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Empirical Research Article

A Systematic Review of Big Data: Research Approaches and Future Prospects

Cihan Cobanoglu[a], Abraham Terrah[a,*], Meng-Jun Hsu[b], Valentina Della Corte[c], and Giovanna Del Gaudio[c]

[a] *Muma College of Business, University of South Florida, Tampa, FL, USA*
[b] *Department of Hotel Management, National Kaohsiung University of Hospitality and Tourism, Kaohsiung, Taiwan*
[c] *University of Naples Federico II, Naples, Italy*

Abstract

This review paper aims at providing a systematic analysis of articles published in various journals and related to the uses and business applications of big data. The goal is to provide a holistic picture of the place of big data in the tourism industry. The reviewed articles have been selected for the period 2013-2020 and have been classified into 8 broad categories namely business strategy and firm performance; banking and finance; healthcare; hospitality; networks and telecommunications; urbanism and infrastructures; law and legal regulations; and government. While the categories are reflective of components of tourism industries and infrastructures, the meta-analysis is organized around 3 broad themes: preferred research contexts, conceptual developments, and methods used to research big data business applications. Main findings revealed that firm performance and healthcare remain popular contexts of research in the big data realm, but also demonstrated a prominence of qualitative methods over mixed and quantitative methods for the period 2013-2020. Scholars have also investigated topics involving the notions of competitive advantage, supply chain management, smart cities, but also ethics and privacy issues as related to the use of big data.

Keywords

business; tourism; hospitality meta-analysis; data driven strategy; analytics

1. Introduction

Since the inception of the internet and the transition to digital age, there have been a lot of developments and changes in the way communication occur and information is disseminated. This also came with the generation of immense amounts of data, which can be recorded, stored and accumulated in large volumes (Álvarez-García et al., 2020). In 2017, *The Economist* had published an article entitled "The world's most valuable resource is no longer oil, but data" (The Economist, 2017) to magnify the importance of big data for businesses, including in the tourism industry. The term big data is mainly used to designate very large sets of data difficultly processable using traditional methods. Nowadays, businesses from all industries collect large amounts of data, making of it an essential priority. Applying big data in the tourism sector encompasses transforming the large sets of available data into valuable information, which can be used to fine-tune strategies to boost profits. For business operators in the tourism industry, big data offers the possibility to take informed decisions, have a better knowledge of consumers and competitors, as well as improving revenues, and customer experience (Revfine, 2020).

During the past half decade, the notion and use of big data have become omnipresent in diverse industries but also in academia. The excitement over big data is mainly due to its potential practical applications and the spectrum of opportunities provided in this era of technological progress. There exists a lack of consensus among academicians regarding the definition of big data; however, the concept is best understood through its main characteristics, the 3Vs—Velocity to explain the speed at which data is growing and changing; Variety to materialize the numerous formats in which data can come into; and Volume to express the huge amount of data that is generated every day through different sources (Benjelloun et al., 2015). In terms of analytics, big data serves for the analysis of data to enhance predictive capabilities and assist in decision-making, for multiple sectors including trading, agriculture, tourism (Benjelloun et al., 2015), scientific research (Oguntimilehin & Ademola, 2014), the development of smart cities (Hashem et al., 2016; Kumar & Prakash, 2014), network and telecommunications (Mahrt & Scharkow, 2013; Zheng et al., 2016), as well as banking and finance (Sun et al., 2014). In addition, big data analytics carry benefits not only for private businesses but also public organizations by providing capabilities to better address citizens' needs, as well as major national challenges related to the economy, the healthcare system, job creation, natural disasters and terrorism (Kim et al., 2014). However, the pace at which big data analytics developed in the recent years also brought challenges related to security (Toshniwal et al., 2015) and privacy (Oguntimilehin & Ademola, 2014).

Despite the security and privacy related issues posed by big data, and the challenges that can be encountered in its uses and applications, there exists a consensus among scholars that big data ultimately contribute to enhancing business strategies and firm performance. In fact, big data and predictive analytics have revealed to be very useful for business departments such as human resources (Angrave et al., 2016; Ghasemaghaei, 2020;

*Corresponding author:
Abraham Terrah, Muma College of Business, University of South Florida, Tampa, FL, USA
E-mail address: abrahamterrah@gmail.com
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Shah et al., 2017), supply chain management (Biswas & Sen, 2017; He et al., 2020), as well as advertising (Couldry & Turow, 2014; Xue & Zhang, 2020). Big data can also contribute at achieving competitive advantage (Barham, 2017; Mikalef et al., 2020; Sellami et al., 2020) and creating value in an organization (Grover et al., 2018; Line et al., 2020; Vidgen et al., 2017). Organizations implementing data-driven strategies also gain by improving customer experience (Kodapanakkal et al., 2020; Spiess et al., 2014) and the overall firm performance (Akter et al., 2016; Yasmin et al., 2020). As stated above, the aim of this study is to provide a systematic review on the literature related to business applications of big data in the tourism industry. As the tourism industry is essentially composed of several businesses contributing to the overall infrastructure, an appropriate lens to understand big data in the sector is through a meta-analysis on business applications of big data. The goal is to deliver a bigger picture on how big data is being discussed in the literature, what are the general trends and what are the methods commonly used in this regard. Thus, this study contributes to the literature with an analysis of big data as a concept and its material applications for business purposes. Articles were collected on Google Scholar using the key terms *big data in business* and covering the period from 2013 to 2020. Although there exists a myriad of business applications for big data, it has been noticed that articles about big data itself are more prominent in the literature, sometimes at the expense of its most direct applications in specific sectors. Only papers dealing with a business application were used, ignoring scientific, computer or cloud engineering related papers. Consequently, existing gaps in the business literature on big data are highlighted in this study, along with the progress that has been achieved since 2013. Directions for future research are also provided.

2. Method

Systematic reviews have been initially designed for the purposes of health sciences but in the recent years, they have become popular in social and consumer sciences for analyzing publications and written works regarding a given topic. Systematic reviews also have the goal of reducing bias through the identification, appraisal and synthetization of relevant articles regarding a precise topic (Uman, 2011). Conducting a systematic review often requires performing first a meta-analysis to gather meaningful data from different studies and analyze them as single quantitative estimates. With regards to big data, several systematic literature reviews in topics such as healthcare (Chen et al., 2020; Mehta & Pandit, 2018), organizational performance (Upadhyay & Kumar, 2020; Wamba et al., 2015), supply chain management (He et al., 2020; Wang et al., 2016), competitive advantage (Barham, 2017; Mikalef et al., 2020), e-commerce (Dekimpe, 2020; Felt, 2016), smart cities (Chauhan et al., 2016), big data analytics (Elgendy & Elragal, 2014; Frizzo-Barker et al., 2016; Ghasemaghaei, 2020; Gillespie, 2020; Torabi Asr & Taboada, 2019) were conducted and provided valuable insights on the concept and its practical applications. This increased use of systematic reviews is mainly due to the fact that they have revealed an efficient tool to have an overview of existing evidence on a particular topic (Chang et al., 2020; Li et al., 2018; Müller et al., 2018), which allow to save time especially in science and medical fields where clinicians cannot always keep up with the developments in the literature (Milan, 2020; Uman, 2011; Zhou et al., 2020).

The articles used for the purposes of this review have been selected from Google Scholar and the search was executed using the key terms *big data in business*. The period covered in the Google Scholar search was from 2013 to 2020. The Zotero software was used to capture Google Scholar results in a rapid fashion. We have used Google Scholar as it covers the databases of Web of Science and Scopus, and the engine was also able to find 93% of the citations found by Web of Science, and 89% of the citations found by Scopus (Taster, 2019). As well, over 50% of all the citations to Social Science articles were only found by Google Scholar.

One reason as to why 2013 was chosen is because this year represents a year of big data tools innovations. Also, in the literature on big data, a majority of the articles related to business applications have been published after 2013 but prior to this date, they were fewer. Due to the various domains of application of big data for businesses, (e.g., business strategy, firm performance, networks and telecommunications, banking and finance, healthcare, hospitality) and the other domains entailed such as government, law, privacy concerns as well as regulations, the search on Google Scholar was privileged over selecting specific databases since these fields of applications present many articles in disparate journals.

At the end of the search, a total of 235 articles were collected after excluding book chapters, book reviews, citations, and duplicate records. Then, 40 articles were further excluded because they were viewpoints, opinions, editorial and lecture notes, Microsoft Word documents and PowerPoint presentations, or draft articles. Following this process, a number of 195 articles remained and were submitted to evaluation to ensure that the main idea of the articles was in relation with a business application of big data. 47 articles have thus been eliminated because they were related to science, education, politics, data, or too deep in the scientific character of big data (algorithms, clouds), drifting away from the business aspect we are looking for. Finally, a total of 148 articles were retained for the purposes of the meta-analysis. They are displayed in Table 1. The retained articles have been classified into 8 broad categories of application namely banking and finance, business strategy and firm performance, healthcare, hospitality, networks and telecommunications, smart cities, government, and law, privacy and regulations. Other studies which discussed about big data definitions, characteristics, potential applications (in a broad manner), opportunities and challenges were classified in the category *Concepts and Definitions*. The content of such articles does not relate to a specific business application of big data, but they present insights about the use and role of big data in business. The distribution of the articles among these categories is displayed in Figure 1.

3. Findings

3.1 General Trends in the Data

The majority of articles collected for the purpose of this study were in the category business strategy and firm performance (40.41%), followed by healthcare (10.96%) and smart cities (4.79%). Articles related to banking and finance accounted for 3.42% of the collected data, while hospitality, and network and telecommunications each accounted individually for 8.21%. This feeble representation of hospitality in the sample can be attributed to the relative recent implementation of big data analytics and technics in the hospitality industry. Regarding network and telecommunications, the articles available in the literature were more relevant to data science and technical infrastructures than to business itself. The categories of law, privacy and regulations represented 8.22% of the data, government represented 2.05%, and concepts and definitions represented 21.92%. It is worth specifying that even though the categories of law, privacy, and regulations; government; and definitions and concepts might not sound *business*, the retained articles for these categories were related to business and dealing of these features as related to business. Moreover, all businesses including the ones in tourism industry operate according to specific laws and regulations, and are also subject to government influence. The present study also revealed a rising trend in researches regarding big data in business over the period 2013-2020, although articles dealing with the scientific parts of big data

such as algorithms, its infrastructures, and applications in general are still prominent in the overall literature on big data. Thus, with regards to applications in the business world, a large number of articles dealt with business components. Nevertheless, the hospitality field, as well as network and telecommunications have been found to be underrepresented in the sample.

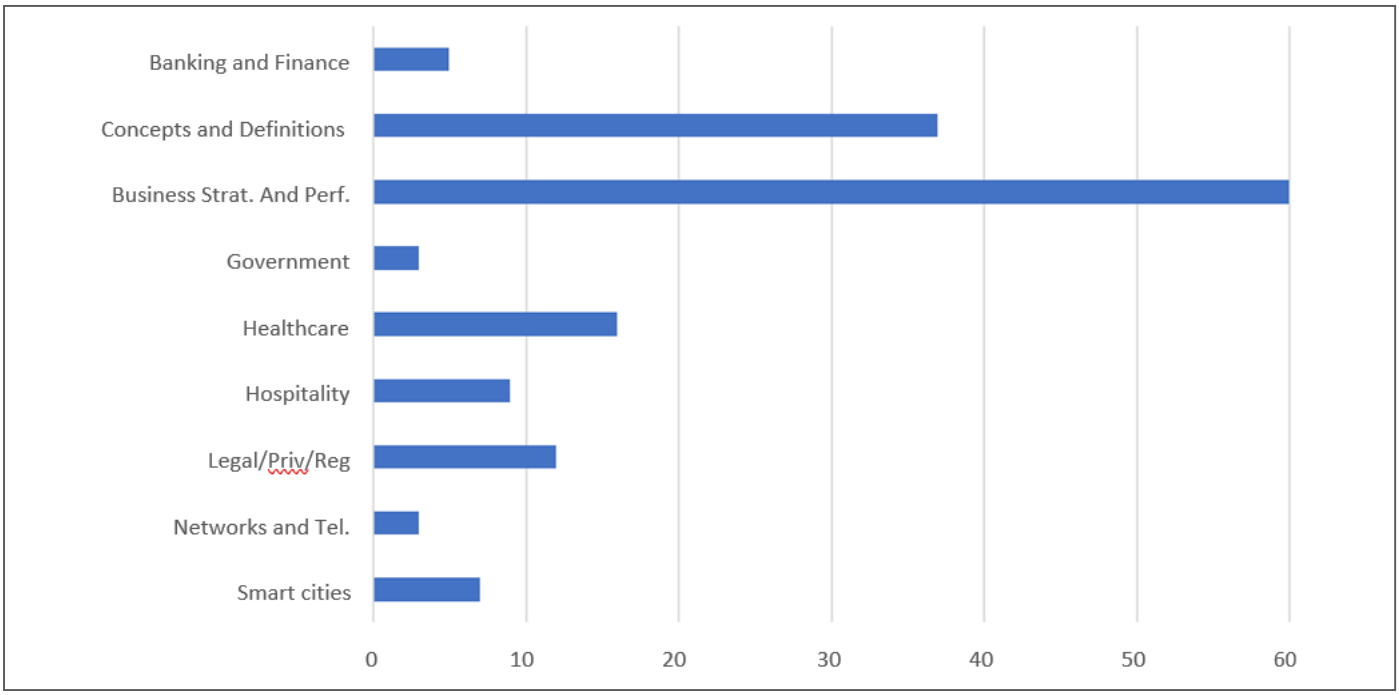

Fig. 1. Distribution of articles per category

3.2 Preferred Research Contexts

The current review results showed that firm performance on one hand, and applications in healthcare on the other, remained popular research contexts, with respectively 56 and 14 articles in this review (see Figure 2). Among the other items in the sample, 16 articles investigated on the potential business applications of big data, but they were classified concepts and definitions due to their generic approach and lack of focus on a specific business application. With regards to firm performance, several studies dealt with ways to improve firm performance using big data analytics capability (see Akter et al., 2016; Davenport & Dyché, 2013; Dubey et al., 2019; Gupta & George, 2016; Hartmann et al., 2016; Mikalef et al., 2020; Popovic et al., 2018; Wamba et al., 2017; Wielki, 2013), as well as creating strategic value (e.g., Grover et al., 2018; Line et al., 2020; Rajpurohit, 2013). Studies related to the role of big data for building competitive advantage in a firm (e.g., Barham, 2017; Kubina et al., 2015; Matthias et al., 2017; Mikalef et al., 2016; Upadhyay & Kumar, 2020; Yasmin et al., 2020), and studies related to supply chain analytics and management (e.g., Biswas & Sen, 2017; Wang et al., 2016; He et al., 2020; Nguyen et al., 2018) presented attractive lines of research. To those can be added studies related to logistics (Zhong et al., 2015), as well as challenges and opportunities with regards big data in supply chain management (Kache & Seuring, 2017; Zhong et al., 2016).

Potential challenges in implementing big data in business were also subject to examination (e.g., Bøe-Lillegraven, 2014; Ghasemaghaei & Calic 2020 (Schroeder, 2016; Sen et al., 2016)). For instance, Ylijoki and Porras (2016) analyzed and conceptualized themes and guidelines for the use of big data in an organization while Chen et al. (2017) provided a case on how big data was used to renovate the business model of the airline company Lufthansa. Similarly, Korhonen (2014) focused on the impact of big data on organizational design. Shim et al. (2015) investigated on how to ensure a sound return on big data investment for a company while Côrte-Real et al. (2017) assessed the business value of big data analytics in European firms. The role of big data in the decision-making processes of organizations was also investigated (e.g., Elgendy & Elragal, 2016; Fu et al., 2020; Poleto et al., 2015) while Provost and Fawcett (2013) as well as Babu and Sastry (2014) emphasized on automated decision-making. E-commerce was also represented with a systematic review of Akter and Wamba (2016), as well as articles related to big data itself as an industry and market (see Bughin, 2016; Dekimpe, 2020; Liu et al., 2014).

Healthcare has also been identified as a field in which the literature displays growing interest. In the sample, 8 articles were related to big data potential applications in healthcare. Examinations in this topic revolved mainly around understanding big data capabilities in healthcare (Chen et al., 2020; Wang et al., 2015) or understanding the problems and perspectives of action for the use of big data in healthcare industry (Mathew & Pillai, 2015). In addition, identifying and prioritizing critical factors for promoting the implementation and usage of big data in healthcare was examined (see Kim & Park, 2017; Wang & Hajli, 2017). In a similar vein, Bates et al. (2014) looked into the use of analytics to identify and manage high-risk and high-cost patients, while Wang et al. (2018b) provided an integrated big data analytics-enabled transformation model for healthcare. Groves et al. (2016) examined the ins and outs of the big data revolution in healthcare, and Kupwade Patil and Seshadri (2014) noted the potential security and privacy issues that may arise with big data tools as related to the healthcare ecosystem. Opportunities and policy implications of big data use in healthcare have also been looked upon in the existing literature (Roski et al., 2014). The diversity of healthcare related topics reveals the various domains in which big data can make a substantial contribution to healthcare.

Some studies also examined banking, most specifically customer behavior from a big data analytics perspective (Sun et al., 2014), and also in the field of risk analysis (Rahman & Iverson, 2015). Articles related to finance examined challenges and opportunities in financial stability monitoring (Flood et al., 2016) and how to improve the predictability of business failure of supply chain finance clients (Zhao et al., 2015). Other studies have dealt with big data impact on operational departments of firms such as marketing (Dekimpe, 2020; Fan et al., 2015), human resources

(Angrave et al., 2016; Lindberg, 2020), and manufacturing (Li et al., 2015).

With regards to hospitality, Banic et al. (2013) looked into the use of big data and sentiment analysis for product evaluation, while Xiang et al. (2015) aimed at demonstrating the relationship between hotel guest experience and guest satisfaction using big data analytics. Del Vecchio et al. (2018) provided ways for creating value for smart tourism destinations using big data. In network and telecommunications, Zheng et al. (2016) proposed a framework of big data driven mobile network optimization; Mahrt and Scharkow (2013) investigated on the value of big data in digital media research; and Liu et al. (2016) provided a social network analysis using big data. Some studies also looked at the applications and role of big data for smart cities (see Al Nuaimi et al., 2015; Hashem et al., 2016; Kumar & Prakash, 2014; Wu et al., 2018). Vilajosana et al. (2013) analyzed the reasons as to why businesses around smart cities can encounter difficulties while Morioka et al. (2015) evaluated a city management platform using big data from people and traffic flows.

Articles related to government evaluated the ability of governments to implement big data applications associated with the business sector (Kim et al., 2014), but also transferring business intelligence and big data analysis from corporations to governments as a hybrid leading indicator (Bodislav, 2015). In this regard, Chatfield et al. (2015) explored organizational capability challenges in transforming government through big data use. Studies dealing with privacy issues as related to big data were also present in the literature related to big data (see Crawford & Schultz, 2014; Custers & Uršič, 2016; Kamakshi, 2014; Kshetri, 2014; Perera et al., 2015; Wachter & Mittelstadt, 2019), studies, as it is also the case for ethics (see Allen, 2016; Nunan & Di Domenico, 2013).

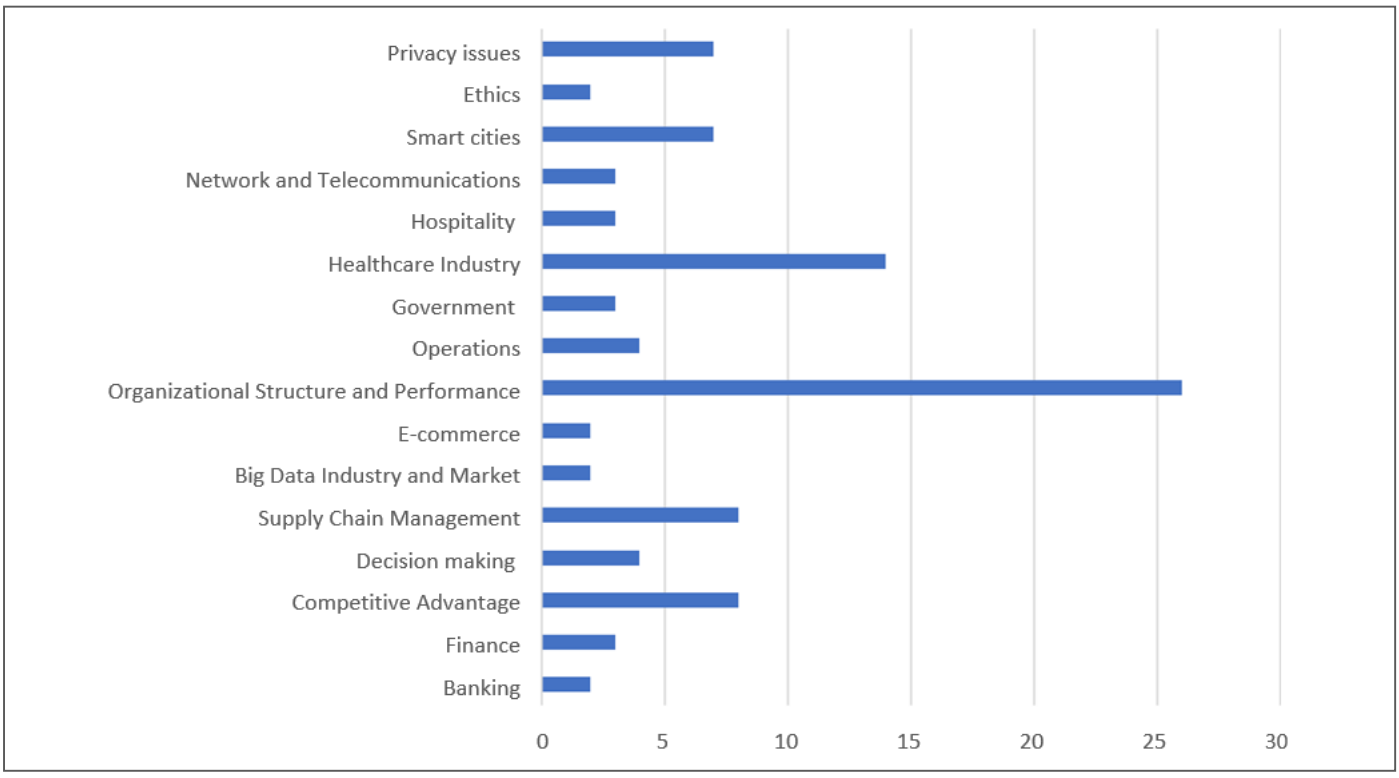

Fig. 2. Preferred research contexts

3.3 Conceptual Developments

Scholars across many disciplines have displayed growing interest in big data. The systematic review of Frizzo-Barker et al. (2016) gives a glimpse about the rise of big data in business scholarship and how business scholars analyze the impacts of this emerging phenomenon. However, as noted above, there is a lack of consensus for a formal definition of big data. In fact, the concept has evolved so quickly that there is no formal meaning denoting its meaning (De Mauro et al., 2015). Attempts at defining big data were mainly built around its essential features (De Mauro et al., 2016), or through surveys of big data definitions in the literature (see Bihl et al., 2016; Ward & Barker, 2013). Some scholars proposed a perspective according to which big data in business can be seen as a service, with three components being big data infrastructure-as-a-service, big data platform-as-a-service, and big data analytics software-as-a-service (Zheng et al., 2013). The concept of big data in business has also been evaluated around the pertinent interdisciplinary characteristics of big data (see Berente et al., 2019; Fu et al., 2020; Geczy, 2014). For instance, Casado and Younas (2015) provided an insight into the main processing paradigms in relation with big data 3V's (variety, volume, and velocity). Big data in business has also been conceptualized based on its challenges (see Acharjya & Ahmed, 2016; Samuel, 2015; Toshniwal et al., 2015; Zhou et al., 2014), data-intensive applications, challenges, techniques, and technologies of big data (Chen & Zhang, 2014; Chen et al., 2020).

The field of big data management was also represented in the sample (see Rossi & Hirama, 2015; Russom, 2013). Gao et al. (2015) provided a process view on critical success factors for big data analytics projects while other scholars provided an account of how recent big data project initiatives have been successful in the scope of delivering business value (see Chang et al., 2020; Rahman & Aldhaban, 2015). For instance, Saggi and Jain (2018) focused on integration of big data analytics contribution to value creation while Maglio and Lim (2016) discussed about innovation and big data in smart service systems such as smart customization and prevention, smart operations management, smart coaching or smart adaptation and risk management. Verma et al. (2016) examined the challenges and applications of social media analytics. In a broad fashion, Markus and Topi (2015) evaluated the implications of big data analytics for science, society and business, while Gupta (2014) described the processes of big data analytics with a focus on data mining.

3.4 Review of Methods Used

A glance at the methods used for researching on big data business applications demonstrates a prominence in the use of qualitative methods, which represent 71.52% of the sample. In contrast, studies that used quantitative and mixed methods represented respectively 7.28% and 21.2% of the collected articles, as displayed in the appendix section. It is worth noting that for the purposes of this study, literature reviews were classified as qualitative methods while systematic literature reviews for which quantifiable samples were available were classified as mixed methods studies. The above-mentioned results show that the literature on big data lacks quantitative studies, which can be explained by the relative recent time in which scholars started to grow their interest on big data. This argument can be supported by the fact that our sample also revealed that most the quantitative studies on big data applications in business were conducted after the year 2016. In fact, before this year, only 2 purely quantitative and 3 mixed studies are available in our sample, there are 9 purely quantitative and 16 mixed methods studies starting from 2016. These results also suggest that more is to come in terms of quantitative studies since in practical terms, researchers will be able to rely on more cases and applications of big data in business to draw their conclusions. In mixed methods studies, we can note the use of the case study approach (e.g., Davenport & Dyché, 2013; Gillespie, 2020; Orenga-Roglá & Chalmeta, 2016; Popovic et al., 2018; Wang et al., 2018a; Wang et al., 2018b; Zheng et al., 2016), content analysis (Lee et al., 2020; Line et al., 2020; Wang & Hajli, 2017; Ylijoki & Porras, 2016), interviews (Chen et al., 2017; Fu et al., 2020; Gunasekaran et al., 2018; Weng & Lin, 2014). Regarding quantitative methods, researchers mainly made use of surveys (Wang et al., 2016; Mikalef et al., 2020; Russom, 2013; Wamba et al., 2017) for the data collection.

Table 1. Methods used in the business literature on big data

Methods used	Number of articles	Percentage
Qualitative	108	71.52
Quantitative	11	7.28
Mixed	32	21.2

4. Conclusion and Future Research Directions

Benefiting from a growing interest from scholars, big data and its applications in business gained in popularity in academia in the recent years. This systematic review on big data in business which covered the period 2013-2020 showed a prominence of qualitative methods, with an overall decreasing trend starting in 2016, year from which the number of quantitative investigations started increasing. Nevertheless, our findings reveal that the literature on big data presents more exploratory studies than conclusive ones, as few were based on empirical methodology. Broadly, most of the studies concerned big data applications for enhancing firm performance with subtopics including competitive advantage, strategy and decision-making. Sectors such as hospitality and network and telecommunications in which the use of big data is expanding will need more quantitative studies to shore the literature on this topic. Healthcare however is a field in which the literature is growing as a result of the diverse themes that can be investigated within the sector. Future research can investigate on big data applications in network and telecommunications as well as hospitality.

Big data is collected from users' generated data to make intelligent and data-driven decisions. With regards to the travel and tourism industry, businesses need to understand travelers' trends in order to offer the appropriate travel experiences to visitors. Big data contributes in this regard through collection of information from various consumers centers in order to develop tailored marketing strategies for specific audiences. For instance, they provide benefits for airline operators and hotels which are both central components of tourism infrastructures and categorized as businesses. As such, understanding how big data impacts businesses in the tourism industry was achieved through a meta-analysis of big data in business. For airlines operators for example, big data analytics provide the mean to dive into passenger behavior in order to understand the underlying motivations of choice of travel for tourists (Future Market Insights, 2019). In addition, operators are provided with tools allowing them to optimize their revenue management, but also apply strategic pricing. The same also applies to hotels, as the case of the international chain Starwood Hotels and Resorts who turned to big data analytics to apply dynamic pricing (Future Market Insights, 2019). Various information, also including economic considerations or local events are used through big data analytics to render competitive prices. Furthermore, big data analytics is also beneficial for governments and tourism board. The Cuban government for instance uses big data to collect tourists' reviews and evaluate the performance of travel accommodations across the country. Further research may introduce other technical approaches to extend our review.

Several scholars have assessed the importance of big data as enabling fundamental resource for deep learning and machine learning, which contribute at enhancing the decision-making process and support operational excellence (Chang et al. (2020); Ghasemaghaei & Calic, 2020; Mikalef et al. (2020). There exist several routes for collecting user-generated data that can be used for analytics. User data can be collected on social media and other web-based applications (Onete et al., 2020) through the use of cookies and other user-tracking tags that relate on users' behavior when online. Other ways through which data is collected include human interaction interfaces (Lindberg, 2020), as well as communication tools based on natural language processing (e.g., chatbots, voice-assisted technologies) which collect data based on their interactions with users (Grover et al., 2020). These data collected from websites, social media, and human interaction interfaces are called unstructured data. In the context of big data, interpreting this unstructured information remains capital to acquire relevant insights, and at the same constitute one of the biggest challenges for the implantation of big data in the tourism industry.

Declaration of competing interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ORCID iD

Cihan Cobanoglu https://orcid.org/0000-0001-9556-6223
Abraham Terrah https://orcid.org/0000-0002-0300-562X
Meng-Jun Hsu https://orcid.org/0000-0003-1175-1478
Valentina Della Corte https://orcid.org/0000-0001-7113-3167

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Author Biographies

Cihan Cobanoglu is a Professor at the Muma College of Business, University of South Florida. His research interests are hospitality information technology, e-tourism, and restaurant technology

Abraham Terrah is a Graduate Research Assistant at the Muma College of Business, University of South Florida. His research interests are consumer behavior, services marketing, tourism management, and hospitality technologies.

Meng-Jun Hsu is an Assistant Professor at the National Kaohsiung University of Hospitality and Tourism, Taiwan. His research interests are hospitality information technology, business intelligent, knowledge management, e-commerce, and smart hospitality management.

Valentina Della Corte is a Professor of Business Management at University of Naples Federico II, Italy. Her research interests are strategic management, resource-based theory, dynamic competences service-dominant logic, and tourism management.

Giovanna Del Gaudio is a researcher in the Department of Economics, Management and Institutions at University of Naples Federico II, Italy. Her research interests are destination marketing and management, resource-based theory, value creation and capture, entrepreneurship, and dynamic capabilities.

Appendix. List of articles reviewed, per year of publication

Articles	Author(s)	Publication Year	Sample size in quant/mixed studies	Methods
1	Banic et al.	2013	N/A	Qualitative
2	Davenport & Dyché	2013	N/A	Qualitative
3	Fanning & Grant	2013	N/A	Qualitative
4	Kubina et al.	2013	N/A	Qualitative
5	Mahrt & Scharkow	2013	N/A	Qualitative
6	Nunan & Di Domenico	2013	N/A	Qualitative
7	Provost & Fawcett	2013	N/A	Qualitative
8	Rajpurohit	2013	N/A	Qualitative
9	Russom	2013	693	Quantitative
10	Vilajosana et al.	2013	N/A	Qualitative
11	Ward & Barker	2013	N/A	Qualitative
12	Wielki	2013	N/A	Qualitative
13	Zhang	2013	N/A	Qualitative
14	Zheng et al.	2013	N/A	Qualitative
15	Kim et al.	2014	N/A	Qualitative
16	Babu & Sastry	2014	N/A	Qualitative
17	Bates et al.	2014	N/A	Qualitative
18	Berger & Doban	2014	N/A	Qualitative
19	Boe-Lillegraven	2014	N/A	Qualitative
20	Chen & Zhang	2014	N/A	Qualitative
21	Couldry & Turow	2014	N/A	Qualitative
22	Crawford & Schultz	2014	N/A	Qualitative
23	Elgendy & Elragal	2014	N/A	Qualitative
24	Geczy	2014	N/A	Qualitative
25	Gupta	2014	N/A	Qualitative
26	Kamakshi	2014	N/A	Qualitative
27	Kemp	2014	N/A	Qualitative
28	Korhonen	2014	N/A	Qualitative
29	Koronios et al.	2014	N/A	Qualitative
30	Kshetri	2014	N/A	Qualitative
31	Kumar & Prakash	2014	N/A	Qualitative
32	Liu et al.	2014	N/A	Qualitative
33	Oguntimilehin & Ademola	2014	N/A	Qualitative
34	Patil & Seshadri	2014	N/A	Qualitative
35	Raghupathi & Raghupati	2014	N/A	Qualitative
36	Roski et al.	2014	N/A	Qualitative
37	Sun et al.	2014	N/A	Qualitative
38	Watson	2014	N/A	Qualitative
39	Weng & Lin	2014	33	Mixed
40	Zhou et al.	2014	N/A	Qualitative
41	Benjelloun et al.	2015	N/A	Qualitative
42	Bhimani	2015	N/A	Qualitative
43	Bodislav	2015	N/A	Qualitative
44	Casado & Younas	2015	N/A	Qualitative
45	Chatfield et al.	2015	326	Mixed

46	Chluski & Ziora	2015	N/A	Qualitative
47	De Mauro et al.	2015	N/A	Qualitative
48	Fan et al.	2015	N/A	Qualitative
49	Gao et al.	2015	N/A	Qualitative
50	Lambrecht & Tucker	2015	N/A	Qualitative
51	Li et al.	2015	N/A	Qualitative
52	Markus & Topi	2015	N/A	Qualitative
53	Matthew & Pillai	2015	N/A	Qualitative
54	Morioka et al.	2015	N/A	Qualitative
55	Al Nuaimi et al.	2015	N/A	Qualitative
56	Perera et al.	2015	N/A	Qualitative
57	Rahman & Aldhaban	2015	N/A	Qualitative
58	Rahman & Iverson	2015	N/A	Qualitative
59	Rossi & Hirama	2015	N/A	Qualitative
60	Samuel et al.	2015	N/A	Qualitative
61	Shim et al.	2015	N/A	Qualitative
62	Toshniwal et al.	2015	N/A	Qualitative
63	Wamba et al.	2015	62	Mixed
64	Wang et al.	2015	N/A	Qualitative
65	Xiang et al.	2015	529	Quantitative
66	Zhao et al.	2015	N/A	Qualitative
67	Zhong et al.	2015	N/A	Qualitative
68	Acharjya & Ahmed	2016	N/A	Qualitative
69	Akter & Wamba	2016	48	Mixed
70	Akter et al.	2016	152	Quantitative
71	Allen	2016	N/A	Qualitative
72	Angrave et al.	2016	N/A	Qualitative
73	Ardagana et al.	2016	N/A	Qualitative
74	Bihl et al.	2016	N/A	Qualitative
75	Bughin	2016	714	Quantitative
76	Cohen et al.	2016	N/A	Qualitative
77	Custers & Ursic	2016	N/A	Qualitative
78	De Mauro et al.	2016	N/A	Qualitative
79	Elgendy & Elragal	2016	N/A	Qualitative
80	Erevelles et al.	2016	N/A	Qualitative
81	Flood et al.	2016	N/A	Qualitative
82	Frizzo-Barker et al.	2016	219	Mixed
83	Groves et al.	2016	N/A	Qualitative
84	Gupta & George	2016	N/A	Qualitative
85	Hartmann et al.	2016	100	Mixed
86	Hashem et al.	2016	N/A	Qualitative
87	Chauhan et al.	2016	38	Mixed
88	Liu et al.	2016	N/A	Qualitative
89	Maglio & Lim	2016	N/A	Qualitative
90	Mikalef et al.	2016	N/A	Qualitative
91	Mishra et al.	2016	286	Mixed
92	Orenga-Rogla and Chalmeta	2016	N/A	Qualitative
93	Poleto et al.	2016	N/A	Qualitative
94	Gunasekaran et al.	2016	205	Quantitative
95	Popovic et al.	2016	13	Mixed
96	Schroeder	2016	28	Quantitative
97	Sen et al.	2016	N/A	Qualitative
98	Verma et al.	2016	N/A	Qualitative
99	Wang & Hajli	2016	109	Mixed
100	Wang & Wang	2016	N/A	Qualitative
101	Wang et al.	2016	101	Mixed
102	Ylijoki & Porras	2016	49	Mixed
103	Zheng et al.	2016	N/A	Qualitative
104	Zhong et al.	2016	N/A	Qualitative
105	Menon & Sarkar	2016	N/A	Qualitative
106	Felt	2016	N/A	Qualitative
107	Barham	2017	N/A	Qualitative
108	Biswas & Sen	2017	N/A	Qualitative
109	Chen et al.	2017	40	Mixed
110	Corte-Real et al.	2017	500	Quantitative
111	Kache & Seuring	2017	15	Quantitative
112	Kim & Park	2017	N/A	Qualitative
113	Matthias et al.	2017	N/A	Qualitative
114	Wamba et al.	2017	297	Quantitative
115	Wolfert et al.	2017	N/A	Qualitative
116	Del Vecchio et al.	2018	N/A	Qualitative
117	Grover et al.	2018	N/A	Qualitative
118	Gunasekaran et al.	2018	4	Mixed
119	Li et al.	2018	N/A	Mixed
120	Mehta & Pandit	2018	58	Mixed
121	Nguyen et al.	2018	88	Mixed
122	Saggi & Jain	2018	N/A	Qualitative
123	Wang et al.	2018a	33 cases	Mixed
124	Wu et al.	2018	N/A	Qualitative
125	Wang et al.	2018b	26	Mixed

126	Wachter & Mittelstadt	2019	N/A	Qualitative
127	Dubey et al.	2019	173	Quantitative
128	Berente et al.	2019	N/A	Qualitative
129	Sadowski	2019	N/A	Qualitative
130	Torabi Asr & Taboada	2019	N/A	Qualitative
130	Chang et al.	2020	N/A	Mixed
131	Chen et al.	2020	N/A	Mixed
132	Chun et al.	2020	N/A	Mixed
133	Dekimpe	2020	N/A	Qualitative
134	Fu et al.	2020	141	Mixed
135	Ghasemaghaei	2020	571	Qualitative
136	Ghasemaghaei & Calic	2020	1286	Qualitative
137	Grover et al.	2020	N/A	Mixed
138	Kodapanakkal et al.	2020	979	Mixed
139	Lee et al.	2020	N/A	Qualitative
140	Lindberg	2020	N/A	Mixed
141	Line et al.	2020	N/A	Qualitative
142	Lv & Zhu	2020	N/A	Mixed
143	Mehraliyev et al.	2020	63,974 (review)	Mixed
144	Onete et al.	2020	N/A	Mixed
145	Zhou et al.	2020	N/A	Mixed
146	Gillespie	2020	N/A	Qualitative
147	Milan	2020	N/A	Qualitative
148	Passi et al.	2020	N/A	Qualitative