1985–2004. *Tourism Management*, 28(2), 476–490.
- Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, 18(3), 429–472.

Appendix 1: List of Tourism and Hospitality Journals selected from Scopus

1. Tourism Management
2. Current Issues in Tourism
3. Journal of Travel and Tourism Marketing
4. Journal of Travel Research
5. Annals of Tourism Research
6. Tourism Analysis
7. Worldwide Hospitality and Tourism Themes
8. Journal of Vacation Marketing
9. Tourism Economics
10. Asia Pacific Journal of Tourism Research
11. Tourism Geographies
12. Anatolia
13. Tourism
14. Journal of Sustainable Tourism
15. International Journal of Tourism Research
16. International Journal of Tourism Policy
17. International Journal of Hospitality Management
18. Tourismos
19. Cornell Hotel and Restaurant Administration Quarterly
20. Scandinavian Journal of Hospitality and Tourism
21. International Journal of Contemporary Hospitality Management
22. Tourist Studies
23. Turizam
24. Journal of China Tourism Research
25. Tourism Culture and Communication
26. Journal of Destination Marketing and Management
27. Tourism Management Perspectives
28. Journal of Tourism and Cultural Change
29. Journal of Hospitality Marketing and Management
30. Journal of Human Resources in Hospitality and Tourism
31. Journal of Teaching in Travel and Tourism
32. Cornell Hospitality Quarterly
33. International Journal of Hospitality and Tourism Administration
34. Tourism Planning and Development
35. International Journal of Culture Tourism and Hospitality Research
36. Tourism and Hospitality Management
37. Journal of Hospitality and Tourism Management