Technology-Based Tourism Businesses: Extracting Actionable Knowledge and Insights from Social Networks

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Abstract There are currently many technologies that are changing all types of professional ecosystems around the world. New technologies and business models based on the internet are producing the evolution of the tourism sector towards Digital Tourism, which uses innovation and the interconnection of products and services. The research aim of this study is to identify the main technologies and business models that are transforming the tourism sector into the new digital ecosystem. The trends that will influence the future of Digital Tourism can then be identified. To do this, an original approach is proposed, using textual analysis with data mining and visual data mining techniques with the User Generated Content (UGC) on the Twitter social network. The sample consisted of n = 25,434 tweets downloaded from the Twitter API with the hashtags #DigitalTourism and #Tourism. These were used to get insights and knowledge about the digital tourism industry using the technological innovations in the sector. The results of the research showed the main technologies and business models in the Digital Tourism sector, as well as the trends and future applications for the digital tourism sector. This research fills a gap in the existing research by using data mining techniques to obtain insights and knowledge from UGC about the Digital Tourism industry.

Keywords Digital tourism business · Technological-based strategies · Digital destinations · Business ecosystems

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1 Introduction

There are currently many technologies that are changing all types of professional ecosystems around the world. New developments in information technologies, especially the Internet, have meant that many companies have adopted Internet-based business models and digital platforms with Internet users as the customers (Anttiroiko, Valkama, & Bailey, 2014; Atzori, Iera, & Morabito, 2010).

These new digital environments are ecosystems which use bi-directional information. Users have the power to publicly give their opinions and comments about the services and products to other users. Companies can also use these platforms to help their customers with any problems that may occur with their services or to inform customers about improvements to their products (Bakıcı, Almirall, & Wareham, 2013). These channels allow mass communication and promotions can be sent to themed user communities in only a few seconds.

These ecosystems provide and use improved channels for interconnectivity between companies and users. This has given rise to the appearance of new technology-based businesses in various sectors, such as tourism, finance, consulting, design, marketing, along with others (Sigala & Marinidis, 2012).

In this environment, companies use customer generated data on the internet to obtain information which allows them to create and improve competitive strategies and identify user patterns which allow them to provide added value to products and services. Various technologies have been created which provide companies with ways to collect data and transform unstructured databases into structured ones. Subsequent analysis of the databases allows knowledge, which was not available a few years ago, to be obtained with automated analysis processes (West & Gallagher, 2006).

New technologies such as big data, machine learning, artificial intelligence or data mining allow companies to apply new technological approaches and create new business models based on data and digital ecosystems. An important concept is Big Data, which is defined as information stored in enormous databases that cannot be managed with traditional software because of the size. Companies must use data analysis strategies from data science to obtain the data they are interested in (Bennett, Yábar, & Saura, 2017; Wang & Xiang, 2012).

One technique that has been used in the tourism sector is content analysis, in which companies analyze the content of a large amount of user generated data with qualitative software. Textual analysis is a strategy that allows companies to analyze the lexicon that is contained in these large databases in order to obtain keywords and key indicators that indicate ways in which value can be added to the company's competitive strategy. Other techniques and approaches can be used with the data to obtain different insights from the information stored in the databases of the sample (Wang, Park, & Fesenmaier, 2012).

In the last decade, several authors have become interested studying the evolution of the tourism sector with the digital environment (Benyon, Quigley, O'Keefe, & Riva, 2014; Minghetti & Buhalis, 2010; Hojeghan & Esfangareh, 2011; Santos,

Azevedo, Patriarca, & Leitão, 2019). This research has shown that the tourism sector needs to understand how travelers feel during their trips in order to offer them unique experiences to increase user satisfaction and include the sustainability of tourism ecosystems in the company strategies.

The Digital Tourism environment is the tourism sector using the Internet, new technologies and digital ecosystems and has also been studied by different researchers (Pelet, Barton, & Chapuis, 2019; Pierdicca, Paolanti, & Frontoni, 2019; Neumann, 2019). Different methodological approaches in research have detected the shortcomings of the tourism sector in terms of adapting to the new products, services and technologies of the digital era.

The aim of this research into digital tourism is to identify the main technologies and business models that are transforming the tourism sector into a new digital ecosystem. The trends that will shape the future of digital tourism are also identified. An original approach using textual analysis of User Generated Content (UGC) was proposed. The content comes from the user reviews, opinions and publications on the Twitter social network. The sample consisted of n = 25,434 tweets downloaded from the Twitter API with the hashtags #DigitalTourism and #Tourism, which were used to gain insights and knowledge about the digital tourism industry. Trends and future applications in the tourism sector were found and the investigation which fills a gap in research by using data mining techniques to obtain UGC insights.

2 Literature Review

2.1 Digital Tourism and New Business Models Using Technology

Different researchers have taken an interest in the digital tourism sector using new technologies. Benyon et al. (2014) investigated how digital tourism could create experiences for the user by comparing the tourists experiences when using traditional and digital tourism.

Minghetti and Buhalis (2010) researched the factors that facilitate the use of ICT by tourists when travelling and at their destinations by analyzing indicators in different cases. The importance of ICT in the tourism sector and in destinations, as well as the use of new technology in tourism business models was found. Kotler, Bowen, Makens, and Baloglu (2017) analyzed team and people management in the hotel industry, taking into account the importance of technological developments in tourism business models.

Hojeghan and Esfangareh (2011) studied the effects that new technologies in the digital economy have on the tourism industry. They gave examples of digital platforms that have business models based on the Internet and the interconnection with users. Tzanelli (2013) examined the effect of tourism on the evolution of cultural heritage management by using cinematographic interventions to document changes.

Table 1 Previous research on technological based tourism businesses

Author	Description
Maci (2013)	Investigate the evolution of communication in the tourism sector and how this has changed the sector
Munar, and Gyimóthy (2013)	Study the changes in tourism due to the use of "social media"
Baggio, and Del Chiappa (2014)	Evaluate the effects and extent of technological changes in the structure of the tourism system
Chiappa, and Baggio (2015)	Study how ICTs are used to exchange information and knowledge in the tourism sector
Saura, Palos-Sanchez, and Reyes-Menendez (2017)	Analyze mobile applications for tourism and the new business models which have appeared with them
Palos-Sanchez, Saura, Reyes-Menendez, and Esquivel (2018)	Analyze located-based applications in the tourism sector and the associated business models

Source: Author's own table

The importance of technological developments in this scientific approach is emphasized in the study.

Benckendorff, Xiang, and Sheldon (2019a, 2019b) studied new technologies in the tourism system by using different approaches to promote good practices, case studies and examples that illustrate the evolution of the polyvalence of the tourism sector when adapting to new business models and emerging technologies. One example is the research presented by Dredge and Gyimóthy (2015) in which the collaborative economy in industrial tourism systems was analyzed and the technological evolutions that have been applied in this industry were described.

Table 1 shows the previous research on the topics of the present study.

2.2 User Generated Content (UGC) on Social Media in the Tourism Industry

The content generated by social media users is an area which has been studied on numerous occasions in the last decade. Van Dijck (2009) studied the content generated by users of the 2.0 web and social networks for tourism, finance, and consulting industries. The study is concerned with the 2.0 ecosystem in general, which was made up of web pages, social networks, wikis, blogs and other types of media and digital channels that allowed content to be shared bi-directionally.

Cha, Kwak, Rodriguez, Ahn, and Moon (2007) analyzed the impact of user generated content on the YouTube platform by studying the comments that users made about the content they watched. The comments about the content of the videos, the number of visualizations and the number of "likes" obtained were used to obtain insights and knowledge about successful content.

Daugherty, Eastin, and Bright (2008) studied the feelings shown in the UGC and the consumption that this produces. The feelings shown in the UGC of user profiles

Table 2 Research on UGC in tourism

Author	Description
O'Connor (2008)	Studied the communication between users on the Tripadvisor platform by analyzing the UGC about the reviews in order to make improvements for travelers at their destinations
Girardin, Calabrese, Dal Fiore, Ratti, and Blat (2008)	Studied the intentions and motivations of tourists from the positive content published in the UGC on tourism platforms
Cox, Burgess, Sellitto, and Buultjens (2009)	Research the influence of comments in UGC when travelers plan a trip and the effect it has on tourist at their destination
Reyes-Menendez, Saura, and Alvarez-Alonso (2018)	Studied the UGC on Twitter about the hashtag #WorldEnvironmentDay obtaining insights on tourism
Saura, Palos-Sanchez, and Rios Martin (2018)	Studied the user attitudes in the UGC about the hotels which won the TripAdvisor Travelers Choice Award 2018
Saura, Reyes-Menendez, and Alvarez-Alonso (2018)	Analyze the UGC comments about the environmental management and sustainability of hotels on TripAdvisor and connect user behavior with the attitudes and feelings shared in the hotel reviews

Source: Author's own table

was linked to the consumption of the digital content type. This research showed how feelings about the contents on a digital channel are an important factor in adding value to content on the Internet.

Krumm, Davies, and Narayanaswami (2008) analyzed six different articles on UGC about innovation. The different definitions of this type of content were studied with different approaches and perspectives. Future possibilities of study for these concepts on different platforms were also identified.

Smith, Fischer, and Yongjian (2012) compared the user generated content about different brand names on Twitter, Facebook and YouTube. The UGC from these platforms was studied to find the relationships that users have with the brand, as well as the types of comments made about favorite brands.

Thurman (2008) studied the UGC of its own users paying special attention to the "appearance of new journalists" who publish events in real time on social networks. This is known as "new journalism" or "journalism 4.0" in which users become journalists by sharing information as soon as an event occurs.

Dhar and Chang (2009) studied the UGC on digital platforms to obtain an estimate for the sales of music from the feelings expressed in the comments. UGC was found to influence the amount of music sold and future areas of study were planned (see Table 2).

Table 2 shows the studies in which insights are extracted from databases of UGC-type content on social networks.

3 Research Questions

In order to adapt the business models of the tourism sector to the demands of the market, CEOs and managers of hotels and companies must be aware of the technological advances available. In a digital ecosystem with an increasing number of technology-based business models, it is interesting to identify the trends that travelers will use in future strategies when organizing trips and when travelling.

With the current changes, technological advances and innovation in the tourism sector, business models must adapt to the demands of the market. In the current digital ecosystem, where large quantities of data are generated every day by users on the Internet, UGC has become an important tool to use when analyzing different industries in order to obtain insights and knowledge in a new way (Saura, Rodriguez Herráez, & Reyes-Menendez, 2019).

There are various platforms available to users where content can be published to express opinions and comment on different topics. Twitter, TripAdvisor or Booking.com have become suppliers of data for research to gain insights that help companies improve their business models and marketing strategies (Saura, Rodriguez Herráez, & Reyes-Menendez, 2019).

Therefore, this study aims to identify new technologies and business models which use innovation in the tourism industry by downloading UGC with the hashtags #DigitalTourism and #Tourism from the Twitter social network. The following Research Questions (RQ) were proposed in order to reach the planned objectives:

RQ1. What are the dominant themes of discussion in Digital Tourism and Technology-based Tourism Businesses?
RQ2. What network users and groups participate in these discussions about Digital Tourism and Technology-based Tourism Businesses?
RQ3. What are the new trends and future directions for Digital Tourism and Technology-based Tourism Businesses?

4 Methodology

Textual analysis with data mining techniques with posterior data visualization have been used in this research to identify patterns that help analyze insights and indicators for new technologies and business models in the digital tourism sector, These processes allow a holistic view of the knowledge to be obtained from the sample collected on Twitter.

The sample consisted of n = 25,434 tweets that were collected from the Twitter API from April 18 to April 25, 2019. Then a textual analysis of the UGC was carried out to obtain insights after applying different of data visualization and data mining techniques.

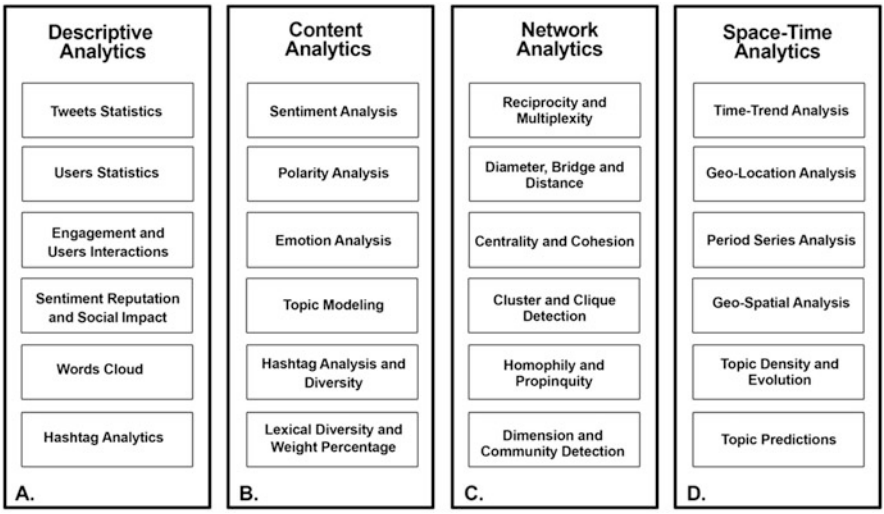

Fig. 1 Main types of analysis in social media analytics. Source: The authors

Figure 1 shows the different methodological processes applied to data mining in order to obtain insights from samples collected from digital platforms and social networks (Aswani et al., 2018).

In this research a descriptive analysis is carried out with user account statistics, word-clouds and hashtag analytics. The content analysis used topic-modeling, hashtag analysis with lexical diversity and percentage weightings.

Network analytics techniques were chosen for analysis of dimension and community. The space-time analysis looked into topic density and evolution, as well as topic predictions.

The Nvivo Pro software was used for the textual analysis to find insights from the sample. This process uses a qualitative approach when analyzing data. There are many types of software available for textual analysis, along with algorithms written in Python and other programming languages (Saura, Rodriguez Herráez, & Reyes-Menendez, 2019).

The Nvivo software was used in this research because it has a simple interface that allows the researcher to easily and correctly classify and structure the database into nodes even though the researchers are not data experts. The data entry process is manual for Nvivo. The researchers created a structure of nodes for words identified as connectors, prepositions, articles, and plural forms. The following Eq. (1) was used to eliminate repeated words with the Nvivo software.

$$K = {}^{ki}/_{n} \quad i = \{1, \ldots, n\} \quad n = \{1, x\} \tag{1}$$

An empirical approximation constant, which is called K, is established in Eq. (1). K is used to eliminate all words that are repeated in the different imported texts

(Saura, Palos-Sanchez, & Grilo, 2019). K is found from the query which searches the databases, so K is established for each sample or topic studied and is later compared with that found for rest of the samples. The global weight, Xs, is the average of K for all the identified topics or indicators (Saura, Reyes-Menendez, & Alvarez-Alonso, 2018).

The nodes are defined as data containers that can be grouped according to their characteristics. It should be noted that the design and development of nodes is a way to analyze pure data in order to achieve the highest possible quality from the descriptive research (Saura & Bennet, 2019). An important indicator when using this software is the weighted percentage (WP) which shows the number of times the data in a node is repeated in the sample. The following formula is used to calculate the weighted percentage:

$$K = \sum k_i/n_i = \{1, \ldots, n\}\ n = [1.25] \tag{2}$$

As explained in the research by Saura and Bennett (2019), K is found from the query that is used to search the text. The behavior of each word and sample of text can be seen, and a value of K should be found for each research purpose. The average value of K for all the tweets was calculated in order to obtain the global value.

5 Analysis of Results

This study uses analytical techniques to extract actionable insights from UGC data on Twitter about the digital tourism industry. The following analysis was carried out for a total of 25.4341 tweets extracted from the Twitter API.

The descriptive statistics give an overview of the tweets, the users that interact with them and the engagement found (Bruns & Burgess, 2013; Saura & Bennet, 2019).

Of the total 25,434 tweets, 17,450 were original tweets and 7984 were re-tweets (RT). This indicates a very large amount of interaction between the parties involved with digital tourism on Twitter. A total of 5701 different hashtags were detected in the sample from 19,043 unique users who published UGC.

Over 58% of the tweets contained more than one hashtag, which indicates that many of the tweets were about several similar digital tourism topics. It seems that most of the users are active and visible on this social network, so the content used in this study is valid for obtaining relevant insights (Aswani et al., 2018).

A global vision was gained of the different community groups of the users in the sample after the textual analysis of the tweets. The algorithm for visualization and classification of data presented by Vincent et al. (2008) was used to detect the communities in the UGC (see Fig. 2) using the data visualization software, Gephi.

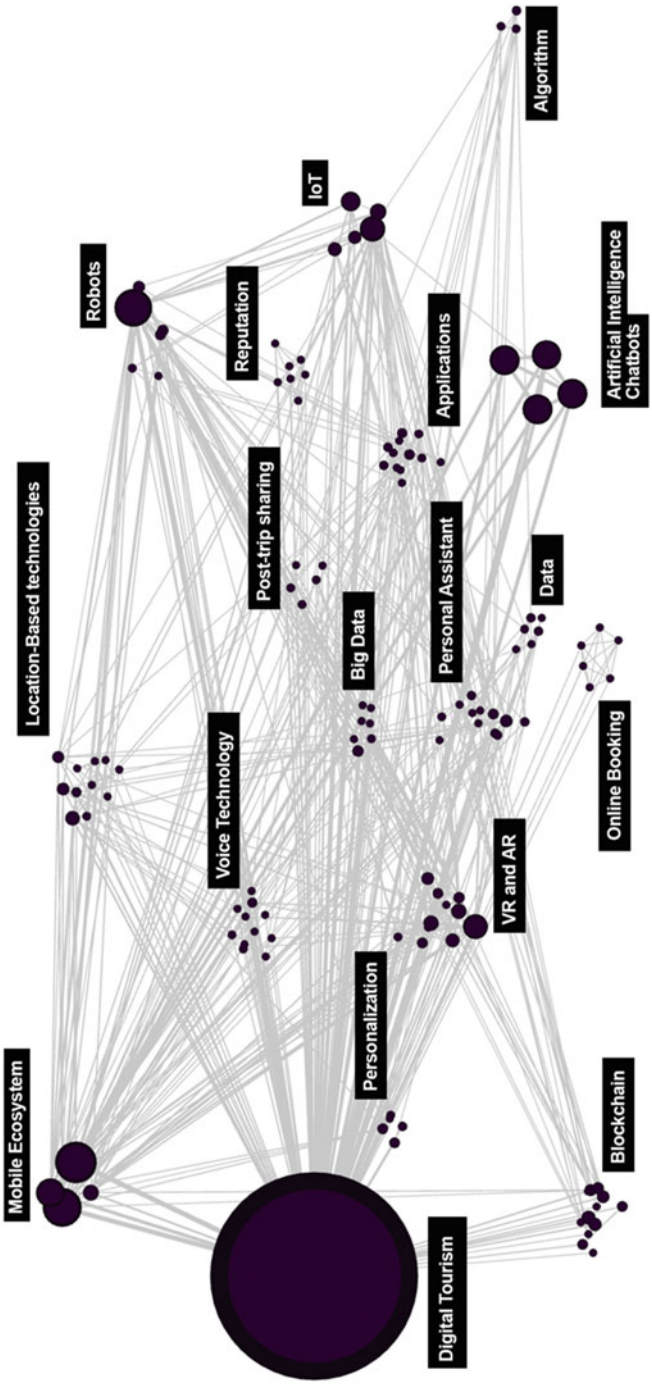

Fig. 2 Main UGC topics for digital tourism on Twitter. Source: The authors

The modularity of the sample showed that the UGC and digital tourism users were grouped into communities.

The Lambiotte et al. (2009) algorithm was used to find the resolution of the results by grouping the results into communities of neurons or nodes. The modularity of communities is a measure of the network structure and was designed to measure the strength of the division of a network into clusters or communities (Vincent et al., 2008). Networks with high modularity have strong connections between the nodes contained in a module but weak connections between nodes in different modules. Modularity is often used in optimization methods for detecting community structures in networks and was also used in this way in this research.

Figure 2 shows the main UGC user communities found for the terms #Tourism and #DigitalTourism on Twitter by analyzing the neural connections and weights of the different nodes of the communities on the social network.

5.1 Technology Used in Digital Tourism

The main technologies on which the digital tourism sector should be based in the near future are detailed below in order to create a roadmap for the future of the tourism sector using the technologies identified in this research and supporting the theoretical framework proposed by Little, Bec, Moyle, and Patterson (2019), Salerno (2019), Santos et al. (2019), Pelet et al. (2019), Bec et al. (2019) and Benckendorff et al. (2019a, 2019b).

5.1.1 Mobile Integration (Mobile-Friendly Ecosystem)

With the migration of the tourism industry towards a mobile-friendly ecosystem in which the smart-phone becomes the main tool used before, during and after trips, the integration of smart-phones into the tourism environment has become another necessary service.

Businesses must track the innovations in services and facilities using mobile technology such as Wi-Fi access or check-in using these mobile terminals.

Daily habits for tourists, such as ordering room service or opening room doors with the mobile smart-phone, are actions that show tourists that the facilities of hotels and tourist businesses are dynamic and mobile-friendly.

5.1.2 AI (Artificial Intelligence) and Chatbots

The use of Artificial intelligence has increased exponentially in the last few years. This is a technology that is being applied to chatbots and is increasingly being used to provide low cost services 24/7.

By correctly configuring and programming this technology and the services required, chatbots can offer information about schedules or tourist routes and offer additional applications that complement a hotels' or tourist business' services.

This technology can also be connected to other technological devices such as mobile smartphones so that assistants can analyze and decide on their own the best solution to a problem that guests, or travelers might have. These AI-based devices can resolve unforeseen events and provide differentiating value to the tourism business.

5.1.3 Integration of the IoT

As devices increasingly connect to the Internet and transmit data, the technology known as Internet of Things (IoT) gives meaning to the large amounts of data to enhance the travelers experience at the given destination.

These small devices can collect any type of information about the clients, from the time spent in a room, the temperature at which the guests feel comfortable or even their favorite water temperature.

The opportunities available when using IoT technology are endless when considering the volume of data collected and used.

5.1.4 Virtual Reality (VR)

Hotels, hospitality businesses, museums and other businesses in the tourism sector can implement this type of technology in their products and services. It is currently transforming various sectors such as video games, self-help and some health industries.

Virtual reality can provide the tourism sector with additional services that allow users to test an experience in advance or use a service provided by businesses in the tourism sector in a different way.

Technology which uses VR can provide travelers with additional services or innovative experiences at their destinations.

5.1.5 Virtual Personal Assistant

Personal assistants are being used more and more in the tourism sector. The developments in AI mean that more virtual personal assistants are appearing. These can help the traveler to prepare trips and make decisions about recreational visits during the trip.

Virtual assistants are being offered as additional packages by restaurants, hotels and hostelry services, which complement the sales and services offered by the companies in the tourism sector.

5.1.6 Augmented Reality (AR)

The use of AR technology in applications and mobile smart-phones allows travelers to enjoy innovative experiences. By using this type of technology, travelers and tourists can enjoy real-time recreations of historical monuments, old locations and other situations that are presented at the actual site in real time.

These AR applications are also being used as an additional service to attract customers as a complement to the normal tourist packages because they provide innovative activities and experiences with both visual and auditory content.

5.1.7 Robots

Robots are an innovative technology that is being used to provide services in the hotel and hostelry sectors. This technology uses machine-learning and artificial intelligence to offer physical assistants to accompany trolleys at check-in or check-out, or to provide room service orders and deliveries.

Several hotels and tourist accommodation offer advice from robots to answer questions or offer information about the tourist destination in any language. This technology will surely have an important role in the future of the tourism industry.

5.1.8 Block-Chain

The technology known as block-chains is changing organizations all over the world. This technology is usually associated with finance and accounting, but it can have an important impact on the tourism industry both digitally and offline.

Although there are not currently many examples of block-chain use in the tourism sector, this technology can be used in airports to identify and safely place passengers, review information and opinions, make reservations in tourist accommodation, as well as increase the security of online payments.

5.1.9 Location-Based Technologies

Smart devices that contain GPS have become an important tool when travelling around the world. Location-based applications not only have a GPS that helps travelers find their destinations, but also offer additional functions such as finding exclusive discounts and offering promotions depending on the location of the user.

Without a doubt, the application of location-based technology will help hotels to provide new products and increase the safety of trips and package tour.

5.1.10 Voice Technology and Apps

Voice technology and applications that use it have become a normal tool for tourists. Devices such as Google Home or Amazon Echo are voice aids that help users with their typical routine habits. Using these systems during trip can help travelers feel at home, which means that they can spend more time outside and, therefore, consume a larger number of products and services.

The complementary applications for this technology, known as voice-search, could be important in the future of the interaction between man and machine in the tourism sector.

5.2 Technology-Based Business Models in the Tourism Sector

From the results of this study and the research and results of Pelet et al. (2019), Pierdicca et al. (2019), Yuan, Tseng, and Ho (2019), Ankomah, and Larson (2019), Nam, Dutt, Chathoth, and Khan (2019), and Neumann (2019) the roadmap for business models using digital tourism are the following.

5.2.1 Focus on Data

As mentioned above, data is an important part of the new business ecosystem due to the amount of data that is generated daily. Companies such as Airbnb, Booking.com or TripAdivor are creating budget items for R&D&I projects to try to develop data-based improvements for their services.

There are different business models which exclusively use data for the tourism sector. The tourism sector generates data about the mobility of people, preferences for destinations and additional demographic and behavioral data.

The strategies of these business models are to sell data with reports that can detect patterns or market trends so that large tourism companies can use these types of insights to improve their service.

5.2.2 Digital Reputation Management

The fact that users can publicly share reviews on platforms such as Facebook, Twitter, Google Maps, Yelp or TripAdvisor has given rise to the emergence of new business models that use the digital reputation of companies operating in the tourism sector.

This business model is used in the tourism sector to purchase user reviews, which may be real or not, and to program bots posing as travelers to improve the scores of these businesses.

The users consult this type of platforms to make decision about their trips before making them, so a good digital reputation can influence users to decide to buy the tourist products or services offered.

5.2.3 Algorithm Use

There are business models that create algorithms that can be applied to the data collected by hotels, restaurants or even companies. These business models create algorithms technically, which is an expertise that tourism companies do not usually have, and later offer reports about the data found by applying these algorithms.

Tourism companies can use the results of these algorithms to improve their services, find trends and patterns in the complex data and consequently make their businesses profitable in the long term.

5.2.4 Big Data

The collection of data with IoT technology or with any other type of data collection technologies has given rise to the emergence of companies that sell the data collected in order to segment advertising on digital platforms in the tourism sector.

The objective is to make business more profitable by applying advertising segmentation strategies with big data type analysis.

5.2.5 Personalization

The personalization of products and services purchased by consumers in the tourism sector has become an important way to offer added value and innovation to the customer.

Personalization uses business models that offer exactly what the traveler wants with low-cost packages that connect flights and excursions through different countries with low-cost offers. There are also business models that specialize in luxury-based approaches and other types of personalization during the trip.

5.2.6 Online Booking Platforms

The use of the business model which works with online booking platforms is increasing strongly. There are many opportunities which include personalization of the service, but always using online booking platforms to find the supply and demand for solutions.

Table 3 Summary of technologies and business model for digital tourism

Digital tourism	Technology	Digital tourism	Main focus
Technology based	AI (Artificial Intelligence) and Chatbots	Business model based	Data
	Integration of the IoT		Digital reputation management
	Virtual Reality (VR)		Algorithms
	Virtual personal assistant		Big Data
	Augmented Reality (AR)		Personalization
	Robots		Online booking platforms
	Block-chain		Post-Trip
	Located-based technologies		
	Voice technology and Apps		

Source: The authors

These platforms try to find the best deals in the sector by searching a multitude of different booking platforms and finally offer travelers the best results. In this way customers save time planning the trips. These business models usually receive income from advertising revenues or booking fees for the packages they offer.

5.2.7 Post-Trip: Sharing Is Living

There are also business models which take advantage of the importance of shared data and the attraction of UGC on social media and platforms by allowing travelers to post their experiences online. These business models use the content generated by travelers to show their travel experiences and also share the reviews made by other users.

Data is once again the focal point of profitability in this model, which relies on reports that add value and promote companies and destinations or give exclusive offers related to the shared data.

Table 3 shows a summary of the main technologies and business models for the future of the tourism sector.

6 Conclusions

This study has shown that the tourism and digital tourism sectors are influenced by technology and the evolution of the business models which are currently being used (Yoo, Sigala, & Gretzel, 2015).

In a sector which is influenced by data and consumption habits in a constantly changing digital ecosystem, the tourism industry is nowadays using the profitability of data and internet-based business models (Werthner et al., 2015).

RQ1 has therefore been verified from the main topics found in the data collected in the UGC on Twitter. The topics were identified by analysis of the hashtags used and the content shared by users.

RQ2 has also been identified and includes the network of users who share content on social media and platforms and who are important for the future of the tourism sector in the digital environment.

RQ3 used a textual analysis of the results from topics which were previously identified in order to find the future trends and directions of the digital tourism sector and the business models that it uses.

Two main lines of results have been obtained. Firstly, digital tourism which uses technology, and secondly, business models in the tourism sector that mainly use Internet elements, such as data, personalization, algorithms or online platforms, among others.

There is no doubt that CEOs and managers of hotels, restaurants and any other type of business in the tourism sector can use the results of this research to improve the added value they offer in their marketing strategies as well as using the identified elements to give additional value to their digital marketing strategies.

The application of data mining and data visualization research techniques can be of interest to other researchers who would like to apply this type of research methodology.

Researchers and academics can use the business models and technology found in the digital tourism sector for future research into tourism that can help to improve and consolidate marketing strategies and management on the Internet.

The limitations of the research are related to the size of the sample, the period of data collection, as well as the number of references consulted, and the number of topics and technologies analyzed.

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