

The Behavioural Intention of Adopting Big Data Analytics in the Tourism Sector: An Empirical Investigation in Egypt

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Abstract

In today's turbulent competitive business environment, having relevant data and high quality market information is critical for business success. In this sense, big data has climbed to the top of the business agenda transforming the way companies do business. The substantial value added of using big data applications and analytics for business success and growth has been proved in many business sectors including tourism. This study aims to understand the behavioural intention among tourism-related businesses in Egypt with respect to the adoption of big data analytics. Based on the Technology Acceptance Model (TAM), a questionnaire is designed with a measurement scale of 14 statements plus additional questions to investigate awareness, implementation status, and key challenges for big data adoption. The findings reveal that although the high awareness of big data concept and its applications in the tourism-related business in Egypt, a small number of these businesses is using big data analytics. Also, the results of Pearson's product moment correlation coefficient confirm the statistically significant strong positive relationship between "perceived ease of use", "perceived usefulness", and "attitude toward use" as independent variables and the dependent variable, "behavioural intention". Besides, through the multiple regression analysis, it is indicated that about 60% of variation in the behavioural intention is explained by these three variables. Furthermore, the findings refer to cost of big data tools and infrastructure, lack of big data and analytics skills, and lack of sponsorship from top management as the key challenges for big data adoption in tourism-related businesses in Egypt. Finally, some recommendations have been presented as well as preparatory steps have been suggested as guidelines for tourism-related businesses in Egypt to help them adopting big data analytics in their business environment.

Keywords: Big data, Tourism in Egypt, Decision making, Behavioural intention.

Introduction

In today's turbulent competitive business environment, having relevant data and high quality market information is critical for business (Lam and McKercher, 2013). Evidently, companies that rely on data to reinforce decision making gain higher yields in comparison to those that do not (Brown, Chui, and Manyika, 2011). Most businesses in different sectors recognize the value of data to support their steady growth and sustainable success (Ritchie and Ritchie, 2002). This has been confirmed through the findings of a study of 142 CEOs from private companies in different sectors illustrating that increasing recognition of the role of data in making right decisions achieving healthy growth in revenues (Black, 2011). Cooper stated that "the tourism sector is also data hungry, for having the right information at the right time provides businesses with knowledge about customers, buying behavior, and market trends that can help developers, marketers and operators make the right investment and product decisions" (as cited in Lam and McKercher, 2013: 82). Also, the tourism-related businesses need to have high quality data to stay competitive because of the ever-changing business environment (Lee, Close and Love, 2010). Likewise, the heightened need for data in tourism-related businesses is explained by the necessity to understand tourists behaviour, the satisfaction of tourists needs, and the correlation between consumers expectations and the products offered by the tourism suppliers in destinations (Lennon, 2003).

Recently, research, discussion, and analysis with respect to supporting decision-making using new data streams have increasingly emerged. Power (2016) illustrated that the data collection space is rapidly expanding with increasing data amounts and volume, more data variety and faster, higher velocity data, and many new data sources. These expanding new data streams are typically called as "big data" (Davenport, Barth, and Bean, 2012). It is argued that big data has climbed to the top of the business agenda transforming the way companies do business (Labrinidis and Jagadish, 2012; Chen et al., 2016; Muller et al., 2016). Generally, big data is often about where people are, where they intend to be soon, what their activities are, what they buy or what they are looking for to buy (Fuchs, Hopken, and Lexhagen, 2014). All of these said topics of interest also are applicable to the behaviour and whereabouts of tourists. Hopken, and Fuchs (2016) demonstrated that the big data usage become vital for tourism-related businesses due to the crucial role and significance of social media and online product reviews in tourism.

In response to this stated importance of big data in the tourism filed, this study aims to understand the behavioural intention among the tourism-related businesses in Egypt to adopt big data analytics.

Literature review

The term big data is widely used and has been defined in several and different ways according to people understandings, however it is basically derived from business intelligence and analytics (Sun et al., 2016; Power, 2016). Hurwitz et al. (2012:16) defined big data as “the capability to manage a huge volume of disparate data, at the right speed, and within the right time frame to allow real-time analysis and reaction”. Another definition presented by McKinsey Global Institute (2013) stating that big data refers to data sets whose size is beyond the ability of typical database software tools to capture, store, manage and analyze. The most cited definition of big data is the data sets that are characterized by their volume (how much data), velocity, (how fast that data is processed) and variety (various types of data) that, because of their size and complexity, cannot be analyzed through traditional methods (Laney, 2001; Labrinidis and Jagadish, 2012; Chen et al., 2016). These three qualities of the big data (volume, velocity, and verity) are considered as the main characteristics of big data. However, an additional characteristic, veracity, was suggested to refer to accuracy of data and reliability of data sources (Phillips and Hoskisson, 2015). From this, it can be said that big data involves extracting information from large amounts of available data and analyzing this data based on innovative technological approaches to broaden the scope of knowledge, and business and market insights.

In recent years, different businesses and industries have seen an upsurge of interest in big data. Versace and Massey (2012) explained that in this digital age, more than 2.5 quintillion bytes of data is daily created, 90% of the data in the world today have been created in the last 2 years alone, and the big data market is amounted to \$5.1 billion in 2012 and is estimated to grow to \$53.4 billion by the year 2017. The big data in the business environment are mainly sourced from data collected by companies about customers (e.g. addresses, purchase history), and transactions (e.g. point of sale data) or externally collected financial data (e.g. competitive intelligence), supply chain/inventory data (e.g. sensor data, product tracking), inputs from customer service interactions (e.g. web/call logs), and demographic or other data supplied by a third party (e.g., social media data) (Li et al., 2015). The big data sources can be summarized in five different groups as illustrated in Figure 1.

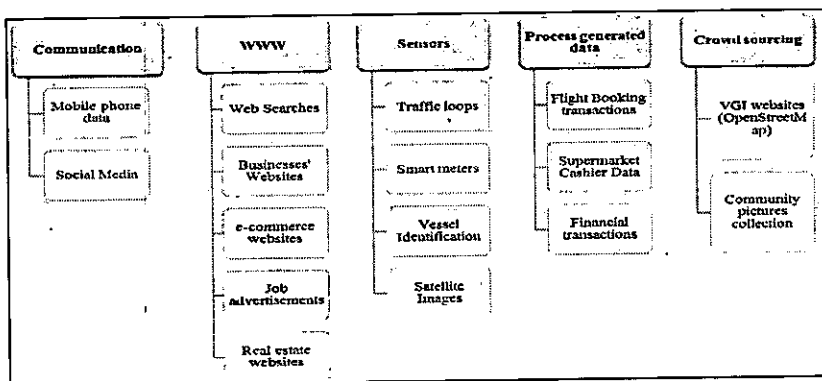


Figure 1. Big data sources

Source: Demunter, c. (2015). Overview of big data sources with relevance for a system of tourism statistics. Working Group on Tourism Statistics, 21-22 September 2015, Luxembourg.

In this regard, many studies have been conducted exploring the main business areas that big data can be used in driving decisions. In 2013, the Economist Intelligence Unit surveyed about 212 global executives to investigate their views on the increasing integration of big data into organizations decision-making processes. This survey findings revealed that the most practices of big data in their business were concentrated in human resources management, financial management, investment decisions, sales strategy, marketing strategy, product development and innovation, supply chain management, and operations. Likewise, the Data Warehousing Institute (2013) conducted a survey on 641 data management professionals and found that most business tasks that have been improved through employing big data in their business were data analytics, information exploration and discovery, accurate business insights, greater business value from big data, broader data sourcing for analytics, business optimization, recognition of sales and market opportunities, segmentation of customer base, more data for data warehousing, sentiment analytics and trending, addressing new business requirements, development of new data-driven products, understanding business change, definitions of customer behaviors aspects, better targeted social influencer marketing, quantification of risks, and cost control. More recently, in 2017, NewVantage company conducted a big data executive survey with 1000 respondents in financial and insurance services, health sector, media, and entertainment services. It found that these sectors have a range of big data initiatives with successful results

including decrease expenses through operational cost efficiencies, establish a data-driven culture, create new avenues for innovation and disruption, accelerate the speed with which new capabilities and services are deployed, launch new product and service offerings, increase revenues and new revenue sources, and transform and reposition business for the future.

As a research area, Halevi and Moed (2012) argued that research on big data emerged in the 1970s but has seen an explosion of publications since 2008. They proceed explaining that, although the term is commonly associated with computer science, the data shows that it is applied to many different disciplines including health, engineering, arts, humanities and environmental sciences. Herein, many empirical research papers indicated high adoption of big data analytics in many different sectors such as supermarket sector (Ochieng, 2015), financial services industry (Seth, and Chaudhary, 2015), social sector (Strange, 2015), telecommunication companies (Lee and Jung, 2014).

However, few research on big data applications in the tourism field have been done in the last years. This is confirmed by Baggio, (2016:3) who said, "although the much hype about the big data issue, not many tourism researchers have decided to pay some effort in studying these topics, and only a handful of them have invested time and resources in considering the possibilities of an application of big data to the tourism and hospitality field": One of the big data and tourism studies is conducted by Davenport (2013) who interviewed 21 industry participants including airline, hotel, rail, online travel agency, and travel management executives. He found that the benefits of big data for the tourism businesses are better decision support, new products and services, better customer relationships, and cheaper and faster data processing. This study recommended that tourism businesses need to research big data, strategize about big data, explore big data technologies, study the changes they need to make for business and operational processes, start assembling big data skills, and work with partners. Likewise, Phillips and Hoskisson (2014) studied the inclusion of big data in decision making in the hospitality Industry and found that analyzing "Twitter" data with Apache Hadoop is the most "big data" applications at surveyed hotels. Hadoop is an open source software that stores and processes huge amounts of complex, unstructured data such as opinions, emotions, and attitudes contained in sources like social media posts, blogs, online product reviews and customer support interactions (Hortonworks, 2013).

For the tourism sector, Soualah et al. (2016: 752) illustrated that “with the intensive use of social networks and web sites specialized in e-tourism (TripAdvisor, Booking.com, etc.) web users are no longer passive recipients of contents; they absorb information from the web and in return produce their own new content. Professional tourism services collect this data while providing information or services to users” and these data sets are big data. Accordingly, businesses tend to invest in big data applications since “they cannot rely anymore on the data provided by their destination management organization because se it is often a couple of months old by the time it gets to them. With last-minute booking becoming the norm, intelligence therefor requires a near-real-time aspect in order to be useful tourism businesses” (Wiersma, 2013: 15). In this, it is worth mentioning that, at the official statistics level, innovative methods for compiling official tourism statistics from non-traditional sources have gained a considerable attention over the last decade. Many initiatives have emerged globally that adopt big data sources for tourism statistics (e.g. mobile positioning data, booking and ticketing data, web searches, social media, etc.) (Alawwad et al., 2016).

In the Egyptian context, based on the results from “Google search engine” as well as the Egyptian Universities Libraries Consortium database, there were no published studies in field of big data and tourism in Egypt. From this sprang, the main purpose of this study is to understand the behavioural intention among the tourism-related businesses in Egypt to adopt big data analytics. Three main study objectives were specified as follows:

- 1- exploring the awareness and implementation status of big data analytics in the tourism-related businesses in Egypt;
- 2- investigating the behavioural intention among the tourism-related businesses in Egypt to adopt big data analytics; and
- 3- determining the key challenges for big data implementation in the tourism-related businesses in Egypt.

Methodology

The study depended on the Technology Acceptance Model (TAM) which is developed by Davis (1989). The TAM is one of the most influential models that is widely used for measuring technologies adoption among professionals and academics (Lee, Kozar, and Larsen, 2003; Chuttur, 2009). Many previous studies have adopted and expanded this model which was empirically proven to have a high validity (Ramayah et al., 2002: 2). The main purpose of the TAM is to evaluate user’s acceptance

of emerging IT systems and technologies through measuring three factors which are: 1) perceived ease of use, 2) perceived usefulness, and 3) attitude toward using new technology (Davis, 1989; Ramayah et al., 2002; Lee, Kozar, and Larsen, 2003; Chuttur, 2009).

Data collection

High-management level and IT professionals at the leading tourism-related businesses in Egypt including travel agencies, hotels, and the national air transport carrier (EgyptAir), were targeted. In November 2016, invitations sent via e-mails to target participants asking them to complete a web-based survey. Thereafter, many reminders were sent every two-weeks till the end of January 2017. The survey drew responses from 103 respondents from travel agencies and hotels. However, no responses from the EgyptAir were received. This sample is relatively small. However, it is still valid for statistical analyses as explained by Susan, Spinks, and Canhoto (2015) who indicated that a sample size of 100 respondents is acceptable at 90% confidence level.

Survey instrument

Based on the TAM dimensions, a measurement scale with 14 statements was developed to realize the study objectives (Figure 2). In addition, the questionnaire involved 3 other sets of questions about respondents' profiles, big data awareness, implementation status, and key challenges for big data implementation in tourism-related businesses in Egypt. To assess the internal reliability of the study dimensions, Table 1 showed that the Cronbach's alpha coefficient for the 3 items used to measure the "perceived ease of use" was 0.856. By using 5 items in measuring "perceived usefulness", the alpha coefficient is 0.843. Also, 3 items were used in measuring the "attitude toward use" and showed alpha coefficient of 0.787. Besides, the 3 items of "behavioural intention" achieved alpha coefficient of 0.832. Overall, the internal reliability coefficients of the entire studied dimensions are moderate strong to very strong as all alpha coefficients are close to 0.8. With this proved internal consistency reliability among the study's dimensions, the relationships among the questioned items are reliable for further analysis.

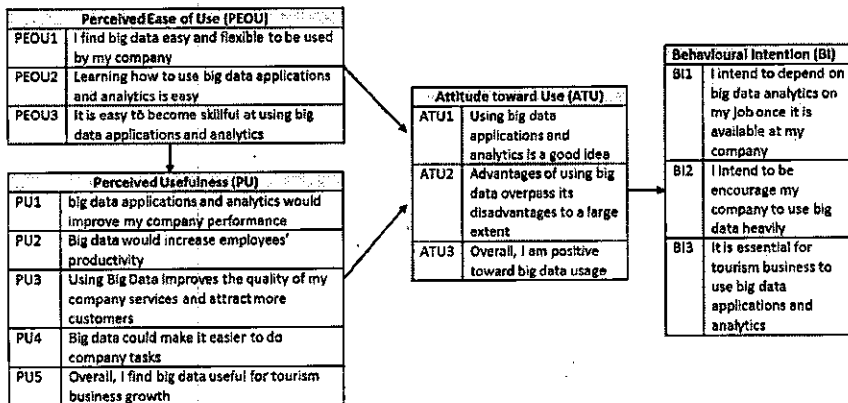


Figure 2. The study model

Source: Adopted by the Author based on Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* 13(3), 319-340.

Table 1. The internal reliability of the study dimensions

Dimension	Cronbach's alpha	No. of items
Perceived Ease of Use (PEOU)	0.856	3
Perceived Usefulness (PU)	0.843	5
Attitude toward Use (ATU)	0.787	3
Behavioural Intention (BI)	0.832	3

Data analysis

The data was analyzed through the main three study's objectives using the statistical software SPSS version 21. Using descriptive statistical methods, the collected data from sample tourism businesses was analyzed. Pearson's product moment correlation coefficient (PMCC) was used to examine the strength of association between dependent and independent variables. Furthermore, the regression coefficient had been used to determine the relations between this study variables. According to Saunders, Lewis and Thornhill (2016), if the regression coefficient is statistically significant, it can be concluded that a relation is existed between the study variables. That, the multiple regression analysis was used to investigate the relationship between the study measures.

Results

Profile of the respondents

As mentioned previously, the sampled respondents were 103 participants; approximately 77% of them were affiliated to the hotels while 23% were belonging to travel agencies. The high-level management participants represented about 41% while IT professionals were 59% of the total number of respondents (Table 2).

Table 2. Demographic profile of the respondents

Characteristics n= 103	Relative Frequency (%)
Sector	
Travel agencies	23
Hotels	77
Job	
High- level management	41
IT professionals	59

Awareness of and implementation status of big data analytics in the tourism-related businesses in Egypt

Respondents were asked to report on their awareness of the big data concept and its applications as well as to state the current situation of big data analytics implementation in their business environment. Surprisingly, 82% of respondents were aware of the concept and its applications in the tourism-related business, however only 19% of businesses, where the respondents are working for, were actually using them and most of them were hotels (Figure 3).

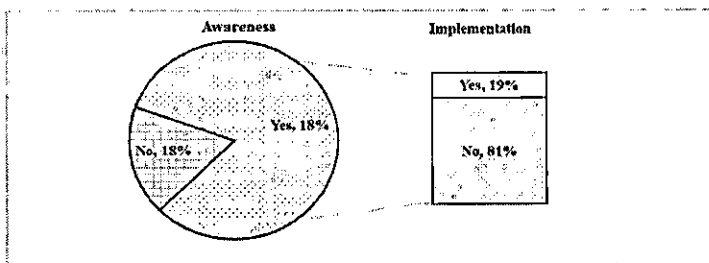


Figure 3. Awareness and implementation of big data analytics in the tourism-related businesses in Egypt

An associated question was asked about the most used applications of big data among those businesses that mentioned initially they are using such applications. The respondents said unanimously that the only current used big data analytics is online customer reviews at social media networks.

The relationship between the TAM dimensions and the behavioural intention

To assess the relationship between two variables, the behavioural intention (BI) and each of the independent variables of the TAM dimensions, Pearson’s product moment correlation coefficient (PMCC) was used. The Pearson Correlation Coefficients revealed that there is a statistically significant strong positive relationship between each of the 3 TAM dimensions (perceived ease of use, perceived usefulness, and attitude toward use) and the behavioural intention (the dependent variable). These results, did not show multicollinearity problem in the study. Hair et al. (2006: 464) said that “multicollinearity occurs if the (r) value between each pair of independent variable in Pearson’s correlation exceeds (0.90)”.

Table 3. Correlations between the study variables

Variables		Perceived Ease of Use (PEOU)	Perceived Usefulness (PU)	Attitude toward Use (ATU)
Perceived Usefulness (PU)	r	0.695**		
	Sig. (2-tailed)	0.000		
	N	103		
Attitude toward Use (ATU)	r	0.633**	0.650**	
	Sig. (2-tailed)	0.000	0.000	
	N	103	103	
Behavioural Intention (BI)	R	0.601**	0.733**	0.701**
	Sig. (2-tailed)	0.000	0.000	0.000
	N	103	103	103

** Correlation is significant at the 0.01 level (2-tailed).

Furthermore, to examine the causal relationship between three independent variables, (perceived ease of use, perceived usefulness, attitude toward use) and one dependent variable (behavioural intention) the multiple regression analysis is the most appropriate test to apply. The model summary table (table 4), illustrated that R square = 0.604 meaning that 60.4% of variation in behavioural intention is explained by perceived ease of use, perceived usefulness, and attitude toward use. That is to say, 60.4% of behavioural intention depends on three factors, namely perceived ease of use, perceived usefulness, and attitude toward use.

Table 4. Model summary of regression analysis (PEOU, PU, ATU, BI)

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.784 ^a	0.604	0.583	0.48213

a Predictors: (Constant), PEOU, PU, ATU. Dependent variable BI.

From the coefficients table (table 5), it indicated that perceived ease of use ($t = 4.468, p = 0.000$), perceived usefulness ($t = 3.240, p = 0.000$), and attitude toward use ($t = 4.4001, p = 0.000$) had made substantial contributions in predicting behaviour intention of big data adoption in the tourism-related businesses in Egypt.

Table 5. Significance of the regression coefficients (PEOU, PU, ATU)

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	β		
constant	2.231	0.470		0.656	0.011*
PEOU	0.252	0.103	0.225	4.468	0.000**
PU	0.301	0.123	0.343	3.240	0.000**
ATU	0.339	0.117	0.289	4.001	0.000**

Notes: *p-value<0.05. **p-value<0.01 (two-tailed). N=103. Dependent Variable: BI

Overall, these abovementioned results were in line with the findings of many previous research that have been conducted using TAM model to explore the adoption of different technologies other than big data, for example, 3G mobile services (Suki and Suki, 2011), online trading (Lee,

2009), GIS technology (Mirda, 2010), and mobile banking (Maduku, 2014). Likewise, these results were consistent with the findings of two research papers that used TAM model to study the adoption of big data in sectors other than the tourism sector, for example, finance, insurance, education, healthcare, government (Hood, 2016) and supermarkets (Ochieng, 2015).

key challenges for big data implementation in the tourism-related businesses in Egypt

Respondents were asked to tell their opinions about the key challenges that encounter the implementation of big data applications and analytics in the tourism-related business in Egypt. It was a closed-ended question with 7 statements, which were adopted from (Capgemini Consulting, 2014). (Figure 4)

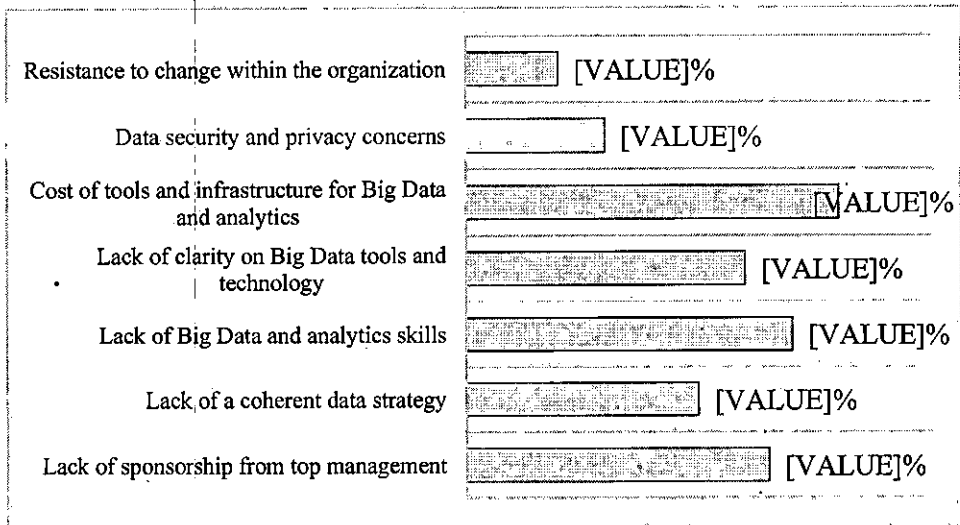


Figure 4. Key challenges for big data implementation

The top five challenges that may encounter tourism-related businesses in Egypt to adopt big data were highlighted in Figure 4. These were ordered as per their importance as follows:

- Cost of tools and infrastructure for Big Data and analytics;
- Lack of big data and analytics skills;
- Lack of sponsorship from top management;
- Lack of clarity on big data tools and technology; and
- Lack of a coherent data strategy.

Conclusion and recommendations

Nowadays, businesses are influenced by an environment that is increasingly dynamic, complex and full of competition. In this turbulent competitive business environment, having relevant data and high quality market information is critical for business success. In this sense, big data has climbed to the top of the business agenda transforming the way companies do business. The substantial value added of using big data applications and analytics for business success and growth has been proved in many business sectors and tourism is no exception. This study was designed to understand the behavioural intention among the tourism-related businesses in Egypt to adopt big data analytics. More specifically, three main areas were studied, namely, the awareness and implementation status of big data analytics, behavioural intention, and the key challenges for big data implementation in the tourism-related businesses in Egypt. To realize these study's objectives, the Technology Acceptance Model (TAM), which is developed by Davis (1989) has been adopted. This TAM is one of the most widely used models for measuring technologies adoption through measuring three factors which are: 1) perceived ease of use, 2) perceived usefulness, and 3) attitude toward using new technology. High-management level and IT professionals at the leading tourism-related businesses in Egypt, travel agencies, hotels, and the national carrier (EgyptAir), were targeted. The survey drew responses from 103 respondents from travel agencies and hotels. However, no responses from the EgyptAir were received. The questionnaire was designed based on the TAM dimensions with a measurement scale of 14 statements plus additional questions about big data awareness, current implementations status, and key challenges for big data implementation in tourism-related businesses in Egypt. In the assessment of the internal reliability of the study dimensions, it was found that the internal reliability coefficients of the entire studied dimensions were moderate strong to very strong, meaning that the relationships among the questioned items are reliable for further analysis.

The findings of this study revealed that 82% of respondents were aware of the big data concept and its applications in the tourism-related business, however only 19% of these businesses were actually using them and most of them were hotels. Currently, online customer reviews at social media networks is the most used big data application among tourism-related business in Egypt. The results of Pearson's product moment correlation coefficient (PMCC) confirmed that there is a statistically significant strong positive one-to-one relationship between

each of the 3 TAM dimensions (perceived ease of use, perceived usefulness, and attitude toward use) and the behavioural intention (the dependent variable). Besides, through the multiple regression analysis, it was indicated that 60.4% of variation in the behavioural intention is explained by perceived ease of use, perceived usefulness, and attitude toward use. Furthermore, the findings highlighted five challenges that encounter tourism-related businesses in Egypt to adopt big data, these are cost of tools and infrastructure for big data and analytics, lack of big data and analytics skills, lack of sponsorship from top management, lack of clarity on big data tools and technology, and lack of a coherent data strategy.

This study was not free of limitations. The sample size was relatively small due to the low response rate as it is always experienced in research that is based on the tourism private sector in Egypt. Also, only two tourism businesses (tourism companies and hotels) were covered in this study.

The original contribution of this research is ascribed to the research topic of big data, which has been remarkably growing and is still a new area of academic research especially in the tourism field. Also, this research contributes to tourism literature in the Egyptian context. However, this research should be extended to study other tourism-related businesses in Egypt such as airlines, restaurants and car rental services, etc. Also, the external and internal factors that affect big data implementation in the tourism business environment in Egypt deserves research as well.

Based on findings of this study, tourism-related businesses in Egypt should invest in adopting big data applications and analytics to get more comprehensive and deep knowledge about their customers and market trends resulting in sound decisions and increasing yields. It is recommended to follow the below suggested preparatory steps to adopt big data in tourism-related businesses in Egypt. (Figure 4)

In the same context, the tourism education institutes in Egypt should incorporate big data as a subject or a course in their education programs. To add, the ministry of tourism in Egypt should work with the industry and academia to build and develop big data skills for the tourism private sector.

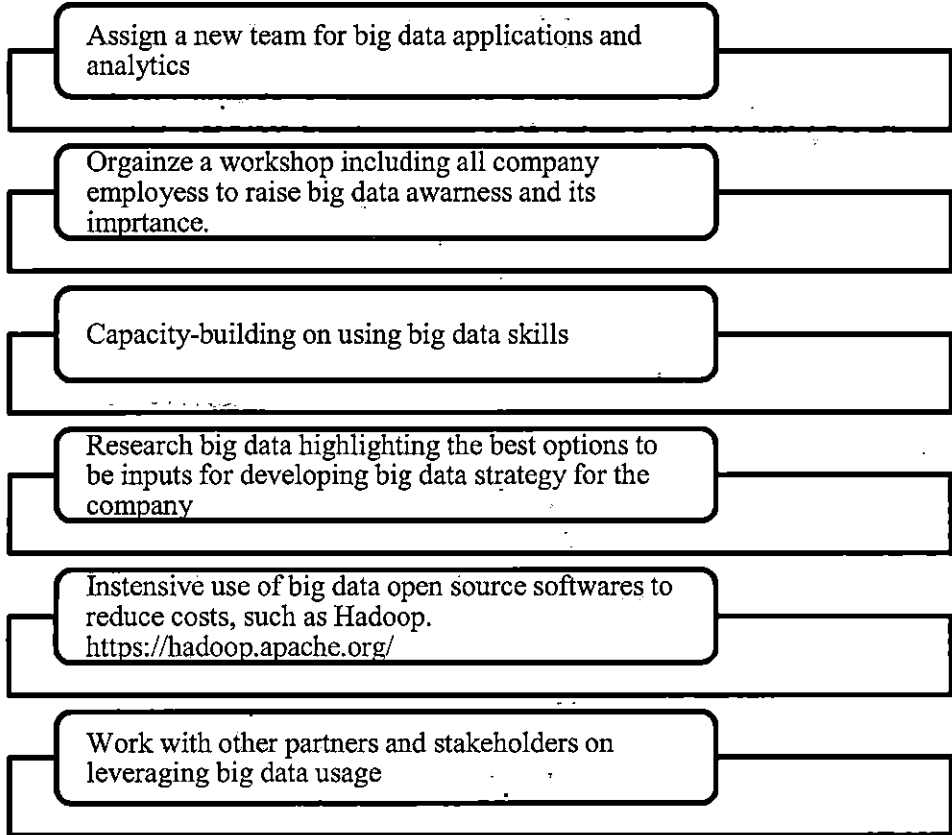


Figure 4. Preparatory adoption steps of big data

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