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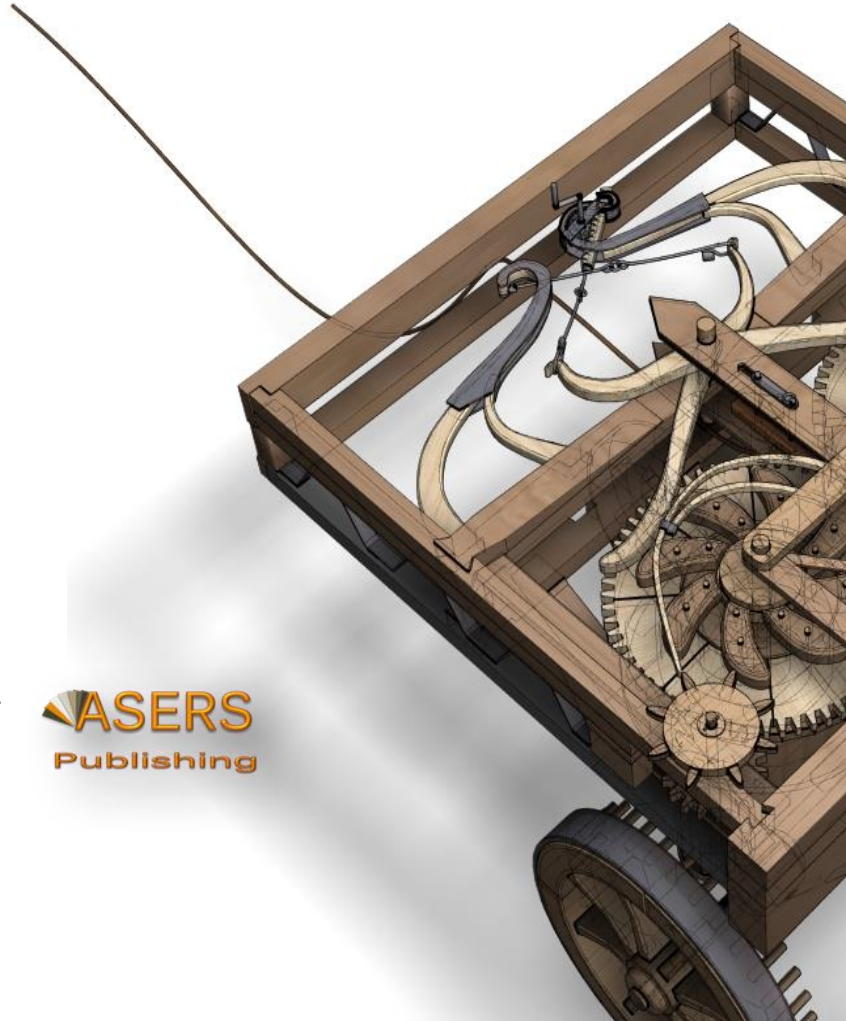
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## Table of Contents:

1	<b>Strategic Analysis of Mediterranean Island Destinations: The Case of Corfu</b> Georgios KONTOGEORGIS, Christos LIVAS, Nansy KARALI	1525
2	<b>The Untapped Potential of Ethno-Tourism in Ulytau Region</b> Rabiga MUKATOVA, Kamshat MUSSINA, Maribel RODRÍGUEZ	1534
3	<b>Observing the Dunning – Kruger Effect in the Results of Tourism Studies</b> Tibor GONDA	1551
4	<b>Strengthening Natural Tourism Empowerment Construction through Brand Strategy – Based Online Marketplace</b> Anak Agung Sagung Alit WIDYASTUTY, Muslichah Erma WIDIANA	1557
5	<b>Management of Recreational Areas. The Impact of Management of the Development of Shchuchinsko-Borovsky Resort Area on the Improvement of the Level of Financial and Economic Sustainability in the Region</b> Kazbek Kuandykovich BOKENCHIN, Marat ALTAY, Aigul SHAIMERDENOVA, Laura Kurymbaevna BOKENCHINA, Bibigul DABYLOVA	1565
6	<b>Corporate Social Responsibility, Knowledge of COVID-19, and Risk Perception in International Tourism Enterprises</b> Mohammad KHASAWNEH, Bashar M. AL NAJDAWI, Hakam M. SHATNAWI, Samer Fandi ABABNEH	1574
7	<b>Historical Relations between Kazakhstan and Hungary and Their Impact on Economic Cooperation and Development. New Experiences and Perspectives upon Tourism</b> Nurlan DULATBEKOV	1584
8	<b>Promoting Tourism Marketing and Service Quality in Thailand's Secondary Tourism Cities</b> Chayapoj LEE-ANANT, Therdchai CHOIBAMROONG, Boonnawat SRIKHWAN	1595
9	<b>Analysis of the Youth Policies and Its Impact on the Economic Policy of the State for the Tourism Development</b> Dinara JAKUPOVA, Gaukhar KOSHEBAYEVA, Nazym ALPYSBAYEVA, Valeriy BIRYUKOV	1603
10	<b>The Potential of Halal Tourism System on Growth for the Province Lampung's Tourism Industry</b> Tulus SURYANTO, Mardhiyah HAYATI, Yeni SUSANTI	1616
11	<b>A Research on Econometric Analysis of Tourism Sector, Economic Growth and Unemployment Indicators in Turkey</b> Bahman HUSEYNLI	1629
12	<b>Interpersonal Communication Between Sign Language Interpreters as Tour Guides and Deaf Tourists in Indonesia</b> Farid Hamid UMARELLA, Endri LISTIANI, Ahmad MULYANA, Endri ENDRI	1637
13	<b>Academic Tourism as an Emerging Tourism Industry in Kazakhstan</b> Bakhyt ALTYNBASSOV, Aigerim BAYANBAYEVA, Baurzhan ISSABEKOV, Yerbolat BARLYKOV, Bekmukhan AKHMETOV, Bakhytbek ZHANKUBAYEV, Indira SHOKHANOVA	1646

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University of Craiova, Romania

**Laura Ungureanu**

Spiru Haret University, Romania

- 14 **Corporate Governance in Organizations of Higher and Postgraduate Education as Leverage Point for Pathways to the Tourism Development** 1658  
Daniyar ISMURATOV, Gulnar KUSHEBINA, Saltanat VALIYEVA, Dina MANGIBAYEVA
- 15 **Coping Competence and Social Support on Job Performance in the Nigerian Tourism Industry** 1672  
Olusoji Damaro ARUBAYI, Dafe Marcus EJETA
- 16 **Service Employees' Expressions of Emotions in Restaurants: A Transcendental Phenomenology Study** 1681  
Mohammad Shahidul ISLAM, Fariba AZIZZADEH, Sebastian ZUPOK, Hassan BABAPOUR, Janusz SOBOŃ, Joanna ROGOZIŃSKA-MITRUT, Aziz HOSSEINI, Lawrence JONES-ESAN
- 17 **A Critical Review of COVID-19 Pandemic Outbreak in the Restaurant Industry** 1697  
Perumal RAJA, Ankathi RAGHU, R. KANNAN, K. SURESH, V. SIVAKAMI, I. Hiller ARMSTRONG
- 18 **Cloud Gaming: An Antipandemic Case for Restaurants** 1705  
Liudmyla BOVSH, Inna LEVYTSKA, Larysa HOPKALO, Alla RASULOVA, Kateryna KOMPANETS
- 19 **The Influence of Tourist Experience on Local Product Purchase Behavior** 1712  
Dac Hung NGUYEN, Hoang Nguyen KHAI, Quang Van NGO
- 20 **Improving the Innovative Activity of the Region with Impact upon Tourism** 1728  
Adil TOLEPOV, Aigul TLESOVA, Anar MOLDASHEVA, Kuat MUSABAEV, Yerkenazym ORYNBASSAROVA, Botagoz SAPAROVA
- 21 **Nautical Tourism Development Model Based on Coastal Community Empowerment and Financial Literacy in Indonesia** 1740  
Sumani SUMANI, Intan Nurul AWWALIYAH, Ika Barokah SURYANINGSIH, Kristian Suhartadi Widi NUGRAHA
- 22 **Medical Tourism in Mexico: An Economic Activity with Great Potential** 1752  
Laura FISCHER
- 23 **Factors Affecting Performance: Jordanian Hospitality Employees as a Case Study** 1759  
Ahmad A. AL-MKHADMEH, Hakam S. SHATNAWI, Omar ALANANZEH, Ra'ed MASA'DEH
- 24 **Management and Impact of Electronic Commerce in Hotels in Tabasco** 1770  
Rosa del Carmen SÁNCHEZ TRINIDAD, Rocío del Carmen CASTILLO MÉNDEZ, Raymundo MARQUEZ AMARO, Antonio AGUIRRE ANDRADE, Samantha SÁNCHEZ CRUZ, Adriana del Carmen SÁNCHEZ TRINIDAD, Wilber DE DIOS DOMINGUEZ
- 25 **Integration of Electronic Business on Tourism: A Bibliometric Network Analysis** 1779  
Yogi Sugiarto MAULANA, Erna MAULINA, Nenden KOSTINI, Tetty HERAWATI
- 26 **Distance Elasticity of Tourism Demand** 1798  
Robert BĘBEN, Zuzanna KRAUS, Izabela PÓŁBRAT

# Call for Papers Winter Issues 2022 Journal of Environmental Management and Tourism

**Journal of Environmental Management and Tourism** is an interdisciplinary research journal, aimed to publish articles and original research papers that should contribute to the development of both experimental and theoretical nature in the field of Environmental Management and Tourism Sciences.

Journal will publish original research and seeks to cover a wide range of topics regarding environmental management and engineering, environmental management and health, environmental chemistry, environmental protection technologies (water, air, soil), pollution reduction at source and waste minimization, energy and environment, modeling, simulation and optimization for environmental protection; environmental biotechnology, environmental education and sustainable development, environmental strategies and policies, etc. This topic may include the fields indicated above, but are not limited to these.

Authors are encouraged to submit high quality, original works that discuss the latest developments in environmental management research and application with the certain scope to share experiences and research findings and to stimulate more ideas and useful insights regarding current best-practices and future directions in environmental management.

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## Integration of Electronic Business on Tourism: A Bibliometric Network Analysis

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### Abstract

This paper aims to map the position of electronic business tourism research and how these topics are related to one another. The bibliometric analysis method with VOSviewer is used to provide our understanding of the structure related to the topic under study, as well as to map and identify certain patterns, including analyzing and visualizing the co-occurrence of keywords, co-citations of cited authors, and co-citations of cited sources. A total of 117 documents on e-business and tourism topics from the Scopus database are reviewed. We find that the trend of research on e-business and tourism simultaneously has not increased significantly since 2003. We also found research topics that have the opportunity to be researched based on emerging keywords. In addition, we found the authors and journals who contributed the most to the topic of e-business and tourism research, and how they were connected. To our knowledge, this study is the first to conduct a bibliometric analysis on the topic of e-business and tourism simultaneously, in which 117 publications were systematically examined using bibliometric analysis with VOSviewer.

**Keywords:** e-business; tourism; bibliometric analysis; literature review; VOSviewer

**JEL Classification:** Z32; C88; M15.

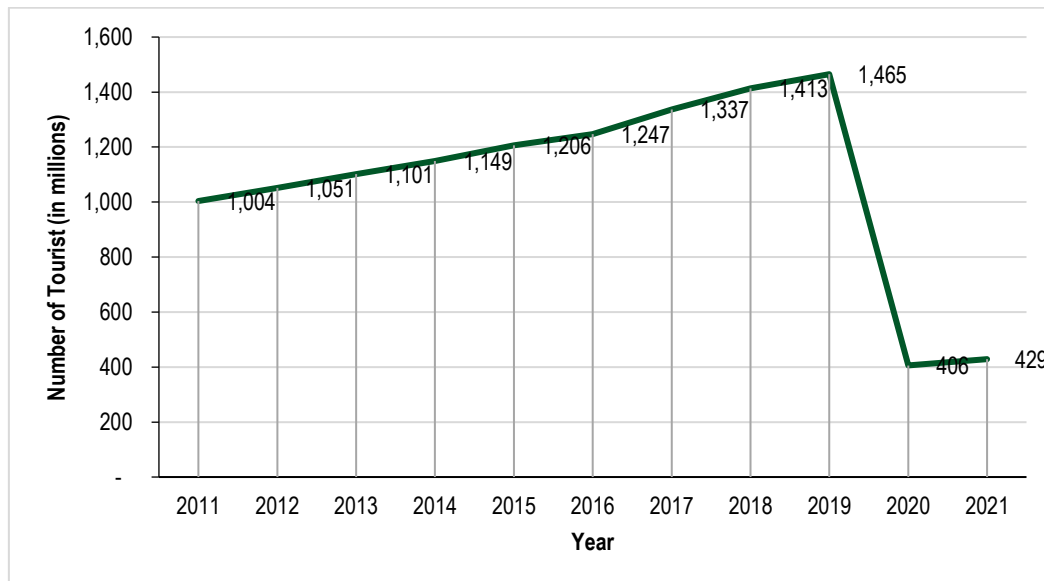
### Introduction

Internet provides an unprecedented level of connectivity and efficient and effective communication with customers at a low cost. The increasing use of the internet by households has an impact on the tourism sector (Setiawan *et al.* 2018), and has changed the way businesses handle their processes and interact with their customers (Biclesanu *et al.* 2021). Many businesses agree on the importance of internet technology in distributing and disseminating tourism product information (Law *et al.* 2015). In everyday business practice, it is currently inconceivable without integrating the Internet and Website in the tourism business (Šimunić, Pilepić and Šimunić 2013). Furthermore, information technology and telecommunications are the main prerequisites for the domestic tourism industry globally (Morella 2017). The data provides an understanding of the importance of using information technology in business activities. The business concept and way of business processes at all levels of

business today are also influenced by technology development (Morella 2017; Biclesanu *et al.* 2021). Thus, it can be concluded that information technology and telecommunications affect the tourism industry (Benckendorff, Xiang and Sheldon 2019).

In recent years, the tourism industry has improved, as reflected in the International Tourist Arrivals data, although there has been a decline starting in 2020 due to the COVID-19 pandemic (see Figure 1). Researchers report the growth of the tourism industry due to the use of the internet for marketing (Wang *et al.* 2017). The development of modern information technology has had a huge impact on the tourism industry, and the rise of e-business has brought about major changes in the tourism value chain (Yu 2014). Synergistic interactions between technology and tourism have brought revolutionary changes to the industrial structure (Munikrishnan *et al.* 2018).

Figure 1. International Tourist Arrival



Source: The World Tourism Organization (UNWTO, 2022)

Information and Communication Technology facilitates operational activities and strategic marketing and management of tourism destinations (Buhalis 2003; Zehrer and Fenkart 2008). E-business application for tourism is increasing rapidly due to high efficiency and low cost (Guo 2012). In the tourism industry, high demand for tourism is one of the triggers of the proliferation of travel-based e-commerce (Dharmanto *et al.* 2019). The increase of e-commerce creates a competition that demands every service provider to improve its features and services, whether in the travel agency industry or travel, hospitality, and tourism as a whole. However, tourism e-commerce is new, and its development has a strong uncertainty (Ping 2018). Therefore, a deeper investigation is needed, which focuses more on the application of e-commerce to tourism, which does have different characteristics from other industries.

## 1. Research Background

Previous studies have been conducted on the topic of e-business, as well as on tourism. Standing *et al.* classifying and analyzing research published in tourism journals over the past ten years, aims to identify key focus areas and gaps in the Internet-related research landscape in tourism (Standing, Tang-Taye, and Boyer 2014). This study is different from our study. It also focuses on e-business utilization in tourism as a whole, not only on the adoption of the internet in tourism. Furthermore, Vadimirov researched the main factors affecting the adoption of e-business by small tourism companies (Vladimirov 2015). This study has different objectives from our paper, although the research topics have similarities, namely e-business and tourism. Other researchers focused on analyzing the application of information technology and post-adoption evaluation on SME Travel Services Sector. The results of this study revealed that decisions about the integration of information technology vary because they have their terms of reference (Kaewkitipong and Brown 2007). Liying and Ke (2009) researched tourism e-business from a direct marketing perspective, where marketing activities are conducted through two-way information communication using technology. Viewed from a customer perspective, Vlachos researches the behavior of tourism companies with the adoption of technology and e-business applications, and the goal is to identify groups of companies with homogeneous behavior among three European countries, Greece, Portugal, and Norway (Vlachos 2013). Moharrer *et al.* investigated the determining factors of tourist

satisfaction in online tourism (Moharrer, Tahayori, and Sadeghian 2013). Another study revealed that the adoption of 3D virtual reality technology can attract and satisfy tourists' curiosity (Dionisio and Nisi 2021). The basic thinking of the tourism industry that builds collaborative electronic business patterns has been proposed, and collaborative electronic business systems are designed (Yang and Jiang 2009). Although the research was conducted more than one decade ago, it does not close the possibility of collaborative-based tourism development. It becomes a future research trend by utilizing crowdsourcing and technology. As Wang *et al.* did, in addressing the growing problem of tourist demand by harnessing public creativity using the Tourism Crowdsourcing Model (TCM) (Wang *et al.* 2017). Lastly, research on e-business and tourism seen from the perspective of the Internet of Things (IoT), Cloud Computing, and other information technologies have been widely used in the tourism industry, where the issue of smart tourism development is becoming popular today (Ren *et al.* 2018). The rapid growth of machine learning and artificial intelligence has led to major improvements to the intelligent tourism recommendation system, including recommendations for choosing more sensible, diverse, and customized modes of transportation than previous methods (Zheng *et al.* 2020).

E-business studies on volatile tourism causes problems in exploring and exploiting the topic. In addition, the integration of e-business in tourism is inevitable. For that, mapping on this topic is important. With this mapping, it is hoped that other researchers will get an overview of the current research position and how a research topic is related to one another. It provides an overview research map that will be carried out in the future and offers opportunities to conduct e-business and tourism integration studies, which have not been widely studied, especially in the scope of MSMEs. Previous research used literature review techniques to determine the development of a science and the relationship between authors and keywords, such as Askeyev and Baizholova (2022), which presented quantitative data related to the research topic on efficiency issues in tourism (Askeyev and Baizholova 2022). Other researchers used bibliometric analysis to compare the concepts of "Ecotourism" and "Agrotourism" which resulted in studies on these issues being very popular and relevant in the scientific literature (Vysochan *et al.* 2022). Finally, research that uses a systematic literature review technique on the topic of tourism, namely researchers Thao and Bakucz (2022), whose purpose of the study is to determine the impact of tourism growth on the economy and human development during the period 1975 to 2021 (Thao and Bakucz 2022). Some of these studies indicate that the use of bibliometric analysis techniques or the like is beneficial to find out research trends on specific topics and how these topics are interrelated and provide an overview of future research recommendations.

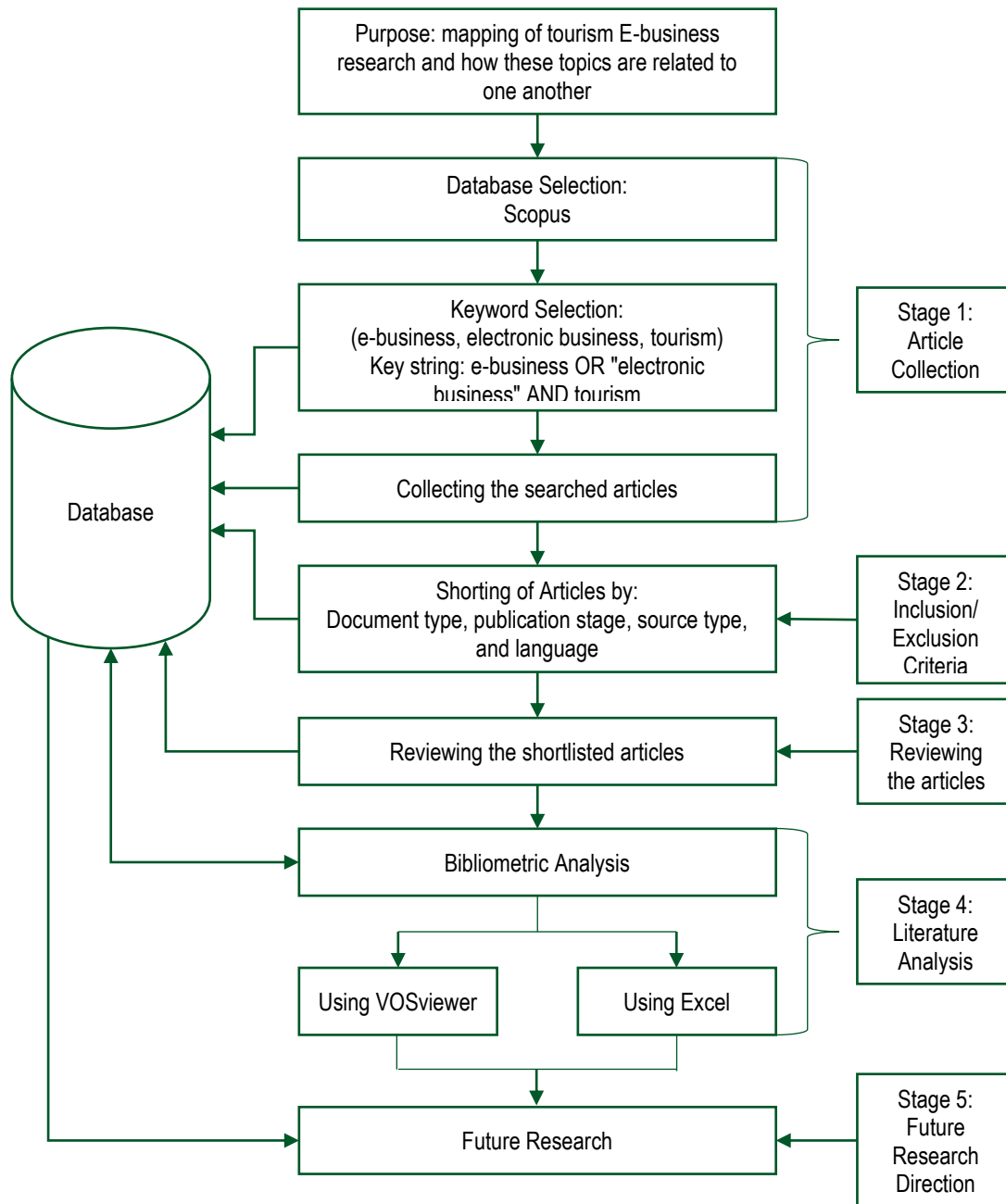
The purpose of this study was to review articles on the theme of e-business and tourism contained in the scopus database, mapping the position of the research and how the topics are related to each other. To achieve the objectives of this study, the following research questions (RQ) are considered:

- RQ1. What are the trends in the development of e-business and tourism research and the distribution of each country?
- RQ2. What is the pattern of interrelationships between keywords in e-business and tourism articles, which keywords appear the most, and what are the implications?
- RQ3. What is the pattern of relationships between cited authors with one another through a network of shared citations (co-citation), and what are the implications?
- RQ. What is the pattern of relationships between cited source with the topic "e-business tourism" and what are the implications? We will discuss it in the findings and discussions section.

## 2. Research Methodology

Systematic mapping study (SMS) method is employed in this paper. SMS is a method of systematic library review to obtain a thorough overview and analysis of the development of science-based scientific publications, conducted by classifying, analyzing publication trends, and compiling knowledge about a research topic based on a particular category (Petersen *et al.* 2008; Purnomo *et al.* 2020). Several categories are included in systematic mapping study, namely scientometric analysis, bibliometric network analysis, and informatics analysis (Hilal, Maqsood, and Abdekhodae 2019). In this paper, we use bibliometric network analysis. There are five stages used in this study based on the adoption of Dohale *et al.* (2020), namely search, locate, select, review and analyze the articles (Dohale *et al.* 2020) with adjustments as necessary based on the purpose of this study (see Figure 2).

Figure 2. Research Process



Source: Adoption from Dohale *et al.* (2020)

#### Stage 1: Article collection

The data source used in this study is sourced from the Scopus database. The Scopus database was chosen because it has a reliable search feature, has a large data availability, and has powerful tools, one of which analyzes search results tools. Based on the search results in the Scopus database on March 1, 2021, using the search key string "e-business OR "electronic business" AND "tourism", we found a total of 179 documents.

#### Stage 2: Inclusion/exclusion criteria

Based on search results with keywords used. We exclude publications by 2021, bringing it to 177 documents from 179. We limited the research to Article and Conference Paper Document types, in Final Publication Stage, and in English, with the final result of the search being 117 documents. The search results are downloaded in comma-separated values (CSV) format (Appendix 1) and analyzed manually using the Excel and VOSviewer app. Here's the search string that has been done:

TITLE-ABS-KEY (e-business OR "electronic business" AND tourism) AND (EXCLUDE (PUBYEAR, 2021)) AND (LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (SRCTYPE, "p") OR LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (LANGUAGE, "English"))

### Stage 3: Reviewing the articles

The downloaded documents from our Scopus database are identified and reviewed to determine the type of research, the type of tools/methods used to conduct the research and the type of industry in which the research was conducted (if any), to highlight the significant contribution of each study. Finally, we ensure that the data downloaded from the database is a publicly published scientific publication. Therefore, it is public information that does not require special permission to be processed and analyzed.

### Stage 4: Literature analysis

Comma-separated values (CSV) file is used to create a network of co-authorship analysis, analysis co-occurrence of keywords, and co-citation analysis. VOSviewer version 1.6.15. used in this paper to create networks and visualize those networks due to their comprehensive capabilities, simplicity, and compatibility with Scopus databases. VOSviewer pays special attention to graphical representations of bibliometric maps. The VOSviewer function is very useful for displaying large bibliometric maps in an easy-to-interpret way (van Eck and Waltman 2009). In addition, VOSviewer is compatible with a large number of operating system and hardware platforms, available for free, and can be opened directly from the internet.

The next stage, the interpretation of map visualization, is based on three characteristics, namely circle size, distance, and color. The closer the distance between the two authors means the closer the relationship of the two authors. Furthermore, the larger the size of the author's circle means the higher the frequency of authorship. As for color, the same author's color means having a close link.

### Stage 5: Future research direction

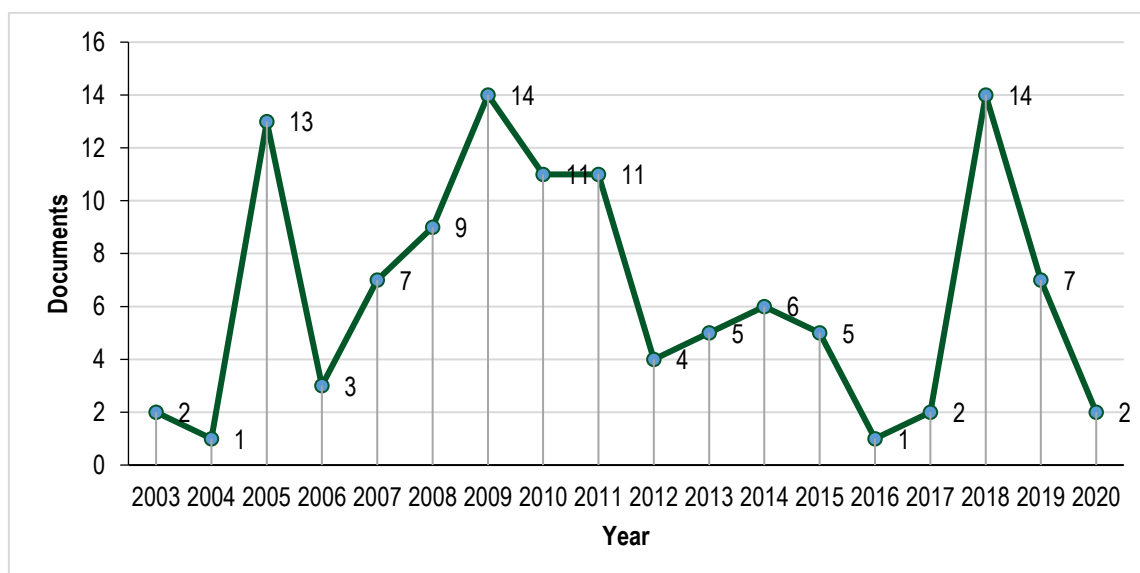
We will examine the research gaps of the literature analysis that have been carried out at the previous stage. Based on those research gaps, we recommend future research opportunities. Finally, we provide theoretical and practical research implications of this study.

## 3. Results and Discussion

### a. Research Trends of E-business and Tourism

We use the *Analyze Search Results* tool provided by Scopus to present scientific research trends from year to year. Total publications on e-business on tourism are 117 documents, consisting of 53 documents with article types and 64 documents from conferences or proceedings. The largest number of publications were in 2009 and 2018, with 14 documents each. The least number of publications was in 2004 and 2016 with the number of documents of 1 article each. Trends in the development of E-business research on Tourism that we present in figure 3.

Figure 3. Research Trends



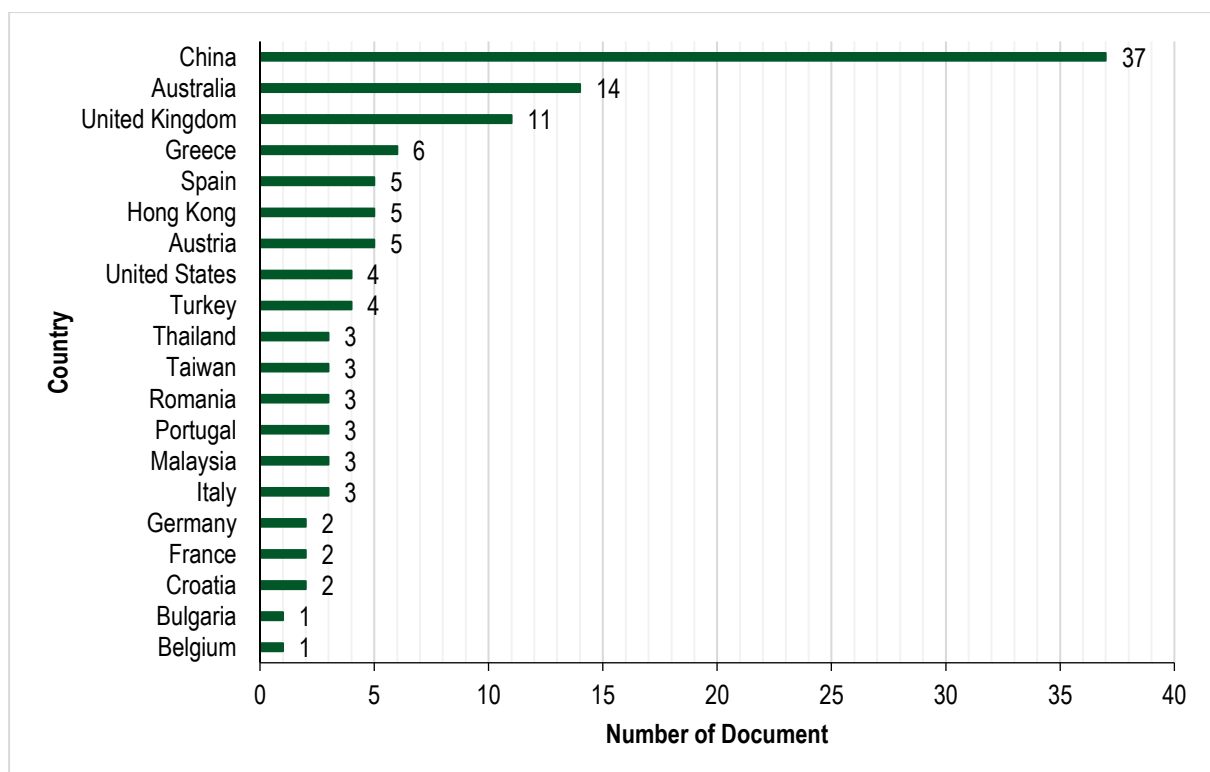
Source: scopus.com

We found that studies on E-business in Tourism recorded in the Scopus database only started appearing in 2003, which consist of two documents. The first document was written by Silva and Rocha (Silva and Rocha 2003) under the title "Semantic Web complex ontology mapping". The second article was written by Dale (Dale

2003) under the title "The competitive networks of tourism e-mediaries: New strategies, new advantages". In 2020, there are two documents that appear in the search, namely research that discusses the use of tourism itinerary models by utilizing artificial intelligence (AI) to provide more reasonable and diverse itinerary recommendations that can be integrated into smart service systems, as part of e-business (Zheng *et al.* 2020). Furthermore, Halawani's research discusses the integrated model of e-business use and its impact on hotel social media characteristics (Halawani, Soh, and Halawani 2020). Based on this explanation, it can be concluded that the integration of e-business technology into tourism activities has existed since 2003 and continues to develop, especially in the technology used, which in 2020 has talked about artificial intelligence (AI) technology integrated into tourism activities. In addition, the use of social commerce which is one of the most technological innovations that are considered very profitable for many industries, including the tourism industry.

We also found that all the published documents come from 39 countries. The country with the most e-business and tourism topics is China, with 34 documents out of 117 documents. China also contributed to one of the most recent articles (2020) contained in our database, namely zheng *et al.* research entitled "Navigating through the complex transport system: A heuristic approach for city tourism recommendation" (Zheng *et al.* 2020). In the second sequence of Australia that are 14 documents, followed by the British are 11 documents. Other countries contributed only 1 article, including Canada, Czech Republic, Finland, Ghana, India, Indonesia, Iran, Lebanon, Macao, Montenegro, New Zealand, Pakistan, Poland, Russian Federation, Saudi Arabia, Serbia, Slovakia, South Korea, Sweden, and as many as 3 unidentified articles (Undefined) (see Figure 4). It indicates that research on e-business in tourism has not shown consistency and still has the opportunity to be studied more deeply.

Figure 4. Research Distribution by Country



Source: scopus.com

**b. Co-occurrence analysis of keyword**

Co-occurrences are used to display data (keywords) in pairs in one network group unit based on the most common keywords (van Eck and Waltman 2010). The calculation is useful for knowing what units often appear in the field of the study displayed simultaneously, and it is possible to examine concepts (keywords) and topics (groups) (van Eck and Waltman 2010; Herrera-Franco *et al.* 2021). We use the type of analysis: co-occurrence, unit of analysis: all keyword and full counting method. Because several keywords have different spellings but have the same meaning, we upload a thesaurus file to combine the keywords with similarities (Appendix 2). A total of 870 keywords were extracted from the database, 23 of which appeared simultaneously in the document

five times. In the last step, we remove irrelevant keywords, *i.e.*, china, ontology, and research. As a result, there are four clusters/groups with a minimum number of clusters are two.

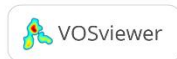
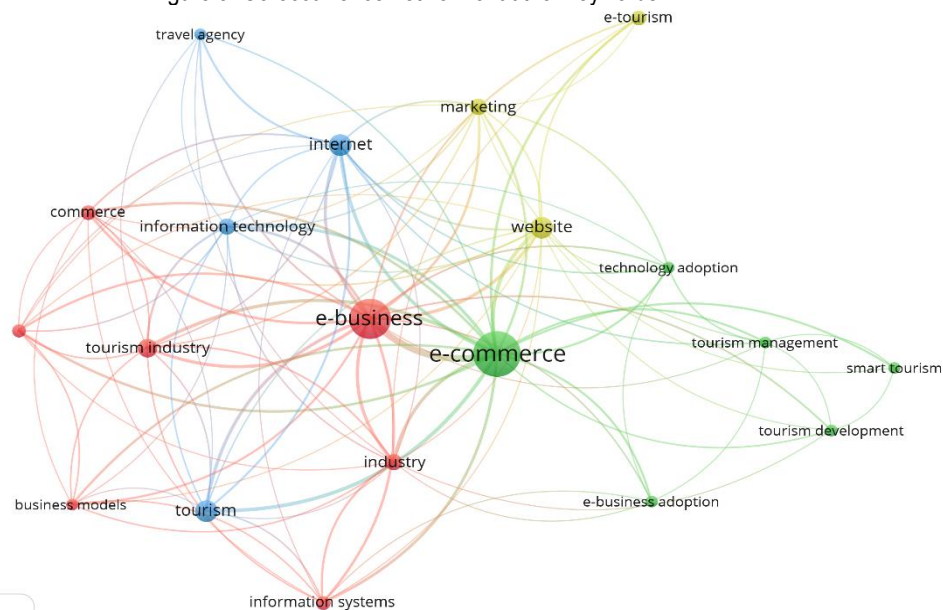
Table 1. Cluster of Author Keywords

Cluster	All Keywords	Co-occurrence	Links	Total Link Strength
1 Red (7 nodes/items)	1. Business models	5	10	21
	2. Commerce	8	10	24
	3. E-business	56	18	133
	4. Industry	9	14	37
	5. Information system	7	10	27
	6. Tourism e-business	6	10	22
	7. Tourism industry	12	12	41
2 Green (6 nodes/items)	1. E-business adoption	5	6	10
	2. E-commerce	72	19	157
	3. Smart tourism	5	4	7
	4. Technology adoption	5	8	16
	5. Tourism development	5	6	9
	6. Tourism management	5	8	13
3 Blue (4 nodes/items)	1. Information technology	9	12	33
	2. Internet	16	14	47
	3. Tourism	17	10	36
	4. Travel agency	5	6	12
4 Yellow (3 nodes/items)	1. E-tourism	8	5	13
	2. Marketing	9	11	26
	3. Website	17	15	44

Source: VOSviewer

Based on the Results of the co-occurrence network of author keywords, there are four clusters where each cluster is represented by a different color, and each cluster consists of several groups of keywords. Cluster 1 is represented in red, consisting of 7 keywords. Cluster 2 is represented in green, consisting of 6 keywords. Cluster 3 is represented in blue, consists of 4 keywords, and Cluster 4 is represented in yellow, consisting of 3 keywords (see Table 1). Each keyword has a connection with other keywords, the linkage can be seen from the line that echoes between the "nodes" that intersect, and the line has a color according to the color of the cluster. Figure 5 visualizes these four clusters, with 20 items, 104 links, and a total link strength of 364.

Figure 5. Co-occurrence network of author keywords



Source: VOSviewer

Based on the Results of the co-occurrence network of author keywords, the most extensive research area based on the number of nodes is Cluster 1 (red) with the keyword "e-business". The keyword "e-business" appears 56 times, which is the largest node in cluster 1. Rotchanakitumnuai *et al.* investigate the development of e-business implementation in the tourism industry. Many tourism businesses do not pay careful attention to the details of their websites, nor do they understand the usefulness and importance of informative websites (Rotchanakitumnuai, Kaewkitipong, and Ractham 2011). Another study also focuses on the travel services sector in Thailand in using e-business technology and its advantages (Kaewkitipong and Brown 2007). Guo focuses his research on measuring the performance of e-businesses applied to the tourism industry. Guo provides several solutions to improve e-business service performance for consumers (Ping 2011). Other researchers looked at the perspective of e-business tourism based on direct marketing in China (Liyang and Ke 2009). Lastly, this cluster also highlights issues that will affect the tourism sector due to the adoption of information and communication technology. Implementing new business models and applying e-business technology can increase the chances of competitive advantage in the international market (Vidas-Bubanja 2008). Some of the focus of the research, giving an overview of the topic of research on network groups in cluster 1, namely discussing the topic of e-business implementation, which is interrelated with the keywords "tourism industry", "industry", "commerce", "information system", "tourism e-business", and "business models".

Cluster 2 (green) represents the topic of the 2nd research area with a keyword of 6 items. The keyword "e-commerce" appears 72 times, which is the largest node of all existing clusters. In the cluster, researchers mentioned that e-commerce in the tourism industry needs to be organized collaboratively to provide maximum benefits (Yang and Jiang 2009). In addition, Song and Wu expressed concern about internal and external resources in the tourism industry in expanding the dissemination of information and tourism promotion, so that they built a teaching curriculum on internet-based e-commerce tourism (Song and Wu 2016). Other research emphasizes the adoption of information technology to develop electronic business systems in the tourism industry. Some of the focus of the study provides an overview of the topic of research on network groups in cluster 2, namely discussing the topic of e-commerce implementation and technology adoption in building smart tourism.

Cluster 3 (blue) represents the topic of the 3rd research area with keywords are four items. The keyword "tourism" is the largest node on the cluster with 17 occurrences. Zheng *et al.*'s research contributed to the model of artificial intelligence system in selecting tourism transportation modes. The model can be integrated into the service system of application providers and travel organizations as part of e-business to improve the travel experience for customers (Zheng *et al.* 2020). Halawani *et al.* developed an integrated model of e-business usage and its impact on the social media characteristics of hotels in Lebanon (Halawani, Soh, and Halawani 2020). Some of the focus of the research provides an overview of the topic of research on network groups in cluster 3, namely discussing the topic of internet utilization and integration for tourism.

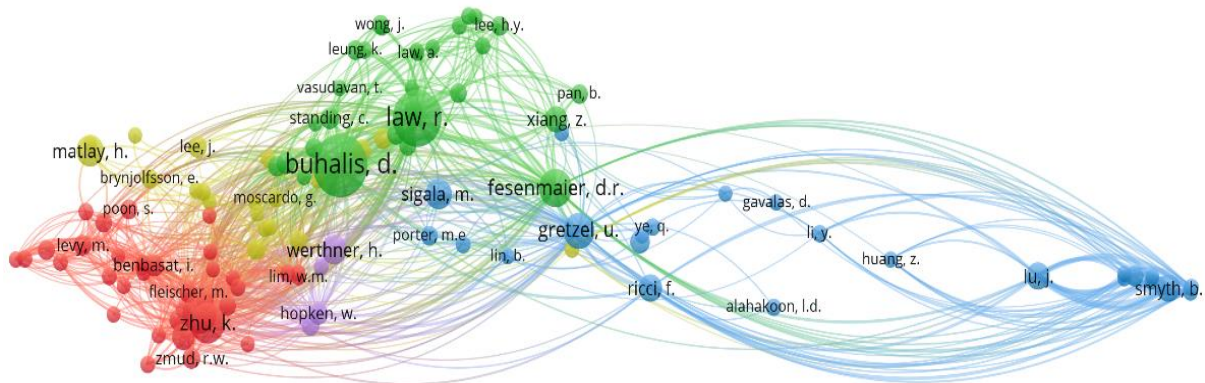
Cluster 4 (yellow) represents the topic of the 4th research area, with keywords are three items. The keyword "website" is the largest node on the cluster. Ping G researchers reviewed the quality evaluation index system of the tourism e-commerce model mainly by evaluating website functions (Ping 2018). Li and Feng explored how online customer reviews affect business performance with website credibility as an intermediary variable and the quality of information as moderators. The results showed that the website's credibility had a significant intermediary effect on online customer reviews and business performance (Li and Feng 2018). Rotchanakitumnuai identifies the quality of multi-channel electronic services from e-tourism Thailand, including various online channels such as websites, social networks, smartphones, and the Internet of Things, and their impact on cognitive imagery. The results show that travelers consider the quality of service through the Internet of Things technology important because of direct responsiveness through devices and applications that can create cognitive and affective imagery (Rotchanakitumnuai 2017). Lu *et al.* explore mechanisms for how website electronic service factors impact customer satisfaction and further their behavior (Lu, Wang, and Xu 2012). Some of the focus of the research provides an overview of the topic of research on network groups in cluster 4, namely discussing the integration of tourism marketing through electronic media and websites. Other research has also highlighted the use of websites in restaurants, especially specific elements in the design of web interfaces used to match customer expectations (Gunden, Morosan, and DeFranco 2020) and accessibility issues (Singh *et al.* 2020).

### c. Co-citation Network of Cited Authors

Co-citation network analysis is used to determine the most active field of study, emerging trends, or how knowledge is spreading (Diez-Martin, Blanco-Gonzalez, and Prado-Roman 2019; Herrera-Franco *et al.* 2021).

The Co-citation Network of Cited Authors analysis emphasizes outstanding authors linked to each other using citation notes (Zupic and Čater 2015; Herrera-Franco *et al.* 2021), so we can focus the reading on documents that have high levels of co-citations. The co-citation network identifies key documents across research domains that can be utilized to integrate perspectives and advance transdisciplinary research (Trujillo and Long 2018). We use VOSviewer application to build the Co-citation Network, with Cited-Author as an analysis unit, and use the full counting method. Since some data contains different names but are the same person, we uploaded a thesaurus file to combine those names (Appendix 3). As a result, 4,699 cited authors were extracted from the database, 115 of whom presented at least 5 citations. Of the 115 authors detected, 113 authors were connected to each other. As a result, there are five clusters/groups. Figure 6 visualizes these five clusters, with 113 items (authors), 2,812 links, and a total link strength of 13,414. The ten most-cited authors are shown in Table 2.

Figure 6. Co-Citation Network of Cited Authors



Source: VOSviewer

The structure of co-citation network cited authors on e-business and tourism generated by VOSviewer is discussed one by one. Cluster 1 (red), there are 36 authors led by Kevin Zhu, are 29 citations. This can be seen from the size of the "nodes" in the red cluster. Four of the 117 articles citing Kevin Zhu's documents, including Munikrishnan *et al.* (2018), which discusses the driving factors and inhibits the adoption of ICT technology in traditional travel agencies (Munikrishnan *et al.* 2018). The article cites four articles/documents by Kevin Zhu, one of which is a document entitled "Global e-commerce: impacts of national environment and policy" (Kraemer *et al.* 2006). Kevin Zhu is also closely related and connected to 80 other authors. Based on these data, it can be concluded that Kevin Zhu is one of the most cited authors and has a great contribution to the topics of e-business research and tourism.

Cluster 2 (green), 29 authors led by Dimitrios Buhalis with 71 co-citations, and Rob Law with 57 co-citations, both are not very close in the network. Dimitrios Buhalis is the most cited author, not only in cluster 2, but from the entire cluster. There are 30 of the 117 articles that citing the Buhalis document, including the article Rondović *et al.* (2019), which discusses the diffusion of e-business in tourism organizations, the results of which are obtained that the diffusion of technological innovation needs to be accelerated in such a way that it can affect several factors simultaneously and lead to greater diffusion (Rondović, Djuričković and Kaščelan 2019). In the article Rondović *et al.* citing Buhalis as many as three documents, one of which is a document entitled "Progress on information and communication technologies in hospitality and tourism" (Rob Law, Buhalis, and Cobanoglu 2014). Another article citing Buhalis, namely the research entitled "Artificial intelligence in smart tourism: A conceptual framework", the article discusses the components in smart tourism that utilize artificial intelligence (AI) (Tsaih and Hsu 2018). In Tsaih & Hsu's article, citing Buhalis as many as three documents, one of which is entitled "Smart tourism destinations" (Buhalis and Amaranggana 2013). Buhalis is also closely related and connected with 95 other authors. Based on these data, it can be concluded that Buhalis is the most cited author and has a major contribution to the topic of e-business and tourism research, especially on the use of artificial intelligence (AI) technology and smart tourism with a total of 71 co-citations.

Cluster 3 (blue), 24 authors, led by Ulrike Gretzel with 24 co-citations and Sigala, m. with 17 co-citations. There are at least 14 of the 117 articles citing Gretzel's documents, including the article Zheng *et al.* (2020), which discusses the use of a tourism itinerary model by utilizing artificial intelligence to provide more reasonable and diverse travel itinerary recommendations that can be integrated into smart service system, as part of e-business (Zheng *et al.* 2020). In Zheng *et al.*'s article, citing Gretzel as many as two documents, namely an article entitled "Intelligent systems in tourism: A social science perspective" (Gretzel 2011) and an article entitled "Smart

tourism: foundations and developments" (Gretzel *et al.* 2015). Gretzel also has close links and connections with 72 other writers. Based on these data, it can be concluded that Gretzel is the most cited author in cluster 3 (blue) and has a major contribution to the topic of e-business and tourism research, especially on intelligent systems with a total of 24 co-citation citations.

Cluster 4 (yellow) has 20 authors, led by Harry Matlay with 18 co-citations. There are at least 2 of the 117 articles citing the Matlay document, namely the article entitled "Collaborative and competitive strategies in virtual teams of entrepreneurs: A Pan-European perspective", the article discusses the evaluation of collaborative and competitive strategies that appear in small e-business (Matlay and Martin 2009). In the article, Matlay cites 12 documents, one of which is an article entitled "Virtual teams and the rise of e-entrepreneurship in Europe". (Matlay and Westhead 2005). Interestingly, the article was also written by Matlay, in which the documents were cited from each other by the same author. Matlay's research does not mention tourism much but focuses more on the use of e-business for entrepreneurial activities.

Cluster 5 (purple) shows four authors, led by Hannes Werthner, are 16 co-citations. There are at least 11 of the 117 articles citing Werthner's documents, including the article Liu & Liu (2019), which discusses Travel recommender systems (TRSs), in a hybrid way by utilizing the preferences of both individual and group users. (Liu and Liu 2019). In the article Liu & Liu (2019) citing Werthner's book entitled "Travellers and their joint characteristics within the seven-factor model" (Neidhardt and Werthner 2017). Werthner also had close connections and connections with 78 other authors. Werthner is the most cited author in cluster 5 (purple) and has made a major contribution to the topic of e-business and tourism research, especially on the use of technology systems, one of which is Travel recommender systems (TRSs).

In the end, it appears that the five clusters are related to each other. However, cluster 3 (blue) is far away, while cluster 1 (red) is closer to cluster 3 (yellow) and cluster 5 (purple), this means that the adjacent cluster has a stronger linkage in co-citation. As well as being the most widely used reference source in the 117 articles we analyzed related to the theme of e-business and tourism.

Table 2. Most-Cited Authors

Rank	Authors	Cluster	Co-Citation	Links	Total Link Strength
1	Dimitrios Buhalis	2 (green)	71	95	1,618
2	Rob Law	2 (green)	57	89	1,141
3	Kevin Zhu	1 (red)	29	80	1,141
4	Kenneth L. Kraemer	1 (red)	27	80	1,068
5	Daniel R Fesenmaier	2 (green)	26	85	819
6	Ulrike Gretzel	3 (blue)	24	72	596
7	Harry Matlay	4 (yellow)	18	9	114
8	Marianna Sigala	3 (blue)	17	83	274
9	Hannes Werthner	5 (purple)	16	78	277
10	Francesco Ricci	3 (blue)	14	81	666

Source: VOSviewer

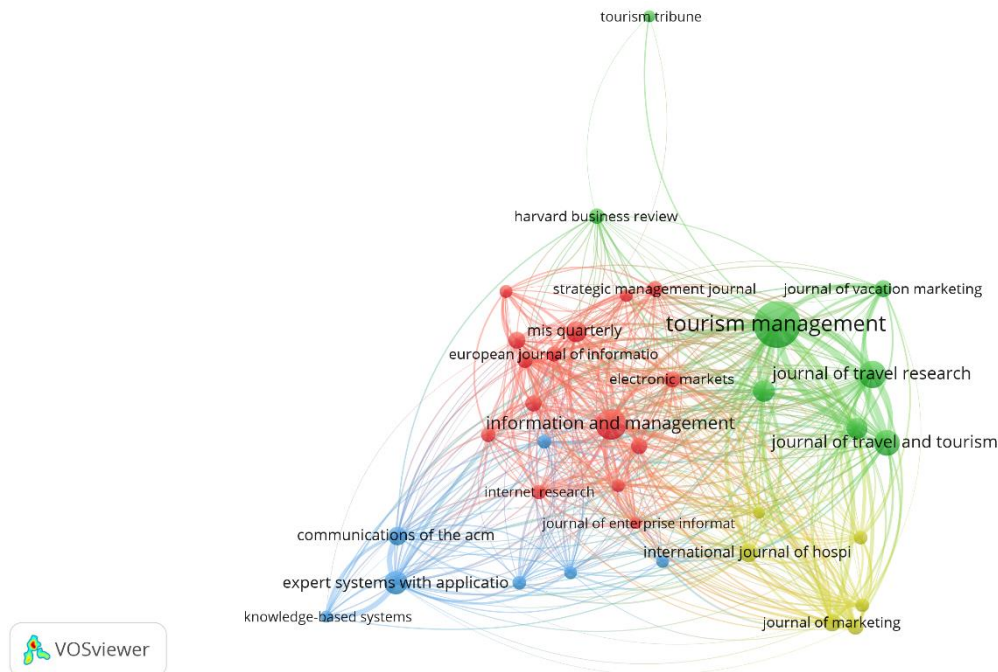
#### d. Co-citation Network of Cited Sources

Analysis of direct citations from the source is essential for researchers interested in deepening knowledge of a topic and disseminating it and obtaining accurate and reliable information within a given domain. Several previous studies used the co-citation of cited sources method to analyze the co-citation linkages between journals that were used as reference sources on certain research topics. Among other things, research on the intellectual structure of zakat published in Scopus indexed journals (Alshater *et al.* 2021). In Yumnam & Singh's (2021) research which produced a visualization of sources cited in an article published in The Malaysian Journal of Library & Information Science (MJLIS) (Yumnam and Singh 2021). In the study of Raman *et al.* (2021) used to analyze co-citation by cited sources in publications on blended learning in higher education (Raman *et al.* 2021). In Burak's (2021) research on network mapping with the topic of e-logistics, the result is that the International Journal of Physical Distribution & Logistics Management is the most cited source on the topic of e-logistics research (Burak 2021). In this research, we will try to map which reference sources most often appear on the topic of e-business and tourism research, and how these reference sources are connected to each other.

We use the Co-citation Network, with Cited-Sources as an analysis unit, and use the full counting method. Since several journals have different names but are the same journals, we uploaded a thesaurus file to combine those names (Appendix 4). As a result, 1,784 cited sources were extracted from the database, 36 of which presented at least 10 citations. As a result, there are 4 clusters/groups. Figure 7 visualizes these four clusters,

with 36 items (sources), 526 links, and a total link strength of 8,207. The ten most cited sources are shown in Table 3.

Figure 7. Co-Citation Network of Cited Sources



Source: VOSviewer

We discuss the structure of the co-citation network between cited sources (journals) regarding e-business and tourism produced by the VOSviewer. Cluster 1 (red) shows 15 items/journals, the largest “node” is information and management journals with 60 co-citations. The journal is based on a network pattern produced by VOSviewer, adjacent to the journal of small business and enterprise development, which is still in the same cluster. There are 14 of the 117 articles citing from the journal "information and management", including the article Bingbing *et al.* (2019), which discusses personalized recommendation technology in B2B using Filter Bubble Phenomenon (Bingbing, Tianlong, and Yan 2019). The article cites one article/document, namely the article entitled “Psychological reactance to online recommendation services” (Lee and Lee 2009). We found the article didn't talk much about tourism, but more about using technology. Furthermore, there is a study from Munikrishnan *et al.* which discusses the factors driving and inhibiting the adoption of ICT technology in traditional travel agents. (Munikrishnan *et al.* 2018). The article cites 2 articles/documents in the journal "information and management", both of which discuss technology adoption (Kuan and Chau 2001; Mehrstens, Cragg and Mills 2001) Based on these data, it can be concluded that the journal "information and management" is one of the most cited journals and has a major contribution to the topic of e-business and tourism research, especially in information technology.

Cluster 2 (green): There are eight items (journals), the largest “node” is “tourism management” journals with 143 co-citations, the most co-citation journal of all journals that publish articles about e-business and tourism. Tourism management journals based on network patterns produced by VOSviewer, adjacent to the international journal of Conte, journal of vacation marketing, and journal of travel research. There are 49 of 117 articles citing from the journal "tourism management", including articles (Zheng *et al.* 2020), which discusses the use of a tourism itinerary model by utilizing artificial intelligence (AI) to provide more reasonable and diverse itineraries recommendations that can be integrated into smart service systems, as part of e-business. The article cites 19 articles/documents sourced from the journal "tourism management". Several articles, including those entitled “Using a heuristic approach to design personalized urban tourism itineraries with hotel selection” (Zheng *et al.* 2020). In addition, it also cites another article that discusses tourist mobility using GPS (global positioning system) (Zheng *et al.* 2019). We found that some of these articles discussed more about technology adoption in tourism management. Based on these data, it can be concluded that the journal "tourism management" is one of the most cited journals and has a major contribution to the topic of e-business and tourism research, especially in tourism management.

Cluster 3 (blue) has seven items/journals, the largest “node” is “Expert Systems with Applications” journal with 35 co-citations. Based on the network patterns generated by the VOSviewer application, the journal is adjacent to the communication of the ACM journal, which is also a top 10 journal with 23 co-citations. There are 11 of 117 articles citing from the journal "Expert Systems with Applications", including articles that examine the quality evaluation index system of tourism e-commerce models, especially through evaluating website functions (Ping 2018). As well as articles exploring how online customer reviews affect business performance with website credibility as an intermediary variable and information quality as a moderator (Li and Feng 2018). Li & Feng's article cites an article from the journal "Expert Systems with Applications". This article develops a theoretical framework to examine the role of utilitarian and heonic values in the phenomenon of mobile data services (MDS) adoption (Kim and Han 2011). We found that the article didn't talk much about tourism, but only discussed the technology side. Based on these data, it can be concluded that the journal "Expert Systems with Applications" is one of the journals that has a significant contribution to the topic of e-business and tourism research, especially in terms of information technology and applications.

Cluster 4 (yellow): There are six items/journals, the largest “node” of the “International Journal of Hospitality Management”, with 23 co-citations. Based on the network pattern generated by the VOSviewer application, the journal is adjacent to the management decision journal, which has ten co-citations. There are 13 of 117 articles citing from the journal "International Journal of Hospitality Management", including articles that discuss the integrated model of using e-business and its impact on the characteristics of hotel social media (Halawani, Soh and Halawani 2020). The article cites three articles sourced from the journal "International Journal of Hospitality Management". Among other things, research on digital marketing (De Pelsmacker, Van Tilburg and Holthof 2018), social media in hotel business (Garrido-Moreno *et al.* 2018), continuance intention of online customers (Tran, Pham and Le 2019). We found that the article didn't talk much about tourism, but more about social media. Based on these data, it can be concluded that the journal "International Journal of Hospitality Management" is one of the journals that has a significant contribution to the topic of e-business and tourism research, especially on the digital marketing side.

In the end, it appears that the four clusters are related to each other. Cluster 1 (red) and cluster 2 (green) are closer to cluster 3 (yellow) and dominate, especially cluster 2 (green) which has the largest “node”. This means that adjacent clusters have stronger co-citation linkages. It is also the most widely used reference source (journal) in the 117 articles we analyzed related to the theme of e-business and tourism.

Table 3. Top 10 Co-Citation Network of Cited Sources

Rank	Source	Cluster	Co-Citation	Links	Total Link Strength
1	Tourism Management	2 (green)	143	35	2,208
2	Information and Management	1 (red)	60	33	1,291
3	Journal of Travel Research	2 (green)	48	34	929
4	Journal of Travel and Tourism Marketing	2 (green)	44	34	790
5	Expert Systems with Applications	3 (blue)	35	32	634
6	International Journal of Contemporary Hospitality Management	2 (green)	31	35	487
7	MIS Quarterly	1 (red)	29	33	565
8	Annals of Tourism Research	2 (green)	28	34	510
9	Communications of The AcM	3 (blue)	23	34	368
10	International Journal of Hospitality Management	4 (yellow)	23	32	458

Source: VOSviewer

We have observed that based on a bibliometric analysis, research on the topic of e-business and tourism simultaneously provides a more detailed understanding of how these topics are constructed, and how the pattern of interrelationships is formed between them. As we know that e-business and tourism are separate studies, however, the development of information technology has an impact on all aspects, including tourism activities. Based on the database we used, studies with the theme of e-business and tourism together had started appearing in 2003, but the development was not very significant, with a tendency to fluctuate (see Figure 3). The latest document that we obtained discusses the use of Artificial intelligence (AI) technology in tourism travel planning models (Zheng *et al.* 2020). This proves that technological developments have caused major changes to the tourism business.

Based on the contribution of the author's country of origin, we found that China contributed the most according to the number of scientific publications, followed by other countries in Australia and Europe (for example, Australia, England, Greece, Spain) and a small number of other countries in Asia, America, and Africa (see Figure 4). It is an interesting fact that these countries are also the most visited countries in the world (UNWTO 2020). In other words, research conducted indirectly has an impact on improving the quality of services in the tourism sector, and ultimately increasing the number of tourist visitors.

Furthermore, according to the results of co-occurrence visualization using the VOSViewer application, the most frequently mentioned topics were "e-commerce", "e-business", "tourism", and "website" (see Table 1, and Figure 5). The keyword "e-commerce" (cluster 2) has a strong relationship with the keyword "e-business" (cluster 1), this indicates that research on e-business and tourism aims to increase trade in tourism destinations, both through websites and through media social. For example, research (Halawani, Soh and Halawani 2020) discusses the integrated model of using e-business and its impact on the characteristics of hotel social media. Li and Feng explored how online customer reviews affect business performance with website credibility as an intermediary variable and the quality of information as moderators (Li and Feng 2018), and other researchers (Ping 2018), and (Gunden, Morosan, and DeFranco 2020) with the same topic, namely discussing the use of websites to market tourism-related activities.

We also examined the co-citation relationships between the cited authors. The authors who are widely cited are Dimitrios Buhalis and Rob Law who are in cluster 2. In the third position, Kevin Zhu is in cluster 1 (see Table 2, Figure 6). Dimitrios Buhalis is a professor who has expertise in the field of e-tourism, so it is not surprising that he became the most referenced source on the theme of e-business and tourism research. Based on the results of the visualization of the VOSViewer application, Buhalis has a close relationship with Rob Law. This indicates that the two often conduct research together. Rob Law is a Professor in the fields of tourism, hospitality, and technology management. Kevin Zhu who is in cluster 1 does not have a strong relationship with Buhalis and Law, even though he is in the third position in the co-citation cited authors. This is reasonable, considering that Kevin Zhu is a professor who focuses on the field of information technology (IT), so that there is not much collaboration with tourism experts.

The sources most cited in articles with the topic of e-business and tourism came from the journal "Tourism Management" which was in cluster 2 (green), and from the journal "Information and Management" which was in cluster 1 (see Figure 7). The two journals have different clusters, in other words, different focus and scope, but still have a relationship. This means that many articles on the topic of e-business and tourism refer to these journals at the same time. What we find interesting is that there is a link between the cited author and the cited source. The article written by the author in cluster 2 (green) turned out to be in the journal that was quoted the most, namely cluster 2 (green). As Dimitrios Buhalis is the author who is cited the most, and most of the articles written by Buhalis are in the journal "Tourism Management" which is in cluster 2. Overall, it can be concluded that, research topics on e-business and tourism often refer to these authors and sources.

Based on bibliometric analysis, several joint research opportunities have emerged. Future research directions that can be identified are as follows:

(1) Logical linking of keywords in different clusters (see Table 1, and Figure 5) can increase opportunities to expand current research into the domain of e-business and tourism integration. For example, the keywords are smart tourism, commerce, travel agencies, and e-tourism. So, further research can target to logically combine different keyword clusters for broader research.

(2) One of the findings is that the authors prefer to research in their country of origin. Such as (Liyang and Ke 2009) and (Zheng *et al.* 2020) who conducted their research in their own country, namely China, and (Dharmanto *et al.* 2019) from Indonesia, researched in their own country. With these findings, it is hoped that future research can target case studies from different locations. Thus, it can be useful because it discusses issues related to different locations with different cultures.

(3) There is a great opportunity for researchers to conduct case-based research on different tourism industries, namely rural tourism, which is growing in various countries, especially in countries with tropical climates.

This study has empirical implications. The trend of e-business studies on volatile tourism causes problems in exploring and exploiting the topic. With this mapping, it is hoped that other researchers will get an overview of the current research position and how a research topic is related to one another. It provides an overview research map that will be carried out in the future and offers opportunities to conduct e-business and tourism integration studies, which have not been widely studied, especially in the scope of MSMEs.

## Conclusion

A comprehensive review of bibliometric analysis of e-business publications on tourism has been completed. Based on the data we collected from Scopus sources using existing methods, as many as 117 articles were selected during the period between 2003 and 2020. The results of the bibliometric analysis help researchers understand the type of research, themes, and research gaps to conduct further research. The selected articles were analyzed and categorized using bibliometric co-occurrence and co-citation analysis. In addition, we consider publication trends from year to year, and contributions by country. The articles are classified according to keyword groups, called clusters. A total of 4 keyword clusters were generated using the VOSViewer application. The keywords that often appear are "e-commerce" and "e-business" from different clusters. Next, we highlight the journals that have most contributed to the topic of e-business and tourism research, including the interrelationships between the authors cited. The implication of this research is to provide a research map that will be carried out in the future and offer opportunities to conduct studies on the integration of e-business and tourism, which have not been widely studied, especially in the scope of MSMEs. In addition, it provides knowledge regarding which authors and reference sources are the most influential in building e-business and tourism research topics. This study also has a novelty in, which conducts bibliometric analysis on the theme of e-business and tourism simultaneously.

This study has two limitations regarding the data source used, which is only sourced from the Scopus database, and one language (English). There are possibilities of more varied results when using additional sources, such as from web databases of science (WoS) and Google Scholar (GS) and with another language. In addition, searching articles is strictly limited to the keywords "e-business" and "tourism", thus closing the possibility of articles that have similar topics with keywords that are different but have the same meaning, to be included in this study.

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**APPENDIX 1 Scientific Publications Related to E-Business on Tourism**Database available on Google Drive: <https://bit.ly/3vlqJV3>**APPENDIX 2 – Thesaurus Keyword**

Label	Replaced by
ebusiness	e-business
electronic business	e-business
electronic commerce	e-commerce
world wide web	website
websites	website

File available on Google Drive: <https://bit.ly/3vlqJV3>**APPENDIX 3 – Thesaurus Author**

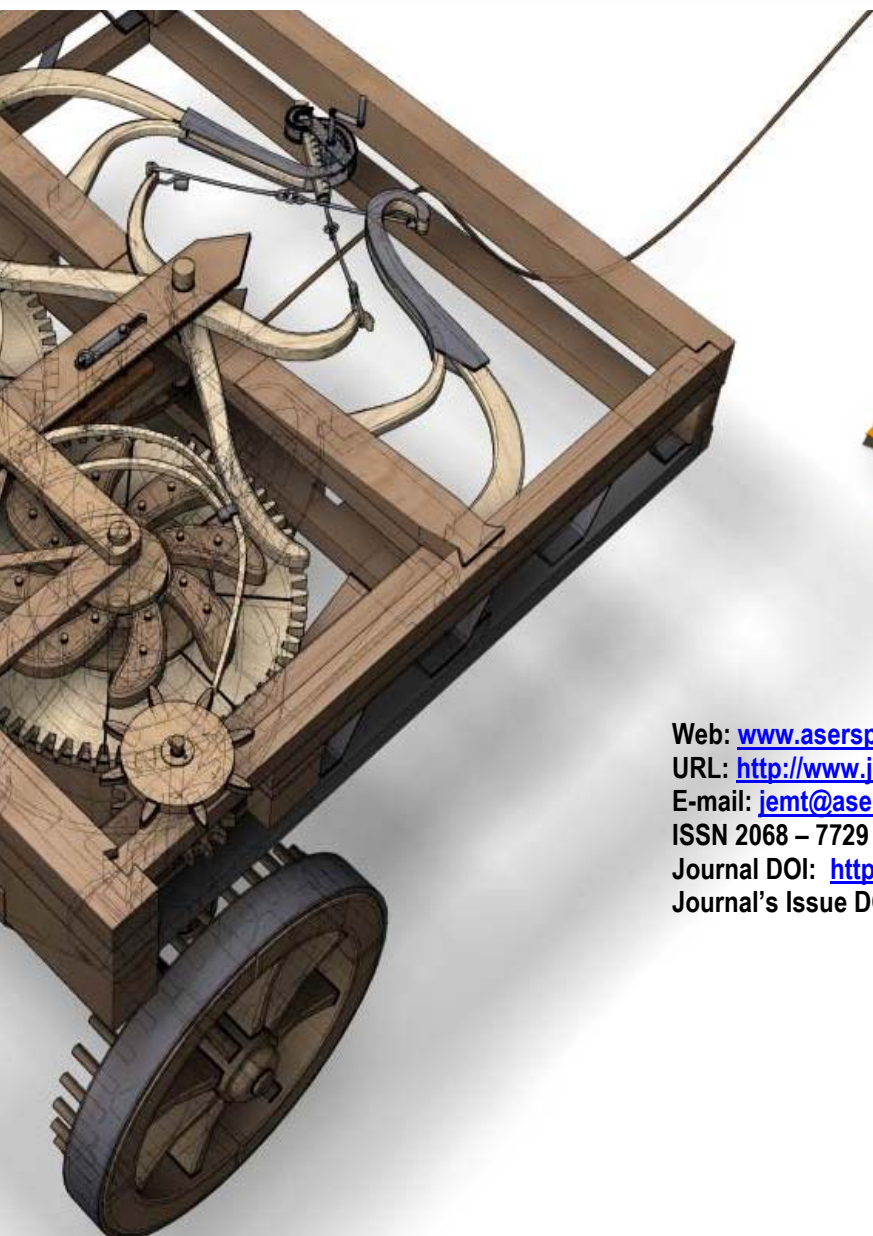
Label	Replaced by
porter, m.	porter, m.e

File available on Google Drive: <https://bit.ly/3vlqJV3>**APPENDIX 4 – Thesaurus Source**

Label	Replaced by
information & management	information and management
journal of travel & tourism marketing	journal of travel and tourism marketing

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