Article

Big Data Analytics and Firm Performance in the Hotel Sector

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Abstract: Big data (BD) analytics play a key role in helping hotel firms gain competitive advantages and achieve superior performance. The purpose of this study was to determine which factors encourage the use of big data analytics (BDA) by hotel firms and the impact of BDA on hotel firms' performance. Understanding the impacts of big data analytics in the hotel sector is important to help hotel managers use big data for creating business value by increasing hotel performance. A research model was developed and tested with data collected through a questionnaire sent to hotel managers in a European country and analysed with PLS. The results indicate that organisational readiness and competitive pressure encourage the use of BDA through the mediating role of top management support. The findings also indicate that the use of BDA can create business value by increasing the main dimensions of hotel performance: financial performance, customer retention rate, and hotel reputation.

Keywords: big data; big data analytics; hotel sector; dynamic capabilities; hotel performance

1. Introduction

In the current age of competitiveness, every organisation continually faces new problems and challenges in accomplishing their mission or purpose. The speed of technological development and the emergence of available data on a large scale that form big data (BD) and big data analytics (BDA) have been playing keys role in offering new resources and competitive advantages to organisations [1] and in adding value to products or services in several industries and companies [2]. BDA contributes to a better decision-making process which, in turn, may help a company gain a strategic advantage. Additionally, the growth of social media and user-generated content have urged the development of data analytics tools to solve real-life problems [3].

While data are increasing in quantity and diversity and are being created at a faster rate, companies face the challenge of analysing and transforming data in order to gain competitive and strategic advantages [4]. Particularly in the hotel sector, user-generated content through hotel reviews on online platforms are impacting guest satisfaction [5].

As more companies are considering adopting BDA to improve their decision-making processes in order to offer better products and services and gain a competitive advantage [6], the business value generated by the use of BDA is of extreme importance for organisations. Although some researchers have already addressed the issue of value creation when using BDA in the tourism sector [5,7], the existing literature on the influence of BDA on performance and value creation is still scarce [8], particularly in the hotel sector.

This paper contributes to this strand of literature by analysing the influence of the use of BDA on hotels performance. We choose to focus on this sector for two main reasons. First, while big data are produced and used by different industries and different types of organisations [9], existing empirical research works on the assumption that BDA resources are equal across different contexts [10], with the specificities of the setting rarely being

analysed in such investigations [8]. Second, as hotel firms offer essentially homogeneous products and services, the hotel industry is highly competitive [2]; thus, BDA may play a key role in helping hotel firms to gain competitive advantages. Ref. [11] highlight that with BD, tourist behaviour and the tourism market can be better explored and understood by both researchers and practitioners from the sector.

Therefore, to understand in which ways the use of BDA by hotel firms enhances their performance and business value, the following research questions guide the development of this work: (i) What are the factors that influence the use of BDA by hotel firms? (ii) What is the impact of the use of BDA on hotel firms' performance?

We build on the dynamic capabilities theory and on the technology–organisation–environment framework to extend this stream of research by determining the antecedents of BDA use in the hotel industry. We also assess how this usage influences firms' performance. For this, we consider different metrics of hotel firm performance such as financial performance, stakeholder satisfaction, customer retention rate, and hotel reputation [12].

The remainder of the paper is structured as follows: Section 2 presents a theoretical background to BDA. In Section 3, we provide the conceptual model and the hypotheses. Section 4 describes the methodology, and Section 5 presents the results. Finally, in Section 6, we present a discussion and the conclusions of our findings.

2. Background

2.1. Big Data Analytics

With the fast development of information and communication technologies, BD are generated from a variety of sources, including internet traffic, mobile phone transactions, user-generated content, social networks, sensors, business transactions, and other operational domains such as bioinformatics, healthcare, and finance [13].

When defining BD, the first property that comes to mind is the dimension. The latest definitions of BD consider five "V's": volume, velocity, variety, truth, and value [14,15]. Value plays a key role in the definition of BD, referring to the importance of being able to extract economic value from the data collected, relating the use of BD to the decision-making process and firms' performance [16].

The concept of BDA emerges to emphasize the process and tools used to extract value from the data [8]. According to Ref. [17], BDA includes not only the data but also the tools, the technology infrastructure, and the management skills to analyse the insights of big data. BDA applies statistical techniques such as data mining, text mining, and mathematical models to predict future outcomes based on historical data [18]. Historical data standards allow organisations to identify opportunities and risks [19] to create business value. In the literature review conducted by Samara et al., for the tourism sector, the authors found evidence that the usage of BDA can create value and benefits including "increased efficiency, productivity and profitability (. . .) combined with an extremely rich and personalized experience for travellers" [7], p. 343.

Considering that hotels offer very similar services and products, all the elements that may differentiate hotels from their competitors are crucial to gain a competitive advantage [3,20]. Therefore, the use of BDA tools plays a key role for hotel firms to increase business value as it helps in understanding consumers, competitors, market characteristics, the environment, the impact of new technologies, and supplier characteristics [3]. The analysis of social networks and consumer-generated content regarding the hotel sector has been highlighted by the market, considering the ability to create value from these data [13]. Indeed, there are many websites related to the hotel industry that are responsible for booking management and accumulating large amounts of consumer data, which have been increasing dramatically [20]. The analysis of these consumer data allows a better understanding of consumer behaviour, allowing the formulation of more adequate consumer-oriented marketing strategies [21]. The sentiment analysis technologies that are able to extract opinions from unstructured data can be very important for improving organisations' reputation management and forecasting market trends [3].

2.2. Dynamic Capabilities

The dynamic capabilities theory aims to understand how organisations build and adapt their resources to maximize their interaction with their environment [22]. Teece et al. define dynamic capabilities as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" [23], p. 516. Organisations should change to adapt to new environmental challenges [24]. It is crucial that managers accept new management styles and practice dynamic capabilities to create business value [24].

In order to achieve a competitive advantage through dynamic capabilities, organisations should have the capacity to reconfigure and transform their competencies. The effective reconfiguration and transformation of companies' core competencies require the ability to understand the environment and its changes, as well as the constant surveillance of markets and technologies [25].

Chen et al. [26] consider that the use of BDA by an organisation develops dynamic capacities as it supports knowledge creation routines, especially when the environment is very dynamic and turbulent. BDA can also be considered an organisational information processing capability that stimulates value creation and streamlines the strategic decision-making process [26]. For this reason, we argue that there is a theoretical basis for considering BDA as a dynamic capability in the hotel industry, and for justifying its impact on value creation by the organisation.

2.3. Technology–Organisation–Environment (TOE) Framework

The technology–organisation–environment (TOE) framework is an organisation-level theory that explains that there are three different elements of a firm's context (technological, organisational, and environmental) that influence the adoption and use of technological innovation [27].

First, the technology context refers to internal and external technologies that may be relevant to the organisation. Salleh et al. [28] state that the decision to adopt a new technology depends on the fit between the technology and the existing technology setting in a firm. The organisational context characterizes the internal dimensions of an organisation, such as strategy, degree of centralization, degree of formalization, managerial structure, and human resources, among other structural and cultural aspects [29]. The environmental context includes the structure of the industry, the presence or absence of technology service providers, and the regulatory environment. According to this theory, several external factors will influence organisations when adopting new technologies [29].

In summary, the TOE framework maintains that these three dimensions present "both constraints and opportunities for technological innovation" [27], p. 154. Regarding the adoption of BDA, Chen et al. [26] suggest two modifications to the original TOE model, namely the incorporation of the behavioural perspective of organisations (translated into the influence exerted by the decision makers) and the presence of management support as a mediator of organisational and environmental TOE factors on the one hand and the use of BDA on the other. Thus, the technological factor has a direct impact on the use of BDA, and the organisational and environmental factors will be mediated by the support of top management. This paper extends the model developed by Chen et al. [26] regarding the impact of the use of BDA on firms' performance by applying the specific dimensions and factors of the hotel industry.

3. Conceptual Model

To assess the use of BDA tools, we build on the dynamic capabilities theory and the TOE framework as a theoretical lens as well as the model proposed by Chen et al. [26] to develop a research model adapted to the hotel context. This model analyses the technological (expected benefits and technology compatibility), organisational (organisational readiness), and environmental (competitive pressure) factors [27]. We consider that there is a direct impact by technological factors on the use of BDA, and the impact of organisational and

environmental factors is mediated by top management support. Additionally, we also examine how the use of BDA influences the four main hotel performance indicators: financial performance, stakeholder satisfaction, customer retention rate, and hotel reputation [12]. Figure 1 presents the research model.
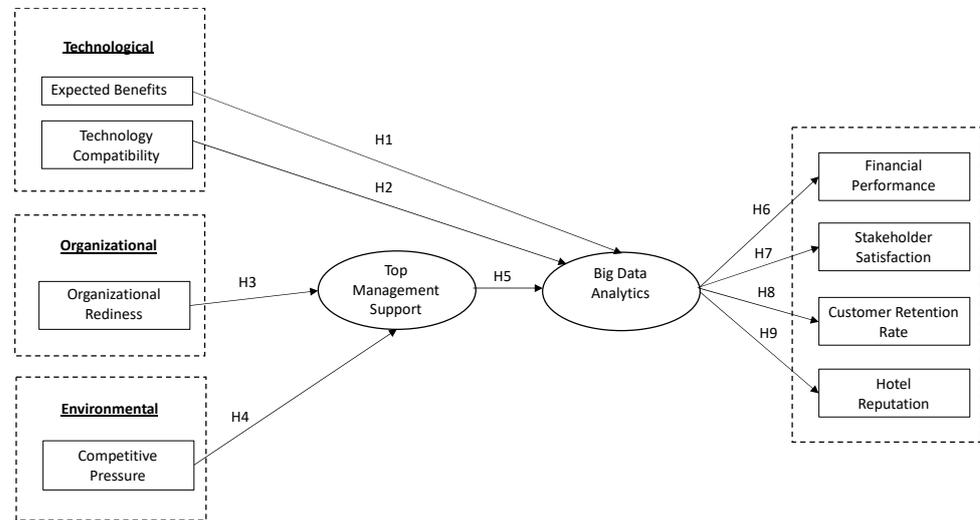

Figure 1. Conceptual Model (adapted from [26]).

The expected benefits constitute the anticipated benefits or positive impacts for the organisation from using a new technology [26]. The literature suggests that the influence of these benefits may be direct or indirect [26]. In the hospitality sector, these benefits may include lower operating costs, high precision, and a better understanding of tourist behaviour [3,11]. The indirect benefits reflect opportunities arising from the use of this technology, such as an improvement in customer service and the enhancement of tourism management and tourist market knowledge [11]. Once managers understand that using BDA can provide benefits to their organisation, the likelihood of moving forward with the introduction of new technologies to leverage their business increases exponentially [26]. We propose the following hypothesis:

Hypothesis 1: *The expected benefits have a positive influence on the use of BDA.*

Table 1 presents a summary of the literature used to determine the different factors and pathways that explain the impact of BDA on hotel firms' performance.

Table 1. Summary of the Literature Review.

Factor	Variable	Source	Hypothesis	Impact	Sign
Technological	Expected Benefits	[26,30]	H1	Direct Impact on BDA	Positive
Technological	Technology Compatibility	[26,31]	H2	Direct Impact on BDA	Positive
Organisational	Organisational Readiness	[8,26]	H3	Indirect Impact on BDA via TMS	Positive
Environmental	Competitive Pressure	[31,32]	H4	Indirect Impact on BDA via TMS	Positive
Management	Top Management Support	[32,33]	H5	Direct Impact on BDA	Positive
BDA	BDA Use	[14,34,35]	H6	Direct Impact on Corporate Financial measures	Positive

Technological compatibility refers to the degree to which the new technology is perceived as compatible with the existing practices and infrastructure of an organisation [36]. These authors distinguish two types of compatibility: cognitive compatibility (translating what people think or feel about an innovation) and operational compatibility (translating what people do with the innovation). Technological compatibility in the BDA context can be defined as "the characteristics of big data are perceived as being consistent with the existing IT architecture in an organisation (e.g., scalability, integration into the existing information systems)" [31], p. 6). If managers realize that the adoption of BDA is consistent with business values and operating practices, there is a greater propensity to use it in business processes [26].

Hypothesis 2: *Technology compatibility has a positive influence on the use of BDA.*

Organisational readiness refers to the structures and processes that may positively or negatively influence the implementation of a technological innovation [36]. Organisational structure and top management support are important factors for BDA usage [8]. Chen et al. [26] suggest that the degree of support from top management in the implementation of BDA tools is determined by the availability of resources within the organisation. In the implementation of BDA, the existence of professionals who are able to perform business analytics is, therefore, a critical factor in organisational readiness [26]. These authors argue that there is greater support from top management when they believe that the organisation has the resources and skills needed to implement BDA tools. For this reason, we consider the following hypothesis:

Hypothesis 3: *Organisational readiness has a positive influence on top management support.*

The external context also influences the adoption and usage of a technological innovation [36]. External forces such as competitive pressure or customer pressure may influence the implementation of innovative technological tools in response to external demand. "The extent of the pressure from a firm's competitors that can be combatted by the adoption of big data (e.g., competitive market, external threats from competitors)" [31], (p. 6) may have a positive impact on the importance of a BDA project to the organisational managers. Competitive pressures include external pressures from the organisational environment, which are able to positively affect top management support for the implementation of innovative tools [32]. An example of competitive pressure is the adoption of BDA by competitors. This factor may encourage similar behaviour from top management as successful competitor behaviours can reduce uncertainty in implementing innovative tools. Therefore, we propose the following hypothesis:

Hypothesis 4: *Competitive pressure has a positive influence on top management support.*

Sun et al. [31] defined top management support as "managers are willing to allocate sufficient resources and encourage the initiative adoption of big data (e.g., top executives responsible for data management, CIOs' willingness to adopt big data)" (p. 6) and found that it ranks fourth in terms of importance for BDA success. The literature suggests that if decision makers believe in the potential benefit of technology systems to the organisation, they will support their development [32]. The existing literature clearly shows that top management support plays a key role in the success of a new project [32]. Additionally, it reflects the relationship between management support and the intention to use BDA [33]. Therefore, we formulate the following hypothesis:

Hypothesis 5: *Top management support has a positive influence on the use of BDA.*

In order to assess hotel performance, we define four variables that are specific to this sector: (1) financial performance and (2) stakeholder satisfaction [12]; (3) customer retention

rate and (4) hotel reputation [37], combining financial and nonfinancial performance measures. In fact, nonfinancial performance is a long-term operational objective with the aim of increasing customer loyalty, attracting new customers, and enhancing the organisation's image and reputation.

Financial performance is the measure by which a company uses its primary resources as a form of revenue generation and can be assessed through revenue, cost reduction, and market share [37]. BD potentially offer new opportunities to all companies in creating new businesses, developing new products and services, and improving business operations [34]. There are few studies that show the impact of BDA on financial performance in the hotel industry. Nevertheless, there are several studies that clearly demonstrate the positive influence of BDA on corporate financial performance [14,35]. Therefore, we state the following hypothesis:

Hypothesis 6a: *The use of BDA has a positive effect on the hotel's financial performance.*

BDA may impact different organisation stakeholders, such as customers, employees, suppliers, partners, and investors, among others. BDA can be used to better understand customers and other stakeholders and thereby act to increase customer or stakeholder satisfaction [3,5]. Customer satisfaction has become a critical measure of success; additionally, it is an important indicator of hotel performance [3] along with employee satisfaction [38]. Using the broader concept used by Pereira-Moliner et al. [12], we state the following hypothesis:

Hypothesis 6b: *The use of BDA has a positive effect on stakeholder satisfaction.*

Customer experience and satisfaction are essential for the customer retention rate as they contribute to consumer loyalty, favourable consumer feedback, and repeated experiences, which in turn increase hotel performance. The fact that BDA enables a deeper understanding of tourist behaviour may also positively impact the customer retention rate [11]. BDA fosters the generation of new insights about hotel customers, and it has a strong and positive effect on guest experience and satisfaction [3]. Moreover, guest satisfaction is further enhanced through BDA by allowing hoteliers to create better products and services [5]. Given these arguments, we consider the following hypothesis:

Hypothesis 6c: *The use of BDA has a positive effect on customer retention rate.*

Traveller reviews influence a significant number of travellers' hotel purchase decisions, sustaining a hotel's competitive advantage [39]. Higher visibility, presence on the web, and the dissemination of positive reviews online not only increase occupancy rates and the number of reservations [40], but also positively influence hotel reliability, reputation, and customers' confidence [41]. Due to the large increase in unstructured data from social networks and consumer-generated content, text analytics (through opinion mining) and sentiment analysis have played a key role in BDA [3]. In fact, technologies capable of extracting information from unstructured data are crucial in managing business intelligence (BI) tasks, such as management reputation [3]. Therefore, we state the following hypothesis:

Hypothesis 6d: *The use of BDA has a positive effect on hotel reputation.*

4. Research Design

To answer our research questions, we developed a questionnaire to collect data that allowed us to analyse the relationships between different constructs according to our research model. As a way to operationalise the constructs present in the model, we adapted the questionnaire proposed by Chen et al. [26] to the hotel sector, taking into account the revised literature on the subject. Regarding the operationalisation of the financial

performance and stakeholder satisfaction constructs related to hotel performance, the questions were adapted from Pereira-Moliner et al. [12] and Chen et al. [37].

As the questions regarding our constructs were defined, a questionnaire (Appendix A) was built and released through the Qualtrics platform. As a pre-test, a director of a hotel in the central region of the country was asked to answer the questionnaire, which resulted in small improvements including rewording some phrases and reordering questions. The questionnaire was sent to a database with 700 hotels and was also disseminated through LinkedIn and the t-network platform. As a result, 50 responses were obtained. Data analysis was performed in Smart PLS 3.0.

5. Results

Table 1 presents the demographic statistics of the final sample. The sample had almost the same number of male and female respondents (52% male and 48% female). The predominant ages of our respondents were between 25 and 44 years old (68%), presenting, in general, medium–high knowledge about the topics covered in the questionnaire (80%). In the hotel units where they worked, they were mainly general managers (44%), with a greater predominance of management department personnel (52%).

To analyse the quality of the measurement model, we began by accessing the internal consistency reliability of the reflective variables by calculating Cronbach's alpha and composite reliability (Table 2). We found that all constructs presented values greater than the threshold value of 0.7 for both criteria, indicating that they were reliable and internally consistent.

We then calculated the mean extracted variance (AVE) in order to demonstrate the unidimensionality of each construct according to its indicators [42]. Each of the constructs must have a value greater than 0.5 to be included in the study. Table 2 shows that all the AVE values were between 0.605 and 0.972.

Table 2. Final Sample Descriptive Statistics (N = 50).

	(N)	(%)		(N)	(%)
Gender			Does your hotel belong to a hotel chain?		
Male	26	52%	Yes	21	42%
Female	24	48%	No	29	58%
Age			Number of years working on that hotel		
18–24	3	6%	1–5	29	58%
25–34	18	36%	6–10	10	20%
35–44	16	32%	11–15	5	10%
45–54	12	24%	>15	6	12%
>54	1	2%			
Department			Overall knowledge about the questionnaire		
Sales	3	6%	Very low	8	16%
F&B	4	8%	Low	7	14%
Management	26	525	Medium	22	44%
Reception	5	10%	High	18	36%
Other	12	24%	Very high	1	2%
Job Function			Number of years on that job function		
Board Member	4	8%	1–5	34	68%
General manager	22	44%	6–10	10	20%
Receptionist	19	38%	11–15	3	6%
Other	5	10%	>15	3	6%

The discriminant validity of the instrument was assessed according to two criteria: (1) the Fornell–Larcker criterion and (2) the cross-loadings criterion (Tables 3 and 4) [42]. The Fornell–Larcker criterion implies that the AVE value of each variable is greater than the square of the correlations with each of the other variables [42]. The bold values are higher

than the others in each column, meaning that the latent variables share more variance with their indicators than any other variable. The cross-loadings criterion states that each indicator must have a greater correlation with the variable to which it is associated than any other variable [43], which was confirmed in the data collected.

Table 3. Measurement Model Quality Indicators.

Construct	Cronbach Alpha	Composite Reliability	AVE
Top Management Support [TMS]	0.972	0.982	0.948
Expected Benefits [EB]	0.933	0.942	0.732
Technological Compatibility [TC]	0.851	0.908	0.769
Financial Performance [FP]	0.919	0.939	0.756
Competitive Pressure [CP]	0.904	0.937	0.833
Organizational Readiness [OR]	0.783	0.860	0.605
Hotel Reputation [HR]	0.971	0.986	0.972
Customer Retention [CR]	0.808	0.905	0.827
Stakeholders Satisfaction [SS]	0.779	0.891	0.813
Use of BDA [UBDA]	0.957	0.963	0.722

Table 4. Fornell–Larcker Criterion.

	[TMS]	[EB]	[TC]	[FP]	[CP]	[OR]	[HR]	[CR]	[SS]	[UBDA]
Top Management Support	0.974									
Expected Benefits	0.440	0.855								
Techn Compatibility	0.683	0.569	0.877							
Financial Performance	0.584	0.392	0.417	0.869						
Competitive Pressure	0.324	0.300	0.230	0.127	0.913					
Organizational Readiness	0.417	0.010	0.232	0.302	0.262	0.778				
Hotel Reputation	0.313	0.315	0.356	0.607	0.045	0.110	0.986			
Customer Retention	0.518	0.255	0.401	0.580	0.039	0.169	0.543	0.909		
Stakeholders Satisfaction	0.269	0.127	0.259	0.546	0.0015	0.130	0.705	0.599	0.902	
Use of BDA	0.778	0.333	0.519	0.533	0.403	0.434	0.232	0.277	0.182	0.850

The structural model assessment started by analysing the coefficient of determination R^2 of the latent variables and the path coefficients. We tested the hypotheses under study and evaluated the model in terms of fit [42,43] using the bootstrapping technique that generated 500 random samples with 50 cases. Figure 2 shows the results obtained from the analysis developed through SmartPLS 3.0 [44].

Regarding the model fit, Chin [43] suggests that R^2 values of 0.67, 0.33, and 0.19 describe the fit as substantial, moderate, and weak, respectively. It can be seen from the above figure that BDA use was over 0.33 ($R^2 = 0.606$), while top management support and financial performance were over 0.19 at ($R^2 = 0.223$) and ($R^2 = 0.284$), respectively. The constructs of stakeholder satisfaction, customer retention, and reputation had R^2 values less than 0.19: ($R^2 = 0.033$), ($R^2 = 0.077$), and ($R^2 = 0.054$), respectively. Thus, we can state that the model had a moderate fit.
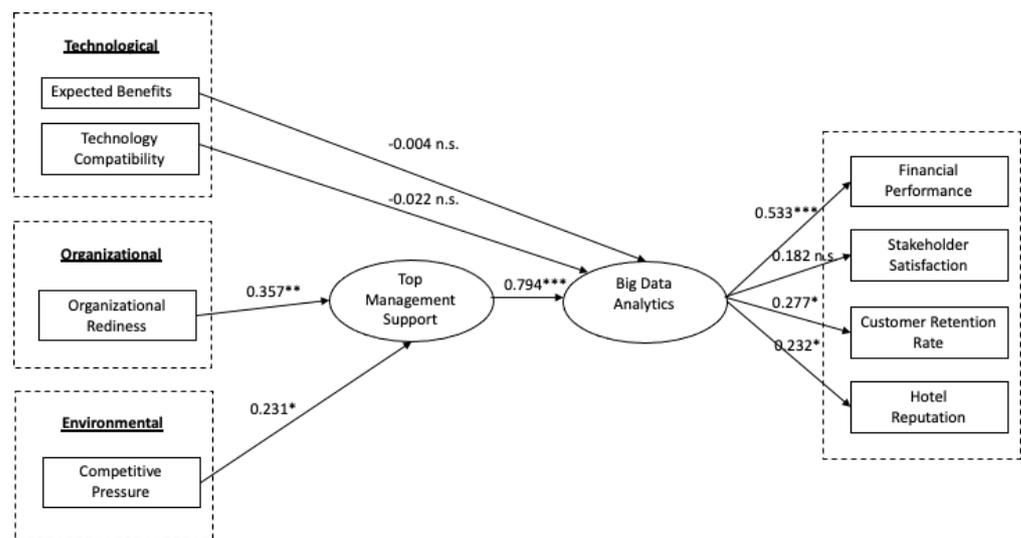
Figure 2. PLS results (N = 50). Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; n.s.—not significant.

6. Discussion and Conclusions

Considering that the hotel industry is highly competitive, the use of BDA has become an important tool for increasing business value. Therefore, based on the TOE model modified by Chen et al. [26] and adapted for the hotel context, we investigated which factors determine the use of BDA in the hotel industry and how BDA implementation influences several hotel performance indicators.

Our results show that the technological factors such as expected benefits and technology compatibility do not have a direct influence on the use of BDA. Ref. [8] affirms that the use of data technologies and tools is highly dependent on the skills and knowledge of the human resource. A lack of knowledge regarding the expected benefits and technological compatibility of the use of BDA can justify such a result.

However, our findings indicate that organisational readiness and competitive pressure encourage the use of BDA through the mediating role of top management. The existing literature has shown that top management plays a key role in the implementation of an IT system, namely, if they believe in the potential of such innovation [26,32]. In line with Hypothesis 3, the results show that organisational factors such as the existence of internal knowledge to use BDA will encourage top managers to implement such tools. Additionally, environmental factors also have a positive impact on the use of BDA. As the hotel industry is highly competitive, the adoption of BDA by competitors can be a strong incentive to managers to innovate in order to gain a competitive advantage.

The results strongly support the hypothesis that BDA can provide business value with an increase in the main dimensions of hotel performance: financial performance, customer retention rate, and hotel reputation. The only coefficient that is not statistically significant is related to stakeholder satisfaction. This can be justified by the fact that hotel guest satisfaction is a complex construct that is difficult to define [3].

Overall, we can conclude that the use of BDA can help hotel managers to enhance the organisational decision-making process, which in turn creates business value. This study is in line with Chen et al.'s results [26], but it extends this work by analysing the impact of BDA in the highly competitive hotel industry for which big data analysis plays a key role in creating competitive advantages. In many cases, empirical contributions to the performance issue begin to focus on the industrial or service sector such as the banking or insurance industries, with the travel and tourism sector being less studied [45].

This study responds to a call for a better understanding of the decision-making process in the hospitality industry within the era of big data [3]. Our findings will help hotel managers understand that the use of BDA influences the main drivers of hotel performance

and that organisational and environmental factors encourage top management to use BDA in the decision-making process.

This study contributes to big data research by empirically testing and finding that the use of big data can increase firm performance and that managers play a key role in encouraging big data's use and the technology that allows the analysis of such data. Beyond financial indicators, we also use nonfinancial variables to measure performance such as customer retention rate and hotel reputation. It is important to highlight that beyond the financial performance, BDA have significant and positive impacts on customer retention rate and hotel reputation. For practitioners, this study shows which factors most influence managers' decisions to use these new tools to improve hotel performance. Both technology consultants and hotel managers can not only improve their understanding about the use of BDA regarding the main drivers for its usage and the importance of top management support in this process, but also understand the avenues of value creation that they can expect from this use.

Although this paper makes important contributions to theory and practice, it also has limitations. First, one limitation is the small sample size and the fact that we surveyed organisations from a single country. Further research could improve the sample size and include hotels operating in other geographies as well. Second, we used a self-completion questionnaire as the main source of data collection, so there are some issues that we could not control. Other data sources could also improve this type of study in the future; for example, the financial performance indicators could come from a secondary data source.

Author Contributions: T.C. developed the research model, hypotheses, data collection, and discussion. I.P. did the literature review and edited the hypotheses development. W.N.P. did the data analysis and edited the discussion and conclusions. All authors have read and agreed to the published version of the manuscript.

Informed Consent Statement: The questionnaire was sent by email and participation was optional, and participants could withdraw from it at any time.

Data Availability Statement: Data are available on request from the authors.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Research model operationalization: constructs and measurement items.

Construct	Item	Scale	Reference
Big data usage	Sourcing analysis	(1–5)	[26]
	CRM/customer management		
	Marketing/communication		
	Warehouse operations improvements		
	Revenue management		
	Process/equipment monitoring		
	Distribution channel		
	Logistics improvements		
	Forecasting/demand management—SandOP		
	Inventory optimization		

Table A1. *Cont.*

Construct	Item	Scale	Reference
Expected benefits	Improve the quality of work	(1–5)	[26]
	Make work more efficient		
	Lower costs		
	Improve customer service		
	Grow sales to new customers or new markets		
	Identify new product/service opportunities		
Technology compatibility	Using BDA is consistent with our business practices	(1–5)	[26]
	Using BDA fits our organizational culture		
	Overall, it is easy to incorporate BDA into our hotel management practices		
Organizational readiness	Lacking capital/financial resources	(1–5)	[26]
	Lacking the needed IT infrastructure		
	Lacking analytics capability		
	Lacking skilled resources		
Competitive pressure	To what extent have your competitors implemented BDA?	(1–5)	[26]
	To what extent have your suppliers implemented BDA?		
	To what extent have your clients implemented BDA?		
Top management support	To what extent does the TMT promote the use of BDA in your organization?	(1–5)	[26]
	To what extent does the TMT create support for BDA initiatives within your organization?		
	3. To what extent has the TMT promoted BDA as a strategic priority within your organization?		
Financial performance	Room occupancy rate	(1–5)	[12]
	Income per room		
	Gross profit per room		
	Wealth creation (Accounting value of the firm with respect to its market value)		
	Capacity to generate profit in times of crisis		
Stakeholder satisfaction	Customer satisfaction level	(1–5)	[12]
	Employee satisfaction level		
Hotel characteristics	No. of stars	#	[12]
	Chain affiliation	name	
Client retention	We improved customer loyalty	(1–5)	[12]
	We attracted a large number of new clients		
Hotel reputation	We have a good image	(1–5)	[12]
	We have a good reputation in the market		

References

1. Côrte-Real, N.; Oliveira, T.; Ruivo, P. Assessing business value of big data analytics in European firms. *J. Bus. Res.* **2017**, *70*, 379–390. [CrossRef]
2. Ang, L.-M.; Seng, K.P. Big Sensor Data Applications in Urban Environments. *Big Data Res.* **2016**, *4*, 1–12. [CrossRef]
3. Xiang, Z.; Schwartz, Z.; Gerdes, J.H., Jr.; Uysal, M. What can big data and text analytics tell us about hotel guest experience and satisfaction? *Int. J. Hosp. Manag.* **2015**, *44*, 120–130. [CrossRef]
4. Baesens, B.; Bapna, R.; Marsden, J.R.; Vanthienen, J.; Zhao, J.L. Transformational issues of big data and analytics in networked business. *MIS Q.* **2014**, *38*, 629–631. [CrossRef]
5. Lee, M.; Cai, Y.; DeFranco, A.; Lee, J. Exploring influential factors affecting guest satisfaction: Big data and business analytics in consumer-generated reviews. *J. Hosp. Tour. Technol.* **2020**, *11*, 137–153. [CrossRef]
6. Maroufkhani, P.; Wagner, R.; Ismail, W.K.W.; Baroto, M.B.; Nourani, M. Big data analytics and firm performance: A systematic review. *Information* **2019**, *10*, 226. [CrossRef]
7. Samara, D.; Magnisalis, I.; Peristeras, V. Artificial intelligence and big data in tourism: A systematic literature review. *J. Hosp. Tour. Technol.* **2020**, *11*, 343–367. [CrossRef]
8. Mikalef, P.; Boura, M.; Lekakos, G.; Krogstie, J. Big data analytics and firm performance: Findings from a mixed-method approach. *J. Bus. Res.* **2019**, *98*, 261–276. [CrossRef]
9. McAfee, A.; Brynjolfsson, E.; Davenport, T.H. Big data: The management revolution. *Harv. Bus. Rev.* **2012**, *90*, 60–68.
10. Gupta, M.; George, J.F. Toward the development of a big data analytics capabilities. *Inf. Manag.* **2016**, *53*, 1049–1064. [CrossRef]
11. Li, J.; Xu, L.; Tang, L.; Wang, S.; Li, L. Big data in tourism research: A literature review. *Tour. Manag.* **2018**, *68*, 301–323. [CrossRef]
12. Pereira-Moliner, J.; Claver-Corttn, E.; Molina-Azor, J.; Tar, J.J. Quality management. environmental management and firm performance: Direct and mediating effects in the hotel industry. *J. Clean. Prod.* **2012**, *37*, 82–92. [CrossRef]
13. George, G.; Haas, M.R.; Pentland, A. Big Data and management. *Acad. Manag. J.* **2014**, *57*, 321–326. [CrossRef]
14. Wamba, S.F.; Gunasekaran, A.; Akter, A.; Ren, S.J.-F.; Dubey, R.; Childe, S.J. Big data analytics and firm performance: Effects of dynamic capabilities. *J. Bus. Res.* **2017**, *70*, 356–365. [CrossRef]
15. Assunção, M.D.; Calheiros, R.N.; Bianchi, S.; Netto, M.A.; Buyya, R. Big Data computing and clouds: Trends and future directions. *J. Parallel Distrib. Comput.* **2015**, *79*, 3–15. [CrossRef]
16. Wamba, S.F.; Akter, S.; Edwards, A.; Chopin, G.; Gnanzou, D. How big data can make big impact: Findings from a systematic review and a longitudinal case study. *J. Prod. Econ.* **2015**, *165*, 234–246. [CrossRef]
17. Mikalef, P.; Boura, M.; Lekakos, G.; Krogstie, J. Big data analytics capabilities and innovation: The mediating role of dynamic capabilities and moderating effect of the environment. *Br. J. Manag.* **2019**, *30*, 272–298. [CrossRef]
18. Haider, M. Beyond the hype: Big data concepts, methods, and analytics. *Int. J. Inf. Manag.* **2015**, *35*, 137–144.
19. Liu, Y. Big Data and Predictive Business Analytics. *J. Bus. Forecast.* **2014**, *33*, 40–42.
20. Ting, P.J.L.; Chen, S.-L.C.; Chen, H.; Fang, W.-C. Using big data and text analytics to understand how customer experiences posted on Yelp.com impact the hospitality industry. *Contemp. Manag. Res.* **2017**, *13*, 07–130. [CrossRef]
21. Erevelles, S.; Fukawa, N.; Swayne, L. Big data consumer analytics and the transformation of marketing. *J. Bus. Res.* **2016**, *69*, 897–904. [CrossRef]
22. Schilke, O. Second order dynamic capabilities: How do they matter? *Acad. Manag. Perspect.* **2014**, *28*, 368–380. [CrossRef]
23. Teece, D.J.; Pisano, G.; Shuen, A. Dynamics capabilities and strategic management. *Strateg. Manag. J.* **1997**, *18*, 509–533. [CrossRef]
24. Teece, D.J. Capturing value from knowledge assets: The new economy markets for know-how, and intangible assets. *Calif. Manag. Rev.* **1998**, *40*, 55–79. [CrossRef]
25. Braganza, A.; Brooks, L.; Nepelski, D.; Ali, M.; Moro, R. Resource management in big data initiatives: Processes and dynamic capabilities. *J. Bus. Res.* **2017**, *70*, 328–337. [CrossRef]
26. Chen, D.Q.; Preston, D.S.; Swink, M. How the Use of Big Data Analytics Affects Value Creation in Supply Chain Management. *J. Manag. Inf. Syst.* **2015**, *32*, 4–39. [CrossRef]
27. Tornatzky, L.G.; Fleischer, M.; Chakrabarti, A.K. *Processes of Technological Innovation*; Lexington Books: Lanham, MD, USA, 1990.
28. Salleh, K.A.; Janczewski, L.J.; Beltran, F. SEC-TOE Framework: Exploring Security Determinants in Big Data Solutions Adoption. In Proceedings of 19th Pacific Asia Conference on Information Systems (PACIS 2015), Singapore, 5–9 July 2015.
29. Baker, J. The Technology–Organization–Environment Framework. In *Information Systems Theory*; Dwivedi, Y., Wade, M., Schneberger, S., Eds.; Integrated Series in Information Systems; Springer: New York, NY, USA, 2012; Volume 28.
30. Chwelos, P.; Benbasat, I.; Dexter, A.S. Research report: Empirical test of an EDI adoption model. *Inf. Syst. Res.* **2001**, *12*, 304–321. [CrossRef]
31. Sun, S.; Cegielski, C.; Jia, L.; Hall, D. Understanding the Factors Affecting the Organizational Adoption of Big Data. *J. Comput. Inf. Syst.* **2016**, *58*, 193–203. [CrossRef]
32. Liang, H.; Saraf, N.; Hu, Q.; Xue, Y. Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management. *MIS Q.* **2007**, *31*, 59–87. [CrossRef]
33. Sam, K.M.; Chatwin, C.R. Understanding Adoption of Big Data Analytics in China: From Organizational Users Perspective. In Proceedings of the IEEE International Conference, Kansas City, MO, USA, 20–24 May 2018.
34. Lee, I. Big data: Dimensions, evolution, impacts, and challenges. *Bus. Horiz.* **2017**, *60*, 293–303. [CrossRef]

35. Xie, K.; So, K.; Wang, W. Joint effects of management responses and online reviews on hotel financial performance: A data-analytics approach. *Int. J. Hosp. Manag.* **2017**, *62*, 101–110. [CrossRef]

36. Tornatzky, L.G.; Klein, K.J. Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IIEEE Trans. Eng. Manag.* **1982**, *29*, 28–45. [CrossRef]

37. Chen, D.Q.; Tsou, H.T.; Huang, A.Y. Service delivery innovation antecedents and impact on firm performance. *J. Serv. Res.* **2009**, *12*, 36–55. [CrossRef]

38. Hwang, I.S.; Chi, D.J. Relationships among Internal Marketing, Employee Job Satisfaction and International Hotel Performance: An Empirical Study. *Int. J. Manag.* **2005**, *22*, 285–293.

39. Levy, S.E.; Duan, W.; Boo, S. An analysis of one-star online reviews and responses in the Washington, DC, lodging market. *Cornell Hosp. Q.* **2013**, *54*, 49–63. [CrossRef]

40. Ye, Q.; Law, R.; Gu, B. The impact of online user reviews on hotel room sales. *Int. J. Hosp. Manag.* **2009**, *28*, 180–182. [CrossRef]

41. Cantallops, A.; Salvi, F. New consumer behavior: A review of research on eWOM and hotels. *Int. J. Hosp. Manag.* **2014**, *36*, 41–51. [CrossRef]

42. Henseler, J.; Ringle, C.M.; Sinkovics, R.R. The use of partial least squares path modeling in international marketing. In *New Challenges to International Marketing*; Emerald Group Publishing Limited: Bingley, UK, 2009.

43. Chin, W.W. The partial least squares approach to structural equation modelling. In *Modern Methods for Business Research*; Marcoulides, Ed.; Lawrence Erlbaum Associates: Mahwah, NJ, USA, 1998; pp. 295–336.

44. Ringle, C.M.; Wende, S.; Becker, J.-M. SmartPLS 3. Bönningstedt: SmartPLS. 2015. Available online: http://www.smartpls.com (accessed on 10 February 2023).

45. Sainaghi, R. Hotel performance: State of the art. *Int. J. Contemp. Hosp. Manag.* **2010**, *22*, 368–380. [CrossRef]