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Examining the Adoption Barriers of Big Data Applications from the Perspective of Tourism Authorities in Egypt

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دراسة معوقات تبني تطبيقات البيانات الضخمة من وجهة نظر سلطات السياحة في مصر

تركز هذه الدراسة على تحديات تبني واستخدام تطبيقات البيانات الضخمة في صناعة السياحة لإحدى البلدان النامية، وكيفية الاستفادة من التكنولوجيا في تحسين عملية صنع القرار. على وجه التحديد، يهدف الباحثان إلى التحقيق في عوائق تبني تطبيقات البيانات الضخمة من قبل سلطات السياحة في مصر، وتقييم مدى إلمام العاملين بالهيئات السياحية المصرية بتقنيات وتطبيقات البيانات الضخمة، وتحليل كيفية تأثير استخدام تطبيقات البيانات الضخمة على جودة قراراتهم. تم استخدام المنهج الكيفي لتحليل البيانات، مع مقابلات شبه منظمة لجمع البيانات. أظهرت النتائج أن تبني تطبيقات البيانات الضخمة تعيقه خمسة عوامل رئيسية: إمكانية الوصول إلى البيانات، وبعض العوامل التنظيمية والمالية والبشرية والتكنولوجية الأخرى. لهذا السبب لم يتم حتى الآن استغلال تطبيقات البيانات الضخمة بشكل فعال من قبل سلطات السياحة المصرية. قدمت الدراسة نتائج ودلالات إدارية وسياسية هامة لصناع القرار، بالإضافة إلى طرح آفاق ومسارات جديدة لمزيد من البحث في هذا الموضوع الهام.

Abstract:

The focus of this study is on the application challenges of big data (BD) in tourism for one of the developing countries and how to utilise technology to improve the decision-making process. Specifically, the authors aimed to investigate the adoption barriers of BD applications by the tourism authorities in Egypt, evaluate the extent to which the Egyptian DMO members are familiar with BD techniques and applications, and analyse how the usage of BD applications impacts the quality of their decisions. A qualitative method was used for data analysis, with semi-structured interviews to collect data. The findings showed that the adoption of BD is hindered by five key factors: data

accessibility, organisational, financial, human, and technological factors. That's why BD applications are not yet effectively exploited by the Egyptian tourism authorities. The study provided important managerial and policy implications for decision-makers in addition to suggesting new horizons for further research.

Keywords: big data, technology adoption, barriers, DMOs, decision making

Introduction:

With the advancement of technology and the growing speed of data generation by electronic devices, decision-makers and DMOs have become keener on apps that can capture and analyse generated data and make use of the beneficial information that the data provides to improve the effectiveness of their plans, minimise the potential risks of their decisions, and distinguish themselves as a destination from competitors. Big data is widely acknowledged as an explanation for various organisations' management processes across industries (Ziora, 2015). Boyd and Crawford (2012) define big data as a high-volume, high-velocity, and/or high-variety information asset that requires innovative and cost-effective information processing techniques to provide improved insight, decision-making, and process automation. This data includes two types of content: textual (structured, semi-structured, and unstructured) and multimedia (audio, video, and visual) that

operate on manifold platforms (machine-to-machine communication, social media websites, sensor networks, the Internet of Things (IoT), and cyber-physical systems) (Sivarajah et al. 2017). According to Davenport and Dyché (2013), large organisations regularly gather big data and use analytics to aid in decision-making. Several companies depend on decision-support systems and data analytics capabilities, and many are developing data-driven support systems (Demirkan & Delen, 2013). Moreover, companies try to stay up-to-date with the most recent technologies and invest in data analytics to make effective long-term decisions. As a result, companies use data analytics to make sound decisions and predict future steps (Jeble et al., 2018). According to Li et al. (2018), although big data can play an important role in the tourism sector, it is still in its infancy. Moreover, by reviewing the literature, the researches found a dearth of studies covering this important area of research, especially in developing countries. To the authors' knowledge, no study has investigated the adoption barriers of BD applications inside the tourism industry as perceived by the Egyptian tourism authorities. Thus, this research will cover a crucial gap and add to the literature on BD apps in tourism in developing countries.

Based on the previous introduction, two major objectives drive this study. First, investigate the extent to which decision-makers in the Egyptian tourism authorities are using big data applications. Second, discover what the barriers to big data adoption are from the perspective of

tourism authority representatives. Thus, this research is intended to investigate the following questions:

Research questions:

1. To what extent are decision-makers in the Egyptian tourism authorities using big data applications in their daily operations?
2. What barriers face the adoption of big data from the perspective of tourism authority representatives?
3. How likely is it that the adoption of big data will affect the quality of decision-making from the perspective of tourism authority representatives?

1. Literature review:

1.1 Role of big data in tourism:

Big data can have a significant effect on the creation of knowledge about tourism (Singleton & Arribas-Bel, 2019). Centobelli and Ndou (2019) stated that there is still much to be discovered and researched about the topic of BD in the field of tourism.

BD sources are categorised into six fields with different features when it comes to data generation by participants (mobile communication, sensors and wearable devices, cameras, lasers, and satellites; business; process-generated data; websites; and social media) (Schmücker &Reif, 2020). For example, big data apps (BDA) can be used to

measure tourist destinations through the use of mobile-tracking data (Raun et al., 2016). Mariani and Borghi (2018) clarified that the impact of the Booking.com rating system, which incorporates hotel class, is well-known in tourism and hospitality studies. Vu, Li, and Law (2015) showed that researchers use geo-tagged photos of tourists to investigate the behaviour of inbound tourists. Schmücker and Reif (2020) stated that passive mobile data (PMD) is defined as event data that is being recorded by mobile network operators (MNOs) while the client is using a mobile phone that is connected to data networks and public phones. PMD can very easily cover all demands in the tourism sector, and that includes visitors who come on the same day and visitors staying in holiday apartments, which are all considered useful tools for facilitating managers' decision-making in the tourism field.

According to McAfee et al. (2012), companies have become more effective not only because they have access to more and better data but also because their leadership teams have a clear vision for using big data to set and achieve lofty goals. Stylos and Zwiegelaar (2019) indicated that BD has dramatically changed business intelligence, especially in dynamic, time-sensitive, and rapidly and unpredictably changing businesses. This needs great mobility and cooperation from several stakeholders. British Airways gathers and integrates data that is created while customers are interacting in real time in waiting areas and check-ins (Towerdata, 2018). Staff members even use their iPads

during flights to keep track of offers and the current status of customers. Recently, the company launched "Know Me," an application that enables them to contact customers directly. In addition, they also send messages about certain customers to other travel agencies cooperating with them. For instance, information about the type of traveller and the class in which they are flying. In addition, if a customer is unfamiliar with the privileges that the business class cabin offers, the app notifies the flight attendant. On the other hand, if a traveller faced any challenges or mishaps during his flight, the app helped employees identify the problem and offer solutions (Towerdata, 2018).

In this way, tourist organisations can improve their market performance by leveraging customers' engagement in the business by implementing BDA (Saldanha, et al., 2017). Demunter (2020) suggested that the overview of big data sources relevant to tourism indicates that if statistical offices or authorities fall behind the curve, others will meet the user needs that official statisticians cannot or will no longer meet with the same level of detail and timeliness, which explains why organisations' management should apply big data.

1.2 Impact of big data on decision-making:
In the context of decision-making, Invat tur (2015) contended that BD refers to any data set that is larger than the capacity of conventional computer tools to search, capture, store, manage, analyse, transfer, view, or legally protect. It also includes the infrastructure, solutions, and

models required to extract value from these information groups in the most cost-effective, time-efficient, and flexible manner possible for smart decision-making. In addition, Jin et al. (2015) argued that big data is commonly defined as a large volume of data that can be used to generate meaningful insight to aid management decisions. BD allows managers to identify behavioural patterns and consumer trends that would be nearly impossible to detect using traditional methods and techniques (Invat.tur, 2015). To fully capitalise on big data opportunities, an organisation must first change its culture to be supportive of fact-based decision-making. This type of cultural change can be accomplished by keeping records, executing, and communicating a transparent vision of the organisation concerning BD and ensuring that the top management is committed to this vision (Rogers and Meehan, 2007).

According to Aboushouk and Elsawy (2020), being able to leverage the enormous volumes of data and analytics made available in the digital age for decision-making, innovation, and development is essential for becoming a high-performance business. BD does lead to better performance, both directly and indirectly, by creating an incentive for managers to rely on analytics when making strategic or operational decisions (Thirathon et al., 2017). Thus, BD will undoubtedly become a driving force in the transformation of tourism in order to promote innovation (Liu, et al, 2015). Davenport & Dyché (2013) concluded that the benefits of using big data in decision-making include understanding the customer journey. They create a comprehensive profile of customer journeys by combining structured, semi-structured, and unstructured data from call

centre logs, website clicks, transaction records, ATM transactions, clickstreams, and other sources. Nair and Anbuudayashanka (2009) stated that cost and time reduction can help make real-time decisions about promoting offers and services to customers based on their current location. Mayer-Schönberger & Cukier (2013) stated that Google search by specific keywords can define customer intent to purchase a specific product, what specific information citizens are looking for or concerned about, and the role of social media as a source of big data can enable comparative evaluation of competing products, which will enable them to make the right decision (de Vries et al., 2015). Davenport & Dyché (2013) showed that account usage online and call centre logs create a comprehensive profile for the customer journey, which will create future strategies for better customer service.

Companies need BDA to make better decisions because, although they have large amounts of data, these data are spread over multiple sources, which makes the analysis and use of this information an onerous task (Contreras & Franch, 2013). The goal of BDA is to predict outcomes, and its key characteristics are "volume, veracity, variety, velocity, volatility, and value." Volume indicates the large amount of data that needs to be filtered, compressed, and handled in a special manner. Veracity is equivalent to the quality and accuracy of the data provided. Variety means gathering data from different sources, from in-house devices to smartphone GPS and what people are saying on social networks. The term velocity refers to how quickly these data are generated and their resolution in time (Belias et.al, 2021; Bbva, 2020). Volatility refers to how long the

data remains relevant and how long it should be kept, taking into account the billions of impulses registered every second or the legal framework governing personal data retention. Finally, data is valuable in two ways: first, as a richer and timelier source for statisticians, and second, for businesses and policymakers where it is used to make decisions (Demunter, 2020). Liu et al. (2015) showed that BD technology can be used in tourism enterprise demand management and forecasting, product and revenue management, service and performance management, information sharing, and collaboration. All of these can help make accurate decisions.

1.3 Barriers to big data applications:

In order to embrace big data (BD), a variety of barriers in the areas of technology, people, and organisations must be addressed. Leung and Lo (2019) contended that there are still important barriers inhibiting the adoption of big data for managerial decisions. They cited the findings of various user surveys to arrive at the conclusion that big data was not being used as effectively as it could be. Fear of new technology, a lack of a change in mindset to deal with data and data systems, and a lack of support from the top executive level are the three most significant barriers to bid data adoption. Alharthi et al. (2017) also agreed that big data adoptions must overcome technological, human, and organisational barriers. Kataria and Mittal (2014) showed that some of the BD adoption challenges are that it compromises the confidentiality requirements of the data, deciding whether to use cloud computing and virtualization to host data outside the firm, and determining how long to keep this massive and costly data.

Leung and Lo (2019) indicated that respondents, especially those from the hotel industry, airlines, and attractions, were particularly concerned about a general lack of knowledge about big data, a lack of employee skills, and the lack of organisation capability to manage and analyse different data formats. A conclusion by Elsawy (2023) supports these results, as he found that the level of technological competency of travel agencies affects their capacity to understand the relative benefits of e-business as an emerging technology connected to BD applications and that the negative attitude of these technologically illiterate enterprises towards technology use may be justified. The findings show that these companies lack top-notch ICT infrastructure. Furthermore, the majority of their staff members are not technically proficient.

In addition, privacy could hinder the adoption of big data analytics within organisations. Moreover, some current information gateways were perceived as complex. Users may occasionally have difficulty accessing the same reports that they have been using and struggle to make quick market decisions in the absence of up-to-date information, or they may not have access to information that they deem critical (Alharthi et al., 2017). The volume of data, which has been a major characteristic of big data, has not been identified as a core attribute for some users. Except for respondents from large hotel chains and airlines, the majority of respondents indicated that they would lack the time and manpower to use a large database (Leung and Lo, 2019).

Another challenge is that, because the value of big data experts is increasing, it is becoming increasingly difficult for organisations to retain talented employees with big data

analytic skills (Tambe, 2014). Additionally, many believe that using BD is an onerous task, which is considered a major drawback to adoption (Alaei et. al., 2019). Furthermore, a lack of top management support and commitment are crucial barriers to IT innovation adoption (Lamba & Singh, 2018). Watson (2019) indicated that by designing incentive systems and linking them to BD use, management can encourage and motivate employees to use BD applications.

Although there are ways to facilitate the use of Big Data, many people who work in the tourism industry do not have the necessary knowledge and skills to use such apps (Belias, 2021). Furthermore, companies which face difficulties with the apps such as BDA, are usually unwilling to use them (Maroufkhani et. al., 2020). As a result, monetary resources, technology, and highly skilled human resource are essential in the implementation stage (Maroufkhani et. al., 2020). Laudon & Laudon (2018) clarified that the absence of data governance policies can significantly reduce the likelihood of successful big data adoption. Moreover, Security refers to the policies, procedures, and technical measures used to protect information systems from unauthorized access, alteration, theft, or physical damage which is regarded as the primary impediment to big data adoption. In terms of staff barriers, the majority of BD experts (69.57%) agreed that the barriers to BD adoption and applications are education, experience, training, awareness, and skills all need to be evaluated and improved to support the processes of BDA which is critical for the service sector (52.17% of BD experts agreed) (Alalawneh & Alkhatib, 2020) .

To manage some of these barriers, specialised software tools and algorithms should be used to store, manage, and analyse complex data in a more efficient, reliable, fast, and cost-effective manner (Van Rijmenam, 2014). To increase processing power and storage capacity, big data platforms can be designed and developed using low-cost hardware (Trelles et al., 2011). However, financial and initial technological resources are required to outsource BDA, and skilled employees are critical in the implementation stage (Maroufkhani et al., 2020).

2. Methodology:

The research model is grounded in a qualitative study due to its exploratory nature (Stylos et al., 2021). Wherein the main structure of the data was generated by semi-structured interviews. The study sought to determine what barriers the Egyptian Tourism Authority faced in adopting big data applications. Therefore, participants in the survey were invited from the Egyptian Ministry of Tourism's offices and affiliated bodies. Data were gathered using a purposive sampling technique. The authors have developed a list of qualified respondents and ensured that they represent the major sectors and departments of the tourism authorities in Egypt. Thirty-two interviews were conducted from November 2022 to February 2023, out of the initial list, which included thirty-nine respondents (see table no. 1).

Table (1): List of participants

Participant ID	Authority	Male		Female		Avg. years of experience	Total	
		No.	%	No.	%		No.	%
P1 – P3	General Administration of Tourist Guides (Egyptian Ministry of tourism – MOTA)	3		0		15	3	9.38
P4 – P6	General Administration for Supervision and Inspection of Hotel Establishments (MOTA)	2		1		14	3	9.38
P7 – P10	General Administration of Diving and Maritime Activities (MOTA)	2		2		16	4	12.5
P11 – P14	The Strategic Management Department (Egyptian Tourist Authority - ETA)	3		1		22	4	12.5
P15 – P19	General Administration of Foreign	2		3		19	5	15.63

	Offices (ETA)						
P20 – P23	Administration of information systems and digital transformation (ETA)	2		2		16	4	12.5
P24 – P28	General Egyptian Authority for Tourism Promotion (ETA)	3		2		20	5	15.63
P29 – P32	Regional Organization for Tourism Development (Tourism Development Authority – TDA)	2		2		19	4	12.5
Total		**19**	**59%**	**13**	**41%**	**18**	**32**	**100%**

Research notes were created by the authors in Arabic during the interviews, and from the original Arabic text, the authors tabulated the information before translating it into English. Then, additional content analysis was done to identify themes and attributes. For coding and transcript analysis, the authors employed the "**Delve**" web-based software.

To find answers to the three questions of this study, interview open-ended questions were developed based on

the related existing literature (e.g., Shamim et al., 2021; Stylos et al., 2021; Lai et al., 2018; Chen et al., 2015; Raguseo and Vitari, 2018). Eight sub-questions were developed to answer Q1, five for Q2, and eight for Q3 (see table no. 2).

Table (2): Interview questions

Research questions	Interview questions
1. To what extent are decision-makers in the Egyptian tourism authority using big data applications in their daily operations?	• How often do you make decisions based on big data analysis? • Does your leadership encourage decision-making based on big data analysis? How? • Does your leadership express attention to big data usage? How? • Is your organisation active in managing and utilising big data? Give example. • Does your company want to hire staff that are knowledgeable about big data? • Does your leadership care to enhance the big data management skills of their staff? Give example. • Does your organisation use the latest technology to manage big data? Give example. • Do you monitor market trends and tourists' activities through data tools? Give example.
2. What barriers face	• Does your technological competency help you enhance big data

	the adoption of big data from the perspective of tourism authority representatives?	management? • Do you face technological problems in managing big data within your organization? Give examples. • Do you possess the ability to access big data whenever it is required? • Do you have the ability to interpret and understand big data? • From your point of view, what are the barriers to adopting big data in the tourism bodies in Egypt?
3.	**How likely is it that the adoption of big data will affect the quality of decision-making from the perspective of tourism authority representatives?**	• Do you think that big data will help you understand tourists in a better way? how? • Does big data analysis often lead to new knowledge related to your field of work? • Do you think that using big data will increase your knowledge of tourists' preferences? how? • Do you think that using big data will increase your understanding of what drives tourists to make decisions? how? • Do you have the ability to transform big data insights into actions? Give example. • Do you often use big data in your organisation to modify your decisions? Give example. • How can big data be used to improve and integrate tourism bodies in Egypt? • How can tourism organisations use big data to develop a unique tourism offering that could provide them with a

	competitive advantage?

2.1 Data analysis

For data analysis, the authors adopted the thematic analysis approach with its six phases (Braun and Clarke, 2006). Namely, 1) carefully reviewing the transcripts and scanning for any probable themes or patterns. 2) Create an initial code list that identifies the main concepts or ideas (whether latent or semantic) present in the data. 3) assemble all the necessary coded data extracts into the themes that were discovered after sorting the first codes into likely topics. 4) Inspect the potential themes to make sure that they are distinct from one another and that the data supporting each theme is coherent in a meaningful way. 5) Rearrange the generated data extracts for each topic in a way that is logical and internally consistent, and add a narrative outlining the unique qualities of each extract. 6) The ultimate evaluation and judgement. Make sure your narrative tells a convincing story about your data and uses vivid quotes from your data to support your ideas. Your analytical narrative should also support your research questions with arguments (Tuckett, 2005).

And to ensure the credibility and rigor of the results, the authors followed some processes based on the trustworthiness model of Guba (Nel, 2018). These processes include following the "thick description" technique by going beyond describing the answers and providing interpretation to derive meaning and add arguments. The "inquiry audit" technique was also

employed by asking two researchers who were not engaged
in this research to assess the study's findings and processes.
In addition, the "triangulation of sources" technique was
also adopted by targeting interviewees representing a wide
range of the Egyptian Ministry of Tourism's offices and
affiliated bodies.

2.2 Findings

The results showed the respondents' perspectives on the
barriers to the adoption of big data applications by the
tourism authorities in Egypt. In addition, their views
regarding some other related issues have been revealed,
namely, to what extent the Egyptian tourism authorities use
big data in their decision-making and how this impacts the
quality of their decisions.

Following are the four main themes that emerged from the
thematic analysis of the gathered data:

1) current uses of big data applications;

2) adoption barriers of big data;

3) impact of big data usage on the quality of decision-
   making;

4) efforts of the Egyptian Tourism Authority toward
   employing big data.

2.2.1 The current uses of big data applications:

It was revealed from the participants' responses that big
data applications are not optimally used by the tourism

authorities in Egypt, but what is actually done is the use of some of its elements individually and unorganized. Also, no specialized and advanced programs are used to manage big data, but some primitive programs are used to save and process data, such as " Google Analytics" and "Power BI".

> *"...through google trend, for example, I can find out which country is most interested in diving, and then start directing a campaign to them…" (P10)*

and

> *"We monitor the views of the digital promotional campaigns launched by the authority on social media (YouTube, TikTok, Snapchat, Ad colony) in those targeted markets." (P21)*

and

> *"This is done indirectly by following the reports of international organizations such as UNWTO and WTTC." (P12)*

In addition, the Egyptian Tourist Authority often contracts with some advertising companies to promote Egyptian tourism destinations abroad, such as JWT, which performs all tasks related to analyzing markets and identifying promising ones to target on behalf of the Egyptian Ministry of Tourism. This trend confirms the lack of digital and analytics competencies among the employees of ETA, to the extent that they are using outsourced marketing and analytics services.

> *"We use some advanced technology companies to promote Egyptian tourism and launch advertising campaigns abroad". (P26)*
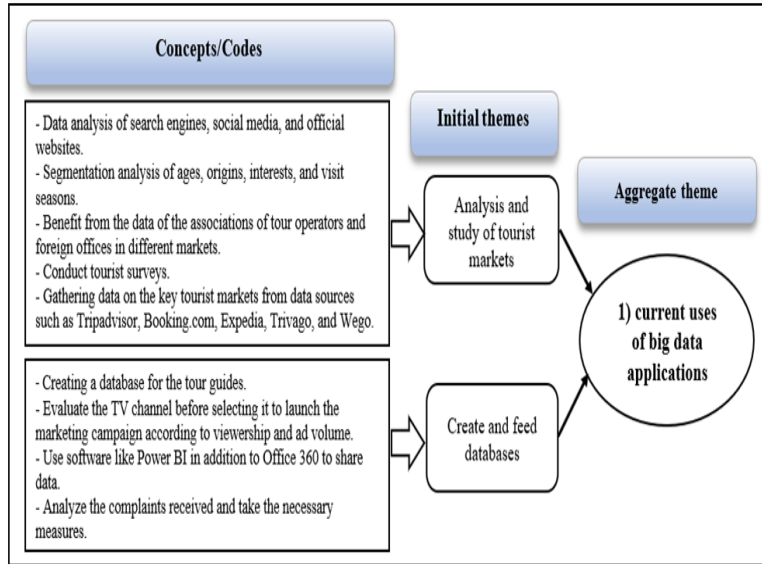
Figure (1): Data structure displaying inductively produced theme no.1 of findings

Some other random and primitive uses of big data applications include creating a database for tour guides, tracking and saving TV channel figures and performance, and tracking tourist complaints.

> *"We monitor any comments by visitors to the official page of the ministry (Experience Egypt), deal with complaints published, whether against the Egyptian tour guides or others, investigate the cases, and take the necessary measures." (P2)*

and

> *"We keep the data of the clients dealing with the authority from the tour guides on the ministry's database." (P1)*

and

> *"We have data on TV channels that we use to evaluate the channel before choosing it to launch the promotional campaign in terms of viewership, the size of its ads, the available budget, and the desired goals." (P17)*

2.2.2 The adoption barriers of big data:

In this theme, some interesting findings were revealed to justify the limited, if not nonexistent, use of big data applications by the tourism authorities in Egypt. Responses formed five themes, representing five major barriers to big data adoption: 1) technological, 2) organizational, 3) human, 4) financial, and 5) accessibility.

Respondents agreed that the poor information and technology infrastructure, along with the scarcity of financial resources, had a significant negative influence on the adoption of BD.

> *"We are aware that there is an urgent need to carry out market studies and analyze the target segments, which require the use of BD, but due to the financial aspects and the lack of budgets, this is not possible." (P11)*

and

> *"The inadequacy of the information structure, such as the availability of good internet networks, the*

> *poor condition of computers in some departments, the breakdown of the electronic system from time to time, and the poor physical capabilities are all reasons that impede our use of BD applications." (P9)*

and

> *"We used to rely on statistics that we obtained directly from various sources, such as the Association of Foreign Offices and the Association of Tour Operators (a paid subscription by the Egyptian Tourist Authority was in place to obtain this data), and now the annual subscription is not paid. There were also 23 external offices, most of which have been suspended to reduce costs." (P18)*

The organizational and human factors also appeared in many examples to justify the limited use of BD and hinder the adoption of such an essential and powerful tool.

> *"I believe that the lack of manpower trained in the use of modern technological methods, administrative red tape and bureaucracy, and the lack of motivation provided to the technically gifted are among the critical factors that limit the adoption of big data applications within government departments in Egypt." (P22)*
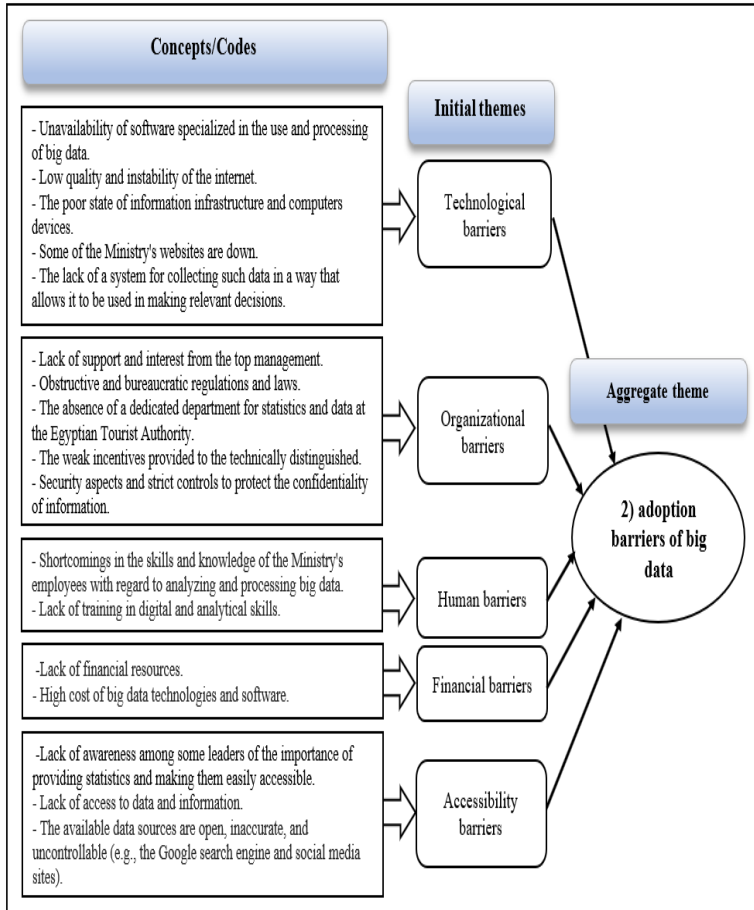
Figure (2): Data structure displaying inductively produced theme no.2 of findings

Last but not least, accessibility barriers played a significant role in preventing the adoption of BD. The majority of the

participants confirmed that there are still many obstacles to the freedom of circulation and availability of data.

> *"We still have a severe lack of awareness of the importance of providing statistics and making them easily accessible." (P23)*

and

> *"Data on the Internet does not belong to us; it is the property of Facebook and Google, for example, so it cannot be controlled, and it could be prevented or made vulnerable to hacking." (P16)*

and

> *"There are no sufficient sources of accurate data because most of the important sources are not available to us except for some free tools such as Google Trends and Insights." (P31)*

2.2.3 Big data usage and decision-making:
Responses analysis of BD usage and decision-making resulted in two key themes: 1) the uses of BD for decision-making and 2) the impacts of BD usage on the quality of decision-making from the perspective of the Egyptian tourism authority representatives.

It was clear that the uses of BD applications by decision-makers in the Egyptian tourism authority are very trivial, and they are limited to randomly using an isolated set of data in the absence of a solid system and a well-established and connected information network.

"We reconsidered the criteria for evaluating applicants to obtain a license to practice the profession of a tour guide as soon as there were many complaints about the scientific and linguistic level of the new guides." (P1)

and

"When important decisions are made, they are presented to the competent higher authority, and justifications for the proposal are requested, including the results of data analysis." (P5)

and

"Recently, the authority has begun to focus on bird-watching tourism due to the significant increase in the number of interested tourists." (P28)

and

"We classify complaints, comments, and preferences expressed by tourists to know how best we can serve them. For example, a tourist may post on social media about his experience while visiting Egypt and how he enjoyed visiting this destination, but he lacked the presence of restaurants serving Chinese food, for instance, or a specific means of transportation, or a specific entertainment area." (P30)

As for the impacts of BD usage on the quality of decision-making, the representatives of the Egyptian tourism authority have come to an agreement that BD applications can lead to more correct, effective, faster, informed, innovative, and realistic decisions and plans.

"The decision should be based on clear and sufficient statistical foundations so that the decision is correct, effective, and realistic." (P12)

and

"Tourists' decisions to travel stem from a previous tourist experience or an urgent desire, which can be identified from various data sources and analyzed to meet these desires and needs, which helps us develop more effective and efficient plans." (P29)

and

"Availability of data means faster decision-making, as well as finding more creative and innovative solutions." (P13)

and

"It helps us make a decision about which promotional tools are optimal to reach the target segments, such as ad placement sites, and in any form, whether it is text, a picture, or a video." (P25)
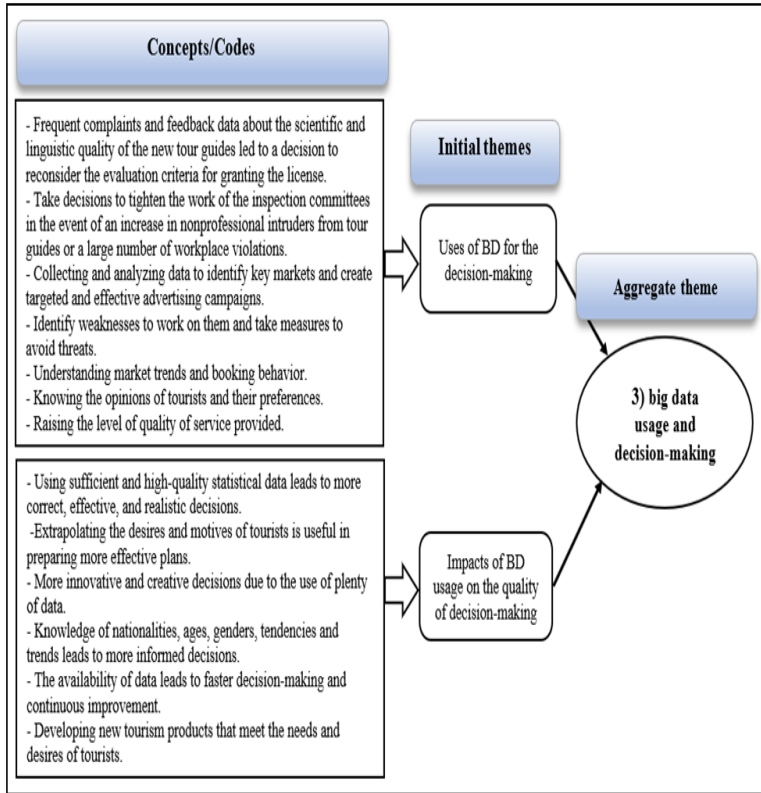
Figure (3): Data structure displaying inductively produced theme no.3 of findings

and

"*Big data applications can be used in the development of one of the tourist areas or products, such as the interest in eco-tourism during COVID-19, for example, during which the search tourists on*

> *the internet went to remote and not-crowded places,
> which can be used to develop the desert tourism
> product, for example." (P17)*

2.2.4 efforts of the Egyptian Tourism Authority toward employing big data:

Several efforts have been made in Egypt to employ the BD
applications in tourism decision-making, but they have not
yet been effective or sufficient. Results revealed three
themes representing these efforts: 1) training courses and
workshops; 2) regulatory actions; and 3) outsourcing.

The role of the tourism authorities in Egypt in enhancing
skills and building capacity concerning the application and
use of big data was limited to holding a set of beginner
training courses in databases and information technology in
general or simply introducing big data without actual
preparation on how to use its specialized programs or
analyze its multiple sources and make it available for use in
decision-making.

> *"A training program was presented to us, but it was
> only to introduce BD; it was not specialized in how
> to deal with its specialized programs, how to
> analyze them, or how to benefit from them." (P25)*

and

> *"There are courses for the use of information
> technology skills, but they are not specialized in the
> use of BD." (P11)*

In addition, some other regulatory actions (e.g., establishing a recent department for digital transformation, making all services available electronically, and developing information and communication systems) took place by the tourism authority that can pave the road for the usage and application of BD, but most of which are done in light of the endeavor toward digital transformation in the first place.

> *"Care is now being taken to make all services provided by the Ministry available electronically in preparation for the move to the new administrative capital and the digital transformation." (P13)*
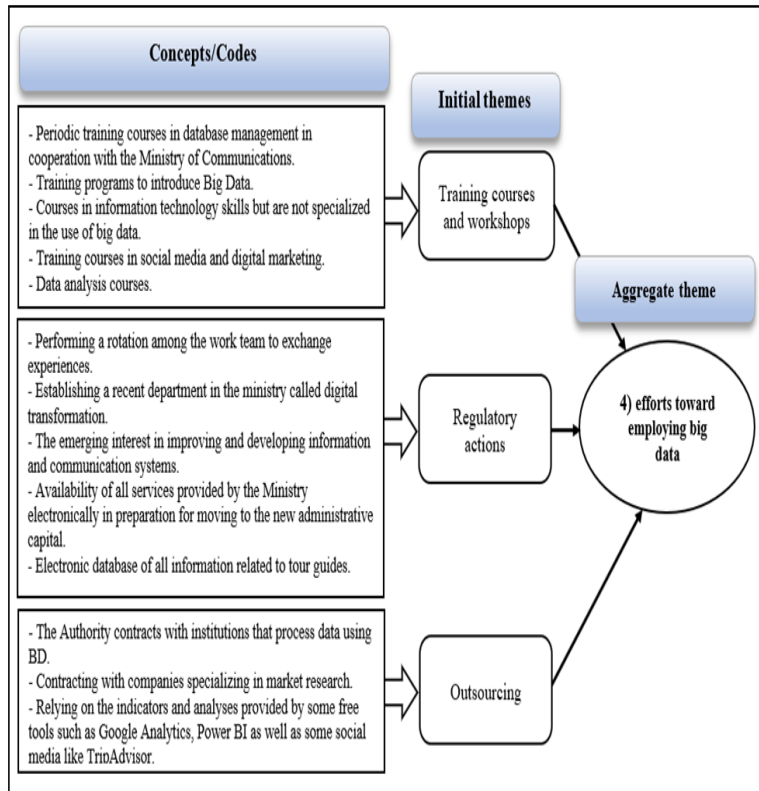
Figure (4): Data structure displaying inductively produced theme no.4 of findings

It seems that outsourcing in the use of big data applications and data analysis (e.g., contracts with institutions that process data using BD and those specializing in market research) takes the greatest share of attention from the official tourism authorities in Egypt. Although it is the easiest and fastest way to reach the desired goals, it is more expensive and less sustainable. In addition, using online,

freely available data and analyses contain risks of inaccuracy.

> *"The authority usually contracts with third parties that process data using big data applications, in addition to companies specializing in market research." (P27)*

and

> *Due to limited financial resources, ready-made analysis is collected from free sources such as Google Analytics, Power BI, and some other social media platforms like TripAdvisor. (P4)*

3. Discussions

As one of the early studies looking into innovation and technology usage, specifically big data applications, by tourism authorities in developing countries utilizing the thematic analysis approach, this study adds to the theory by filling in some crucial gaps. The study sought to answer three key questions. *First*, to what extent does the Egyptian tourism authority use BD applications in making decisions? The results showed that decision-makers used BD applications in trivial and random ways. The tourism authority lacks an effective system and reliable databases. Despite some recent regulatory initiatives (e.g., the establishment of a department for digital transformations), the use of BD is still rudimentary and disorganized.

Second, what barriers hinder the adoption of big data as perceived by tourism authority representatives? According to the findings, the adoption of big data is hindered by five key factors: 1) data accessibility (e.g., lack of access to data

and that the available data sources are open, inaccurate, and uncontrollable). 2) organizational (e.g., the weak incentives provided to the technically distinguished and bureaucratic regulations). In this regard, Rogers and Meehan (2007), Leung and Lo (2019), and Lamba and Singh (2018) stressed the significance of commitment from upper management as a crucial enabler or hindrance to BD adoption. 3) financial (e.g., lack of financial resources and the high cost of big data technologies and software). 4) human (e.g., shortcomings in the skills and knowledge about analyzing and processing big data). According to Tambe (2014), organizations face a huge challenge in retaining talented employees with BD analytic skills. In addition, the majority of professionals in the tourism industry, according to Belias (2021), lack the knowledge needed to comprehend and utilize BD applications. 5) technological (e.g., the poor information infrastructure and the unavailability of software specialized in big data) factors. Alharthi et al. (2017) concluded that some organizational, human, and technological challenges must be surmounted before BD adoptions can take place. In addition, the results revealed a lack of awareness among employees of the Ministry of Tourism and its affiliated bodies about big data and its applications, as their knowledge of it is limited to the information available on social media and non-specialized programs, which are the entirety of the individual efforts of some departments and sections and not an official decision or general strategy. The study also found that there's a lack of human and physical resource readiness to adopt and use big data applications in managing tourism planning and its decision-making in Egypt.

Third, how likely is it that big data usage will affect the quality of decision-making as perceived by the representatives of the tourism authority? The Egyptian tourist authority representatives have agreed that BD applications can result in more accurate, efficient, quicker, informed, inventive, and realistic plans and decisions. These findings are in alignment with what was indicated by Liu et al. (2015), that BD is a driving force to promote innovation in tourism, and with Nair and Anbuudayashanka (2009), that BD usage leads to more effective and timely decisions. Nevertheless, no adequate resources have been dedicated, nor has proper preparation been provided to the employees on how to use BD-specialized software and analyze its multiple sources for decision-making. The decision-makers chose the easiest and fastest way from their point of view by outsourcing big data applications (e.g., contracts with companies specializing in market research). They were wrong, as this option was more expensive, less sustainable, and didn't even bring the desired results.

4. Conclusions

The big data applications are not effectively exploited by the Egyptian tourism authorities; instead, certain of their components are used singly and randomly. This situation is due to some barriers that need immediate intervention from the decision-makers to take advantage of this powerful technological tool in such a dynamic and information-based industry. Support from top management comes first, along with a consciousness of the importance of BD and its applications, especially in decision-making. A proper incentive structure and sufficient training for all employees

are prerequisites to adopting BD and a key element of success. Regulation reforms are necessary for more freedom of circulation and accessibility of data in the presence of a solid system and a well-established and connected information network. Finally, there is a need to redirect the financial resources from outsourcing to investing in developing information and technology infrastructure and human capacity building as a more viable, effective, and sustainable solution.

Some limitations in this study might encourage further research. It is vital to explore the perspectives and readiness of other stakeholders to use BD, such as service providers (hotels, attractions, airlines, etc.), tourists, and other governmental key players that have a role to play in this field. Stylos and Zwiegelaar (2019) emphasized the necessity of collaboration among all stakeholders if BD is intended to be used to the max. Furthermore, the authors are aware that countries differ in terms of the state of their economies, politics, technology infrastructure, and tourism structures, despite the commonalities between Egypt and a sizable number of developing countries. Thus, there is a need to conduct this study on more developing countries to enhance the generalizability of the findings and provide a solid framework for future comparative studies between developed and developing countries.

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