TELKOMNIKA Telecommunication Computing Electronics and Control
Vol. 22, No. 4, August 2024, pp. 838~845
ISSN: 1693-6930, DOI: 10.12928/TELKOMNIKA.v22i4.25543

Big data in the hospitality industry: a methodical review

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Article Info

Article history:

Received Jul 18, 2023
Revised Mar 4, 2024
Accepted Mar 29, 2024

Keywords:

Big data
Business intelligence
Data mining
Hospitality
Machine learning

ABSTRACT

This study intends to identify research gaps and future trends and provide a framework for the next generation of research to assess how much big data (BD) is employed in hospitality and tourist research. The study is based on a comprehensive quantitative evaluation of the relevant literature: Scopus and Web of Science (WoS)-listed academic works. The following criteria were used to assess the submissions: those who have the following traits an overview of the study's subject matter, including its theoretical and conceptual framework, data sources, data kind and quantity, data collection methods, and data analysis methodologies. Research shows that the usage of books on hospitality and tourism management has increased in recent years. Massive volumes of data are analyzed using analytical methods. However, the scope of this investigation is really wide. Furthermore, this research contributes to an in-depth and systematic assessment of the extent to which scholars in hospitality/tourism know and work on business intelligence and BD. This is the first complete survey of the literature on the topic of hospitality and tourism.

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1. INTRODUCTION

Big data (BD) is radically altering hotel sector management and client-to-business relationships by making enormous volumes of data decision-making simpler [1]. Nowadays, the technological foundations of both tourist organizations and hotels require that marketers and managers increase their access to data intelligence in order to make the most of it [2]. In recent years, these professionals have made significant investments in assembling strong scientific teams that include statisticians and database specialists who are well-equipped to develop and analyze the contents of their data warehouses [3]. Even though human analysis is often necessary, BD may now improve decision-making and raise organizational output via five approaches: analytical description, inquisitive analytics, statistical analysis, prescriptive analytics, and preemptive analytics. The majority of BD analytics are descriptive and exploratory, yet even basic descriptive statistics enable firms to identify simple and apparent patterns that become incredibly valuable for decision-making.

The hotel business has evolved into an information-intensive industry, storing vast amounts of data with few practical uses. With the advent of BD, it is now feasible to handle such data to fulfill goals and turn information into knowledge [4]. Furthermore, existing information systems often incorporate meta-search-generated data, such as Tripadvisor, Kayak, or Trivago, as well as social networks like Facebook, Twitter, or LinkedIn.

The term "big Data" was coined in 1990. However, the technology did not acquire popularity until 2005, when social media sites such as Facebook arrived on the market. As customers create an infinite amount of data every day, BD technologies affect everything from managing products to fraud detection. It refers to

the collection of data from both online and offline sources to support the ongoing development and operations of a business or organization. In the hotel industry, BD solutions are often associated with customer behavior and interactions. Hotels and other hospitality facilities are comprehending the concept of data analytics in order to increase their performance and profitability.

Travel and hospitality firms, in general, are mood enhancers. They flood customers with amazing content in order to enhance their travel experiences. A hotel's capacity to help people transport costly items has a big influence on its business. Customers have high standards for companies. They want the hotel industry to do more than simply satisfy their needs; they expect their needs to be anticipated [5]. Using BD is one way to have a better, more personalized experience. Hotels use data analytics to price and manage their customers as efficiently as possible. Its applications also help hotels listen to their customers' requirements and provide them with appropriate content. Let's have a look at some BD applications in the hotel industry.

Anticipating consumer desires is crucial in the hotel industry. To increase the hotel's performance, important criteria such as the quantity of rooms needed should be kept in mind at all times. Fortunately, the hotel industry is acquiring knowledge by using current data and collecting more data from other parties and online platforms. Hotel operations may benefit from data on occupancy rates, current bookings, crucial performance measurements, vacations, local events, and other BD sources. They use data analytics to forecast demand levels more accurately. This will have a direct impact on the hotel's revenue management strategy. If necessary, divide each part as follows.

2. LITERATURE REVIEW

This research paper presents a literature analysis on the topic of how teachers in the hotel and tourism industries may incorporate the use of new technologies and BD analytics into course content. The authors believe that students' analytical abilities will increase if hospitality curricula include statistics, research, and an awareness of data exploration, analysis, and insight [6]. They also anticipate an increase in starting salaries and attractive career opportunities for recent hospitality school graduates as a consequence. Data collection in the hospitality and tourism industries has shifted from cash registers to mobile devices and the internet of things. BD analytics is a cutting-edge research strategy that may be used to learn new things and anticipate trends.

BD's importance to our economic and social knowledge of the future cannot be overemphasized. This study draws on previously published works in the fields of hospitality and tourism. The purpose of the study is to examine the level of readiness of hospitality and tourism software for BD analytics [7]. The bulk of relevant publications used internet and social media BD in their studies. The hospitality industry might benefit from analyzing complex (big) data on energy usage in hotels (or restaurants).

Researchers might speedily eliminate unnecessary material by employing BD analytics to uncover common schematic and connotative themes in reviews. Having this information allows firms to provide flexible solutions that boost customer satisfaction [8]. The tourist industry, from start to finish, must be able to respond instantly to these fleeting moments. It's possible that Google's concept of "micro-moments" may be amplified with the help of BD technologies. It is possible that a cost-effective roster might be created by taking advantage of market inefficiencies at sporting events in order to boost attendance and income.

It's possible that BD may be used in child sports to track how well the kids are doing. Managers' strategic vision is required to understand how BD contributes to company efforts. Who, how often, and what kinds of experiences people share online may also be determined by BD technologies. Data and computers can't solve every business issue by themselves. You'll need your instincts, your creativity, your common sense, and your experience.

Managers need to fully grasp the potential and value of BD analytics before they can confidently invest in them. Investing time and money into training data analysts with prior experience in the hotel and tourism business can provide better results faster. An radio frequency identification (RFID)-enabled wristband (Disney's MagicBand) that can be used as a credit card, FastPass, hotel key, and more is suggested for usage in Disney world [9]. The article makes a compelling case for the benefits of quicker industry adoption of BD, citing the attraction's capacity to capture passenger data by linking with sensors throughout the park as an intriguing example of BD improving the tourist experience and contributing to better knowledge of guest behavior. The feasibility of using RFID cashless payment technology in the hotel industry was shown to have a strong correlation with future adoption [10]. Aluri and Palakurthi [11], imagine a future in which hotels become more automated and customizable, with guests' individual tastes taken into account to improve their overall stay. Thermostats with built-in humidity, temperature, and air quality sensors are only one example. Recently, voice control has been introduced to the mix with the introduction of Amazon Alexa and other voice assistants with hotel industry applications [8]. Another innovative use of big Applications in the hotel industry is Starwood Hotels' smart door lock system [12], which allows guests who are also members of the chain's loyalty program to enter without using a key [13]. The hotel's IT, front desk, engineering, and security departments have all profited from the installation of networked locks. Some advantages cited [14] include

centralized monitoring, insights into access log data, battery status, and remote procedures like rescinding keys or extending validity dates.

Table 1: explanation AI is a developing method for analyzing large amounts of data, but its significance in integrating business intelligence predictors into demand forecasts for tourist destinations is highlighted. In the hospitality and tourism industries, social media analytics have been used to collect and understand large amounts of data from social networking sites. We provide a data mining technique to evaluate a conceptual model in tourism and utilize machine learning and computational modeling to provide recommendations for optimal outcomes

Table 1. BD's major components and functional subdomains

Concept	Explanation	References
Machine learning BD predictors	Although AI is one of the developing methods for analysing huge data, it is still in its infancy emphasize the significance of integrating BD predictors into daily demand forecasts for tourist destinations.	[15], [16] [17]
Online processing of analytical data	Give an overview of research that has utilized social media analytics to collect and make sense of "big data" from social networking sites with regard to the hospitality and tourist industries. The article elaborates on the analytic methods of yore and now, which the chosen social media analytics research hopes to further.	[5], [18]
Data mining	Provide a data mining technique for evaluating a conceptual model in tourism that includes a BD set described by dimensions based on current literature.	[19]
Intelligence in business descriptive analytics	Helps fill out an overall overview of hospitality and tourism professors' familiarity with and use of business intelligence and BD. According to the authors' knowledge, this is the first comprehensive literature evaluation on the topic of intelligence for business and BD's application to the study of tourism.	
BD	Utilizes machine learning and computational modeling to provide recommendations for best outcomes and answers to the question, "What should we do?" BD collections are so vast or complicated that they are incompatible with standard data processing application software. Data privacy, accessibility, and integrity, as well as their respective implementations, are all addressed here.	[20]

3. RESEARCH METHOD

The study performed a comprehensive review of academic publications indexed in the Scopus and Web of Science (WoS) databases to examine the presence of BD in the tourism and hospitality literature. The practice of conducting a systematic evaluation of the relevant literature has found widespread use throughout the social sciences [21], including the travel and hospitality industries [22], [23]. Therefore, we used this method to identify key scholarly publications. Next, we independently studied and clustered refereed scientific papers into two main categories and looked into them comprehensively based on the following features: research topic, conceptual and theoretical characterization, data sources, data type, data size, gathering methods, analysis techniques, reporting, and visualization of data. BD in the hospitality and tourism industries is analyzed in order to determine where there are gaps in our understanding of the field, what areas need improvement, and what questions should be explored in future studies.

4. RESULTS AND DISCUSSION

As was mentioned before, Scopus and Emerald were employed as sources for the present research. These two databases were included primarily because they have the largest volumes of social science literature and research [24]. More than 22,000 papers from over 5,000 international publishers are indexed in Scopus, making it one of the most comprehensive archives of global research output across a wide range of academic disciplines. WoS is a similar service that provides access to seven databases citing over 28,000 publications from various fields of study. These primary sources are contrasted with secondary literature found in the digital library of the International Federation for Information Technologies and Travel and Tourism (https://ezlibrary.ju.edu.jo/login), such as the Journal of Information Technology and Tourism and the proceedings of the Enter conferences. The articles retrieved from these databases are often checked for accuracy, relevance, and currency [22], [23]. The data used in the study was acquired between January and April of that year, and the search was restricted to the years 2000–2021.

In order to maintain an edge in the tourism industry, businesses utilize their own special blend of management and marketing strategies, techniques, and technologies. BD is becoming a more important part of the business world. Few in-depth analyses of BD's potential for business intelligence have appeared in the hospitality and tourism fields. We searched the databases Scopus and WoS for journal publications on the topic of BD in the hotel and tourism industries to get a feel for its ubiquity. The scientific literature that was used for

the review was manually examined and divided into two categories. We searched Emerald and WoS using the terms "business intelligence" and "big data." Only job seekers in the tourism and recreation industries were considered. Over the last 16 years, Scopus's index has expanded enormously to include works from every corner of the globe. Articles that included the terms "travel," "tourism," "tourist," "hospitality," and "leisure" were included in our search. We meticulously examined titles and abstracts to isolate research specifically addressing BD. The aforementioned criteria were used to choose 96 articles covering topics in both BD and the hospitality and tourism industries. The role of BD in travel writing [25] only 31 out of 77 BI articles were chosen for this in-depth analysis and discussion. Analyses of customers' flight-ticket-searching behaviors [26] and location-choice factors [27], [28] are also provided, along with market share evaluations in the automotive and airline sectors.

These issues are not lost on the hotel industry [29]–[31]. Workgroups have been formed by hospitality associations, including hospitality technology next generation and the hospitality financial and technology professionals, to provide uniform standards for transferring BD and a shared knowledge of its architecture. Even if the issues are resolved in the hospitality industry, the solutions may not have the desired effect on other large technology platforms because of the pervasive nature of the problems and the challenges of harmonizing suppliers, regulatory bodies, laws, and technological demands [32]. Some of these concerns are being addressed, as seen by the patenting of cloud-based, secure Big infrastructures in a platform as a service manner for specialized hotel applications [25].

The financial sector is only one of several operational sectors that generate massive amounts of data [33]–[35]. The Internet (clickstreams), mobile commerce, social media, user-generated content (UGC), and so on all fall under this category. The goal of BD analytics is to come up with fresh ideas that can be utilized to effectively supplement more conventional data sources like census records, survey results, and historical documents. The use of Google search queries to predict the spread of pandemic illnesses in the general population is a revolutionary example of BD analytics [36]. For instance, BD analytics necessitates rethinking fundamental concepts like knowledge's nature, a study's method, how one should interact with information, and how one should classify reality. BD analytics paves the way for a wide range of analytical methods to be applied to enormous datasets, rather than just one. Although hypothesis testing is not inherently incompatible with BD analytics, it is often used to reveal hidden patterns or anticipate future trends [37]. While BD analytics have been heralded as a novel method for knowledge creation, critics have pointed to the risks of false positives and the need for theory-based techniques as reasons to be wary.

Business intelligence is one of the most promising areas of usage for BD analytics since it can be put to work learning more about a company's clients, rivals, market features, products, business environment, and the effects of technology. BD analytics has been shown via case studies and examples to be a useful tool for helping firms identify and address issues [38]. User-generated material and social media have received a lot of attention as potentially valuable public and community data sources [33]. Research has shown that online user evaluations may be used to foretell a product's quality, stock market volatility, and a film's gross [39]. It is possible to predict a company's profitability and stock returns using the linguistic data accessible in internet news stories [40]. Buyers depend substantially on online hotel product reviews before making a purchasing decision, as shown by [41]. Marketers may use consumer-generated data in conjunction with other data sources to create tools like product recommendation systems [42].

Because of the sheer amount and lack of structure in social media and user-generated information, text analytics, which includes opinion mining and sentiment analysis, is a crucial component of BD analytics. Business intelligence applications might greatly benefit from including opinion mining and sentiment analysis [41]. Technology that extracts views from unstructured human-authored documents using sentiment analysis might be useful for a variety of business intelligence activities, including reputation management, public relations, monitoring public attitudes, and forecasting market trends. Sentiment analysis and opinion mining rely heavily on AI, natural language processing (NLP), information retrieval (IR), information extraction (IE), and other forms of IR and extraction technology. Pre-processing the paperwork to make it more amenable to analysis, such as by tokenizing it into single words and collecting important data, is standard procedure for sentiment analysis [43]. Sentiment analysis with this technique is common [44]. Sentiment analysis is a kind of text mining that extracts and examines the subjective statements and feelings made by Internet users in user-generated material in a way that typical text mining approaches do not. A data scientist needs domain-specific expertise (such as in company management or hospitality and tourism) to do their job effectively. Data scientists must have strong analytical skills and an in-depth understanding of their chosen fields. According to Marr, the industrial and retail industries are much more advanced in their use of data analytics than the hotel industry.

Knowledge of statistics and the capacity to examine critically are two examples of the analytic abilities needed to tackle large data sets. The hotel industry is only starting to use BD technology, but it is already being put to use in areas such as product sales, social media, online consumer behavior, and even offline data retrieval and analysis [45]. Sites like internet travel companies [12] and tourist hotspots [46] are examples of this. The

hotel sector is beginning to embrace UGC as a means to better comprehend research difficulties that have so far resisted conventional methodologies [47]. In this setting, the most often used BD approach for retrieval is text analytics [48], which frequently makes use of machine learning, statistical analysis, and computational linguistics. Digital platforms were formerly seen as a luxury rather than a need. Technology is crucial in today's competitive business environment, but it also provides the basis for future development and sustainability in the event of a pandemic.

BD has the potential to improve hotel management in several areas [49], including forecasting, pricing, and benchmarking. In addition to the external, unstructured data collected from visitors through BD, large hotel chains also have access to a plethora of internal, organized data. The systems may not always be substantially employed for client knowledge purposes, despite the fact that even elementary statistical analysis in BD may provide considerable and powerful pattern descriptions. While previous research has focused on BD techniques with sophisticated analytics and their applicability to internal data provided by hotel clients [50], we restrict ourselves to simple BD analytics methods like percentage tests to get insight into client profiling.

Nearly every industry today makes regular use of BD solutions, but advertising and marketing are two of the most avid users [51]. They have prioritized data collection and analysis in order to boost efficiency, reduce wasteful advertising, and provide customers with a more engaging and relevant advertising experience. The hotel business is the same. Having access to data allows for a more thorough comprehension of visitor happiness, booking patterns, and other indicators. With the use of data analytics, the marketing department may spend more time studying the tastes of its potential customers. As a result, advertisers may now target a narrower audience with a targeted ad section. Using BD, hotels may determine the optimal mix of marketing channels to target certain customer segments. A better grasp of the industries in which hotel visitors work might help the industry as a whole, including the hotels themselves. A hotel that discovers a specific segment of its clientele routinely makes reservations through social media may decide to direct more of its attention in that direction. Data from hotels may also help identify marketing issues. BD may be used to detect and resolve issues, such as a prospective customer abandoning a booking website without completing a purchase. Several shopper personas, based on a wide range of criteria, have been suggested [52]. Certain authors have placed an emphasis on the role that customers' past purchases and other patterns of behavior play in determining their loyalty [53], [54]. In addition, repeaters may serve as reliable channels for talking to loved ones and employees. The digital transformation initiatives of companies in general and those in the tourism and hospitality sectors specifically are becoming more effective and efficient as a result of the increased use of BD and analytics.

One of the most exciting business innovations of the next five years is BD and analytics, which we discussed in this article. Tourism and hospitality organizations may benefit from innovative ethical data management by gaining sales insights for ongoing marketing activity and competitive advantage [55]. For this reason, this article urges more research into data governance and data ethics in the tourism and hospitality industries, where data privacy and security face important future challenges that must be addressed. It is also common practice to divide the room into sections for the debate and the outcomes.

5. CONCLUSION

Ethical data management practices in the tourism and hospitality industries can be improved by enhancing ethical data governance frameworks. Gig data, a growing area of research, has the potential to improve business performance and make more accurate predictions. Businesses are increasingly relying on business data (BD) to develop, provide, and collect value for their customers. BD is a product of various factors, including mobile transactions, UGC, social media, and website traffic. By analyzing customer interactions and behaviors, businesses can learn more about their customers, develop more effective strategies, and make more accurate predictions. Data-driven businesses are up to 5% more productive and 6% more profitable than their rivals. Data-driven businesses can create significant value for the world economy, enhancing efficiency and competitiveness.

The hospitality industry can benefit from data in advertising, customer relationship management (CRM), business research, data resale, and data sharing. Advertising data sets can be used to enhance targeting, while data mining can provide insight into consumer feelings about a company. Companies can also use data for marketing research, with companies like Experian, Epsilon, and Acxiom establishing dedicated research environments. However, modern inventions like programmatic ad exchanges are also selling off customer data to the highest bidder.may get significant benefits from the use of BD. Large quantities of money are spent by the hospitality industry on the development of software and hardware with the purpose of gathering as much information as possible about its customers. At least four different factors contribute to our conclusion that it is unethical to routinely collect, trade, and analyze customer information without first obtaining the customers' awareness or agreement. First things first, we have to recognize the present trend towards increasing government monitoring of the data gathering and usage processes. The new general data protection regulation

(GDPR) that was just implemented in the European Union (EU) is an excellent example. After it came to light that Cambridge Analytica had attempted to influence the results of both the Brexit referendum and the presidential election in the United States in 2016, lawmakers in both the EU and the United States started looking into the social media data gathering regulations of their respective nations. As a consequence of this inquiry, Facebook CEO Mark Zuckerberg was required to testify about the company's policies regarding the collection, use, and protection of users' data. The public's increased interest in how private corporations gather and use personal information may prompt regulators to create rules that are more stringent in their requirements. BD line and the other employees

The academic world is gradually becoming more receptive to the use of massive data analysis. However, the focus of this study is quite narrow, and the methodologies that were used are all over the place. Lack of a conceptual framework for recognizing essential problems is one of the most basic challenges faced by organizations today. How can we maximize the value of the information we have to strengthen our judgment? the reliability of these figures has been called into question as a result of many investigations that have taken place recently.

A growing number of individuals are falling through the cracks since there are such a large variety of options available for both transportation and accommodation. The use of records that have been posted online by a large number of different people is a possible alternative for increasing the quality of the data. It has been shown that the digital traces that visitors and tourists leave behind might provide insight into the activities that they participated in. Given that the data produced by people, organizations, communities, and networks is the primary source of BD, cultural and national differences continue to play a significant part in the process. The process of organizing and comprehending data, as well as its patterns and relationships, is very complex and difficult to execute. The knowledge of service potential (the condition of the property) and the appraisal of that potential via the real-time input of guests is what makes dynamic demand fulfillment in collaborative tourism environments possible. When it comes to the issue of data consolidation and interpretation, there is an immediate need for creative solutions. Without using one's imagination when it comes to the use of BD in the hotel and tourism industries, there are a great many issues and requirements that have not yet been satisfied. There is still a significant amount of work to be done before data analytics and intelligent tourist development can be combined in an appropriate manner. When it comes to the usage of online platforms as a data source, there has to be more consideration provided at the endpoint. It is going to be a challenging effort to integrate data from internet logs with data from more conventional consumer surveys.

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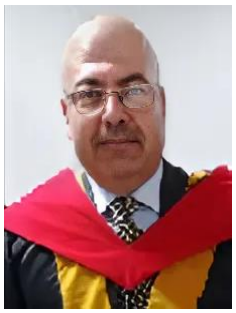

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