Mapping Hotspots and Emerging Trends of Tourism E-Commerce: A Multidisciplinary Perspective

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Abstract: Tourism e-commerce is a multidisciplinary research area that involves tourism management and e-commerce. This paper provides a review of 1960 scientific studies published over the past two decades (1999-2018). This study presents a multidisciplinary comparative study, namely, a systematic review of tourism e-commerce, aiming to provide a reference guide for researchers. Under the methodological framework of a domain analysis, this paper analysed the scientific outputs and visualized the co-cited references, burst keywords, keyword co-occurrences and topic characteristics of journals. The results show that the tourism management discipline represents the main body of tourism e-commerce research and that this research demonstrates a rapid growth trend consistent with overall research. There are two main clusters of representative co-cited references in the tourism management discipline. However, in the e-commerce discipline, the distribution of co-cited references is scattered, lacking obvious cluster characteristics. The keyword co-occurrences in both disciplines present four themes, including network and information technology, consumer behaviour and social media as common themes. Tourism management journals can be divided into two categories, while e-commerce journals can be divided into three categories. Overall, the findings of this study can benefit researchers and practitioners.

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1.0 Introduction

With the rapid development of internet information technology, the habit of using the internet for tourism transactions has gradually become accepted by consumers (Zhang et al. 2016). As an information-intensive and information-based industry, the tourism industry, in combination with modern information technology, has created a new service-oriented paradigm that is known as tourism e-commerce (Zhang et al. 2015). Tourism e-commerce refers to an internet-based commerce system that includes tourism and its distribution systems. Through an online system, customers can access useful information, search for travel service catalogues, book travel and accommodation and make payments (Ho and Lee 2007; Peng and Lai 2014). Tourism e-commerce has changed the way in which traditional tourism services operate. First, consumers can reduce the risk of consumption decision-making by obtaining tourism information and making online bookings on tourism e-commerce platforms. Second, by analysing tourists' preferences, tourism enterprises can engage in tourism marketing and precisely promote tourism service information. Finally, the government can increase its public service knowledge through tourism information systems to oversee the tourism market (Centobelli and Ndou 2019; Vila et al. 2018; Xiang and Gretzel 2010).

According to current research, tourism social media, online consumer behaviour and tourism information systems are the three main research fields of tourism e-commerce. Tourism social media have created new channels of information sharing and communication for tourists, online travel platforms and tourism enterprises (Loureiro and Maria 2015). They play an important role in enhancing communication between consumers and enterprises, improving the user experience, promoting product or brand information, and stimulating consumer behaviour (Baum et al. 2019; Hajli 2018; Zhao et al. 2019). The research on tourism social media mainly employs sources such as online reviews, online virtual communities, and travel blogs. For example, Hou et al. (2019) found that tourism social media have more advantages in terms of authenticity, professionalism, objectivity and clarity than traditional forms of tourism information. In particular, enterprises can better identify the behavioural characteristics of tourists and provide better tourism services by text mining and analysing online tourism reviews. Yuan et al. (2016) summarized tourism information, such as popular tourist locations and their travel sequences (routes) for a previously unknown city, from massive travel blogs with the aim of providing users with better travel scheduling. Colladon et al. (2019) applied the methods and tools of social networks and semantic analysis to study user-generated content retrieved from online communities to forecast demand for both policy makers and tourism company operators and to help researchers comprehensively understand tourist behaviour and satisfaction.

Tourists' online consumer behaviour is one of the most important tourism e-commerce research fields. It is concerned with all activities directly involved in the obtaining, consuming and disposing of products and services including the decision processes that precede and follow these actions. The research on tourists' online consumer behaviour provides a scientific theoretical basis for depicting tourists' characteristics, analysing their demand preferences, subdividing the tourism market and formulating marketing strategies (Chua et al. 2019). This research mainly includes issues such as online purchasing behaviour, online sharing behaviour, and information search behaviour (Kock et al. 2018). Researchers are inclined to study tourists' online consumer behaviour from the perspectives of risk perception, customer satisfaction, trust, loyalty and service quality. Analysing the relevant factors in the online hotel reservation process, Siering et al. (2018) found that perceived usefulness and availability had a significant impact on the information search behaviour of consumers on travel websites. Wani et al. (2017) showed that the user experience on tourism websites is very highly related to consumers' purchase behaviour and that a better user experience can encourage users to make purchase decisions.

Tourism information systems constitute the integration of tourism and information science. The main types of tourism information systems include tourism website information systems, mobile tourism service systems, tourism website application systems, tourism destination management systems, and tourism recommendation systems (Chiu et al. 2019; Joseph et al. 2019; Kim et al. 2019). Tourism information systems provide scientific tools and methods for the development of the tourism industry, and the major areas of research in this field include tourism information processing, information search, website design and development, data mining, and intelligent algorithms (Bao 2017; Kesorn et al. 2017). For example, Mohseni et al. (2018) proposed that tourism recommendation systems can precisely promote tourism products and services to tourists according to the information browsed by tourists to drive purchase decisions. In the latest research, some scholars combine smart tourism with big data and use data mining technology to analyse consumer characteristics and to accurately recommend tourism destinations to tourists (Hassannia et al. 2019).

From the perspective of discipline development, tourism e-commerce originated from multidisciplinary research. Tourism e-commerce was first established as an important research area at the annual ENTER conference held in 1994 in Innsbruck Austria (Buhalis and Law 2008; Peng et al. 2014). Then, in 1998, a multidisciplinary interest research group involving tourism and information technology was

established by the Journal of Information Technology & Tourism (JITT). As a result, research into tourism e-commerce began to flourish. Leung and Law (2007) found that tourism research showed a multidisciplinary trend, especially in areas related to the internet such as the internet's effects on tourism marketing, tourism product pricing, and consumer interactions. Navío-Marco et al. (2018) found that the wide application of wearables, smart tourism, AI, and ontologies has significantly promoted innovations in the tourism industry. They also stressed that the emerging trends of tourism e-commerce should be identified from a multidisciplinary perspective.

Tourism e-commerce is a typical multidisciplinary area that concerns tourism, information technology, management, and business (Lian et al. 2016; Okumus et al. 2018). On the one hand, tourism e-commerce is formed by the interweaving of tourism and information technology, which is an important research direction of the tourism discipline. On the other hand, e-commerce involves many disciplines such as information technology, management and business, which are prominent discipline classifications on the Web of Science. Research papers related to e-commerce in the disciplines of information technology, management and business also belong to the classification of e-commerce. Therefore, the two leading disciplines of the tourism e-commerce research are actually tourism and e-commerce.

In the field of disciplinary research, domain analysis methods are often used to study the information structure of disciplinary knowledge, such as the knowledge scale, knowledge organization and citation mode (Hjørland 1997, 2017). Domain analysis was formulated by Hjørland and Albrechtsen (1995) as a new approach to information science or library and information science and has been studied for more than two decades. Hjørland and Albrechtsen (1995) defined domains as "thought or discourse communities, which are parts of society's division of labor". Smiraglia (2012) provided a definition of a domain as "a group with an ontological base that reveals an underlying teleology, a set of common hypotheses, epistemological consensus on methodological approaches, and social semantics". Moreover, regarding the operationalization procedures of defining a domain, Tennis' two dimensions are understood by Smiraglia as "extension and intension. The terms mean breadth and depth, respectively" (Smiraglia 2015; Tennis 2003). On the one hand, tourism e-commerce covers tourism, information technology, management, and business. On the other hand, tourism e-commerce mainly focuses on tourism social media, online consumer behaviour and tourism information systems. Thus, tourism e-commerce meets all the requirements of a domain.

Domain analysis has obvious advantages in related research employing an effective analysis of knowledge transfer, use and intermediary actions, and is an important methodological approach to research concerning knowledge organization (Joo et al. 2018). Domain analysis has received widespread attention from scholars and has become one of the important theoretical paradigms recognized by the international information science community. For example, using a domain analysis, Castanha and Wolfram (2018) found that the journal *Knowledge Organization* plays an important role as a space for knowledge construction in the area of knowledge organization. Similarly, Zhang et al. (2018) indicated that the number of documents pertaining to vulnerability assessment in the context of climate change presented a general growth trend over the past twenty-seven years. From the ontological and sociological dimension of the knowledge organization domain, Roszkowski (2020) identified the most frequently used keywords in Google Scholar Profiles, and five clusters representing the main areas of interest were extracted under the methodological framework of a domain analysis.

Informetric analysis, which is one of the 11 main approaches of domain analysis, can highlight the hotspots and emerging trends of a research field from a unique subject perspective (Hjørland 2002; Schneider and Borlund 2004; Smiraglia 2015). For example, Bozkurt (2019) used the informetric method in a domain analysis to study hotspots and emerging trends in the research field of distance education. In the field of tourism e-commerce, some scholars have conducted informetric analyses of relevant research topics. Qian et al. (2019) analysed 657 articles related to tourism websites extracted from the Web of Science (WoS) database between 2001 and 2017 using a informetric analysis and found that electronic word-of-mouth (eWOM), behaviour and information are hot topics in tourism website research. Avila-Robinson and Wakabayashi (2018) also used this type of analysis to identify studies in tourism destination management and marketing research from 49 tourism journals published from 2005 to 2016. The results show that information and communication technology (ICT) and social media have been rapidly evolving as research frontiers. Based on the ENTER conference proceedings (2005-2012) of the International Federation for Information Technologies in Travel and Tourism (IFITT), Peng et al. (2014) used informetric analysis and proposed six research themes and development trends of the ENTER conference from the interdisciplinary perspective of information technology and tourism. In the research fields of mobile tourism and information technology, Liang et al. (2017) noted that applications of tourism-related technology and studies of tourists' behaviour will be hotspots in future tourism e-commerce research.

Using a informetric analysis, Lin et al. (2016) investigated the scientific topics of e-commerce journals, and their results show that hospitality management is among the six leading scientific topics in e-commerce research, accounting

for 4% of the total. Buhalis and Law (2008) and Navío-Marco et al. (2018) surveyed the e-tourism literature in the form of a literature review and noted that consumers and demand, technological innovation, and industry and business functions were the three main research topics of e-tourism. To maintain a competitive advantage, develop marketing strategies and support decision-making, tourism has been intertwined with information technology (Cai et al. 2019). The application of information technology has achieved high levels of user satisfaction in the tourism industry through approaches such as information communication technologies (ICTs), virtual reality (VR), information search, multimedia, web design, and electronic word-of-mouth (Buhalis and Law 2008; Navío-Marco et al. 2018).

The previous studies have tended to conduct informetric analysis from the perspective of a single discipline, lacking a multidisciplinary perspective and not directly targeting the theme of tourism e-commerce. However, due to the differences between the two leading disciplines, they provide different contributions to the tourism e-commerce research. It is impossible to grasp disciplinary characteristics and development trends from only a single disciplinary perspective. Multidisciplinary research has attracted the attention of scholars because it can effectively reveal the differences in a research topic among different disciplines. For example, using co-occurrence network analysis and burst detection methods, Dong et al. (2018) identified the subjects of library and information science (LIS) from a multidisciplinary perspective. Discussing the topics of the information science literature from a multidisciplinary perspective, Xu et al. (2016) found that the intersections of external disciplines and the pivots of internal topics for LIS can be identified by utilizing the topic terms multidisciplinary (TI) value and betweenness centrality values. By classifying research articles from a multidisciplinary perspective, Fang (2015) showed the possibility of a more precise determination of the subject categories of articles. Multidisciplinary research can not only help scholars systematically understand hotspots and emerging trends, but it can also facilitate the exploration of the evolution of knowledge and promote the steady development of a research field (Chen et al. 2015; Uddin et al. 2019; Wu et al. 2015).

To better understand the differences in the research on tourism e-commerce in tourism and e-commerce and to extract the hotspots and emerging trends of tourism e-commerce with the intent of providing theoretical reference for interested scholars, we will answer the following questions:

1. What changes have taken place in the research on tourism e-commerce in the past two decades in terms of the volume of relevant literature?
2. Which studies constitute the core of the tourism e-commerce research field? What is the status of their co-cited references? Are there any differences between the two leading disciplines?
3. What are the new emerging trends in keywords in the two leading disciplines?
4. What are the characteristics of the thematic clusters in the two leading disciplines?
5. What are the differences in the research topics of journals between the two leading disciplines?

The remainder of this paper is organized as follows. The "Material" section describes the data collection and pre-processing. The "Analytical Methods and Tools" section introduces the methodologies adopted by this paper. The "Results and Discussion" section explores the hotspots and emerging trends of tourism e-commerce by analysing five indicators: scientific outputs, co-cited references, burst keywords, co-occurrence networks, and journal topic characteristics. Finally, the "Conclusion" and "Limitations" sections conclude the study and discuss limitations and future research directions.

2.0 Material

Regarding the selection of data sources, this study considers only the literature included in the Web of Science (WoS) Core Collection, one of the leading citation index websites worldwide. Therefore, the authoritativeness of the collected literature data can be guaranteed (Song et al. 2016). The WoS Core Collection is a trustworthy, high-quality, definitive database for journals, books and conference proceedings. Most major publications on tourism e-commerce are included in the WoS online database, which allows us to extract the relevant articles by using an appropriate retrieval strategy. The journal articles retrieved were from 1999 to 2018, and the date of retrieval was March 1, 2019.

To search the related research results in a more comprehensive way, we collected relevant literature on tourism e-commerce. This paper collects literature from the tourism and e-commerce disciplines. The tourism journals were selected from the hospitality, leisure, sport and tourism categories in Journal Citation Reports. This study adopted the research conclusion drawn by Köseoglu et al. (2019) regarding the selection of tourism journals in WoS and deleted the irrelevant journals. Finally, 25 tourism journals were identified as data sources. In terms of e-commerce journals, this study adopts the selection criteria of Bharati and Tarasewich (2002), Standing et al. (2010) and Tsai (2015) on e-commerce journals, and excludes journals that do not publish articles continuously, or publish only conference papers such as *Administration Science Quarterly*, and *Scandina-*

Rank	Journal	Abbreviation	Outputs
1	Tourism Management	TOURISM MANAGE	273
2	International Journal of Hospitality Management	INT J HOSP MANAG	177
3	Journal of Travel & Tourism Marketing	J TRAVEL TOUR MARK	172
4	Journal of Travel Research	J TRAVEL RES	104
5	Annals of Tourism Research	ANN TOURISM RES	72
6	Current Issues in Tourism	CURR ISSUES TOUR	68
7	Asia Pacific Journal of Tourism Research	ASIA PAC J TOUR RES	62
8	International Journal of Tourism Research	INT J TOUR RES	57
9	Journal of Hospitality & Tourism Research	J HOSP TOUR RES	54
10	Journal of Hospitality Marketing & Management	J HOSP MARKET MANAG	53

Table 1. Top 10 journals in the tourism discipline.

Rank	Journal	Abbreviation	Outputs
1	Expert Systems with Applications	EXPERT SYST APPL	96
2	Management Science	MANAGE SCI	31
3	Decision Support Systems	DECIS SUPPORT SYST	26
4	Online Information Review	ONLINE INFORM REV	25
5	International Journal of Information Management	INT J TECHNOL MANAGE	25
6	Information & Management	INFORM MANAGE-AMSTER	24
7	Industrial Management & Data Systems	IND MANAGE DATA SYST	19
8	Operations Research	OPER RES	14
9	International Journal of Human-Computer Studies	INT J HUM-COMPUT ST	14
10	International Journal of Electronic Commerce	INT J ELECTRON COMM	12

Table 2. Top 10 journals in the e-commerce discipline.

vian Journal of IS. Finally, 53 e-commerce journals were selected.

In this study, journals on tourism and e-commerce were searched to obtain examples from the research literature on tourism e-commerce. For the 25 tourism journals, the retrieval terms were set as follows: (1) search terms directly related to e-commerce such as e-commerce and e-tourism; (2) search words that are indirectly related to e-commerce but can represent the research content of e-commerce such as social media, social networks, eWOM; (3) terms related to tourism e-commerce platforms such as TripAdvisor, Expedia, and C-trip. A total of 1840 studies were collected. For the 53 e-commerce journals, the retrieval terms were set based on two aspects: (1) words directly related to tourism such as "tourism", "trip", "travel", "e-tourism", and "e-trip" and (2) expressions related to tourism e-commerce platforms such as TripAdvisor, Expedia and C-trip. A total of 610 studies were retrieved. To ensure the accuracy of the results, we conducted a manual comparison of the retrieved studies, reading them one by one (Zhang et al. 2019). Repeated records and papers unrelated to research topics, such as articles on health and medical tourism, were eliminated, resulting in 1960 literature records. Table 1 and table 2 show the top 10 journals and their abbreviations, respectively.

3.0 Analytical Methods and Tools

3.1 Informetric analysis

Hjørland (2002) first proposed 11 approaches to domain analysis, and then Smiraglia (2015) generated a revised taxonomy of approaches including subject pathfinders, special classifications and thesauri, empirical user studies, informetric studies, historical studies, document and genre studies, epistemological and critical studies, terminological studies, database semantics, discourse analyses, and cognition, expert knowledge, and AI. As one of the 11 main approaches to domain analysis, informetrics is widely used to evaluate research performance and impact and analyse the hotspots and emerging trends in a specific research field (Castanha and Grácio 2014; Du et al. 2014). In this study, we use CiteSpace, BibExcel, and Gephi software as a informetric tool to analyse scientific output, co-citation networks, keyword bursts, thematic clustering and journal topic characteristics to reveal the differences between the two leading disciplines in tourism e-commerce and future research directions. Specifically, BibExcel was used to extract keywords, count keyword frequency, and construct the co-occurrence of journal names and keywords, and CiteSpace was used in co-citation analysis, burst detection and thematic clustering. All visualization maps of co-occurrence networks were drawn by Gephi.

3.2 Co-occurrence analysis

Co-occurrence analysis uses a statistical method to analyse the distribution characteristics of the co-occurrence knowledge unit from the text, digging the potential knowledge and its correlation, and displaying the results in a visual form. Co-occurrence analysis is often used to dissect the co-occurrence relationship and intensity of a group of word pairs in the same literature, which can effectively reflect the knowledge correlation and dependence of the literature data (Li and Sun 2017). The higher the frequency of two keywords co-occurring, the closer their relationship (Lian et al. 2016). This paper discusses the knowledge combination relationship among disciplines based on the research direction level, thematic level and other levels to observe the specific knowledge role and process of the discipline of tourism and e-commerce in multidisciplinary development. Through a multidisciplinary perspective analysis, the context and process of the evolution of knowledge in the tourism e-commerce field are revealed to estimate the research trends and the evolution of hotspots of the two leading disciplines (Navío-Marco et al. 2018).

3.3 Social network analysis

Social network analysis considers research objects (such as journals, literature, and keywords) and nodes, and mainly analyses the relation schema among the actors. The connection between nodes represents the association between research objects, and the location of nodes reflects the importance of research objects (Zhao and Wu 2014). Social network analysis is used to calculate and visualize the relationship between knowledge networks in a discipline (Köseoglu et al. 2019). For example, the phenomenon of "cohesion" will appear in a highly cited literature network, which is reflective of the characteristics of a subgroup's interconnectedness with other groups. The subgroups in a network actually represent disciplines. Therefore, a highly cited studies network can present not only the research topics of a field but also the degree of proximity among various disciplines (Vogel and Guettel 2013). Therefore, this study uses the literature metrological and network visualization analysis software CiteSpace, combined with the network analysis software Gephi, to conduct an interdisciplinary analysis of keyword co-occurrences and co-cited references, calculating their network centrality, which can identify and show the hot spots and research trends in the tourism e-commerce field more clearly and scientifically (Scharnhorst et al. 2016; Wei et al. 2015).

4.0 Results and discussion

4.1 Characteristics of scientific outputs

This paper conducts statistical analyses of the scientific publications in the field of tourism e-commerce by year focusing on the two leading disciplines of tourism and e-commerce. The trend of the annual volume of publications from 1999 to 2018 is presented in Figure 1. In the past 20 years, the overall research output of tourism e-commerce has shown a steady upward trend year by year. There is a significant difference between the two leading disciplines in the degree of attention to tourism e-commerce, especially in regard to the tourism literature, which has grown significantly. From 1999 to 2018, the number of studies increases from 1 to 265, while the literature on e-commerce has grown relatively slowly, from 6 to 49.

As shown by Figure 1, it is obvious that the research on tourism e-commerce can be divided into two stages (Xu et al. 2018). The first is the tourism e-commerce research germination stage (1999-2007), representing the exploration stage of tourism e-commerce. At this stage, the theory and methods have not yet matured, and the number of publications is low. More specifically, the increase in the annual output of literature is very slow; only 32 articles were published in the 8 years from 1999 to 2007. The literature

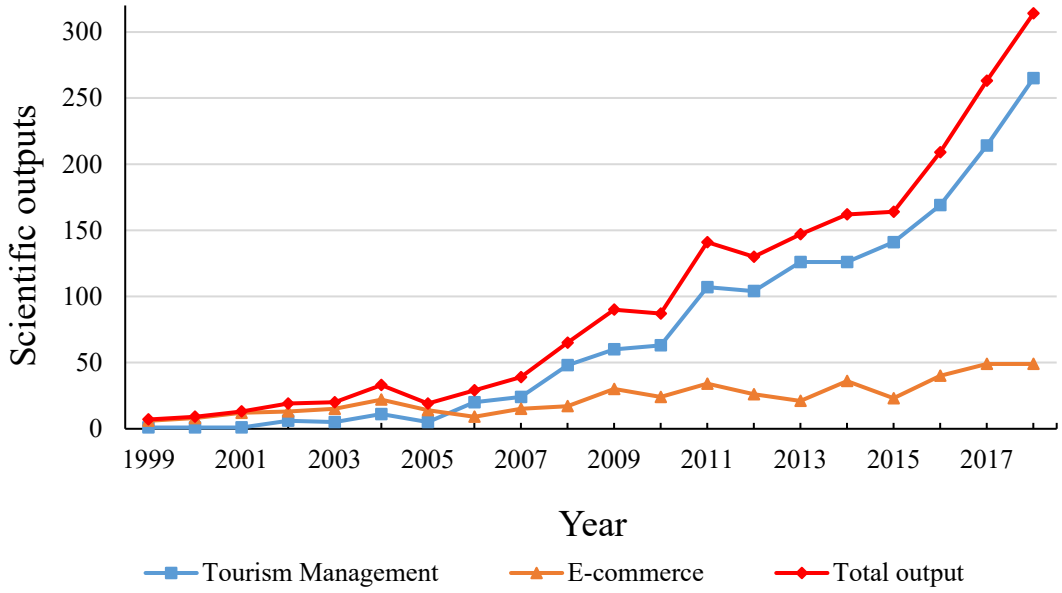


Figure 1. The scientific output of tourism e-commerce literature from 1999 to 2018.

growth trend of the two leading disciplines is overall the same. A total of 188 articles were published in the two leading disciplines, accounting for 9.6% of all publications. The second stage is the research rapid development stage (2008-2018), which is due to the gradual maturation of relevant theories and methods in the discipline, the development of the Internet or information technology, and the deepening of interdisciplinary research (Navío-Marco et al. 2018). Research on tourism e-commerce has received attention from the academic community, and its content has become increasingly extensive (Zhang et al. 2015); thus, the literature has achieved rapid growth. Between 2007 and 2018, the annual output of literature increased from 39 to 314 studies. In particular, the number of publications in the tourism discipline increased from 48 to 265, directly promoting the research on tourism e-commerce overall. Regarding the development of business research, between 2008 and 2018, the growth in publications related to the e-commerce discipline showed a slight increase from only 17 to 49 studies.

4.2 Co-citation analysis

Co-citation networks provide insights into the connections among co-cited literatures. Co-citation analyses make it possible to identify groups of intellectually interrelated scientists and their publications. Citation network analysis is used to reveal the correlation between documents, which can more accurately reveal the structure and process of scientific development in a field of research. This study constructs reference co-citation literature knowledge network maps for the two leading disciplines, as shown in Figures 2 and 3.

As shown in Figure 2, there are mainly two clusters in the knowledge map of the tourism discipline. One cluster is represented by two articles published by Xiang (2010) and Litvin (2008) in *Tourism Management*, which are important documents in the research on tourism social media. Xiang and Gretzel's article titled "Role of social media in online travel information search" has the largest distribution in the graph, and the node has the highest betweenness centrality, with 176 co-citations. This study investigates the extent to which social media appear in search engine results in the context of travel-related searches.

Another topic cluster was the research of tourism consumer behaviour. Its typical representatives were three articles published by Sparks (2011), Ye Q (2009), and Ye QA (2011). The two articles by Ye Q (2009) and Ye QA (2011) on consumers' online booking of hotels have 68 and 65 co-citations, respectively. Notably, a review article on e-tourism in *Tourism Management* titled "Progress in information technology and tourism management: 20 years on and 10 years after the Internet-The state of eTourism research" published by Buhalis (2008) had 118 co-citations, second only to the study by Xiang (2010). This paper comprehensively reviews and analyses prior studies in the context of applications of the internet to tourism.

As shown in Figure 3, there are relatively few landmark documents in the field of e-commerce, and the literature

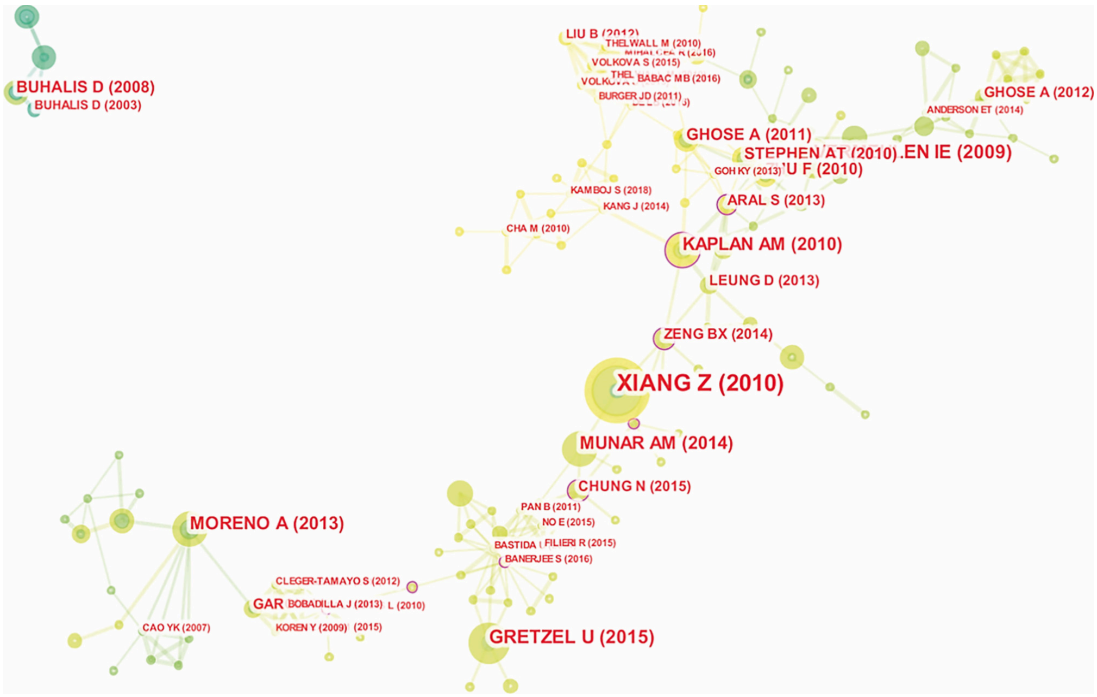


Figure 2. Reference co-citation map of tourism e-commerce research in the tourism discipline.

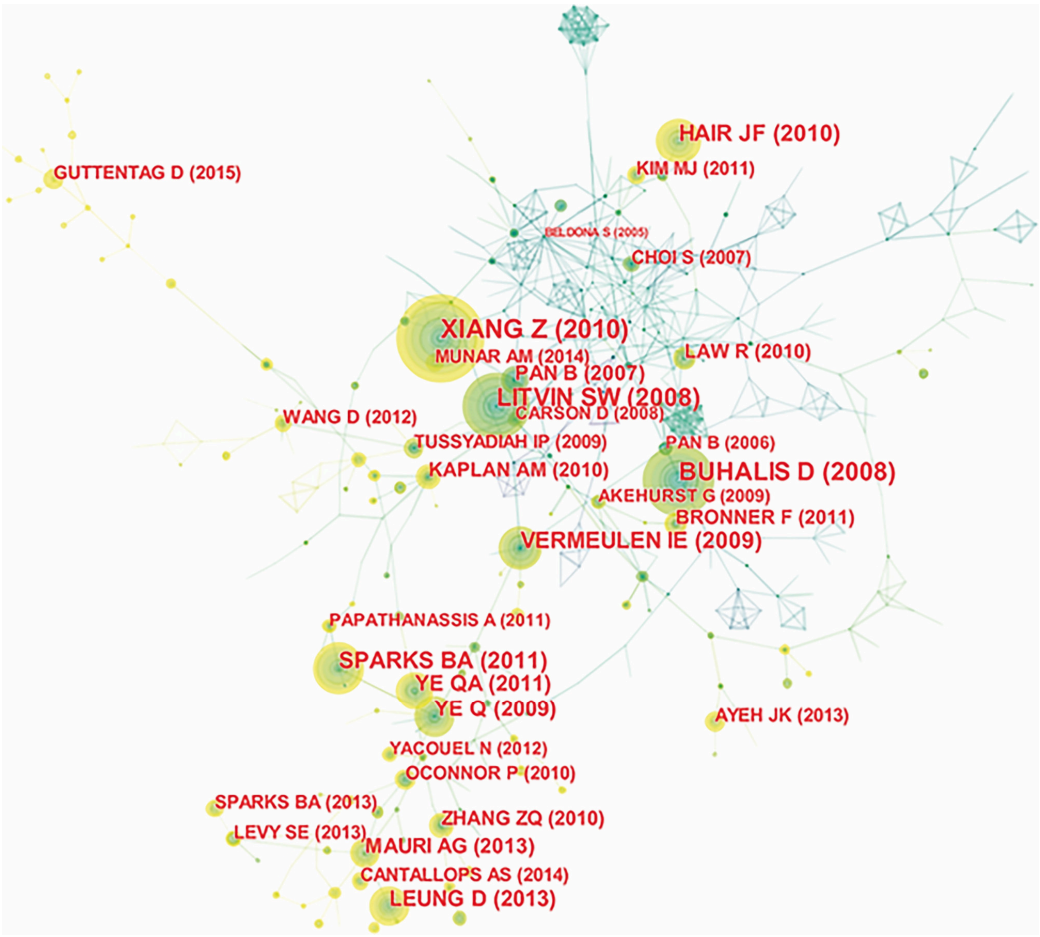


Figure 3. Reference co-citation map of tourism e-commerce research in the e-commerce discipline.

has a divergent distribution that does not have obvious cluster features. The most frequently co-cited article is the same as that in the tourism discipline, the study published by Xiang (2010). The article titled "Motivations for sharing tourism experiences through social media" published by Munar (2014), ranks second with 8 co-citations. The study reveals a dominance of visual content, along with the relevance of altruistic and community-related motivations and the motivational differences between types of content creators.

4.3 Burst detection of keywords

Keywords are the highly refined and summarized core content from articles, and burst keywords can reflect the emergence of certain keywords in a short period of time. Through keyword burst detection, we can identify the growing topics in this research area, delineate the evolutionary path of the keywords in the tourism e-commerce field, highlight the transformation of the main research topics in different years, and help researchers identify the trend of enhancing, weakening and stabilizing interdisciplinary themes (Chen 2017). Figures 4 and 5 show the burst distribution of keywords in two leading disciplines. The red line in the figure represents the beginning and ending times of the study as a research hotspot, and the dark blue line displays the time after publication.

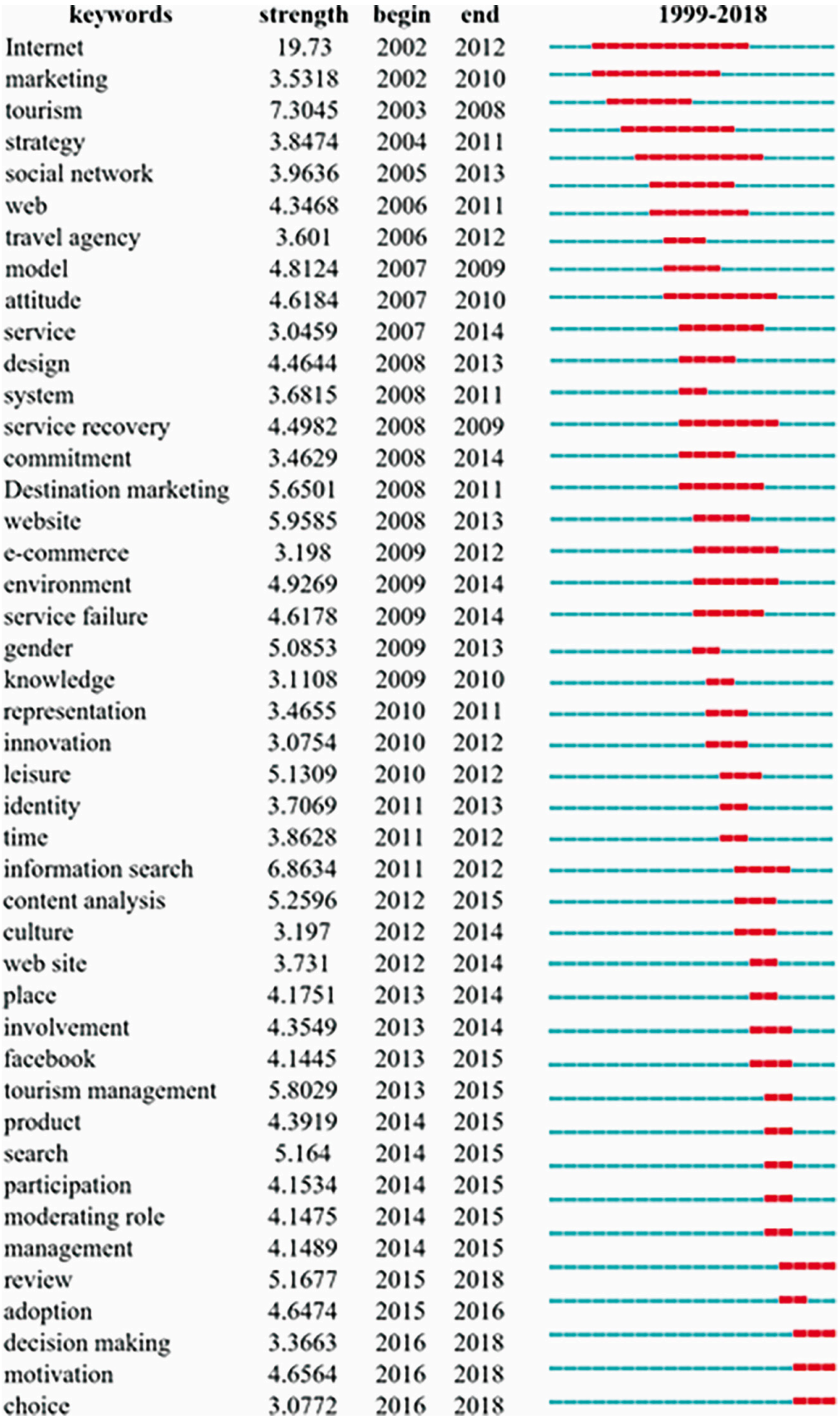
As shown in Figure 4, the burst keywords in the tourism discipline appeared every year from 2002 to 2016. The keywords with the longest burst duration include: Internet, marketing, social network, and service, with their burst duration lasting more than 8 years. Meanwhile, the keywords service recovery, knowledge, representation, time, information search, place, involvement, product, search, participation, moderating role, management, and adoption had a burst duration lasting only two years.

Based on the time period, the burst keywords can be divided into three stages. The first stage, 2002-2009, is characterized by a long duration of burst keywords, rich research hotspots, and a high level of attention. Representative keywords include Internet, marketing, tourism, strategy, social network, web, travel agency, service, design, commitment, website, environment, and service failure. Clearly, in the early stage, tourism e-commerce research focuses on how to apply information technology or e-commerce business to solve management issues such as strategy and marketing. Buhalis and Law (2008) argued that the internet has provided new tools for tourism marketing and management and dramatically changed the market conditions of tourism organizations. The second stage, from 2010 to 2014, shows rapid development in the tourism discipline. The burst keywords last for a short time, and the research hotspots change rapidly. The duration of each burst keyword is generally 2-3 years. Representative keywords include innovation, leisure, content analysis, culture, web site, Facebook and tourism management. This stage concentrates on research on technological innovation and its impact on the tourism industry, particularly, radio frequency identification (RFID), near field communication (NFC), AI and wearables in tourism (Navío-Marco et al. 2018). Regarding the third stage, from 2015 to 2018, the burst keywords in this period include adoption, review, decision making, motivation and choice, of which the latter four are emerging burst keywords that represent the hotspots of tourism e-commerce research.

As shown in Figure 5, the research hotspots in the e-commerce discipline are scattered, and only eight burst keywords are extracted: electronic commerce, performance, information system, knowledge, system, quality, Internet and web site. The burst keywords "electronic commerce" and "performance" had the earliest appearance and lasted for the longest amount of time, indicating that the research hotspots in this period focused on the performance of tourism e-commerce. Then, the three burst keywords "information system", "system", and "web site" appeared in 2003, 2007, and 2011 respectively, showing that research on tourism e-commerce systems and platforms, such as recommendation systems and e-commerce platforms has always been an important topic and has received extensive attention from scholars (Buhalis and Law 2008; Navío-Marco et al. 2018). The burst keywords "knowledge" and "quality" appeared in 2005 and 2008, respectively, showing the focus of research on the quality of tourism e-commerce services. During this period, electronic service quality was an important hotspot in e-commerce research. Scholars introduced the relevant theory of electronic service quality into research on tourism e-commerce, and the research hotspot of tourism e-commerce service quality was formed. There have been no burst keywords in the e-commerce discipline since 2011.

4.4 Thematic clusters

In this paper, the keyword co-occurrence phrases and co-occurrence network were constructed to compare the differences in knowledge correlation in tourism e-commerce between the two leading disciplines and to reveal the context of knowledge evolution. In the case of data processing, the upper- and lower- case letters and the fully written out version and abbreviation of the same keywords are combined. For example, electronic word of mouth, word of mouth, word-of-mouth, eWOM, and WOM are all represented by eWOM. The keyword co-occurrence network is shown in Figures 6 and 7, where the node size represents the weight of the node and the thickness of the connecting lines indicates the co-occurrence frequency of the nodes.



keywords	strength	begin	end	1999-2018
Internet	19.73	2002	2012	
marketing	3.5318	2002	2010	
tourism	7.3045	2003	2008	
strategy	3.8474	2004	2011	
social network	3.9636	2005	2013	
web	4.3468	2006	2011	
travel agency	3.601	2006	2012	
model	4.8124	2007	2009	
attitude	4.6184	2007	2010	
service	3.0459	2007	2014	
design	4.4644	2008	2013	
system	3.6815	2008	2011	
service recovery	4.4982	2008	2009	
commitment	3.4629	2008	2014	
Destination marketing	5.6501	2008	2011	
website	5.9585	2008	2013	
e-commerce	3.198	2009	2012	
environment	4.9269	2009	2014	
service failure	4.6178	2009	2014	
gender	5.0853	2009	2013	
knowledge	3.1108	2009	2010	
representation	3.4655	2010	2011	
innovation	3.0754	2010	2012	
leisure	5.1309	2010	2012	
identity	3.7069	2011	2013	
time	3.8628	2011	2012	
information search	6.8634	2011	2012	
content analysis	5.2596	2012	2015	
culture	3.197	2012	2014	
web site	3.731	2012	2014	
place	4.1751	2013	2014	
involvement	4.3549	2013	2014	
facebook	4.1445	2013	2015	
tourism management	5.8029	2013	2015	
product	4.3919	2014	2015	
search	5.164	2014	2015	
participation	4.1534	2014	2015	
moderating role	4.1475	2014	2015	
management	4.1489	2014	2015	
review	5.1677	2015	2018	
adoption	4.6474	2015	2016	
decision making	3.3663	2016	2018	
motivation	4.6564	2016	2018	
choice	3.0772	2016	2018	

Figure 4. Top 44 burst keywords in the tourism discipline.

keywords	strength	begin	end	1999-2018
electronic commerce	4.5348	2000	2005	
performance	4.1028	2001	2009	
information system	3.0749	2003	2005	
knowledge	3.6863	2005	2009	
system	4.4867	2007	2004	
quality	3.5156	2008	2009	
internet	3.2086	2011	2013	
web site	3.5226	2011	2015	

Figure 5. Top 8 burst keywords in the e-commerce discipline.

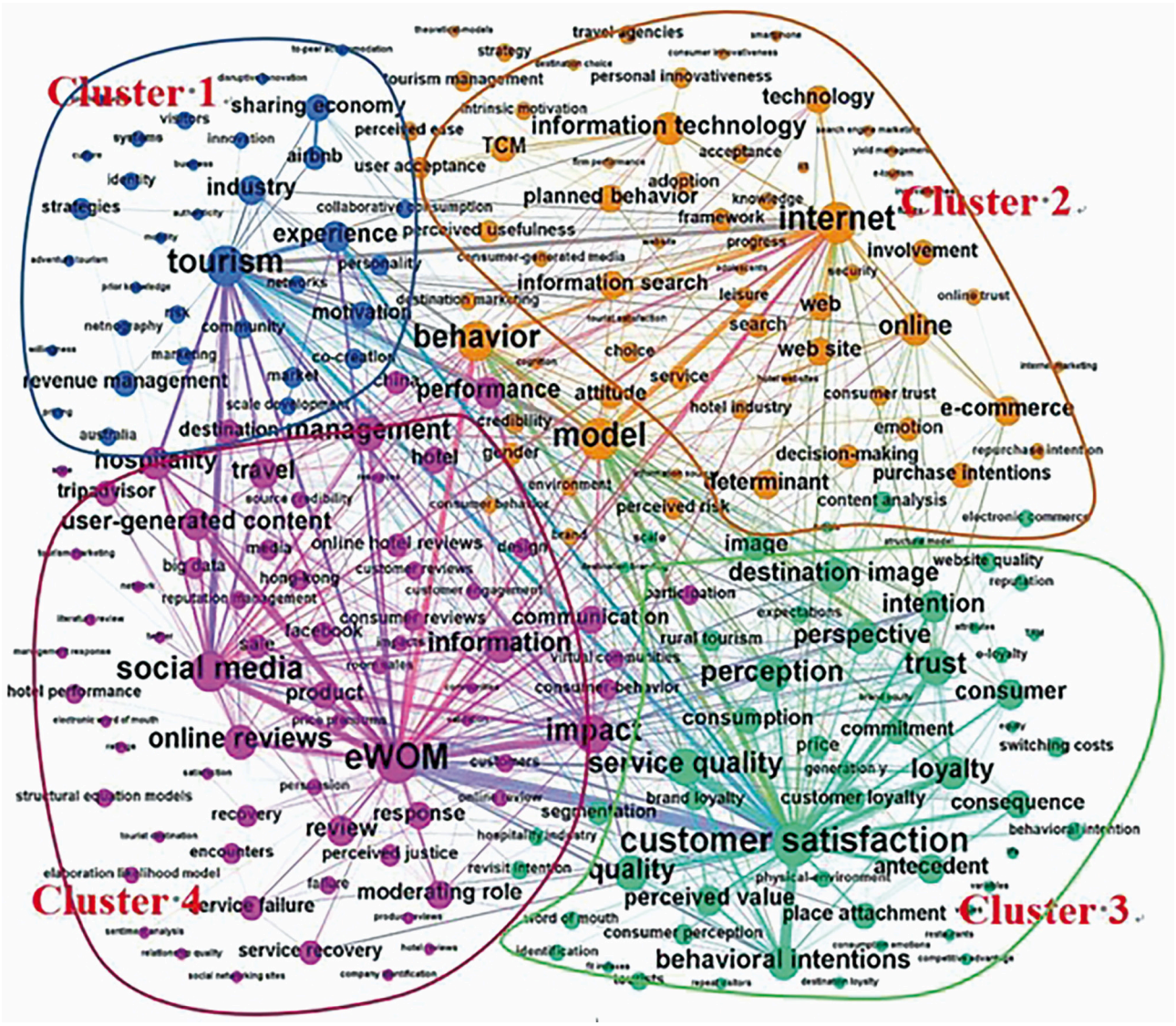


Figure 6. Keyword co-occurrence in the tourism discipline.

As shown in Figure 6, research related to tourism e-commerce in the tourism discipline presents four major clusters. Cluster 1 represents tourism industry research with the following core keyword: tourism. Representative keywords include industry, experience, sharing economy, Airbnb, and marketing. The theme of this cluster is not clear, and the in-

tensity of co-occurrence is lower. The main co-occurrence relationships are tourism-industry, tourism-experience, tourism-sharing economy, sharing economy-Airbnb, and tourism-marketing. Cluster 2 illustrates network and information technology research. The core keyword is Internet, and representative keywords include information technology, information search, web, and TCM. The research content of this cluster is relatively loose, and the overall co-occurrence intensity is not high. There are only weak co-occurrence relationships among Internet-information technology, Internet-information search and Internet-web. Cluster 3 shows research on tourism consumer behaviour. The core keywords are customer satisfaction, and representative keywords include trust, service quality, loyalty, behavioural intentions, and perceived value. The most intensive co-occurrence relationships include customer satisfaction-behavioural intentions, customer satisfaction-trust, customer satisfaction-service quality, and customer satisfaction-loyalty. Cluster 4 concerns social media research which accounts for the largest proportion in the whole study. The core keyword is eWOM, and representative keywords include social media, online reviews, user-generated content, experiences, and performance. Among them, eWOM-social media, eWOM-online reviews and eWOM-user-generated content have the highest co-occurrence intensity and are the most important hotspots in research on tourism social media. Overall, there are close relationships among the four clusters, especially eWOM-customer satisfaction co-occurrence relationship, which is the most frequent relationship in the whole figure. Notably, in the keyword co-occurrence network, model and behaviour are closely related to all four clusters. However, model is not included in any categories of the clusters since its meaning is unclear.

As shown in Figure 7, the research contents of the e-commerce discipline are relatively scattered, and the co-occurrence relationships among keywords are weak. Research on tourism e-commerce is classified into four major clusters. The first is information and network research. This cluster has the closest keyword co-occurrence relationships and the highest frequency of average co-occurrence, showing that this cluster is the most important in the e-commerce discipline. The core keywords of this cluster are Internet and information, and representative keywords include information search, recommender system, information technology, web site, and market. Strong co-occurrence relationships include information system-e-commerce, information-user acceptance, and e-commerce-website. The topic of this cluster is clear, and the co-occurrence relationship among keywords is strong, having a dense distribution. Cluster 2 is organization and management research, which is the most dispersed cluster of the whole e-commerce discipline, and the co-occurrence relationships among keywords are weaker. The core keywords are organization and management, and representative keywords include value creation, technology, product, innovation, performance, efficiency and revenue management. The overall co-occurrence relationships are weaker; performance-management, firm-innovation, and network-firm have higher co-occurrence frequencies. Cluster 3 is research on social media, which is prominent in e-commerce research. Its core keywords are social media and eWOM, and representative keywords include trust, online consumer reviews, social networking sites, user-generated content, loyalty, sale, and online communication. The co-occurrence relationships among keywords, including eWOM-social media, eWOM-sale, and social media-value co-creation, are stronger. Cluster 4 is the research on customer satisfaction and consumer behaviour. Representative keywords include service quality, user acceptance, purchasing behaviour, and behaviour intention. Overall, the research on these keywords covers a wide range, but the co-occurrence relationships between them are weaker. Representative co-occurrence relationships include eWOM-social media and information technology-user acceptance.

4.5 Topic characteristics of journals

To explore the differences among various research contents in journals and to provide a reference basis by which researchers can publish, this study conducted a comparative analysis of the co-occurrence of journal names and keywords. To show co-occurrence relationships more clearly, the study excluded journals and keyword phrases with a frequency of less than 5. Additionally, the abbreviations of journal names were standardized based on Journal Citation Reports. The network diagrams of the co-occurrence of journal names and keywords in the two leading disciplines are shown in Figures 8 and 9.

Based on the results shown in Figure 8, the research related to tourism e-commerce in the tourism discipline is mainly concentrated in journals such as *Tourism Management,* the *International Journal of Tourism Research,* the *International Journal of Hospitality Management,* the *Journal of Travel & Tourism Marketing,* the *Journal of Travel Research,* and the *Journal of Destination Marketing & Management.* Four journals, i.e., *Tourism Management,* the *International Journal of Hospitality Management,* the *Journal of Travel & Tourism Marketing,* and the *Journal of Travel Research,* embrace the most research contents. They basically cover four major areas of tourism e-commerce research, i.e., the tourism industry, network and information technology, consumer behaviour, and social media. Among them, social media research is mostly concentrated in *Tourism Management*, with social media, word-of-mouth, reviews and other keywords having the highest frequency. The *International Journal of Hospitality Management,* the *Journal*

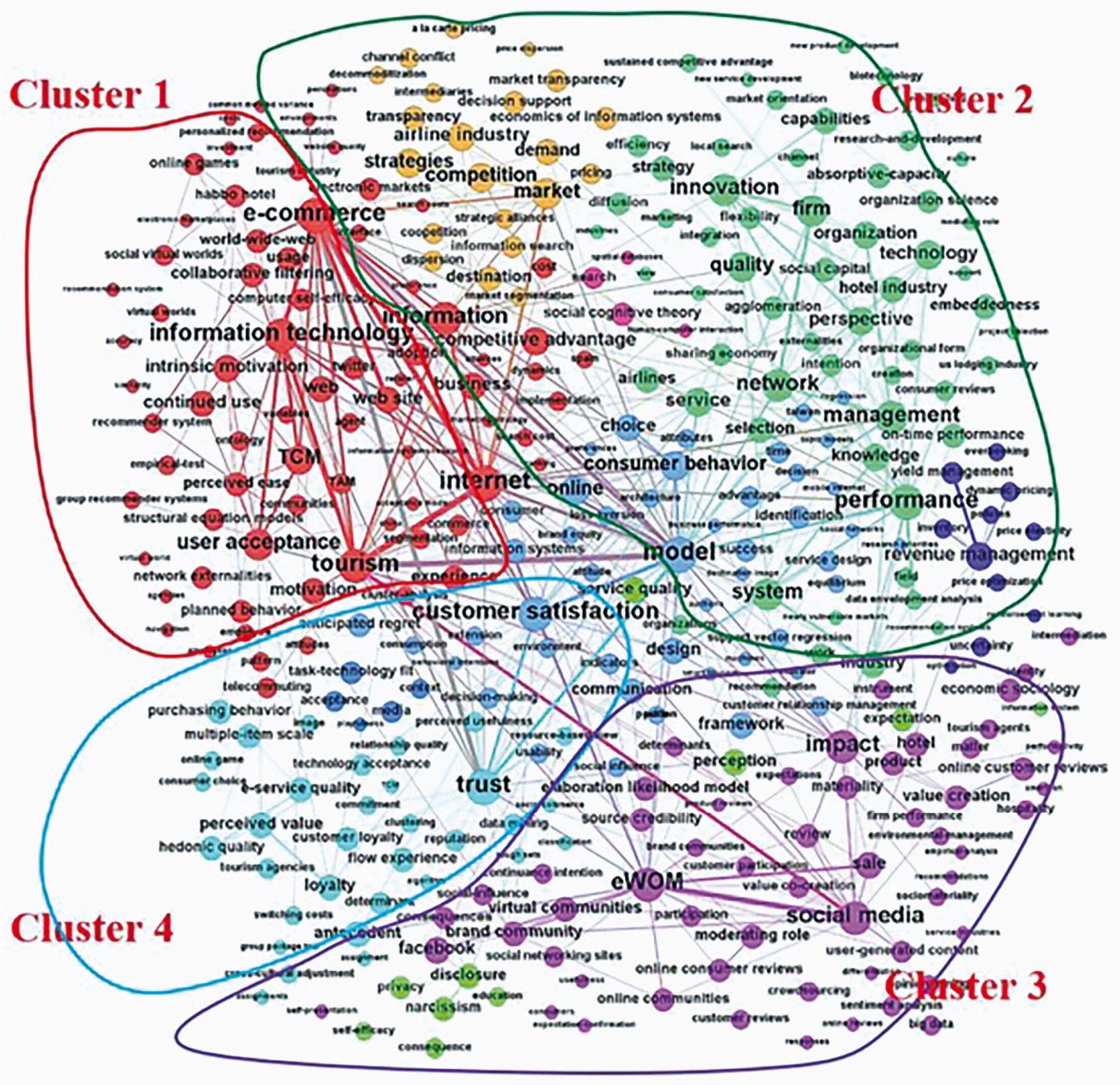


Figure 7. Keyword co-occurrence in the e-commerce discipline.

of Travel & Tourism Marketing, and the *Journal of Travel Research* are more concerned with research into tourism consumer behaviour, and their main keywords include consumer behaviour, customer satisfaction, trust, satisfaction, and performance. However, the research contents of *Leisure Studies*, *Tourism Economics,* the *Journal of Sustainable Tourism,* the *Journal of Vacation Marketing, Current Issues in Tourism, Cornell Hospitality Quarterly* and other journals are relatively scattered, and the key-content is not prominent.

Figure 9 shows that the e-commerce journals publishing research into tourism e-commerce mainly include *Management Science, Electronic Commerce Research and Applications, Industrial Management & Data Systems,* the *International Journal of Information Management, Expert Systems with Applications, and* the *Journal of Management. Information Systems*. These journals can be divided into three categories. The first category consists of management journals, such as *Management Science,* which are mainly focused on management issues in tourism e-commerce, such as revenue management, pricing, competition, performance, and marketing. The second category is represented by *Expert Systems with Applications* and *Decision Support Systems* and can be classified as information technology journals, that mainly concentrate on algorithms and information processing issues in tour-

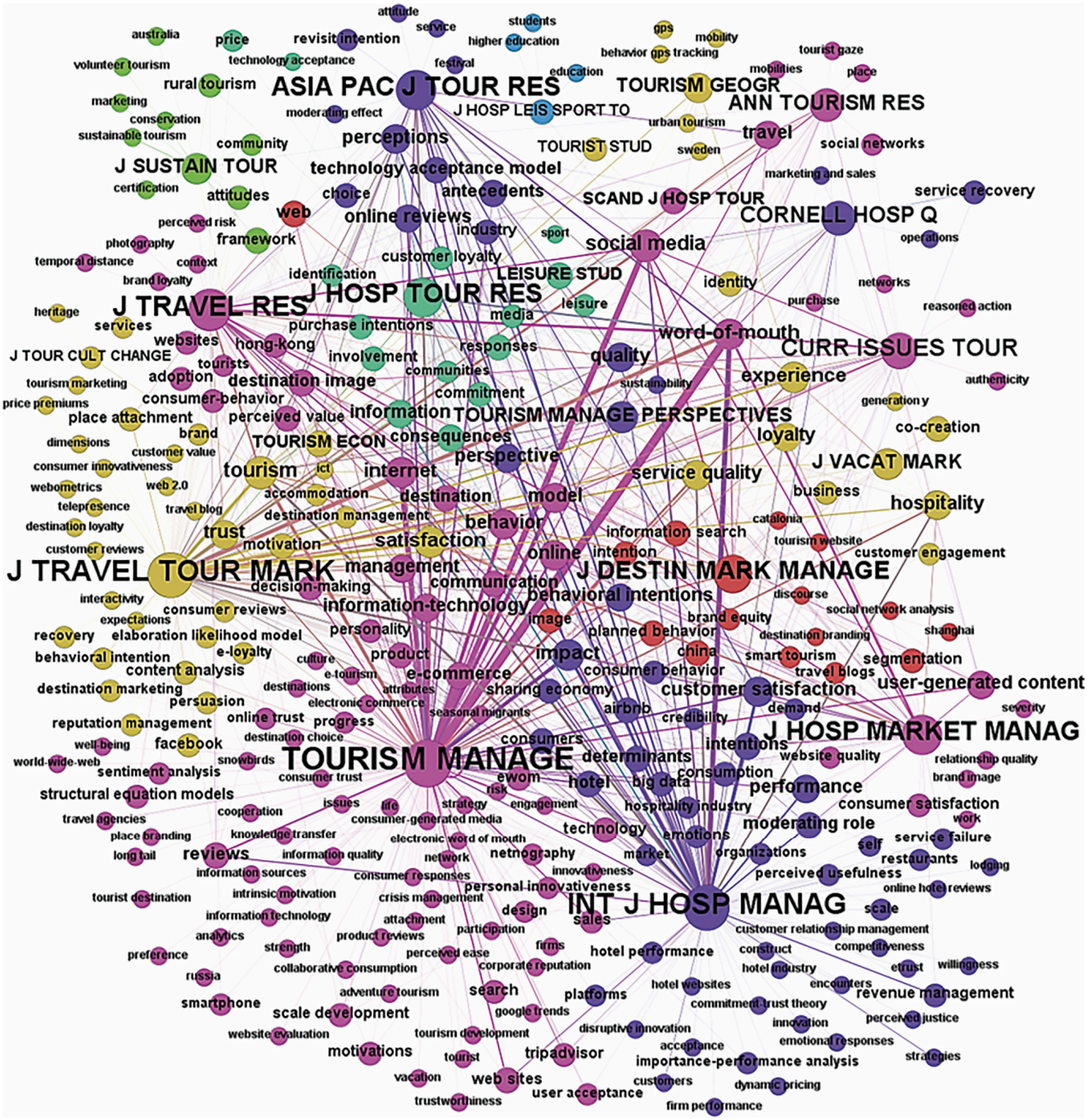


Figure 8. Journal topics of tourism e-commerce research in the tourism discipline.

ism e-commerce, such as data mining, opinion mining, machine learning, recommender systems, and group decision-making. The third category includes information management journals, such as the *International Journal of Electronic Commerce, Electronic Commerce Research and Applications*, *Information & Management,* the *International Journal of Information Management, and Industrial Management & Data Systems.* In this category, the research focuses on classical information management or e-commerce issues in tourism e-commerce, such as social media, information technology, service quality, trust, word-of-mouth, behaviour, and experience. Clearly, the overlapping research contents of the first and second journal categories are relatively small; however, both of them have overlapping contents with the third journal categories.

5.0 Conclusions

The study used the informetric method to conduct a domain analysis to study tourism e-commerce from a multi-

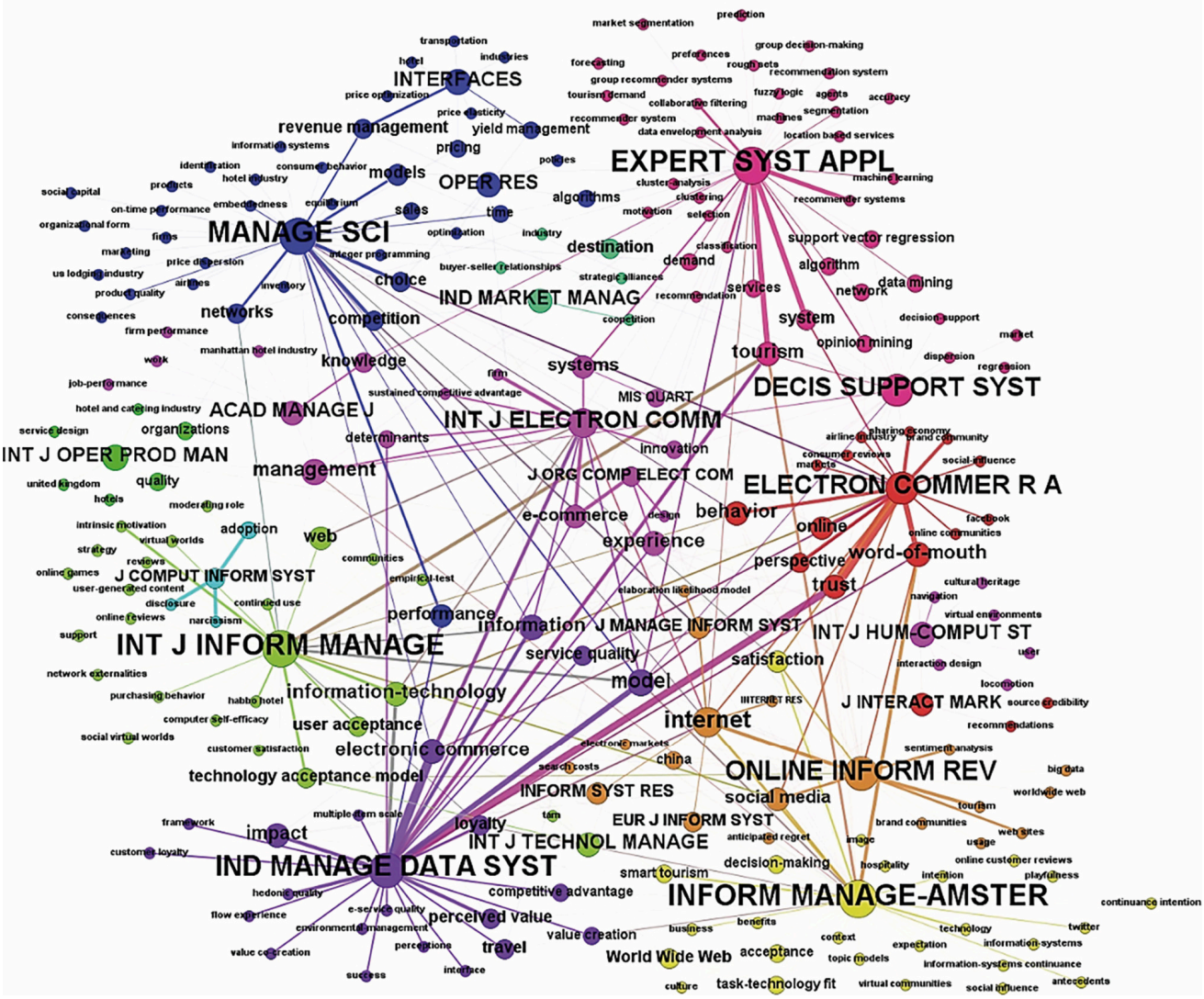


Figure 9. Journal topics of tourism e-commerce research in the e-commerce discipline.

disciplinary perspective and reveals some interesting and useful findings.

As is shown in "Results and Discussion", the data clearly present the extension and intension of the domain of tourism e-commerce. In terms of the extension of the domain, tourism e-commerce covers tourism, information technology, management and business. Thereinto, information technology and management have received relatively high attention. In terms of the intension of the domain, tourism e-commerce mainly focuses on social media, consumer behaviour, internet information technology, tourism organization management, etc. Especially in the domain of social media, several research directions have been proposed such as online reviews, eWOM, user-generated content, virtual community, perception value, value co-creation, forming a more complete research system.

Based on the comparative analysis of the number of publications, the two leading disciplines pay significantly different levels of attention to tourism e-commerce. Tourism e-commerce has become an important research direction of the tourism discipline. In particular, from 2007 to 2018, tourism e-commerce research showed a trend of rapid development coinciding with the development of information technology and e-commerce. In this stage, the profound integrated development of tourism and e-commerce led to the "tourism-Internet" business model and produced a series of hot topics with which researchers were highly concerned, such as mobile Internet and tourism, tourists' online behaviour, tourism eWOM, and travel information systems.

According to the results of the literature co-citation analysis, there are significant differences in the document co-citation networks of the tourism discipline and the e-commerce discipline. The co-citation network of the tourism discipline consists of two clusters, tourism social media and tourist behaviour; however, the e-commerce discipline is relatively scattered. This shows that the research into tourism

e-commerce has already achieved landmark research results and formed a relatively complete citation network, with studies having dense, high-frequency citations in the tourism discipline. In addition, the two disciplines have obvious overlaps in the document co-citation network. For example, Xiang (2010) and Munar (2014) are both important studies cited in the two leading disciplines.

The keyword burst analysis in this paper enabled us to explore time-specific research trends in the domains and shows that the tourism discipline has produced new research hotspots. During the entire 20-year research period, there were 44 emergent keywords, which can be divided into three research stages. By contrast, in the 20-year research period, only 8 burst keywords from the e-commerce discipline were extracted. Except for only one burst keyword, "performance", which lasted 9 years, the others had a relatively short duration. In particular, there are no emerging burst keywords after 2011. This reveals that the tourism e-commerce research is not the core research direction of the e-commerce discipline and that the research hotspots are relatively scattered.

The analysis of thematic clusters shows that the tourism e-commerce research in the tourism discipline presents a multidisciplinary trend involving disciplines such as management, computer science, psychology, and economics. The keywords social media, eWOM, online reviews and user-generated content have the highest co-occurrence frequency during the recent years. This shows that social media is the hotspot of tourism e-commerce in the tourism discipline. However, it should be noted that the e-commerce discipline no longer attaches much importance to the tourism industry; rather, it tends to study organizational and management issues in tourism e-commerce. These issues account for the largest proportion of the keyword distribution in the whole study, approximately 1/3 of all keywords, which also reflects the commercial attributes of the e-commerce discipline. In general, the relationship between the two leading disciplines is growing increasingly closer, and the research content, such as social media and eWOM, is overlapping.

The co-occurrence network of journals and keywords depicts the research theme distribution characteristics of journals, providing a reference for researchers aiming to retrieve and publish papers. The tourism discipline journals are concerned with the application of e-commerce in tourism, especially the changes in travel consumer behaviour brought about by information technology innovation. *Tourism Management,* the *International Journal of Hospitality Management,* the *Journal of Travel & Tourism Marketing* and the *Journal of Travel Research* are the four most important journals in tourism e-commerce research, having the highest rankings in terms of both scientific output and keyword quantity. The journals of the e-commerce discipline have relatively high research content discrimination, and pay more attention to the management reform brought about by the application of e-commerce in the tourism industry. These journals can be divided into three categories: management journals, represented by *Management Science*; information technology journals, represented by *Expert Systems with Applications*; and information management journals represented by *Decision Support Systems.*

6.0 Limitations

This article also has some limitations. Firstly, the data analysed in this study were derived from a single database, i.e., the WoS Core Collection, and only English-language studies were analysed. The literature on tourism e-commerce in other databases has not been searched and studied; thus, there are some limitations regarding how comprehensively we capture the tourism e-commerce research. Future research should consider expanding the number of databases to fully understand the development trend of tourism e-commerce. Secondly, from the domain analysis perspective, this research only uses one of 11 approaches to study tourism e-commerce while ignoring a combination with other approaches. Possible bias should be considered very carefully. To properly interpret informetric analyses, future research needs some knowledge of other types, such as historical and critical studies. Finally, the granularity of the topics determined by a computer can be either large or small, and sometimes, the relationship between the topics seems "inclusive". Although we added an artificial control to merge topics with similar meanings in the subsequent overall analysis, this issue is not completely resolved. In the future, with the continuous development of technologies and tools for semantic analysis and text mining, the negative impact of this problem is expected to be alleviated. To a large extent, this problem will not affect the situation of tourism e-commerce research. It is hoped that this paper can provide guidance for future research directions for scholars or publications in the field of tourism e-commerce research.

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