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Jurnal Manajemen Indonesia

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## Big Data Utilization on Tourism Marketing in Post-Pandemic Recovery Ear: Future Prospect for Indonesia

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### Abstract

*Along with the behaviour changes toward digitalisation in the pandemic, reliable data to manage tourism marketing in Indonesia is needed. The study objectives are to go into detail on the application of big data and identify what kind of data is necessary for tourism marketing based on the previous research. Most studies about big data on tourism marketing come from overseas, with only a few from Indonesian authors. Questions were raised on what big data is used in tourism marketing and what data is needed, mainly for Indonesia. The use of big data and the kind of data for the benefit of tourism marketing in this study has yet to be discovered. The study adopted SLR with the PRISMA approach and continued with bibliometric analysis using VOS Viewers based on keywords and co-occurrence. Scopus is a database source, and 105 articles published from 2002 to 2022 are found. There are six clusters from plotting extensive data application networks. Two forms of big data can be gained to foresee tourism marketing in post-pandemic recovery. The utilisation cluster is the consumer behaviour research, technology operation, social media, future prediction based on network sentiment analysis, and innovation in smart tourism. Data from the tourism industry and non-tourism sector can be utilised. The study implied combining both the tourism and non-tourism sectors as integrated big data in tourism marketing for decision-making in the future.*

*Keywords— big data; marketing; non-tourism; tourism; utilization*

### Abstrak

Pemanfaatan mahadata meningkat terutama dalam pemasaran pariwisata namun diriset secara optimal di Indonesia Riset ini bertujuan melakukan kajian literatur sistematis pada 105 artikel tentang mahadata, pemasaran, pariwisata untuk menemukan topik riset tentang mahadata di masa mendatang sekaligus menjabarkan pemanfaatan mahadata bagi pemasaran pariwisata Indonesia. Kajian dilakukan dengan pendekatan Prisma dari pangkalan data Scopus dengan rentang waktu publikasi tahun 2002 hingga 2022 dilakukan analisis bibliometrik menggunakan MS Excel dan VOSViewer berdasarkan kata kunci dan jejaring *co-occurrence*. Hasilnya menunjukkan bahwa mahadata dalam pemasaran pariwisata dimanfaatkan dalam (1) riset perilaku wisatawan, (2) utilitas teknologi sebagai kecerdasan artifisial, pencitraan destinasi, *smart tourism* dan UGC, (3) bank data dan teknologi informasi sosial media, (4) metode prediksi masa mendatang berdasarkan numerikal dan proyeksi pengembangan pariwisata berkelanjutan, (5) sebagai analisis sentimen berbasis jejaring sosial, dan (6) kebutuhan inovasi pemasaran pariwisata dalam *smart tourism*. Sumber data dalam mahadata bisa dihasilkan dari dalam industri pariwisata dan dari luar sektor pariwisata (non-pariwisata seperti: sektor telekomunikasi, keuangan, tata kota, iklim dan kesehatan). Implikasi kajian diidentifikasi dan membuka peluang topik baru. Terakhir, limitasi atas kajian literatur dan arahan riset mendatang didiskusikan.

Kata kunci— mahadata; non-pariwisata; pariwisata; pemanfaatan; pemasaran

### Article info

Received (06/10/2022)

Revised (09/03/2023)

Accepted (31/07/2023)

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DOI: 10.25124/jmi.v23i2.5481

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## I. INTRODUCTION

The aftermath of the pandemic caused a decline in foreign travel to Indonesia. International travel declined by 74% in 2021 compared to the previous year, resulting in losses of up to \$2 trillion (UNWTO, 2021b). Indonesia has been affected by this massive blow. Foreign tourists entering Indonesia declined by 75%, which had a detrimental effect on tourism industry operations, as hotel room occupancy dropped by 44%, and more than 939,000 tourism workers lost their jobs. Small and medium-sized tourism enterprises went bankrupt (Kementerian Pariwisata dan Ekonomi Kreatif, 2021). This circumstance accelerates behavioural changes toward digitalisation and underlines the necessity for accurate data and intelligence to manage tourism in the post-pandemic recovery period. Governments and tourism enterprises are seeking official statistics with actual data to comprehend changes better.

Tourism recovery decisions demand a data-driven foundation for deliberation. With the application of health protocols, biosecurity technology, and digital health certificates to facilitate the reopening of international borders, big data is the key to facilitating travel. Data availability transforms tourism, particularly in the field of tourism marketing. However, there are obstacles associated with privacy, skills gaps, data reliability, governance and infrastructure, accessibility restrictions, and funding sources that impede safe and equitable access to tourism data. Market data and analytics are expected to help destinations, businesses, and tourism workers better prepare for changes in the business landscape as part of recovery efforts. (Inanc-Demir & Kozak, 2019; Y. Y. Liu et al., 2018; Ma et al., 2021). Big data is anticipated to generate and supplement official tourism statistics, particularly for policy-making and decision-making. However, a comprehensive review of the usage of big data in tourism marketing is a challenge. Many questions have been raised regarding the type of data used in tourism marketing and how to use data for the benefit of tourism sectors, particularly in policy-making and decision-making. The characteristics of data and analysis techniques may influence how big data contributes to the tourism industry's post-pandemic recovery and serve as the foundation for every marketing decision involving the analysis and interpretation of future data. However, most studies on big data and tourism marketing are conducted by foreign writers; only minimal research is conducted by Indonesians. The significant use of big data in tourism marketing in Indonesia has not yet piqued the interest of Indonesian scholars, and there are still challenges with the readiness of big data, especially tourism statistics data. In addition, there is no literature review on using big data in tourism marketing for post-pandemic recovery. This paper, therefore, presents a complete literature review on the use of big data in tourism marketing and offers a systematic analysis to stimulate future research on various topics related to the use of big data in tourism marketing decisions. If Indonesian researchers conduct studies on the use of big data in tourism marketing, various data sources, categories, and methods can be revealed, allowing all stakeholders to make real-deal decisions primarily based on accurate facts and figures instead of bias. This study aims to determine the use of big data in tourism marketing based on prior research and determine the type of data required for tourism marketing to aid post-pandemic recovery to be applied in Indonesian tourism marketing.

## II. LITERATURE REVIEW

### 2.1. Big Data

"Big data" can be defined as a vast and diverse, structured and unstructured collection of data and information generated and sent by companies, individuals, and machines (sensors) (Ghotkar & Rokde, 2016). "Big data" is the vast amount of data generated by robots or humans when regular databases cannot process it. The breadth of big data is illustrated as follows:

- In 2011, humans created more than 1.2 trillion GB of data.
- Data volume increased 50 times in 2020
- Google receives more than 2 million search queries every minute.
- 72 hours of video is added on YouTube every minute.
- Twitter users send more than 100,000 tweets every minute or 140 million dailies.
- Companies, brands, and organisations receive more than 34,000 likes on social networks every minute

Big data can be collected from both internal and external sources. Traditional data focuses on the internal analysis of an organisation or company, but there is a growing need for external data. The internal data of a firm or organisation (in e-commerce, e-shopping, for instance) and log data (such as railway ticket bookings and the availability of seats on carriages) can lead to inconsistencies when data records establish a unique identifier (Id). In contrast, external data sources may be derived from social media that is updated regularly. Facebook, Instagram, Tik Tok, Pinterest, and Twitter, among others, are examples of platforms that encourage external data. Consequently, big data is a combination of social data and business data that possesses the 5 Vs: volume, velocity (speed), variety, veracity (truth), and value (Garg, 2019). Volume is the amount of data generated and stored by an organisation that must be handled or accessed. During the pandemic, this volume substantially rose. Five hundred hours of video were posted to YouTube per minute, 208,333 Zoom matches were created, 1,338,889 phone calls or videos were made, and 41 million WhatsApp messages were sent. Speed refers to the rate at which data is created, stored, analysed, and visualised for downloading and utilisation (BBVA, 2020). For example, 500 hours of YouTube videos are posted every minute, together with their associated metadata (URL, description). This material must be collected, categorised, and made accessible to users in need to form a digital record immediately. Variety refers to the diversity of omniscient formats, which can be structured, consisting of patterned data types that make it easier to search for databases, or unstructured, consisting of files such as videos, audio, images, and social media posts that are not in the database, making it more challenging to analyse to get a clear picture. The quality and integrity of data determine whether it is exhaustive, accurate, and derived from a trustworthy source. The level of the breadth of data sets that can be processed and comprehended to generate analytics and visuals that can enhance the company's decision-making processes and policies defines the value.

Table 1. Location, Category, and Source of Big Data

Locations	Category	Source of Big data
Internal: An organisation or company generates, owns, and controls data.	Structured data consists of established data kinds with search-friendly patterns. Approximately twenty per cent of all big data is data saved in databases. Examples include the date, phone number, customer name, product name, and transaction details.	Organisational: Traditional data is collected and processed by the organisation. For example: in the customer relationship management system, company transaction source plan data, outlet transactions, and ledger data.
External: public data or privately owned data that is not owned or controlled by the company or organisation.	Unstructured data: the type of massive file that is not in the company's database and contributes 80 per cent of all big data, such as video, audio, social media posts	Machine generated: data generated from <i>real-time</i> sensors by machines, examples: detailed recording of conversations, factory sensors, records ( <i>logs</i> ) of equipment, trading system data, <i>remote-sensing</i> data.

Sources: (BBVA, 2020; Garg, 2019; UNWTO & ADB, 2021)

## 2.2. Big Data in Tourism Marketing

In the age of digitalisation and Industry 4.0, data is essential for all facets of life, including the tourism business. Governments and all relevant stakeholders require data for decision-making, policy frameworks, evaluations, and business forecasts. UNWTO advocates the investigation of big data for tourist statistics, even though big data can be difficult, and stakeholders must be attentive regarding accuracy, validity, and reliability (UNWTO & UNDP, 2017). Big data-related technological advances increasingly enable rapid transformation and innovation in tourism (Sigala, 2018). Technology technologies offer real-time, fast, and mobile data gathering and sharing considerable amounts of data in many formats; for example, social media networks facilitate rapid big data, encouraging their enrichment, augmentation, and transformation. Additionally, technology provides rapid processing, display, and analysis of massive amounts of data, which promotes and facilitates decision-making. Big data has generally destroyed modern technologies, methods, data retrieval applications, visualisation techniques, and data aggregation capabilities (Gandomi & Haider, 2015). Big data sources in tourism include (Demunter, 2017). In the age of digitalisation and Industry 4.0, data is essential for all facets of life, including the tourism business. Governments and all

relevant stakeholders require data for decision-making, policy frameworks, evaluations, and business forecasts. UNWTO advocates the investigation of big data for tourist statistics, even though big data can be difficult, and stakeholders must be attentive regarding accuracy, validity, and reliability (UNWTO & UNDP, 2017). Big data-related technological advances increasingly enable rapid transformation and innovation in tourism (Sigala, 2018). Technology offers real-time, fast, and mobile data gathering and sharing of considerable amounts of data in many formats; for example, social media networks facilitate rapid big data collection, encouraging its enrichment, augmentation, and transformation. Additionally, technology provides rapid processing, display, and analysis of massive amounts of data, which promotes and facilitates decision-making. Big data has generally destroyed modern technologies, methods, data retrieval applications, visualisation techniques, and data aggregation capabilities (Gandomi & Haider, 2015). Tourism big data sources include (Demunter, 2017).

1. Communication systems include mobile network data and social media.
2. The worldwide web, for example, individual/business websites.
3. Transaction data include flight booking systems and retail transactions.
4. Physical sensors, for example, places of interest/information; and
5. Crowdsourcing, for example, images and content from the YouTube platform TripAdvisor.

Digital transformation has enabled numerous industries to respond with real-time data and reduce data collection expenses. Findings from big data can supplement conventional measurement techniques, such as surveys and official statistics, by shedding light on human behaviour patterns, experiences, and profiles. Combining traditional and big data methodologies in most industries can facilitate swift and informed decision-making (UNWTO, 2021a). Big data is spatially and temporally complex and is generated by several users and sources. The qualities of big data can significantly satisfy the need for measuring economic development. Analytically, technological advances (e.g., sensors, social media, and web-based tools) produce data in large volumes (large-scale data), at high speeds (high-speed real-time data), in various forms (variability data in the form, e.g., soft and hard data, text-based data, and numerical data), and with a high degree of truth (some interpretations and a great deal of "noise," e.g., the quality and reliability of big data).

### III. RESEARCH METHODOLOGY

For ontological inquiries (questions about the nature and essence of reality) and epistemological perspectives (belief in knowledge and how to acquire it), the selection of research methodologies is essential (i.e., belief in knowledge and how to know it). This study is motivated by the ontological assumption that reality is socially and culturally constructed and by the epistemological belief that the structure of political power influences knowledge production; that is, the study of this literature is motivated by the belief that knowledge production can be generated through a systematic literature review of interest in big data. In addition to the notion that tourism has reached a tipping point, it is possible to gain a greater understanding of the use of big data in post-pandemic tourism marketing. This systematic review of the literature (SLR) on the use of big data in tourism marketing for post-pandemic recovery seeks to identify the application of big data in tourism marketing and the type of data required for tourism marketing decision-making so that it can inspire future research topics. The literature review adheres to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines (Prisma et al., 2009). Before initialising the data, a protocol detailing the analysis method and inclusion criteria is developed. Scopus searches for articles published between 2002 and 2022 in information technology, marketing, and tourism journals. Each article contains keywords related to big data, marketing, tourism, or post-pandemic. The Scopus document search engine's CSV export function exports titles, abstracts, keywords, author names, affiliations, journal names, and publication years as comma-separated values (CSV) files. For this study, data set items are thoroughly screened, and if the article does not contain tourism marketing, it is disregarded. Examining and encoding as data each article that meets the criteria In bibliometric analysis, Microsoft Excel is utilised to depict the quantitative evolution of research by year, the most prolific journal, and the most productive nation. Last but not least, VOS Viewer is utilised for bibliometric network analysis utilising keyword scoring and co-occurrence networking.

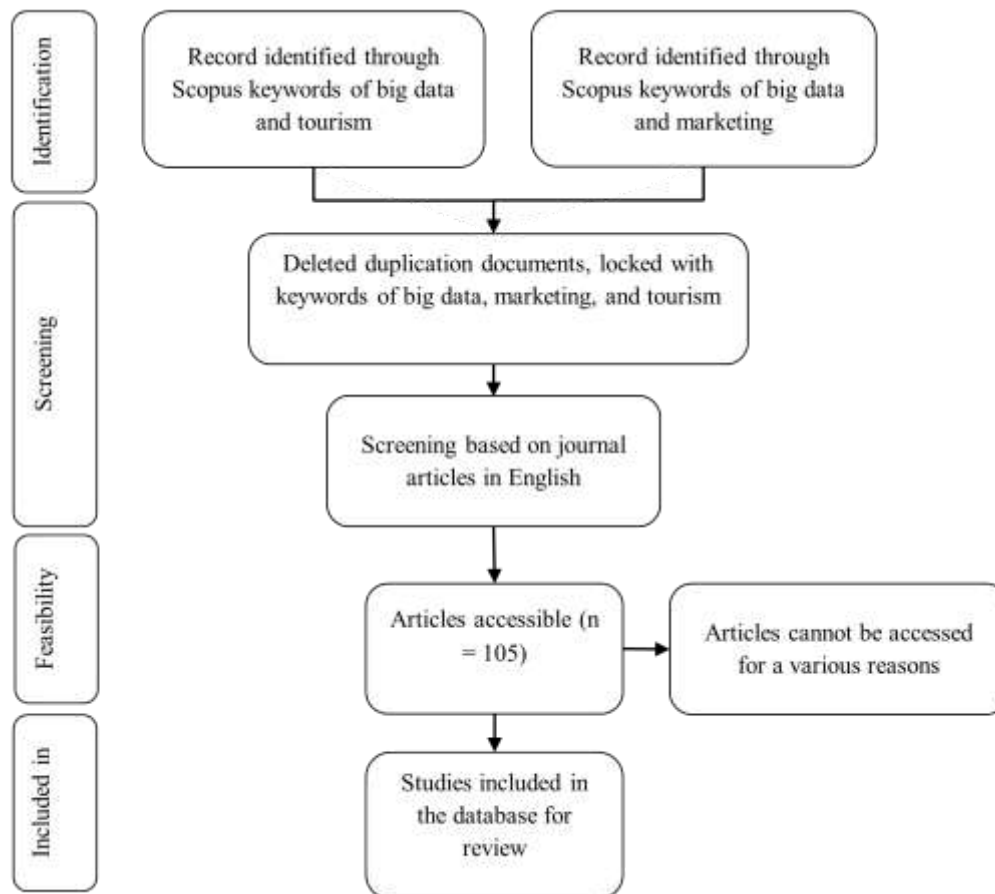


Fig. 1. Study Selection Process Flow

#### IV. RESULT/FINDING

Initial Scopus searches with big data and tourist keywords yielded 689 articles, while searches with big data and marketing keywords yielded 1286 articles; however, screening the database with all three keywords yielded 186 articles. Then, based on the category of English-language journal articles, 186 articles were obtained. It was determined that 105 documents are accessible, and 77 are inaccessible due to various factors, including the presence of articles from predatory journals. This investigation's selection procedure is depicted in Figure 1. The final database containing 105 and 105 articles from 75 journals with 160 authors and co-authors, was available for review. The analysis begins with the publication total for the year (see Chart 1). In 2002, a single article was published on big data and tourism marketing for the first time, and in 2021, 31 articles were published. This demonstrates that big data is not only a statistical supplement to research needs but also a fascinating topic to study, given that post-pandemic research in 2021 will require real-time data and information for decision-making. Tourism industry recovery and revitalisation efforts are based on big data, and marketing is the discipline that employs it.

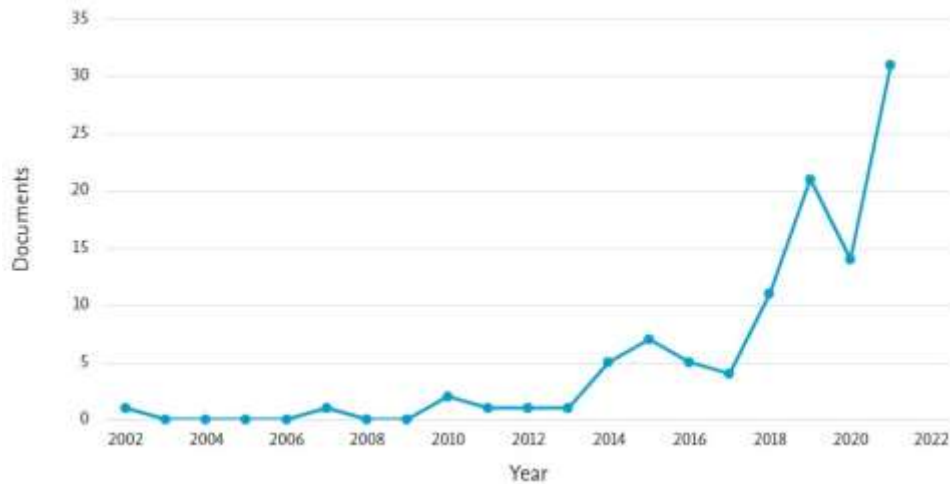


Fig. 2. Number of Articles on Big Data Tourism Marketing in 2002-2022  
(Source: Scopus Analysis, 2022, accessed on 5 February 2022 at 10:18)

The following journals publish articles on big data in tourism marketing: (1) the Journal of Destination Marketing and Management, with six articles; (2) Tourism Management and Journal of Travel Research, with five articles; (3) the International Journal of Contemporary Hospitality Management, with four articles; and (4) the Asia Pacific Journal of Tourism Research, the Journal of Travel and Tourism, Sustainable Switzerland, and the Tourism Review, with three articles each. Most articles on applying big data to tourism marketing focus on tourism destinations, tourist markets, social media, tourism management, decision-making, visitor behaviour, and big data analytics.

In addition, articles are published in business, management, and accounting, as well as in social science and computer science. The publications are distributed by authors from 45 countries, including two articles from Indonesia. China is the most productive country producing goods, followed by the United States. The two largest nations are, in fact, countries that optimise big data for the advancement of tourism marketing, particularly concerning tourism destinations, tourist markets, tourist behaviour, commerce, and tourism enterprises with decision-making authority. The national origin must be acknowledged to comprehend how far the evolution of big data has progressed in tourism marketing. Big data is essential for Indonesia to improve performance via digital technologies that enable more efficient data acceptance and analysis to promote activities (Kemenparekraf, 2020).

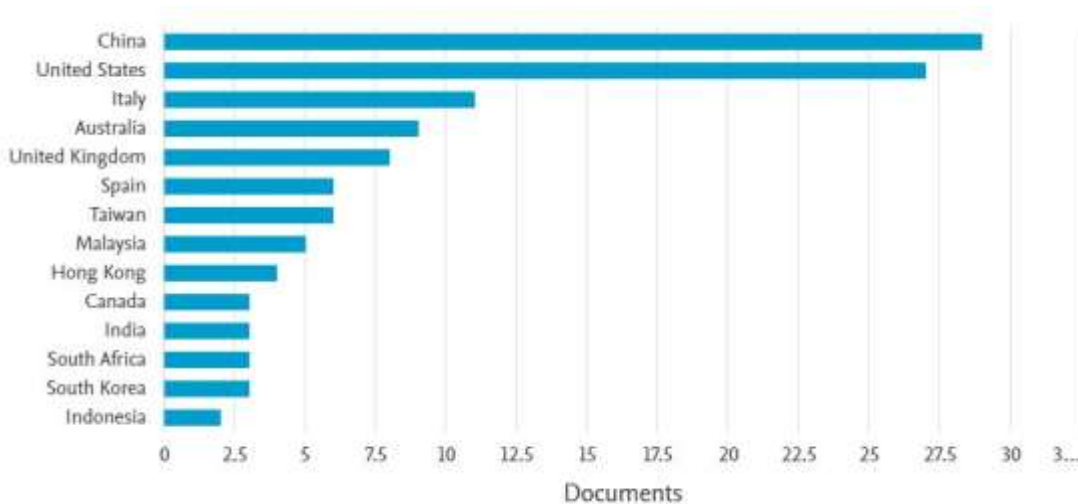


Fig. 3. Contribution Countries in Tourism Marketing Big Data Research  
(Source: Scopus Analysis, 2022, accessed on 5 February 2022 at 10:19).

## V. DISCUSSION

Mapping the application of big data on tourism marketing in post-pandemic recovery is done by researching publications published from 2020 to 2022. All articles' abstract, keyword, and citation information are assembled in an MS Excel file (CSV) and mapped using VOS Viewer to find their utilisation. By plotting big data utilisation networks in tourism marketing, there are six clusters of big data utilisation (see Figure 4).

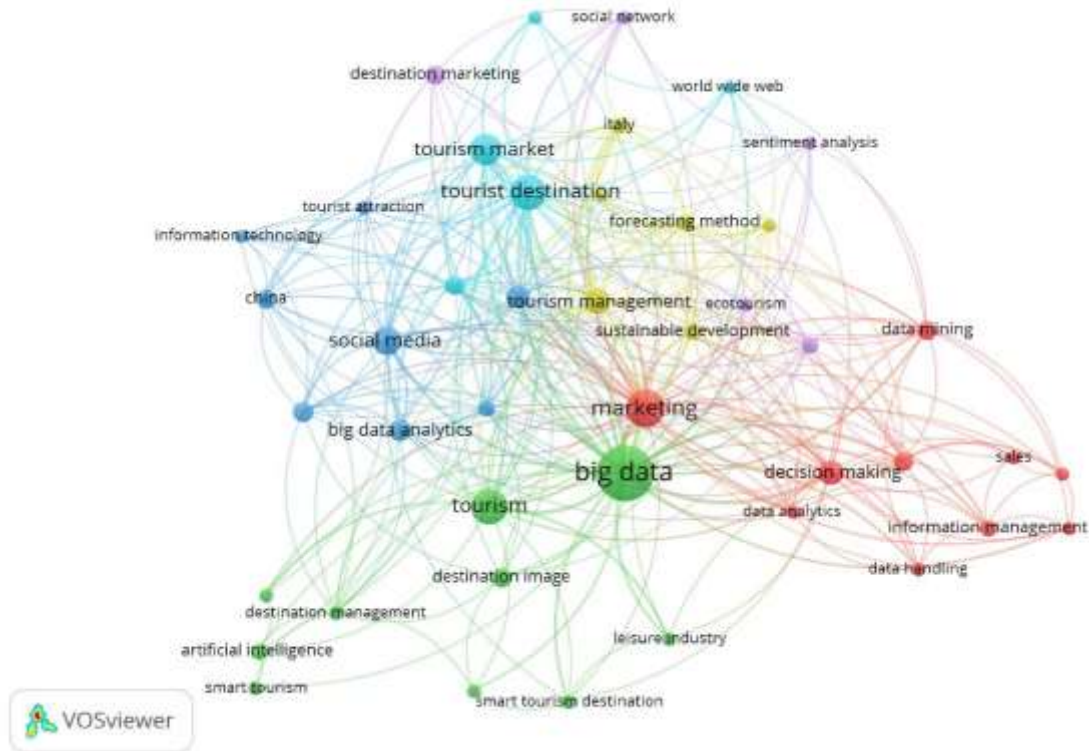


Fig. 4. Big Data Utilization Network in Tourism Marketing  
(Source: VOSViewer, 2022, accessed on 5 February 2022 at 10:26)

The first cluster consists of topics concerning the advantages of big data for tourism marketing research. Behavioural research articles investigate the scope of cross-border integration between big data and tourism marketing that yields advantages due to big data platforms and location-based services. In the tourism e-commerce environment, these enable data mining based on the user's travel behaviour so that user data such as geographical information, consumption patterns, and social data can be used for decision-making to meet tourist demand (Andryeyeva et al., 2019; J. Zhang et al., 2019). While the articles in this cluster on post-pandemic pandemic suggest spatially-based tourist behaviour with intercity tourism movements within the nation or domestic tourism, this is not the case. Travel arrangements for nearby destinations are made through e-commerce, and the preference for driving rather than flying causes resilient tourism businesses to be near urban areas. Big data mining provides information on online sales (Bui et al., 2021; Donaire et al., 2021; Gao et al., 2021). Big data in tourism marketing research, particularly consumer behaviour research, is utilised in trade, data analytics, data handling, and data mining for information management and sales decision-making, particularly in the aftermath of a pandemic.

The second cluster describes the leading big data technology in tourism marketing. Articles on the artificial intelligence (AI) of big data on tourism marketing (Lv et al., 2021; Meng et al., 2021; C.M. Q. Ramos et al., 2017; Samara et al., 2020) are incorporated into a marketing intelligence (MI) database (MI). The automation system helps identify tourist behaviour and attitudes, evaluate the performance of tourism businesses, and predict the future of the tourism industry. AI provides benefits for increasing the efficiency, productivity, and profitability of tourism businesses due to its capacity to explore the depth of experience and personalise tourist behaviour, thereby increasing the business's added value. User-generated content (UGC) enables tourism businesses to comprehend

the disparity between promotional materials and tourist perceptions. The benefits of big data in tourism marketing are examined from the technological perspectives of artificial intelligence, destination imaging, intelligent tourism, and user-generated content.

Social media big data analytics is the third cluster. Big data applications employing data analytics techniques can organise vast data (Mohamed et al., 2020). (Mohamed et al., 2020). Big data analytics is becoming necessary for tourism businesses as tourists become increasingly digitally savvy with their digital footprints. These can be used to evaluate the image of destinations based on travel blogs tourists write. Additionally, data can be used to estimate the number of visitors to tourist attractions (Y. Y. Liu et al., 2018; Park et al., 2016; Wang et al., 2019; Yallop et al., 2021). Some articles also indicate that big data analytics played a role in post-pandemic recovery through the provision of accurate information, the strengthening of agility in dynamics, the vulnerability of the time-sensitive service industry, and the fact that big data affects tourism business performance and assists organisations in predicting tourist behaviour patterns to create demand-based propositions (Andariesta & Wasesa, 2022; Stylos et al., 2021; Sung et al., 2021; Y. Zhang, 2021). In addition, big data provides timely granular data that is crucial in highly volatile situations; therefore, destination management organisations must enhance their analytical capabilities and evaluate the potential impacts of big data to make prompt and accurate decisions (Chen, 2021; Gallego & Font, 2021). Big data analytics in tourism marketing uses data sets and information technology in managing tourist attractions and understanding tourist behaviour to impact the future, particularly in post-pandemic recovery positively.

Cluster 4 is classifying big data for future tourism marketing forecasts, particularly post-pandemic recovery. This demonstrates that tourist travel patterns will be highly dynamic and influenced by health and safety factors. High-frequency data, particularly in communication via mobile phones and Wi-Fi networks, enables the geo-location of its users to be detected as big data, allowing for approximate accuracy in future time-series models based on tourist arrivals at destinations (Y. Y. Liu et al., 2018; V. Ramos et al., 2021). Similarly, in Indonesia, significant data sources such as TripAdvisor travel forums and Google Trends reveal a pattern of post-pandemic growth in foreign tourist arrivals (Andariesta & Wasesa, 2022). (Andariesta & Wasesa, 2022). It implies that it underpins the future prediction method based on numerical models for developing sustainable tourism in post-pandemic recovery.

The fifth cluster illustrates destination marketing based on sentiment analysis. The analysis can emerge rapidly as an automated method for examining semantic relationships in social networks. The analysis generates meaning from reviews in big data applications, typically in the category of travel reviews, which can easily influence tourists' perceptions (Alaei et al., 2019; Gao et al., 2021; Irawan et al., 2019). The sentiment analysis based on big data is closely related to the trend of changing tourist patterns due to the post-pandemic pandemic, in which tourists now choose to travel based on their preference for nature, ecotourism, wellness, and adventurous tourism. Tourism can be sustainable by integrating marketing strategies and data-driven destination imaging (Inventure, 2020; C. H. Liu et al., 2021). As a benefit of big data in tourism marketing, sentiment analysis closely relates to social networks, ecotourism, and sustainable tourism trends.

The final cluster is smart tourism, or the need for big data in tourism marketing innovation. Smart tourism prioritises the value of big data for predicting tourist demand, making better decisions, managing knowledge flows, and enhancing tourist interactions (Ardito et al., 2019; Wise & Heidari, 2019). Thus, innovation could accelerate the tourism industry's expansion, particularly in developing innovative destinations. Algorithms enable tourism business marketing activities to create a more precise mode of marketing management innovation (Inanc-Demir & Kozak, 2019; Su, 2021; H. Zhang, 2021). The role of big data catalysts is to determine tourist preferences via intelligence system mechanisms such as the Internet of Things (IoT), which accelerate information processing and analysis and reach the tourist segment precisely before travel bookings are made. The final cluster is smart tourism, or the need for big data in tourism marketing innovation. Smart tourism prioritises the value of big data for predicting tourist demand, making better decisions, managing knowledge flows, and enhancing tourist interactions (Ardito et al., 2019; Wise & Heidari, 2019). So, the tourism innovation process, especially when it



comes to making intelligent tourism destinations, could speed up the growth of the tourism industry. Algorithms enable tourism business marketing activities to create a more precise mode of marketing management innovation (Inanc-Demir & Kozak, 2019; Su, 2021; H. Zhang, 2021). The role of significant data catalysts is to determine tourist preferences via intelligence system mechanisms such as the Internet of Things (IoT), which accelerate information processing and analysis and reach the tourist segment precisely before travel bookings are made.

Various types of big data used in post-pandemic recovery tourism marketing can be distinguished based on whether they are (1) generated by businesses in the tourism industry or (2) generated by mobile technology or intelligent sensors, covering data such as tourist movement and credit card usage, which provide information on trends and spending patterns (UNWTO & ADB, 2021). Data was gathered from providers in the tourism sector, such as tourism suppliers, the Global Distribution System (GDS), online travel agents, travel metasearch and review sites, search platforms, social media marketing, business operation software providers, business intelligence providers, and travel marketing platforms. Bigdata was utilised for inventory, loyalty programs, reservations, user IDs, web analytics, online search platforms, travel evaluation, online advertising platforms, asset management, reward schemes, social media analysis, and travel study analysis. Here are some examples from diverse providers: Sabre and Galileo, as GDS, utilised big data for their loyalty program and inventory, whereas Traveloka and Tiket.com utilised data for web analytics and travel reviews. As travel metasearch engines, TripAdvisor and Zomato have applied big data to their online advertising and search platforms. TravelAja utilised data for asset management and rewards programs as operational software. Big data providers from industries other than tourism also provide crucial information for measuring mobility, spending, and resource consumption. The collected data can generate meaningful insights for planning and decision-making, and the data is compiled from common sources and provided to non-tourism businesses as well. Providers such as telco companies, technology savvy, financial services, credit cards, retail, city censorship, climate change detectors, geospatial providers, health care, and super applications use data for various purposes. Telecom companies, for example, use data to geotag a destination to facilitate tourist movement. Visa data may provide a profile of transaction numbers, locations, and quantities sold. Peduli Lindungi provides information on patience and test results to facilitate healthy travel in Indonesia. (See Table 2). Following is a summary of the use of big data in tourism marketing for post-pandemic recovery, as well as an outlook for the future:

Table 2. Utilisation of Big Data in Tourism Marketing

Provider	Utilization	Examples worldwide and in Indonesia
Tourism Sector		
Supplier	Inventory, loyalty programs, reservations, user IDs, web analytics, online search platforms	Accor, Marriot, Korean Air
Global Distribution System	Inventory, loyalty programs, user IDs, online search platforms	Sabre, Galileo
Conventional Travel Agents	Inventory, loyalty programs, web analytics, online search platforms	Amex Business Travel
Online Travel Agent	Inventory between suppliers, loyalty programs, bookings, user IDs, web analytics, online search platforms, online advertising platforms, travel review	Traveloka, Tiket.com, Agoda
Travel metasearch and review sites	Inventory between suppliers, user IDs, web analytics, online search platforms, online advertising platforms, travel review	TripAdvisor, Zomato, Trivago
Search platforms and social media marketing	Inventory between suppliers, user IDs, web analytics, online search platforms, online advertising platforms, travel reviews, non-travel searches, non-travel ads, bookings, non-travel, non-travel studies	Google, Facebook
Operation software	Asset management, HR, web analytics, reward schemes	TravelAja
Business Intelligence	Social media analysis, travel study analysis	Mark plus, In.venture
Travel marketing platform	Web analytics, user IDs	Lemon, wondering. Id

Provider	Utilization	Examples worldwide and in Indonesia
Non-Tourism Sector		
Telecommunications companies	Calling, mobile data, geotagging	Telkomsel, XL
Technology	AI, IoT, Robotics	Netflix, Yotel
Financial services and credit cards	Number of transactions, transaction location, product, user ID, transaction volume	Mastercard, Visa
Retails	Product ordered, transaction volume, location of purchase	Mastercard, Visa
City censorship	Vehicle parking, noise monitoring, water gauge, traffic control, crowd control, facial recognition, electric power gauge, pollution indicator	Microsoft, Toshiba
Climate change	Air quality, carbon emissions, water pollution, deforestation, coral reef degradation	Smart City Sensor
Geospatial Data	Location, attributes, space information	Satellite imaging, Landsat
Health	Patient data, test results	Peduli Lindungi, HaloDoc
Super Apps	Communication, movement, food, social, financial, retail	Line, Gojek, Grab, WhatApps

Source: Data Compilation (2022)

## VI. CONCLUSION AND RECOMMENDATION

This study aims to determine the literature on using big data in tourism marketing during post-pandemic recovery and the types of big data required to inspire future research topics. The study examines paradigmatic beliefs, methodological approaches, and methods of emphasis in research focused on tourism marketing concentrations with sub-fields of products, prices, distribution, promotion, physical evidence, programs, packaging, processes, and human resources. A comprehensive literature review reveals that big data is used for (1) research of consumer behaviour with data mining and analytics, (2) utilities of technology such as artificial intelligence, destination imaging, smart tourism, and UGC, (3) data banks and social media information technology as data analytics for the management of tourist attractions and the understanding of tourist behaviour, and (4) future prediction methods based on numerical and projections of sustainable development. In addition, data sources for big data can be generated both within and outside the tourism industry (from non-tourism sectors such as the telecommunications sector, finance, urban planning, climate, and health).

This study contributes to the body of tourism marketing knowledge that has existed in various forms. First, most studies on shoplifting gather information from a single source, such as customer data or government statistics. Due to the importance of utilising dynamic data types, relying on a single data source cannot produce reliable and accurate results; therefore, combining big data usage is suggested. Future research is anticipated to utilise various data sources for the tourism and non-tourism sectors as integrated big data. Secondly, increasingly diverse and contemporary issues must be considered in the era of big data and tourism marketing. The study opens the door to unsummarised marketing research topics such as price and yield management, human resource skills and competencies, and post-pandemic recovery activity programs.

Despite providing comprehensive and scientific studies on using big data in tourism marketing for post-pandemic recovery, several limitations were identified. First, the study excludes proceedings, dissertations, and other publication sources in favour of journal articles. In the future, it will be possible to include a wider variety of literature types in the analysis to gain a deeper understanding of research topics. Second, the study considered articles written in English. Future studies incorporating non-English studies will be more helpful in describing the perspectives of academics who do not speak English. Lastly, studies can consider using automation software to demonstrate literature classification in the digital age. Various computerised approaches can aid in visualising the breadth and evolution of particular research domains.

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