Senior Tourism: a network science approach over the last twenty years through CiteSpace

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ABSTRACT

Adopting a co-authorship and co-citation network approach, the aim of this paper is to evaluate senior tourism research during the last twenty years and to discover structures in terms of leading papers, journals, authors, countries and institutions. The mapping of bibliometric data use CiteSpace. Data from Scopus build a network of 512 articles. The results reveal a slow increase of research, with the last period including 40.69% of outputs. The most co-cited papers are mainly older, represent 2.73% of the sample and account for 13.24% of citations. The authors with most publications are Jang M and King M, representing 1.95%. The co-cited journals show a core-periphery structure, where Tourism Management is ranked first. The co-authorship network reveals that major collaborative networks are based on geographical and institutional proximity, dominated by the United States. The keyword analysis demonstrate that motivation, attitude, satisfaction, experience, heritage and tourism management are significant areas of emerging research**.**

Keywords: Bibliometrics; co-citation network; co-authorship network; senior tourism; CiteSpace.

1. Introduction

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). Consequently, a considerable body of empirical evidence has been accumulated regarding the importance of travelling in later life, and many studies on tourism focusing on this group are likely to emerge over the next decade (Glover & Prideaux, 2009). 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). Bibliometrics, a systematic review of scientific progress in a field, has becoming an increasingly significant issue in tourism studies (Hall, 2011), and are useful in providing the assessment of research or scientific production in a specific area over time (van Raan, 2005). However, the limited number of bibliometric studies focusing on senior tourists precludes the identification of a wide, unified body of work and hence, there is a call for increased effort in this field (Chen & Shoemaker, 2014, Patuelli & Nijkamp, 2015). Responding to this need, the authors conduct a study using the bibliometric methodology to discover structures in terms of articles, journals, authors, countries, institutions and trends within senior tourism covering the period from 1998 to 2017. To obtain a more accurate trajectory, we identify the most productive publications, authors, institutes, journals, countries, citations, keywords distribution (Li, Ding, Feng, Wang, & Ho, 2009; Mao, Wang, & Ho, 2010; Wang L., Wang Q., Zhang, Cai, & Sun, 2013), research hotspots, and areas of research (Zhou & Zhao, 2015). The study's outcomes will provide researchers with all-around insights into the current state of senior tourism research and will establish where further research is required.

Bibliometric analysis is now firmly established as scientific specialities and are an integral part of research evaluation methodology especially within the scientific and applied fields (Ellegaard & Wallin, 2015). Following the same authors, the use of bibliometric methods is obviously driven by a need to evaluate scientific production and making the results available to policymakers, scientists or other stakeholders. Researchers become aware of the new trends, competing groups and possibilities for scientific cooperation (Barth, Haustein, & Scheidt, 2014).

Our paper identifies the course of development and analyze different aspects of senior tourism research using a visual network analysis, which can benefit researchers in better communicating the data as well as facilitating the exploration of the data (Scott, Baggio & Cooper, 2008). The authors obtain a useful overview and understanding of this field over the last twenty years. The visual analysis tools help to investigate research patterns, emerging topics, and collaboration networks.

Therefore, the objective of the paper is to examine the collaboration networks, structures and trends in senior tourism, using a bibliometric visualisation analysis method. Given the need to a better comprehend the broad structure of senior tourism, this paper focuses on relational techniques by using CiteSpace, one of the most popular knowledge domain visualization tool (Chen, 2006; Chen, Ibekwe_SanJuan, & Hou, 2010). Knowledge mapping is defined as processes, methods and tools for analyzing knowledge areas to discover features or meanings and to visualize them in a comprehensive and transparent format (Speel, Shadbolt, De Vries, Van Dam, & O'Hara, 1999). It is one of the most important steps in management and can present concepts, knowledge and links in visual format. Co-citation and co-authorship analysis are applied to examine networks and provide a detailed understanding of the development of the research field. The rest of the paper is organized as follows: Section 2 presents the methodology. Section 3 shows the analytical results and discussion. Finally, Section 4 concludes with a summary of the work, its usefulness and limitations. The methodology and findings have implications for understanding the production of knowledge of senior tourism and will be of interest to tourism researchers.

2. Methodology

This study performs a co-authorship and co-citation analysis using CiteSpace to visualise research patterns and trends in the senior tourism field. To develop the study the sample selection and data analysis are the central issues.

2.1 Sample selection

The dimensions used as a basis for selecting the articles in senior tourism were: keywords, journals and years of publication. Concerning keywords, given the focus on senior tourism, these two words were used together with "aged" and old". To provide more scientific and accurate information about our research, only those articles with the search keywords on the title, abstract and keywords of the paper were extracted for further analysis (Fu, Wang, & Ho, 2012). The empirical study was carried out at the beginning of May 2018 and these keywords were searched in abstract, title and keywords included in Scopus database, which are frequently used for searching the tourism literature (Guz & Rushchitsky, 2009).

Focusing on time horizon, the analysis embraces twenty years, from 1998 to 2017 inclusively. Many articles have adopted similar time horizon (e.g. Ye, Li, & Law, 2013). Four-time periods were identified in order to map trends: first slice 1998-2002; second slice 2003-2007; third slice 2008-2012; fourth slice 2013-2017. Overall, these choices assure a wide coverage of the literature. Finally, concerning the journals, the number of selected papers explicitly focus their attention on tourism sector. Only journals published in English were included in the sample. Using these three criteria (keywords, time horizon and journals), the gross sample includes 1,944 articles from Scopus, as reported in Table 1. Articles are the document type analysed in our research, representing 76.99% of documents in Scopus.

All the articles were analysed to verify the relationship with the "senior tourism" research stream. This choice lead to identify articles outliers, which are not relevant in senior tourism literature, because they analyse aged

people not in tourism, or tourism for groups younger than 60 years old. Then, 67.13% articles from Scopus were excluded from the gross sample. Also papers that are not cited by other studies and therefore remain disconnected, were eliminated. This correspond to 4.68% from Scopus. Subtracting outliers and disconnected articles from the gross sample, we obtain the net sample, which counts 548 connected articles from Scopus. A total of 512 articles were successfully converted from Scopus to the Web of Science (WoS) format for further analysis using CiteSpace Java Application (Chen, 2014). The conversion rate of references in the source articles was very good at 89% after removing data irregularities, which is close to 95% which is described by Chen (2004) as excellent.

Table 1: Sample size from Scopus

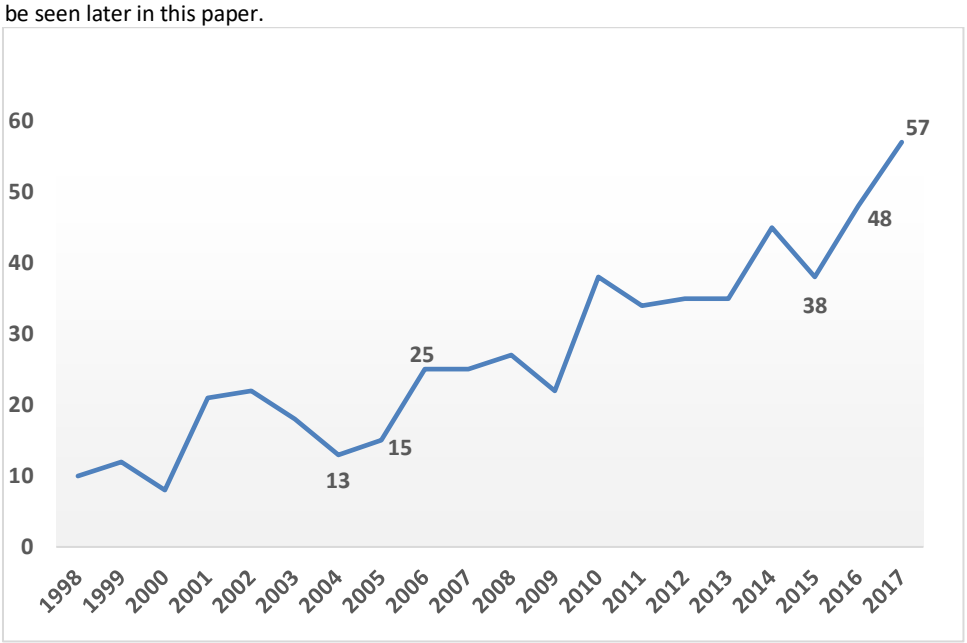
Subnetwork	Documents		Gross sample: Articles		Outliers		Disconnected		Connected		Scopus converted to WoS	
Years	N	%	N	%	N	%	N	%	N	%	N	%
					Scopus							
1998-2002	236	9.35	156	66.10	79	50.64	4	2.56	73	46.79	73	46.79
2003-2007	404	16.00	377	93.32	274	72.68	7	1.86	96	25.46	96	25.46
2008-2012	763	30.22	563	73.79	388	68.92	19	3.37	156	27.71	145	25.75
2013-2017	1122	44.44	848	75.58	564	66.51	61	7.19	223	26.30	198	23.35
Total	2525	100	1944	76.99	1305	67.13	91	4.68	**548**	28.19	**512**	26.34

Source: Elaborated by the authors (2018) from CiteSpace

The analytical methodology to analyse by period the growth pattern of senior tourism, involve computing *TP* (total number of publications), Relative Growth Rate (*RGR*) and Doubling Time (*DT*), adapting Mahapatra (1985). While RGR is a measure denoting the rate of growth with respect to time, the parameter DT measures the time required for the number of publications in a certain year to become double. TP_i and TP_{i-1} are the number of publications in the years *i* and *i-1,* which for our study is:

$$RGRi = [\ln(TP_i) - \ln(TP_{i-1})]$$
$$DTi = log2/RGRi$$

We have measured the number of publish articles on senior tourism for each of the years 1998 to 2017. We can observe that this curve has an increasing trend. The two periods of three consecutive years of increasing number of publications are 2004-2006, with 1.9 times increase; and 2015-2017, with 1.5 times increase. The trend in senior tourism explains the progress of scientific literature in this field of research. External events can influence the progress of scientific literature (Chen, 2006). The increased importance of the senior market is not only the result of demographic changes and a trend towards an ageing population (Patterson, 2006) but is also caused by behavioural shifts on the part of increasingly active older adults (Lohmann & Aderhold, 2009). The publication trends reflect the impact of external events, with several research summits producing burst of papers after particular occurrences, as will be seen later in this paper.



Source: Elaborated by the authors (2018) from CiteSpace
Figure 1: Year-wise publication

We can observe that the RGR in 2017 (0.11) is almost 7 times lower than the value in 1999 (0.79). The mean of RGR and DT are 0.21 and 4.58 respectively. This DT value indicates that the number of research publications is doubling in 4.58 years 'time, which is an indicator of a slow growth in the amount of research work being done on senior tourism.

Table 2: Scopus year wise output and growth pattern

Years	TP	Cumulative	RGR	Mean RGR	DT	Mean DT
				0.21		4.58
1998	10	10	0		0	
1999	12	22	0.79		0.88	
2000	8	30	0.31		2.23	
2001	21	51	0.53		1.31	
2002	22	73	0.36		1.93	
2003	18	91	0.22		3.14	
2004	13	104	0.13		5.19	
2005	15	119	0.13		5.14	
2006	25	144	0.19		3.63	
2007	25	169	0.16		4.33	
2008	27	196	0.15		4.68	
2009	22	218	0.11		6.52	
2010	38	256	0.16		4.31	
2011	34	290	0.12		5.56	
2012	35	325	0.11		6.08	
2013	35	360	0.10		6.78	
2014	45	405	0.12		5.88	
2015	38	443	0.09		7.73	
2016	48	491	0.10		6.74	
2017	57	548	0.11		6.31	

Source: Elaborated by the authors (2018) from CiteSpace

The top 10 source journals represent 2.37% of all tourism journals and accounted for 40.04% of total publications in senior tourism research articles. Tourism Management account for the majority of senior tourism research with 40 papers (7.81%), as shown in Table 3. The remaining 143 source journals contribute a total of 354 source articles. The source papers include citations to 5002 different works, which form the basis for the citation analysis present in the paper.

Table 3: Top 10 tourism journals publishing senior tourism research articles (1998-2017)

SOURCE TITLE	TP	%	Country
Tourism Management	40	7.81	England
Annals of Tourism Research	23	4.49	USA
Journal of Travel Research	**22**	4.30	USA
Asia Pacific Journal of Tourism Research	**21**	4.10	England
Current Issues in Tourism	**21**	4.10	England
International Journal of Contemporary Hospitality Management	**16**	3.13	England
Journal of Travel and Tourism Marketing	**14**	2.73	USA
Tourism Analysis	**13**	2.54	USA
International Journal of Tourism Research	**12**	2.34	England
Journal of Vacation Marketing	**12**	2.34	USA
Journal of Hospitality and Leisure Marketing	**11**	2.15	USA
Total publications	205	40.04	

Source: Elaborated by the authors (2018) from CiteSpace

3.2 Data Analysis

The global scientific outputs were generated from Scopus database and analysed through CiteSpace (http://cluster.cis.drexel.edu/~cchen/citespace/). CiteSpace' structural and temporal metrics was used to analyse data

(Table 4). To generate an individual network and to ensure a comprehensive analysis of the research, in this analysis the authors used the following CiteSpace thresholds: *Top 50 per slice* for co-occurrence and co-authorship analysis, which select the most 50 highly cited or co-occurring items for each slice; and choosing articles with a minimum of 2 citation, one co-citations, and a 12-co-citation coefficient, for the co-citation analysis. The network analysis in the current study apply co-authorship analysis of authors and affiliated countries and institutions; and co-citation analysis based on cited references. The scientific output includes publications, citations, journals, keywords, countries, authors, institutions, research areas and trends. Collaboration and contributions from different countries and institutions were estimated by the affiliation of at least one author to the publication.

Table 4: Key CiteSpace metrics explanation.

	Metrics	Description
Structural		
	Betweeness centrality	The role of a paper (node) in connecting other pairs of papers in the network
	Network modularity	The extent to which a network can be divided into independent clusters with clear boundaries. The modularity between 0.4 and 0.8 demonstrates the overall good structural quality of the network .
	Sillhouette	The silhouette, range from -1 to 1, and is useful in estimating the uncertainty involved in identifying or interpreting the nature of a cluster. The value of 1 represent a perfect separation from other clusters, while a negative one suggests its diversity or heterogeneity.
Temporal		
	Citation burst	A specific duration in which the frequency of an entity increases abruptly with reference to its peers. Bursts detect emergent terms or whether a particular connection has been significantly strengthened within a short period of time.
	Strength of burst	The level of abrupt change of the frequency over time. A higher strenght suggest a more dramatic change.
	Sigma	Is a combination of burtness and centrality, identifying publications that represent creative ideas, with a role more preeminent that the rate of it's recognition by peers.

Source: Adapted from Chen (2014).

3. Results and Discussion

This section presents the results of the co-occurrence, co-authorships and co-citation analysis. The co-occurrence analysis of keywords provides insights into the major senior tourism themes and their evolution; co-authorship analysis examines the social structure by identifying major scholarly communities and collaborative networks; and finally, a co-citation analysis provides insights into the intellectual structure of the field.

3.1 Co-Occurrence of keywords

Distribution of keywords analysis has been statistically analysed to identify leading fields of research (Chen, 2006). In this paper we have applied author keywords and keywords plus. Keyword plus are generated independently of the title and author keywords, describing article's contents with greater depth and variety (Chen, 2004). Through CiteSpace, the network of co-occurring author keywords and keywords plus has N= 128 keywords, E= 448 co-citation links, density 0.0551, and modularity = 0.4776, indicating the dominance of a small number of leading keywords at the centre of the network. Table 5 shows the evolution of key research front terms between 1998-2017. The growth of research topics started in 2013, where three main keywords occurred: *tourist perception, tourist behavior, tourist satisfaction, tourism management, destination, attractiveness, ecotourism, and motivation,* which indicated a growing focus on the management and development of tourism, specially tourist perception, motivation and attitude. This illustrates that detailed issues related to senior tourism were being examined through a broader range of disciplinary backgrounds as the field matured.

Table 5: Keywords with high frequencies in the four 5-year-times during 1998-2017

Terms	Freq.	Terms	Freq.	Terms	Freq.
1998		2006		2012	
Heritage tourism	6	Elderly population	4	Heritage tourism	7
Tourist satisfaction	5	Intentions	4	Knowledge	7
				Spain	6

1999		2007			
Elderly population	8	Cultural attraction	10	2013	
USA	7	Motivation	5	Tourist perceptions	64
		Tourist attractions	5	Tourist behavior	57
2000				Tourism management	57
Australia	8	2008		Motivation	53
Elderly population	5	Tourist attitude	27	Health tourism	39
		Tourism development	25	Ecotourism	36
2001		Tourist perceptions	23		
Tourist safety	5	Tourism management	21	2014	
Tourism development	5	Destination attractiveness	21	Destination attractiveness	46
		Ecotourism	19	Tourist attitude	45
2002		China	17	Tourist experience	42
Destination attractiveness	8	Motivation	13	Tourist satisfaction	36
Tourist perceptions	5				
Tourist satisfaction	5	2009		2015	
		Heritage tourism	33	Landscape	26
2003		Destination attractiveness	12	Authenticity	21
Tourism management	14	USA	11	Service	14
Ecotourism	8			Hong Kong	10
		2010			
2004		Tourist behavior	23	2016	
Eurasia	17	Destination attractiveness	7	Elderly population	19
Asia	10	Pilgrimage	5	Rural tourism	14
Canada	6			Technology	7
		2011			
2005		Tourism market	11	2017	
USA	4	Tourism management	8	Tourist behavior	12
Landscape	4	Tourist satisfaction	7	Cultural attraction	8
Elderly population	4	Destination attractiveness	6	Social tourism	7

Source: Elaborated by the authors (2018) from CiteSpace

Table 6 shows the top 16 keywords with strong citation burst from 1998-2017. Burst detection can identify bursts of keywords as indicators of emerging trends (Chen, Dublin, & Kim, 2014). Geographical keywords such as United Kingdom, Europe and Asia are evident in the results because the tourism industry is largely based on physical location and resources, thus keywords are likely to reflect research exploring this growing segment of seniors and case studies in specific locations. United States was the strongest burst between 1998-2002. Asia, Eurasia, Canada, Europe were the hottest topic from 2003-2007. The hottest topics from 2008-2012 were tourism destination, tourism development, tourism economics, tourist attraction, cultural heritage. The most recent burst of keywords are China, Spain and South Korea, which reflects recent financial issues in these countries. Tourism management and motivations are also hot topics from 2013-2017. This indicates that recent hot topics attracted researchers with a management and psychological background.

Table 6. Top keywords with the strongest citation bursts.

	Citation burst			
Keywords	Strength	Begin	End	Duration (1998 - 2017)
United States	71.096	**2001**	2002	
Asia	62.947	**2004**	2009	
Eurasia	99.476	**2004**	2009	
Canada	55.365	**2006**	2012	
Europe	39.469	**2006**	2008	
Tourist Destination	56.605	**2008**	2014	

Tourism Development	53.648	**2009**	2013	
Tourism Economics	57.996	**2010**	2014	
Tourist Attraction	39.734	**2010**	2014	
Cultural Heritage	32.465	**2010**	2014	
Heritage Tourism	38.203	**2010**	2012	
China	50.489	**2014**	2017	
Motivation	31.932	**2014**	2017	
Tourism Management	58.962	**2014**	2017	
Spain	35.111	**2014**	2017	
South Korea	44.909	**2015**	2017	

Source: Elaborated by the authors (2018) from CiteSpace

4.3 Scholarly communities and collaboration by country

A co-authorship network aims to demonstrate the collaboration relationship between authors country and territory. The co-authorship network has N= 126 references, E= 22 links, Density = 0.0028, Modularity Q = 0.9556. This network is fragmented, with many isolated nodes (authors) and four small disconnected clusters. Figure 2 presents by centrality, the collaboration network between authors countries and territories. A higher centrality score indicates that a country plays an important role in this research field. The USA, Australia and United Kingdom were the top three source countries contributing 48.90% of all publications. The top ranked country by centrality is USA, with a centrality score of 0.62. The second most central country/territory is Australia (0.40), followed by UK (0.29), Canada (0.24), Hong Kong (0.17) and Italy (0.14). China, Taiwan, Spain and Portugal have the same centrality score (0.07), also showing some relevance in senior tourism research. Collaboration between countries highlights some interesting patterns. Collaboration is strong between USA and Hong Kong, China, Canada, South Korea and France. Australia collaborates closely with New Zealand, while the UK collaborates with New Zealand, Turkey, Portugal and Spain.

Figure 2: International collaborative author-country network

The development of senior tourism research collaboration in different countries is presented along a time axis in Figure 3. This figure shows how the USA, Australia and UK 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.

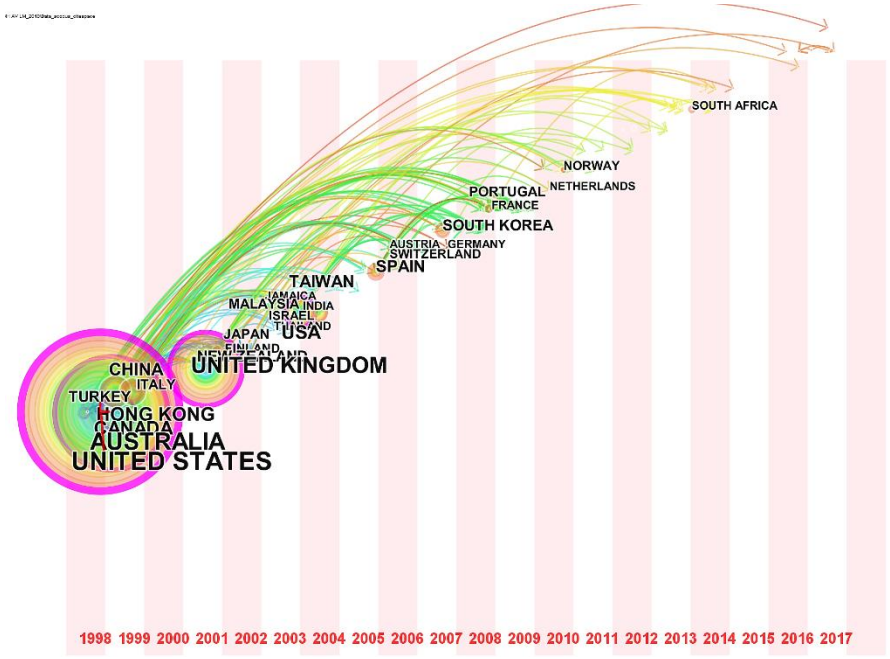


Figure 3: Time-slice view of country co-authorship network.

3.3 Co-Citations analysis

Co-citation analysis use pairs of documents which often appear together in reference list and have something in common (Xiao & Smith, 2008). This methodology focuses on references and in this sense, explores the pillars of a specific research stream. Co-citation analysis is a useful empirical technique for describing the intellectual structure of disciplines (Benckendorff & Zehrer, 2013). Figure 4 shows the central part of document co-citation network from the citations included in the Scopus data set, representing the collective pattern of citations in the research field from 1998-2017. The network has N=185 nodes representing cited references, E= 371 co-citation links (number of times citations appeared in the source document included in the data set), density = 0.0218, and modularity = 0.6818. The size of a node is proportional to the number of citations received by the cited reference (Chen, Dubin, &Kim, 2014). CiteSpace identify the colours of links denoting the time a particular connection was made, based on the publication year of the source papers. Orange colours indicate more recent connections whereas blue colours indicate older connections. The figure identifies a focus on foundation papers produced from 2002 to 2007.

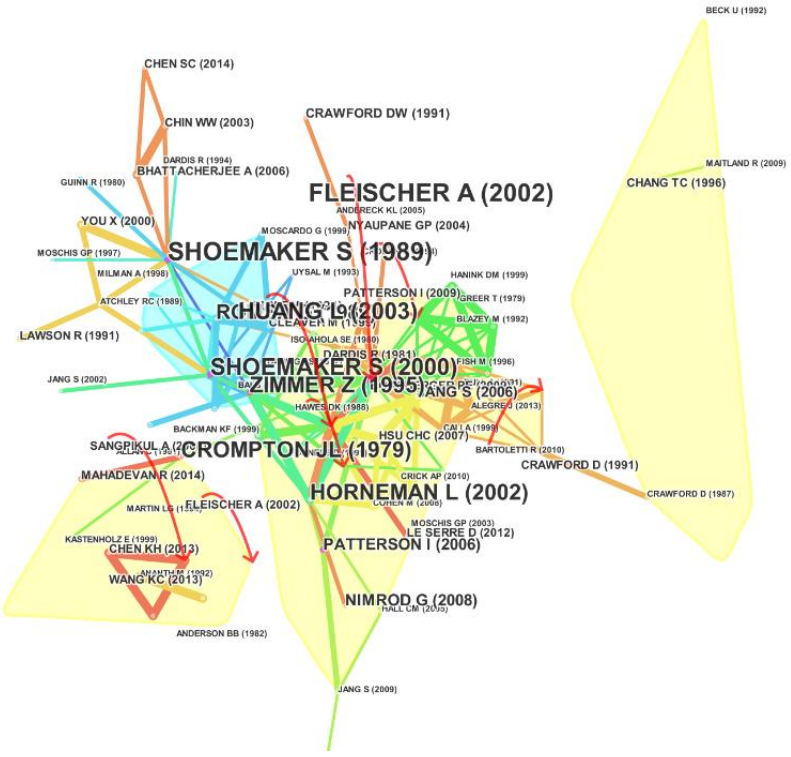


Figure 4: Co-citation network of senior tourism research (1998-2017).

The most cited articles focus on motivations and are central to the network. At the top are Jang and Wu (2006); Fleischer and Pizam (2002) and Hsu, Cai and Wong (2007). Table 7 identify the more cited articles by authors, title, year of publication, journal, the total number of citations (TC), and the international collaboration.

TM= Tourism Management; ATR=Annals of Tourism Research; JTR= Journal of Travel Research; JTTM = Journal of Travel and Tourism Marketing; JHTR= Journal of Hospitality and Tourism Research; JVM= Journal of Vacation Marketing; JHLM= Journal of Hospitality and Leisure Marketing.

Table 7. The top articles with the most citations counts and international collaboration

Author	Title	Year	Journal	TC	International collaboration
Jang S., Wu C.-M.E.	Seniors' travel motivation and the influential factors: An examination of Taiwanese seniors	2006	TM	167	Kansas State University, USA
Fleischer A., Pizam A.	Tourism constraints among Israeli seniors	2002	ATR	166	Hebrew University of Jerusalem, Israel; University of Central Florida, USA
Hsu C.H.C., Cai L.A., Wong K.K.F.	A model of senior tourism motivations-Anecdotes from Beijing and Shanghai	2007	TM	104	Hong Kong Polytechnic University; Purdue University, USA; China University of Technology
Horneman L., Carter R.W., Wei S., Ruys H.	Profiling the senior traveller: An Australian perspective	2002	JTR	98	University of Queensland, Australia
Huang L., Tsai H.-T.	The study of senior traveller behavior in Taiwan	2003	TM	85	Natl. Kaohsiung Hospitality College,Taiwan; National Sun Yat-Sen University,Taiwan
Milman A.	The Impact of Tourism and Travel Experience on Senior Travellers' Psychological Well-Being	1998	JTR	69	University of Central Florida, USA
Jang S.(S.), Ham S.	A double-hurdle analysis of travel expenditure: Baby boomer seniors versus older seniors	2009	TM	68	Purdue University,USA ; University of Kentucky,USA
Sellick M.C.	Discovery, connection, nostalgia: Key travel motives within the senior market	2004	JTTM	66	Central Washington University, USA
Kim J., Wei S., Ruys H.	Segmenting the market of West Australian senior tourists using an artificial neural network	2003	TM	62	University of Queensland, Australia
Jang S., Bai B., Hu C., Wu C.-M.E.	Affect, travel motivation, and travel intention: A senior market	2009	JHTR	62	Purdue University; University of Nevada;Temple University;Fu Jen Catholic University, Taiwan
Littrell M.A., Paige R.C., Song K.	Senior travellers: Tourism activities and shopping behaviours	2004	JVM	55	Colorado State University,USA; Lander University,USA; Iowa State University,USA.
Nimrod G.	Retirement and tourism Themes in retirees' narratives	2008	ATR	49	Ben-Gurion University of the Negev, Israel
Reece W.S.	Are senior leisure travellers different?	2004	JTR	46	West Virginia University, USA
Patterson I.; Pegg S.	Marketing the leisure experience to baby boomers and older tourists	2009	JHLM	36	University of Queensland, Australia

Source: Elaborated by the authors (2018) from CiteSpace.

The development of co-citation in senior tourism research is presented along a time axis in Figure 5. This figure highlights that the most co-cited papers from the major clusters, are mainly old, and represent 2.55% of the sample but account 13.24% of total citations. Articles are displayed by their centrality in senior tourism research.

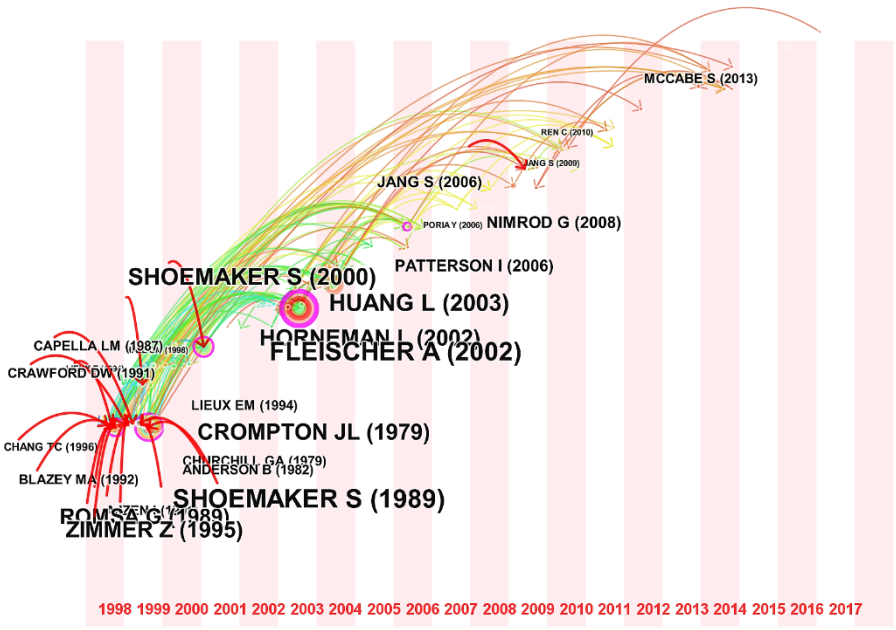


Figure 5: Time-slice view of co-citation network.

The Scopus Citation Overview is a way to find, check and track citation data. Senior tourism 512 papers have 8559 citations, with a mean of 16.72 cites/paper; 427.95 cites/year; 4837.47 cites/author; 305.85 papers/author and with 2.18 author/paper. Figure 6 presents scopus' h-graph, which measures the impact of a set of articles by looking at the amount of citations received. For senior tourism research the star corresponds to h-graph index = 46, identify the article that have at least 46 citations. Reece W.S, (2004) is the article market with a star in h-graph. To the right of the star are the larger number of articles that have less than 46 citations, while to the left of the star are the smaller number of articles that received more than 46 citations. According to our sampling selection, documents refers just to articles.

Insert Figure 9 about here

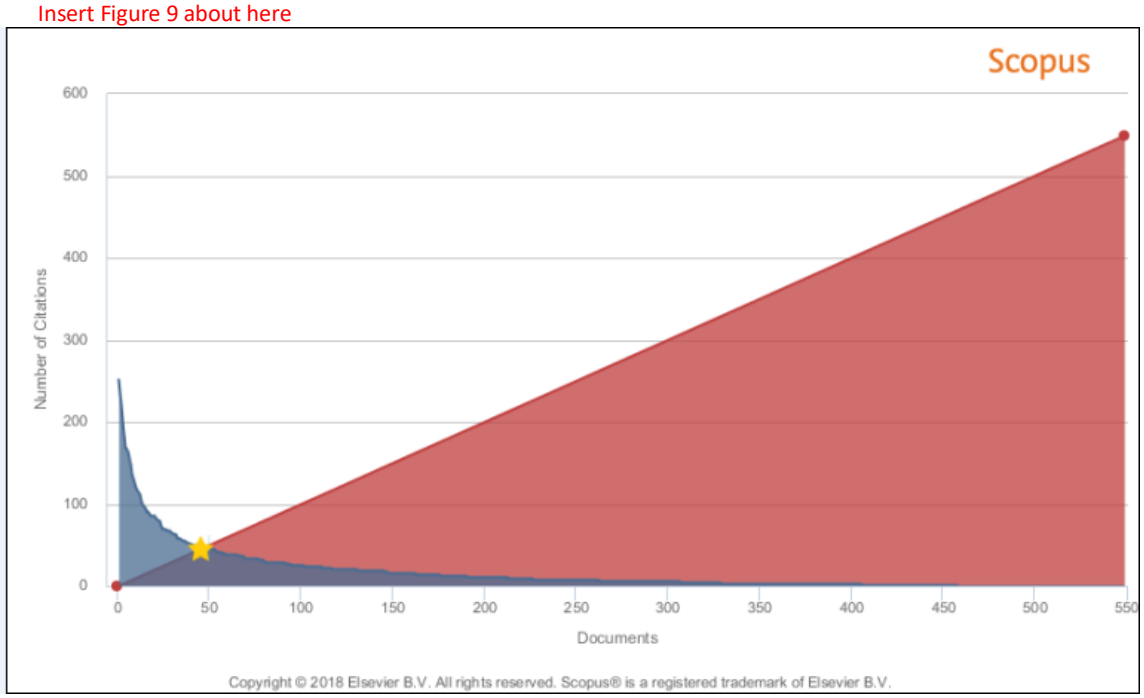


Figure 6: H-Graph of citations per article in senior tourism research.

In terms of publications in senior tourism research, Hong Kong Polytechnic University, Griffith University and University of Queensland were the top three source affiliations contributing to 15.69% of all publications (Figure 7). At the top is the Hong Kong Polytechnic University with 57 publications in senior tourism.

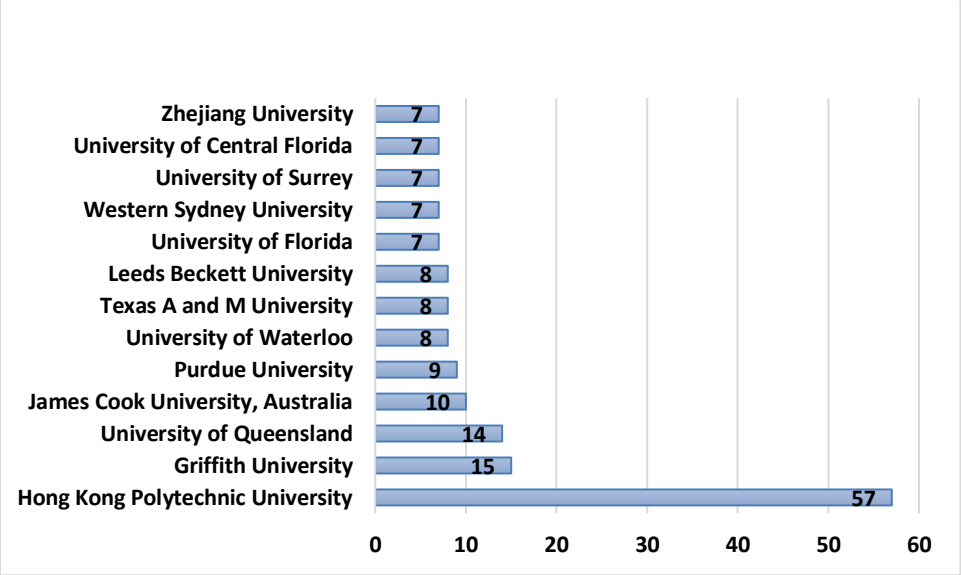


Figure 7: Top source affiliation with at least seven publications on senior tourism research (1998-2017)

3.4. Central and more creative articles

Betweenness centrality scores indicate the role of a paper in connecting other papers. 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 play a more important role in connecting different parts of the network (Freeman, 1977). The absence of links between different clusters in the network creates structural holes, 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 papers that link two nodes or clusters together, bridging the gap and being the only link between otherwise disconnected nodes/clusters. Therefore, they are likely to play an important role in connecting two disparate areas of knowledge and are likely to receive citations from authors working in different areas. 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, 2006). Table 8 shows papers with high centrality and sigma scores, some of them also were highly cited papers, like Fleischer and Pizam (2002). Such papers are extremely important and are likely to be highly cited in the future.

Table 8: Top articles with the highest centrality and sigma scores.

Authors	Year	Title	Source	Centrality	Sigma
Fleischer A., Pizam A.	2002	Tourism constraints among Israeli seniors	ATR	0.8	2.57
Huang L., Tsai H.-T.	2003	The study of senior traveller behavior in Taiwan	TM	0.33	2.02
Horneman L., Carter R.W., Wei S., Ruys H.	2002	Profiling the senior traveller: An Australian perspective	JTR	0.33	1.99
Zimmer Z.; Brayley R.E., Searle M.S.	1995	Whether to Go and Where to Go: Identification of Important Influences on Seniors' Decisions to Travel	JTR	0.28	2.00
Backman K.F.; Backman S.J., Silverberg, K.E.	1999	An Investigation into the Psychographics of Senior Nature Based Travellers	TRR	0.24	2.00
Shoemaker S.	1989	Segmentation of The Senior Pleasure Travel Market	JTR	0.21	2.99

Shoemaker S.	2000	Segmenting the Mature Market: 10 Years Later	JTR	0.21	2.99
Romsa G, Blenman M.	1989	Vacation Patterns of The Elderly German	ATR	0.20	2.04
Patterson I., Pegg S.	2009	Marketing the leisure experience to baby boomers and older tourists	JHLM	0.20	3.33
Jang S.(S.), Ham S.	2009	A double-hurdle analysis of travel expenditure: Baby boomer seniors versus older seniors	TM	0.20	5.36

Source: Elaborated by the authors (2018) from CiteSpace.

3.5 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). Table 9 shows the top 10 references with the strongest citation bursts in the data set. The first two articles that were detected are Shoemaker (2000) and Zimmer, Brayley and Searle (1995), from years 2008 to 2010. The focus of these articles was on the differences among seniors and between seniors and no seniors. The third article detected is Patterson and Peg (2009), registered a sharp increase between 2000 and 2001. This paper focused on seniors 'perceived feelings about the tourism experience. The last group of papers registered a sharp increase from 2013 to 2017, and are identified as current active areas of research, namely tourist perception from Kim, Wei and Ruys (2003); and tourist motivation from: Huang and Tsai (2003), Horneman, Carter, Wei and Ruys (2002), Kim, Wei and Ruys (2003), Shoemaker(1989), and Fleischer and Pizam (2002), this one has the strongest citation burst in the entire data set (41.792).

Comparing the time of publication with the time of citation, it appears that it takes between 1 and 25 years on average for an article of senior tourism to be cited. These results are not consistent with other study which shows an average of two to three years to be cited (McKercher & Tung, 2015). With the exception of Patterson and Peg (2009), the other senior tourism burst papers are called *sleeping beauties* (van Raan, 2004), because are works that are not cited for several years following a publication but then suddenly attract a lot of attention.

Table 9: Top references with the strongest citation bursts.

	Citation burst					
Authors	Year	Strength	Begin	End	Duration (1998 - 2017)	To be cited (years)
Fleischer A., Pizam A.	2002	41.792	**2015**	2017		13
Huang L., Tsai H.-T.	2003	37.403	**2013**	2017		10
Patterson I., Pegg S.	2009	33.914	**2010**	2011		1
Horneman L., Carter R.W., Wei S., Ruys H.	2002	30.781	**2013**	2017		11
Zimmer Z.; Brayley R.E., Searle M.S.	1995	27.422	**2008**	2010		13
Romsa G, Blenman M	1989	25.785	**2014**	2015		25
Jang S., Wu C.-M.E.	2006	22.533	**2013**	2014		7
Shoemaker S	2000	21.602	**2008**	2009		8
Kim J., Wei S., Ruys H.	2003	18.781	**2014**	2017		11
Shoemaker S	1989	11.533	**2014**	2017		25

45. Conclusion

The purpose of this study was to investigate the research evolution of senior tourism research through CiteSpace, a bibliometric visualisation method. This research evaluated during the period 1998 until 2017 the patterns of publications, citations, journals, authors, countries, institutions, keywords, topics of research and trends. The results extent past bibliometric studies of senior tourism research by making contribution to methodology innovation and understanding the intellectual structure of the senior tourism field. It is to the best knowledge of the authors, the first attempt to apply CiteSpace to explore and visualise senior tourism knowledge. The paper is one of the few studies

to combine co-authorship, co-occurrence and co-citation analyses to understand the development of a subfield of senior tourisms from different perspectives. The findings of our research demonstrate the potential of bibliometric visualisation techniques to study the senior tourism literature. These techniques offer several advantages compared with the traditional approaches to analyse the literature. First, by visualisation the relational analysis of top authors and articles, the study provides insides into patterns of international research focus. The clustering techniques used in this research identifies key articles that share similar topics (Chen, 2006) and identifies structural holes between individual clusters to inform potential research directions. Articles that serve as an important bridge between two clusters are also detected in the network. Second, the bibliometric visualisation used in this paper provide a important temporal data by displaying data in different colours. A longitudinal view of country co-authorship, keywords co-occurrence, and citation bursts of key articles adds a new dimension to the analysis and provides insights into the flow of major trends and collaborations. These temporal data allow researchers to identify research frontiers by highlighting emergent hot topics, authors, and articles (Chen, 2006). Third, co-citation analysis is a useful method to provide insights into a field based on a large sample of documents (Chen, 2006). Multiple metrics help to understand and explore relationships between articles, authors, and citations. Betweenness centrality and sigma can reflect the potential pivotal point and creative ones of the senior tourism field; while density, modularity, and burst strength provide a more objective metric analysis of network.

The paper also contributes by providing information into the intellectual structure of the senior tourism field. Co-occurrence analysis was used to detect the most frequently keywords and to identify trends and emergent research topics. The results show that research on senior tourism moved from broader topics, like tourism management, to more specific topics, like perception, motivation, satisfaction, as the field has matured. The collaboration between scholarly communities and collaborative networks help to understand the social structure of the field. Collaboration between authors appears to be based on geographical and institutional proximity. There is a dominance of US, Australia and UK. These networks may also be explained by the increased number of communication technologies, which allows more international collaboration and the greater sharing of ideas and workloads.

The investigations of the more cited articles, map the intellectual structure of the field, also helping to feel structural holes in the network, which represent opportunities for future research. The trends and insights uncovered by the analysis also identify opportunities for future research in the senior tourism field. Further research can combine different keywords from different periods to allow a deeper comparison and generate new insights into this field. New market segments of senior tourism destination can be identified. There is a considerable scope for senior tourism research focus to develop further.

The study has some limitations. First, we have focus exclusively on tourism journals, excluding works published elsewhere, like in books and in conference papers. Second, this work was restricted to the English language journals. Giving the relevance of Spain, Japan, Portugal, France, between others, in senior tourism research, it seems likely that some of the literature may be publishes in the languages of these countries. Also, despite the relevance of Scopus database to tourism research, other important studies could have been included into other databases. Nevertheless, it is evident that bibliometric analysis has helped to characterise both qualitatively and quantitatively, the senior tourism research field in terms of its development, hotspots and trends of investigation, and collaboration. As a result, researchers have been equipped with new tools of exploration.

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