

THE RELEVANCE OF BIG DATA AND DATA ANALYTICS FOR THE HOSPITALITY INDUSTRY

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ABSTRACT

Big Data and data analytics have made significant progress in the past decade. The use of Big Data and data analytics affects hotel management in many ways by improving business operation, performance evaluation, risk assessment, and managerial strategic plans. This paper explores the use of Big Data and data analytics in identifying, assessing, managing and disclosing the business activities of the hospitality industry. The survey results indicate that: (1) the demand for and interest in Big Data/data analytics will continue to increase in the hospitality industry; (2) Big Data/data analytics should be integrated into business strategic decisions and operational processes; and (3) the use of Big Data / data analytics in the hospitality industry includes occupancy forecasting, examining operational efficiency, developing a data warehouse, collecting and assessing customer reviews, improving staff training and retention, and securing customer satisfaction and loyalty. Results present policy, practical and educational implications for the hospitality industry.

Keywords: Big Data, Data Analytics, Hospitality Industry, Hotel Management, Financial Reports.

INTRODUCTION

The usefulness and relevance of conventional financial information in making sound decisions has been challenged in terms of its capability to satisfy the increasing information needs of hotel managers. The emergence of Big Data and data analytics creates an opportunity for the hospitality industry to identify, assess and manage Big Data and transform it to usable information for decision making. Big Data has the potential to change the landscape of the hotel business regarding customer engagement, automating operation processes, occupancy forecasts and predictive analytics for decision making. One way to improve the transparency and

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quality of information with Big Data is to use forward-looking information on products, strategies, plans and performance. Big Data is typically referred to as “huge-volume, high-velocity and high-variety” data that can be processed electronically to facilitate decision-making (e.g. Vasarhelyi, Kogan & Tuttle, 2015; Rezaee, Dorestani & Aliabadi, 2018). Big data and its sources, including internal and external, qualitative and quantitative structured, semi-structured and unstructured qualitative and quantitative text are being used in business decisions (Rezaee et al., 2018). This paper examines the use of Big Data and data analytics in identifying, assessing, managing and disclosing the business activities of the hospitality industry.

The primary objectives of this paper are to: (1) describe Big Data and data analytics in the hospitality industry; in terms of room occupancy, geographic locations, sizes and room rates; (2) investigate the relevance and importance of Big Data and data analytics to effectively manage the operation of hotels and resorts; and (3) present Big Data and data analytics strategies for the hospitality industry. These objectives are achieved by conducting a survey of a sample of Master of Business Administration (MBA) and hospitality management students and obtaining their insight as to the relevance of Big Data and data analytics in hospitality management. Our research questions are: (1) is there a demand for and interest in the use of Big Data and data analytics in the hospitality industry? What are the main drivers and sources of the implication of Big Data and data analytics in hotels and resorts?; and, (3) what are the benefits of using Big Data and data analytics in the hospitality industry? Thus, we examine: (1) the extent of the use of financial and non-financial Big Data in the hospitality industry; and (2) insight from participants regarding the benefits and implications of Big Data for the hospitality industry.

This paper proceeds as follows: Section 2 reviews the related literature in developing the motivations and research questions for the study. Section 3 presents research methods, including the survey questionnaire. Results are presented in Section 4 whereas discussions and remarks are provided in Section 5. The last Section concludes the paper.

LITERATURE REVIEW

The application of Big Data and data analytics in the hospitality industry, including the resort and hotel business, is emerging. However, the literature is rare. We identify two streams of related research as described in the following subsection. The first stream addresses the application of Big Data in the hospitality industry, whereas the second stream discusses the use of data analytics in improving hospitality operation.

The Use of Big Data in the Hospitality Industry

Business organizations including hotels and resorts use Big Data pertaining to the industry, business and media to help them better understand their markets, business industries and operations and to better identify challenges and opportunities that can create business value. Big Data is usually referred to as huge data sets consisting of unstructured, semi-structured, and structured data that can be electronically processed to analyze and transform data into information useful for decision-making (Rezaee et al., 2018). Big data has led many companies to develop

their big data analytic capability (BDAC) in order to enhance their performance (Akter et al., 2016; Fosso Wamba et al., 2017). Prior research suggests a growing awareness of big data's business value in enabling organizational decisions and enhancing firm competitiveness (Sheng, Amankwah-Amoah & Wang 2017). Furthermore, the use of Big Data can help in developing: (1) the tourism market and its policies (Li & Li, 2016); (2) in gaining a better understanding of customer behavior in the hospitality industry using online customer reviews (Ting et al., 2017); (3) in the strategic dimension of human resource (HR) management to handle the big dataset to do HR analytics and improve the work efficiency (Martin-Rios, Pougnet & Nogareda, 2017); and (4) in examining operational efficiency to improve hotel financial performance (Xu & Chi, 2017).

The Application of Data Analysis in Improving Hotel Operation Management

The ever-increasing business complexity, corporate governance reforms, risk management, globalization of hotels and resorts, along with their growing demand for high-quality financial and non-financial information, necessitate the use of technology to modernize their operations and financial reporting and audit processes. Information and insight that once were not publicly available now extend far beyond traditional financial transactions and reports and extend to data from email, social media, video, voice and texts. Big Data and data analytics can be used by hotel management to quickly and effectively respond to online reviews (Xie, So & Wang 2017) and provide new insight into determinates of customer satisfaction (Liu et al., 2017) to increase hotel financial performance.

In the hospitality industry, big data analytics has enabled business decision-makers in their strategic planning purposes in hospitality markets, hospitality management, customer relation management and destination marketing (Miah et al., 2017). Hotels and resorts can use Big Data and data analytics to better understand their operations, markets, business industries and standing in social media; and to identify challenges and opportunities that can create business value. In using Big Data and data analytics, millions of transactions can be searched to spot patterns, customer preferences, occupancy forecasts and detect abnormalities and irregularities. Big data clustering algorithms could help the hospitality industry to improve marketing segmentations. The use of Big Data and data analytics facilitates successful customer relationship management through a better understanding of customers and market conditions (Buhalis et al., 2018) that results in customer loyalty and long run profitability (Chen & Popovich, 2003). Furthermore, Big Data/data analytics can be used to search a large quantity of customer reviews to determine guests' experience and satisfaction (Xiang et al., 2015).

RESEARCH METHOD

This paper focuses on both financial and non-financial Big Data (e.g. forward looking financial information, strategy disclosure, management disclosure, production disclosure, marketing disclosure, customer disclosure and technology disclosure). The research method consists of several steps. First, we review the literature to find the demand for Big Data and data analytics in the hospitality industry. Second, we prepare pretest and revise the draft of the three-page, three-section questionnaire. Third, we conduct a pilot and pretesting of the questionnaire by sending it to several hotel managers and experts in the areas of hospitality management and Big Data. These hotel managers, known to authors, are asked to

review, correct and suggest improvements and refinements of the original draft of the questionnaire for its relevance, accuracy, content, format and wording. Finally, a revised, refined and pre-tested three-page, three-section questionnaire was distributed among 101 students for their insight.

Big data and data analytics questionnaire

This questionnaire is designed to determine the use of Big Data and data analytics in the hospitality industry. When answering the questions below, please keep in mind that Big Data is defined in this study as huge-volume, high-velocity, high-variety, high-veracity and value-relevant data that can be processed electronically to facilitate decision-making. Data analytics is defined as the process of analyzing and utilizing Big Data to predict customers’ behavior, occupancy rates and operational effectiveness and efficiency.

Thank you for your cooperation.

1. Do you expect future demand for and interest in the following to:

	Big Data	Data Analytics
Increase?	<input type="checkbox"/>	<input type="checkbox"/>
Remain the same?	<input type="checkbox"/>	<input type="checkbox"/>
Decrease?	<input type="checkbox"/>	<input type="checkbox"/>
Unsure?	<input type="checkbox"/>	<input type="checkbox"/>

2. Please indicate the extent to which you agree with the following statements by selecting the appropriate responses, where 1=Strongly disagree and 5=Strongly agree. If you have no opinion, please indicate by choosing N/A.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A
A.	The future demand for, and interest in, Big Data and Data Analytics should increase	1	2	3	4	5	0
B.	The use of Big Data should be promoted in the hospitality industry	1	2	3	4	5	0
C.	The use of data analytics should be demanded and promoted among hotel managers and administrators	1	2	3	4	5	0
D.	Big Data and data analytics should be used to predict and determine hotel occupancy demand	1	2	3	4	5	0
E.	Big Data and data analytics should be used to predict and determine operational efficiency and effectiveness	1	2	3	4	5	0

F.	Big Data and data analytics should be used to predict and determine climate and tourist demand	1	2	3	4	5	0
G.	Big Data and data analytics should be used to predict and determine customers' patterns and behavior	1	2	3	4	5	0
H.	Big Data and data analytics should be used to analyze the social media customer reviews	1	2	3	4	5	0
I.	Big Data and data analytics should be used in enhancing firm operational performance	1	2	3	4	5	0
J.	Big Data and data analytics should be used in enhancing firm competitiveness	1	2	3	4	5	0
K.	Big Data and data analytics should integrate the strategic dimension of Human Resource Management to handle the big dataset	1	2	3	4	5	0
L.	Big Data and data analytics should be used in assessing operation efficiency	1	2	3	4	5	0

3. Please indicate the importance of the perceived benefits of the use of Big Data and data analytics in the hospitality industry by selecting the appropriate responses, where 1=Least important and 5=Very important. If you have no opinion, please indicate by choosing N/A.

		Least Important	Less Important	Neutral	More Important	Most Important	N/A
A.	Satisfy the customers' demand for high-quality service.	1	2	3	4	5	0
B.	Improve hotel financial performance.	1	2	3	4	5	0
C.	Promote operational effectiveness and efficiency.	1	2	3	4	5	0
D.	Increase hotel	1	2	3	4	5	0

	occupancy rate.						
E.	Collect and analyze customer reviews.	1	2	3	4	5	0
F.	Improve staffing, training and retention of staff and associates.	1	2	3	4	5	0
G.	Build successful customer relationship management.	1	2	3	4	5	0
H.	Better understanding of market conditions.	1	2	3	4	5	0
I.	Development of hotel competitiveness.	1	2	3	4	5	0
J.	Build strong customer loyalty.	1	2	3	4	5	0
K.	Create long run profitability.	1	2	3	4	5	0

4. Comments: Please feel free to comment on Big Data and data analytics. Thank you for your cooperation and assistance.

RESULTS

The results of the survey are presented in the following sections regarding the use of Big Data and data analytics in the hospitality industry.

Relevance of Big Data and Data Analytics

Respondents were asked to answer a question pertaining to the future demand for, and interest in, Big Data/data analytics. Table 1 indicates that a high majority of respondents (94% and 86%) reported that future demand for, and interest in, Big Data/data analytics will increase. A small percentage of respondents (2% and 9%) felt that the demand for Big Data/data analytics will remain the same in the future. Less than five percent of respondents were not sure about any changes in demand for Big Data/data analytics and about two percent thought the demand

for data analytics will decrease. These findings are consistent with and support the recent move towards promoting the use of Big Data/data analytics by business organizations of all types and sizes.

Table 1. Big data and data analytics.

	Big Data	Data Analytics
Increase?	94%	86%
Remain the same?	2%	9%
Decrease?	0%	2%
Unsure?	4%	3%
Total	100%	100%

We asked several questions regarding participants’ perceptions towards Big Data/data analytics in the hospitality industry. We ranked responses on a five-point Likert scale, with five indicating strongly agrees and one representing strongly disagree. Table 2 reveals that participants strongly agree with the mean response of above 4, that several attributes of Big Data/data analytics are significantly relevant and useful in the hospitality industry. Among these attributes are: (1) the future demand for, and interest in, Big Data/data analytics in the hospitality management should increase (mean response=4.39); (2) the use of Big Data should be promoted in the hospitality industry (4.37); (3) the use of data analytics should be demanded and promoted among hotel managers and administrators (4.31); (4) Big Data/data analytics should be used to predict and determine hotel occupancy demand (4.19); (5) Big data analysis should be used in assessing operational efficiency (4.09); (6) Big Data/data analytics should be used to predict and determine operational efficiency and effectiveness (4.03); and (7) Big Data/data analytics should be used to predict and determine climate and tourist demand (4.00).

Some other characteristics of Big Data/data analytics relevant to the hospitality industry with the mean response of less than 4 and greater than 3.75 are: (1) Big Data/data analytics should be used to predict and determine customers’ patterns and behavior (3.95); (2) Big Data/data analytics should be used to analyze social media customer reviews (3.91); (3) Big Data/data analytics should be used in enhancing firm operational performance (3.87); (4) Big Data/data analytics should be used in enhancing firm competitiveness (3.81); and (5) Big data analysis should integrate the strategic dimension of Human Resource Management to handle the big dataset. Overall, all the attributes of Big Data/data analytics presented in Table 2 regarding the use of Big Data/data analytics in the operations, administration and customer services show a mean response of above 3.75 (with the mean response of 3.00 in a five-point Likert scale as being neutral), suggesting the importance of these attributes in decision-making in hotels and resorts.

Table 2. Perceptions toward big data and data analytics.

Please indicate the extent to which you agree with the following statements pertaining to relevance of Big Data and Data Analytics in the hospitality industry:		
Statements	Mean Responses	Standard Deviation
The future demand for and interest in, Big Data and Data Analytics should increase	4.39	1.15
The use of Big Data should be promoted in the hospitality industry	4.37	1.22
The use of data analytics should be demanded and promoted among hotel managers and administrators.	4.31	1.37
Big Data and data analytics should be used to predict and determine hotel occupancy demand	4.19	1.37
Big data analysis should be used in assessing operation efficiency	4.09	1.21
Big Data and data analytics should be used to predict and determine operational efficiency and effectiveness	4.03	1.14
Big Data and data analytics should be used to predict and determine climate and tourist demand	4.00	1.34
Big Data and data analytics should be used to predict and determine customers' patterns and behavior	3.95	1.13
Big Data and data analytics should be used to analyze the social media customer reviews	3.91	1.23
Big Data and data analytics should be used in enhancing firm operational performance	3.87	1.45
Big Data and data analytics should be used in enhancing firm competitiveness	3.81	1.47
Big data analysis should integrate the strategic dimension of Human Resource Management to handle the big dataset	3.76	1.49

Perception toward the Benefits of the use of Big Data/Data Analytics

We asked eight questions regarding the perceived benefits of the use of Big Data/data analytics in the hospitality industry. Table 3 ranks the importance of the seven listed benefits by using a Likert scale of one to five, with five being the most important and one being the least important. Respondents reported in the order of importance that perceived benefits to:

1. Promote operational effectiveness and efficiency (mean response=4.56).
2. Improve hotel financial performance (4.37).

3. Satisfy the customers’ demand for high-quality service (4.33).
4. Increase hotel occupancy rate (4.32).
5. Collect and analyze customer reviews (4.21).
6. Improve staffing, training and retention of staff and associates (4.11).
7. Build successful customer relationship management (4.08).
8. Better understanding of market conditions (4.03).

Table 3. Benefits of the use of big data and data analytics in the hospitality industry.

Roles	Mean Response	Standard Deviation
Promote operational effectiveness and efficiency	4.56	0.76
Improve hotel financial performance	4.37	0.84
Satisfy the customers’ demand for high-quality service	4.33	0.91
Increase hotel occupancy rate	4.32	0.94
Collect and analyze customer reviews	4.21	1.00
Improve staffing, training and retention of staff and associates	4.11	1.10
Build successful customer relationship management	4.08	1.32
Better understanding of market conditions	4.03	1.37

DISCUSSIONS AND REMARKS

The emerging technological advances have significantly changed the strategic plans of business organizations, the ways they conduct their business operations and the type and extent of Big Data they use in day-to-day operations and decision-making. Results presented in Tables 1-3 support the relevance and use of Big Data/data analytics in the hospitality industry. Overall, results suggest that the demand for and interest in the use of Big Data/data analytics in the hospitality industry will continue to increase as the managers of hotels and resorts utilize Big Data and data analytics in the administration of human resources, customer services, operational efficiency and effectiveness, prediction of customers’ demand, occupancy, review and satisfaction. Managers use Big Data/data analytics in determining occupancy forecasting by using various models based on the local data, city-level data and market segment data.

There are several benefits of using Big Data/data analytics in the hospitality industry including promoting operational effectiveness and efficiency, improving customer services, increasing hotel occupancy rate and strengthening human resources. Technological advances and the extensive use of networking and social media enable customers to write review reports online and share their experiences and satisfaction with others. Data analytics enable hotel managers to gather the data from the internet by using the hotel operating system analyze the social media review and assess and understand tourism behaviors. The effective use of Big Data/data analytics based on city-level data, historical data, national and international data and current events and trends can help hotel managers to make the most efficient, effective and robust decisions.

CONCLUSION

Prior studies as reviewed in section 3 address the definition, importance,

benefits, challenges and opportunities in using Big Data/data analytics by business organizations. This paper focuses on the relevance and use of such attributes in the hospitality industry. Analysis of the insight gained from our survey indicates that: (1) the demand for and interest in Big Data/data analytics will continue to increase in the hospitality industry; (2) Big Data/data analytics should be integrated into the business strategic decision processes; (3) some attributes and techniques of Big Data such as the availability of Big Data and data analytics techniques, are important in improving the strategic decisions and operations of hotels and resorts; and (4) the use of Big Data/data analytics in the hospitality industry includes occupancy forecasting, examining operational efficiency, developing a data warehouse, collecting and assessing customer reviews, improving staff training and retention and securing customer satisfaction and loyalty.

The use and benefit of Big Data/data analytics in the hospitality industry presented in this paper is limited only to the insights from a sample of MBA students and thus the results should be interpreted with caution. Future research should examine the application of Big Data/data analytics to other sources, including structured and unstructured qualitative and quantitative financial and non-financial data, by expanding the survey questionnaire and conducting the survey of professional managers at the hospitality industry. Definitely, the managers of hotels and resorts will benefit from an international survey of experts in determining the use and benefit of Big Data/data analytics. Managers of hotels and resorts will be better off and make proper decisions by employing Big Data/data analytics models than simply ignoring them and lagging other industries.

DECLARATIONS OF INTEREST

None

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