

Smart Tourism Empowered by Artificial Intelligence: The Case of Lanzarote

Xavier Ferràs, ESADE Business School, Barcelona, Spain

Emma Louise Hitchen, University of Vic, Vic, Spain

Elisenda Tarrats-Pons, University of Vic, Vic, Spain

Nuria Arimany-Serrat, University of Vic, Vic, Spain

ABSTRACT

Artificial intelligence (AI) is changing the rules of the game in many industries. This case details how the combination of open innovation and artificial intelligence generates new opportunities in the tourism sector. Specifically, how to create new customer experiences through searching tools, social platforms and cognitive interfaces to make intelligent decisions. The authors show that it is possible to increase tourist satisfaction by offering a set of customized activities and experiences according to their personal characteristics and motivations. The combination of cutting-edge digital technologies makes it possible to design new services in an automated and cost-affordable manner. The experience has been carried out in Lanzarote (Canary Islands, Spain), with support of IBM's Watson system. This is a good example of AI-fueled innovation in services, which is adequate for courses on innovation, technology, entrepreneurship and competitive strategy.

KEYWORDS

Customer Satisfaction, Economic Promotion, Entrepreneurship, On-Site Experience Sharing, Open Innovation, Tourism

LANZAROTE'S TOURISM STRATEGY: TOWARDS A SMART TOURISM MODEL

Tourism has a critical impact on the economy in different territories worldwide, with the Canary Islands being no exception. The Canary Islands are a set of seven tiny islands belonging to Spain located in the Atlantic Ocean, close to the Sahara Desert, and are one of the most visited tourist destinations in the world. As a matter of fact, tourism accounts for 31.4% of its GDP, 35.9% of employment, and 30.4% of total taxes collected in the Islands. Even during the crisis in 2008, tourism survived and sustained the islands despite the economic slump, with an average annual growth (from 2013) of 2% GDP. Thus, it may be confirmed and concluded that tourism is indeed the main driver of economic development of the region. Financial margins of tourism companies have improved over the past couple of years, with a consequent increase of 7.4% in the employment rate (Impactur Canary, 2014). Overall, the tourism sector in the Canary Islands has grown by 3.4% since 2013, exceeding the growth of the Spanish average of 2.4%.

However, the tourism industry has not escaped the impact of technological change. Together with new waves of tourists, since the crisis, new information and communication technologies (ICTs) have arrived in the islands. These technologies are transforming the customer experience and management

DOI: 10.4018/JCIT.2020010101

This article, originally published under IGI Global's copyright on November 8, 2019 will proceed with publication as an Open Access article starting on January 18, 2021 in the gold Open Access journal, Journal of Cases on Information Technology (converted to gold Open Access January 1, 2021), and will be distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and production in any medium, provided the author of the original work and original publication source are properly credited.

systems of the tourism business. Among these technologies, we can find Artificial Intelligence (AI). In Lanzarote, a pioneering endeavor has taken place, introducing AI to the tourism experience. To some extent, and according to IBM Spain, Lanzarote has been a lead user of the new AI systems applied to tourism (in the words of Elisa Martín-Garijo, Chief Technological Officer of IBM Spain). The objective of this article is three-fold. Firstly, it aims to describe how digital transformation in the tourism sector, empowered by AI systems, can play a key role in safeguarding the maintenance and future growth of the industry. To do so, we use the case of CACT (Centers of Arts, Culture and Tourism). Secondly, this article seeks to shed light on how digital transformation and the application of IT systems to customer experience and processes of a mature industry can generate economic externalities. This fosters the development of new, successful startups (in this case, Red Skios). Thirdly, the example shows how advanced technologies such as AI, in combination with open innovation and customer-driven insights, can improve innovation in very mature industries, as is the case of tourism.

At a national (Spanish) level, the impact of the crisis on the tourism sector has been relatively moderate, since its beginnings in 2008 (Torres, Sala & Farré, 2014). The tourism sector has continued to generate income and employment during the most difficult times (Altimira & Muñoz, 2007). Therefore, valuing the quality of tourism services by customers is key to maintaining this engine of economic development. Although quality certifications are a good indicator (until recently tourist establishments demonstrated the quality of their services through quality certifications, such as ISO 9000), customer information stemming from digital sources is growing in weight as an index of quality (Fuentes *et al.*, 2015). Clients consult opinion sites (TripAdvisor, HolidayCheck or Booking.com) while deciding on accommodation, restaurants or things to do once at their destination. Nowadays, we can see quality certificates issued by digital platforms, such as those mentioned above, on the websites of an increasing number of tourist establishments. Through an intermediate digital platform, customers now certify the quality of the services provided, thereby displacing professional quality certification.

In addition, technological innovation, competitiveness and communication have gained traction in tourism strategies (Martorell & Mulet, 2009; Melián & Bulchand. 2015), facilitating the attention of the tourist customers, who themselves are immersed in the technological revolution (Álvarez-García, Fraiz & Del Río, 2012). The current challenges facing tourism are accommodation supply, communication channels and sustainability criteria, among others. Many of them are focused on achieving social benefits, inclusive development, and environmental conservation, as pointed out by the Secretary General of the World Tourism Organization. At the European level, there is a clear interest in promoting smart tourism. For this reason, the European Commission has created an initiative (a European Award) with the following aims: to promote the tourist offering of European countries; increase the willingness of citizens to share local values related to tourism; strengthen innovative development generated by tourism in cities, surrounding areas and regions; increase the attractiveness of the European cities which receive the award; and strengthen economic growth and create jobs. The initiative envisions awarding the title of European Capital of Smart Tourism, recognizing outstanding achievements in the categories of sustainability, accessibility, and digitalization, in addition to the cultural heritage and creativity of urban European destinations. It is anticipated that the award ceremony will be held in November 2018 in Brussels. This initiative complements other political actions and initiatives by the EU in the tourism sector (more information at <http://smarttourismcapital.eu/>).

Lanzarote, one of the Canary Islands, is a clear example of the revolution in the industry, with its complete commitment to the quality of the tourism experience, along with technological innovation. Tourism is thereby blossoming in Lanzarote with an increase in foreign tourism demand of 4% in 2015 and an increase in accommodation in the last decade of 37%, according to sources from the Canary Islands Institute of Statistics (ISTAC). There was an influx of visitors to the Centers of Art, Culture and Tourism during 2016, which was 17% higher than the previous year. The number of tourists visiting Lanzarote has increased by 51% since 2010 (Table 1), with 1,334,470 tourists coming from the United Kingdom, 439,609 from Germany and 242,521 from Ireland.

Table 1. Tourism evolution in Lanzarote (ISTAC)

Year	Number of Tourists
2010	1.929.531
2011	2.169.762
2012	2.114.664
2013	2.294.138
2014	2.532.886
2015	2.640.862
2016	2.915.727

In the Canary Islands, and especially in Lanzarote, the authorities are working towards building a knowledge-intensive tourism model, aligning public and private capacities with social support, consistent with the economic, social and environmental model (Hernández-Martín, 2016a). Public policies favor smart destinations, as in the case of Lanzarote, where the City Council has opted for the technological revolution in order to adequately address the international tourist market: with digital transformation to improve competitiveness, meet the needs of the industry, and launch higher value-added services.

Tourism in Lanzarote is supported by the Centers of Art, Culture and Tourism (CACT), which are public entities located in strategic places of the island. They manage and support tourists' experiences with the aim of increasing their level of satisfaction. Specifically, we highlight 9 CACTs: *Mirador del Río*, *Cueva de los Verdes*, *Jameos del Agua*, *Jardín de Cactus*, *Museo Internacional de Arte Contemporáneo*, *Monumento al Campesino*, *Montañas del Fuego-Timanfaya*, *La Casa Amarilla*, and *Museo Atlántico*; centers which are embedded in the volcanic nature of the island. The aim of the CACTs is to enable visitors to get to know 'the true essence of Lanzarote'. They are centers that are based on the works and life of the local artist César Manrique. Using the island's balanced combination of art and nature, and a model of sustainability, the artist helped Lanzarote to be recognized as a Biosphere Reserve by UNESCO in 1993. The nine CACTs are a model of international tourism that is preserved thanks to the environmental awareness evident in their promotion, which satisfies the visiting client with a positive experience.

César Manrique (1919-1992), an artist born in Arrecife (the capital of Lanzarote) is the main reference in the history of the CACTs, and has been a fundamental point of reference for the revitalization of this sector. His creativity and visual culture have been a triggering factor for tourist development in the region. In 1966, César Manrique returned from New York to settle permanently in Lanzarote and began promoting tourist development of the island. His actions mainly focused on public projects (lookouts, gardens, and coastal reforms) to safeguard the natural and cultural heritage, thus respecting the natural environment with an integrated strategy aligned with local traditional architecture and other modern conceptions. As indicated by the CEO of the municipal tourist service company, Mr. José Juan Lorenzo: "the project of the island conceived by the artist César Manrique has catapulted Lanzarote in an important way to the tourism world."

According to the Global Impact Model (Deloitte, 2016), the CACTs have contributed to Lanzarote through building several kinds of capital: social capital (50% of schools in Lanzarote benefited from free guided school visits to CACTs); economic capital (contributing to the generation of wealth and employment in the region); relational capital (through the Lanzarote Foreign Promotion Society - SPEL – the main tourism promotion body on the island that creates and strengthens an international network of agents relevant to the development of its activity and the promotion of the territory); organizational capital (CACTs contribute to operational excellence by maintaining quality parameters

in the provision of services with 4 certifications of quality management: ISO 14001, ISO 9001, OSHAS 18001 and SICTED); technological capital (incorporating innovative technological tools to create value for the organization and its stakeholders – they have been pioneers in the use of IBM Watson artificial intelligence technology); environmental capital (working to promote, disseminate, preserve and value the nature and biodiversity of the island – they have incorporated 5 electric vehicles – and protect and preserve the endangered *jameito* species, two annelids and 11 crustaceans in the *Jameos del Agua* park); and reputational capital (they project and promote the territory by giving visibility and helping to position the island as a destination of sustainable tourism – the Atlantic museum was created in 2015: the first underwater museum in Europe). Some significant data of the activities generated by CACTs are: 44% of the tourists who visited Lanzarote visited CACTs; the CACT website received 148,333 visits in 2015, 62% more than in 2014; and CACTs have generated €186.7 million of annual expenditure in the Canary Islands (mainly Lanzarote), which represents €231 million of GDP, along with the creation and maintenance of 6,624 jobs.

DIGITIZATION IN TOURISM

Tourism is a key sector in the world economy (Aramendia & Ollo, 2013), and is a strategic industry that has a decisive impact not only on the Canary Islands, but also on the whole of the Spanish economy (Cuadrado-Roura & Morales, 2015) (<http://www.caixabankresearch.com>). Over the last few years, information and communication technology has transformed tourism at an international level, and offers the possibility of innovating in order to ensure the sector's competitiveness and growth (Aramendia & Ollo, 2013). To maintain its competitive edge, continuous innovation is a must in order to ensure and maintain customer satisfaction. Customer satisfaction in a particular tourist destination depends on the perceived image, which in turn is the result of prior knowledge and experience of the destination (whether it responds to the customer's needs, motivations, and preferences, among other personal characteristics) (Beerli & Martin, 2004). Having a satisfactory travel experience is the result of a perceived image of the destination which, if positive, increases the level of tourist satisfaction. This situation occurs when the information coming from the traveler's actual experience is greater than the information, which can be found in other existing sources (Mazursky, 1989).

Likewise, some characteristics such as age, gender, education and professional experience, or social class can influence the choice of travel destination, as argued in some theoretical frameworks (Woodside & Lysonski, 1989; Stabler, 1995). In research conducted by Walmsley & Jenkins (1993b), which analyzed the emotions generated by the tourists in different destinations of Australia, the authors found differences according to the age and gender of the tourist. While concurring, Baloglu & McCleary (1999) additionally found that along with age, the level of education of the tourist also influences the image perceived by the tourist in different destinations. Studying the perception of Pennsylvania as a rural destination, Chen and Kerstetter (1999) concluded that the gender and family status of tourists also played a role in influencing the perceived image significantly. Pearce (1982), however, argues that social class is a deciding factor when choosing a destination. Finally, Sirgy & Su (2000) consider that the perception of a set of users with similar characteristics can influence the choices made by a person with the same characteristics, and the level of satisfaction obtained.

Various studies maintain that the tourist's perception of a visit is a consequence of the impact technology may have on the tourist (Neuhofer et al., 2014), as well as the meaning and final experience entailed (Wang et al., 2012). 85% of international travelers use some kind of mobile device during their trip, such as an iPod, tablet or smart phone, and 97% of users of mobile devices share photos while participating in tourist activities on social networks such as Instagram, Facebook and Twitter. These digital tools contribute to travelers feeling more satisfied both with their travel experience, and with their experience of life in general (Harris, 2017). Mobile technologies contribute to the co-creation of content that improves tourist learning and experience. In this context, the development of web tools, applications, and in general technological innovation, plays a fundamental role for the success of the

tourism experience and therefore, of the tourism industry's competitiveness. In this sense, more and more mobile technologies are used to provide tourism services (Canadi, Hopken & Fuchs, 2010). This new concept called digital travel helps to organize travel plans and share meaningful and important experiences with other travellers with similar profiles (Nichols, 2017; Yang, Hlee, Lee & Koo, 2017).

The use of ICT applied to tourism could have an impact on the globalization of the tourist industry, affecting travel agencies, tour operators, hotels and restaurants. Therefore, the use of ICT has the potential to turn local markets into global ones, and in times of crisis companies can have improved prospects of surviving and improving their market position, especially in tourism, where the number of competitors increases by the day (Aramendia & Ollo, 2013). Getting around an unknown destination, learning more about a point of interest, or being able to choose the best establishments to satisfy the needs of the tourist are some of the features of smartphones (Dickinson, Ghali, Cherrett, Speed, Davies & Norgate, 2014). Smartphones allow tourists to communicate with peers who are not traveling and "transport people to other social environments" (Humphreys, 2010). As pointed out by Germann and Paris (2015), travellers can use their smartphone to share their experiences in real time, leading to increased comfort and satisfaction. Therefore, sharing the travel experience is no longer limited to the post-trip stage; it can also be performed instantaneously and in the present place (Wang, DanLi & Li, 2014). In conclusion, being able to share experiences with peers in real time leads to increased levels of tourist satisfaction.

The immediate feedback of the tourist experience generates an array of positive feelings that contribute to increasing satisfaction. In this sense it is common for tourists to use WhatsApp or Facebook when they travel (Wang, DanLi & Li, 2014). This responds to the human need for interaction, allowing tourists to feel close to their peers (Wang, Jin & Zhou, 2012, pp.372-373) despite considerable physical distances (Höflich, 2006). Additionally, such contact can provide new interpretations to complete their perception. Wang et al. (2014) have identified 25 uses of smartphones and have categorized them into four dimensions: communication, entertainment, facilitation, and information search.

ICTs impact on the competitiveness of a company or organization, optimize their productivity, increase their market share and enable them to face innovation processes effectively. However, these factors are affected to a greater or lesser degree, depending on the economic subsector. While ICT has a high impact on the subsectors of accommodation and gastronomy, in the subsector of travel agencies ICT seems to foster an increase in market share and innovation, but has a negative impact on competitiveness and productivity (Aramendia & Ollo, 2013).

Although this field of investigation (the impact of smartphones on the tourist experience) is relatively new (Lee, Lee & Ham, 2014) the underlying processes that contribute to or reshape user experiences have not been sufficiently researched (Wang, Xiang & Fesenmaier, 2016, pp. 52). Although some studies have found that the use of mobile devices in the tourism industry improves tourist experience and tourist satisfaction (Lee, Lee & Ham, 2014), much remains to be researched in terms of the impact of smartphone, social networks and digitization in the holistic customer experience of the tourist.

SMART TOURISM, A REVOLUTION IN A MATURE INDUSTRY

The review of literature on this subject shows that, thanks to digitization, the tourism sector is taking a new direction that will have a decisive impact on destinations, public bodies' policies, and companies' strategies in tourism services. A new paradigm, the so-called 'smart tourism', is emerging (Li, Hu, Huang & Duan, 2017). With technological change, the role of the tour guide (critical, so far, in the sector) is being replaced by new digital services and applications. The increase in mobile telephony has facilitated the provision of real-time tourist apps that are used as reference guides within the tourism ecosystem. The 'smart' concept is of growing interest in tourist destinations, as it is being widely recognized as playing a transformative role using ICT. Specific technologies like the Internet

of Things (IoT) and Cloud Computing will act as providers of tools and platforms to facilitate the dissemination of information and knowledge among stakeholders within the tourism ecosystem, to innovate and improve customer experience and management efficiency (Del Chiappa & Baggio, 2015; Pichler, 2016).

Yet big data and artificial intelligence are the new frontiers for smart tourism: processing large amount of data generated by tourists to facilitate a better experience is required to achieve a new competitive position, in the face of global competition. Artificial intelligence is composed of a set of technologies capable of a) sensing external information, b) understanding this information, c) acting in turn to achieve given goals, and d) learning from its own experience. Artificial intelligence has experienced an acceleration over the last few years due to the progress in computational power (microprocessors' speed and capacity), machine learning (the ability of computers to test their outputs, accumulate information and learn from their results), deep learning (electronic neural networks that simulate the brain connections), artificial vision (to ability to process images), and voice and speech recognition (the ability to understand words spoken in a natural voice, and to understand the meaning of these words). In tourism, an efficient analysis of large amounts of customer data, and voice interaction with the user using artificial intelligence, may change the rules of the game. Increasing cloud computing capabilities, and connecting different sensors in physical environments to generate and process data, definitely create a better tourist experience holistically, and are indeed generating unprecedented changes in this industry (Pichler, 2016). 'Smart tourism' has been disrupting the value chain and forcing companies within the sector to rethink their internal and external functioning, to clearly define 'smart destinations' for each client, with informed, exclusive and personalized customer experiences. A wide variety of tourism resources are managed through different end user devices (Wang, Jin & Zhou, 2012), which may also be integrated with superior digital intelligence. The concept of 'smart destination' is one of the emerging strategic tools that fuels innovation through advanced technology and lets the sustainable development of tourist areas (López de Ávila, 2015) create the opportune tourism ecosystem (Gretzel, Koo, Sigala & Xiang, 2015).

Smart destinations combine large volumes of data along with opportunities and challenges for tourism agents, but little is known in the academic literature about the impact of the state-of-the-art digital technologies within the tourism industry. Much research has still to be done to understand how to achieve greater competitiveness in this decisive sector (Shafiee, & Ghatari, 2016). Customer experience is being improved or transformed by digital technologies in many industries (Hirt & Willmott, 2014). Tourism does not escape the effect of technological change. The use of advanced digital tools improves the satisfaction of the tourism experience. In conclusion, smart tourism, through ICT, social networks, and next-generation data processing is changing the way of traveling, responding to demands between a leisure society, and a high degree of economic and work competitiveness.

APP CACT LANZAROTE: HOW OPEN INNOVATION IS COMBINED WITH ARTIFICIAL INTELLIGENCE

Lanzarote's public tourism company understood in 2015 that the tourism sector had to structure the information coming from the tourist, so that the leisure offering would fit with the tourist's profile. The authorities of Lanzarote decided that they could offer a radically innovative proposal of intelligent tourism through artificial intelligence, by partnering with an external provider, and selecting IBM's Watson in the process. Watson is a question-answering computing system, able to understand natural language (spoken by a human voice), process the information, access external databases, give a response (in natural language), and learn from itself, becoming more accurate and efficient in its responses in pursuit of a given goal (for instance: maximizing customer satisfaction in a given process). The process of learning of the system is called "training", and to do so it must be fed with data. This system became internationally famous in 2011, when it defeated the two world champions in a real-time TV contest ("Jeopardy"). It was a contest based on riddles, where the machine and the

humans had to solve ambiguous and incomplete clues. The machine showed human-like cognitive abilities: understanding and properly answering the questions formulated by the human host of the competition. The applications of Watson in customer care in the tourism industry are immediate: an artificial intelligence tool like Watson can manage data on personal characteristics of the tourist, and cross it with other data collected from the tourist's social networks as well as data coming from groups of similar individuals. The system acts as a virtual smart guide to propose options that contribute to improving the image and level of satisfaction of the customer, interacting in a natural voice.

In March 2016, IBM and the Centers of Art, Culture and Tourism (CACT) of Lanzarote launched an international hackathon (over three days), which was carried out in the auditorium of Jameos del Agua. The aim was to select a star to develop an app with Watson to better suit the needs of tourists during their stay. The word "hackathon" comes from "hacker" and "marathon". It is a mix between a congress and a software competition, where highly skilled teams meet to face a challenge posed by sponsors, usually related to some customer "pain point". Hackathons are recognized as best practice tools for digital innovation. They are examples of open innovation processes conducted by civic organizations (Almirall, Lee & Majchrzak, 2014). The term "open innovation" was coined by Henry Chesbrough (2003), to define a new model of innovation in which organizations draw on research and development that lies outside their own boundaries. Lanzarote's authorities followed an open innovation approach to find the best solution that could address and impact the tourism strategy of the island, using Watson.

A specific website was made for managing the hackathon. 11 companies participated in the competition. A week later, the jury ruled positively in favor of the startup Red Skios, which obtained a contract of €30,000 to develop the App "CACT Lanzarote." In October 2016 the app "CACT Lanzarote" was presented to the specialized press and its use in the tourism sector began. In November 2016 this project was named as one of the most innovative projects of the year by *Expansión*, the leading economic newspaper in Spain. According to *Expansión*, the app was aligned with the digital transformation of the tourism sector through open innovation principles, at a moment when there was a swarm of new applications arising in the tourism industry fueled by new digital technologies (smart peepholes, voice recognition system for home assistance, pricing systems to compare trip offers, etc.).

The app was a virtual, artificial intelligence-powered tourism assistant. Among all the other possibilities, Lanzarote's tourism authorities decided that smart, automated virtual guides could be of critical importance. The virtual guide knows the potential expectations of the client through the data processing of their personal profile and the accumulated experience for similar profiles. It can interact with the client through the human-like cognitive abilities of Watson (like voice recognition and synthesis). According to José Juan Lorenzo "if we can talk with an application, everything changes in the customer experience, and we did it through an open innovation approach, with a public and transparent process open to any company, and with a total cost of €60,000 (€30,000 to develop the app in three months and another €30,000 for the logistics of the event".

The "CACT Lanzarote" app lets customers interact (through a natural voice) with the virtual assistant, which responds to their questions thanks to a cognitive system, adapting the preferences of each client to achieve a high degree of satisfaction. Each customer improves the system, adding more data and experience to the artificial intelligence algorithm. As tourists visit the different centers, they receive accurate information according to their location and their preferences through the digital assistant. The app allows users to plan their stay on the island and answers their immediate questions. These kind of apps change and personalize the tourism experience through collaboration between people and technology, and "can generate new different jobs and services" as indicated by the CEO José Juan Lorenzo, as well as improving the territorial brand, bringing Lanzarote closer to a smart island in the tourism sector.

A similar case of cognitive smart tourism has been put in place in Orlando, which in the same line triggered the application "Visit Orlando", developed by the company Wayblazer using the same IBM artificial intelligence technology. This application offers the tourist personalized recommendations

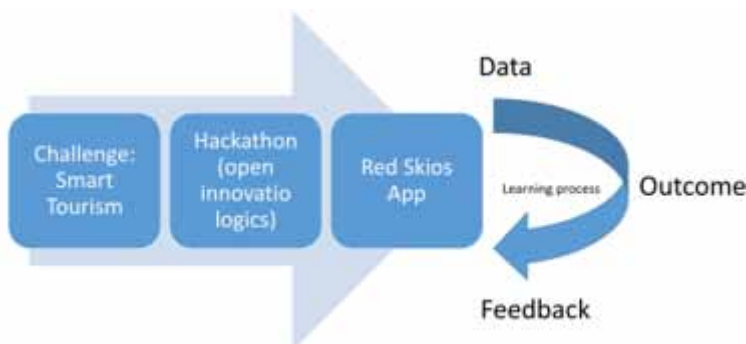
according to their needs and interests, since it obtains information from their profile on social networks. It infers their interests according to the previous searches that the tourist has carried out in the application. The application even has a Pokémon-style augmented reality game where users can collect “magic orbs,” colorful circles marked with the “Visit Orlando” logo, throughout the region. When collecting orbs, players receive discounts at various member destinations: they can also participate in sweepstakes sponsored by the “Visit Orlando” app.

ENHANCING CUSTOMER EXPERIENCE THROUGH TECHNOLOGY

The Canary Islands have become a pioneer site in having an emblematic cognitive tourism application. The application includes natural language through the combination of artificial intelligence and ‘beacon’ technology (small devices that emit short wave signals through Bluetooth technology). 140 beacon devices are deployed in the nine CACT centers, allowing uninterrupted communication with users. They make it possible to visit the volcanic caves or museums and receive information from each room that is visited through the Red Skios software, called Eliza Tourism, again powered by Watson IBM. Eliza Tourism is an innovative, cognitive technological solution directed towards the global tourism sector. The platform allows public-private-society cooperation agreements, management of collaborative content, third-party developers with API support, and extensibility to others platforms, which are updated continually, keeping it at the forefront of digital tourism innovation. It offers a digital revolution of the sector through a mobile application that allows the visitor to personalize their trip according to their tastes, preferences, time, and areas of activity, thus compiling a cognitive profile of the visitor. Through geolocalization, segmentation and classification of users, it offers recommendations and customizable content at specific interactive points using GPS, beacons, push notifications and travel planning options. This complete, integrated platform provides a mobile application that shows all types of content managed by a web application (back office). It improves business efficiency by incorporating the possibilities of e-commerce 24/7, using automatic internal and external information flows. Furthermore, the system feedback is based on the analysis of its own data, which enables the cognitive technology of artificial intelligence to generate automatic learning through an analysis of macro data.

Interpreting natural language, the software responds to visitors’ questions. The application is totally customizable too; it goes in depth into the personal interests of each client (e.g. architecture, music, nature, history), thereby creating a unique experience for each user. The user qualifies the answers and, in case of not being useful, the answer is redirected to the staff of the Tourism Department of the Lanzarote City Council (integrated by tourism graduates) that feeds Watson to learn tighter answers, thus being available again for future questions. In addition, there is an aggregated control

Figure 1. Process summary



system: the application, by means of a 'heat map,' has its tourists located to assess the areas in which they are concentrated. It also identifies groups of tourists with different profiles and complements the tourist experience with attractive offerings for each type of customer. For example, if the tourist is accompanied by children, the system suggests where there are attractions for children. 'Eliza Tourism' is a feedback system with past customer feelings. It accumulates data to manage in subsequent campaigns, learning from its own experience. Complementarily, this technology has contributed to the reinforcement of the digital ecosystem, through the deployment of large capacity Wi-Fi routers in different areas of the island. The system is considered by the authorities as an innovative and revolutionary application that corresponds to the category of 'cognitive'. It enables visitors to navigate and discover the nine CACTs of Lanzarote, ask for information, and plan and organize their holidays on the island: in short, to experience a more satisfying, rich and personalized touristic experience.

Operating the application, (available for iOS and Android), is simple: while downloading the app, the tourist must complete a short profile indicating their hobbies and interests (ranging from food preferences, family composition, to hobbies or sports), which IBM's artificial intelligence uses to plan and customize their travels by the nine tourist centers of Lanzarote that already have this technology. The system's natural language abilities allow the mobile application to initiate a conversation with the visitor, with infinite possibilities (like a human conversation among peers), depending on the concerns, knowledge, experiences, needs, or preferences of the visitor, always from a non-intrusive perspective. The conversation can be extended without theoretical limits. So, for example, if the visitor is an architect, during the visit to Jameos, the system will highlight and present the intervention carried out by César Manrique in the center; while if the visitor is a biologist, the algorithm will highlight the rare species of crabs that populate this habitat, and which are unique in the world. And thanks to IBM's cognitive technology, which learns from interaction with humans, the visitor can propose any possible question in natural language - "where you can eat around here?" or "who painted this painting?" - the app responds automatically or, in the case of not having the answer, it is addressed to a tourist service center (which will feed Watson with the answer for further questions). "Cognitive systems will work as consultants with capacity for dialogue with tourists, support them and make them enjoy the tourist environment based on their preferences, and even address their concerns," says Ms. Elisa Martín Garijo, Head of Technology and Innovation at IBM Spain. For her, "cognitive technology will enrich as ever the interaction of the tourist with the tourist destination where it is, so that the visitor lives a much more gratifying experience." Mr. Pedro San Ginés, President of the Cabildo (the island's top political body) recognized the role played by CACT, IBM and Red Skios who "have designed an application that places the island at the forefront of the tourism industry and makes us more competitive against other destinations." San Ginés highlighted the benefits of this tool as being "useful, simple and modern that, surely, will make the visit to the Centers an unforgettable experience." The application, pioneer in the world, collects a lot of information about the visitors, which is useful to enrich and adapt the tourist offer of the island. The possibility of exploiting all that big data and attracting more visitors encouraged the head of the CACT to bet on the application. "Our goal was to improve the visitor experience and, for the first time, a technology was ready to face the challenges of the sector." A competition has recently been launched to improve the usability of the app. Currently it is downloaded on average by 60 people per day, although it interacts moderately, since talking with a mobile device is not common in all target audiences of the tourism sector.

CONCLUSION

Currently, digital transformation is present in the tourism sector; and this change, which has already begun, seems unstoppable in the sector. ICTs are increasingly linked to the tourist experience, such as search tools, new distribution channels, or social platforms, to make intelligent decisions (Buhalis & O'Connor, 2005). It is possible to increase tourist satisfaction by offering a set of activities and experiences according to their personal characteristics and motivations, thus increasing the emotional

component of the experience, as suggested by scientific research (Baloglu & McCleary, 1999; Beerli & Martin, 2004). Smartphones have also transformed tourist experiences. A good understanding of how the use of mobile phones/smartphones affects tourist experiences is fundamental, since their use has increased in recent years and is related to a higher level of satisfaction on the part of the tourist. Yet the Lanzarote case shows us how the combination of cutting-edge digital technologies (namely: smartphones, voice recognition, big data and artificial intelligence) can transform the customer experience paradigm in an automated and cost-affordable manner, making digitization reach every tourist on the island, including even low-profile visitors. We have analyzed a case that shows how cutting-edge technologies can be used to improve customer satisfaction in a very mature industry. Tourism is a mature industry susceptible to disruption by digital technologies. Also, Lanzarote has been an outstanding case of open innovation and public bodies, as innovation leads users through a public-driven initiative. Finally, while the app has been created specifically for CACT Lanzarote, the aim of the startup Red Skios is to grow and bring its technology to other cities and institutions. Lanzarote has let Red Skios experiment and foolproof its technology. The case also documents how the interaction of high technology and open, civic innovation in a mature industry fosters innovation and new venture development. Lanzarote has been a lab for innovation, which might become a best practice and a source of inspiration for others. “The application is a white label. The CACT of Lanzarote is our first customer, but our intention is to extend it to other places,” says the CEO of Red Skios, Mr. De Córdoba.

REFERENCES

- Almirall, E., Lee, M., & Majchrzak, A. (2014). Open innovation requires integrated competition-community ecosystems: Lessons learned from civic open innovation. *Business Horizons*, 57(3), 391–400. doi:10.1016/j.bushor.2013.12.009
- Altimira Vega, R., & Muñoz Vivas, X. (2007). El turismo como motor de crecimiento económico. *Anuario Jurídico y Económico Escorialense*, 1(1), 677–710.
- Álvarez-García, J., Fraiz Brea, J. A., & Del Río Rama, M. C. (2012). Grado de utilización de las herramientas de calidad en el sector de alojamiento turístico español. *Revista de Turismo y Patrimonio Cultural*, 10(5), 495–510. doi:10.25145/j.pasos.2012.10.065
- Aramendia-Muneta, M. E., & Ollo-Lopez, A. (2013). ICT impact on tourism industry. *International Journal of Management Cases*, 15(2), 87–98.
- Baloglu, S., & McCleary, K. W. (1999). A model of destination image formation. *Annals of Tourism Research*, 26(4), 868–897. doi:10.1016/S0160-7383(99)00030-4
- Beerli, A., & Martín, J. D. (2004). Tourists' characteristics and the perceived image of tourist destinations: A quantitative analysis - A case study of Lanzarote, Spain. *Tourism Management*, 25(5), 623–636. doi:10.1016/j.tourman.2003.06.004
- Buhalis, D., & O'Connor, P. (2005). Information Communication Technology Revolutionizing Tourism. *Tourism Recreation Research*, 30(3), 7–16. doi:10.1080/02508281.2005.11081482
- Canadi, M., Hopken, W., & Fuchs, M. (2010). Application of QR codes in online travel distribution. In U. Gretzel, R. Law, & M. Fuchs (Eds.), *Information and Communication Technologies in Tourism 2010* (pp. 137–148). Academic Press. doi:10.1007/978-3-211-99407-8_12
- Chen, P. J., & Kerstetter, D. L. (1999). International Students' Image of Rural Pennsylvania as a Travel Destination. *Journal of Travel Research*, 37(3), 256–266. doi:10.1177/004728759903700307
- Chesbrough, H. (2003). Open innovation: a new paradigm for understanding industrial innovation. *Open innovation: Researching a new paradigm*, 400, 0-19. Oxford. Oxford University Press.
- Cuadrado-Roura, J.R. & Morales, L. (2015). El turismo, motor del crecimiento y de la recuperación de la economía española. Instituto Universitario de Análisis Económico y Social.
- Del Chiappa, G., & Baggio, R. (2015). Knowledge transfer in smart tourism destinations: Analyzing the effects of a network structure. *Journal of Destination Marketing & Management*, 4(3), 145–150. doi:10.1016/j.jdmm.2015.02.001
- Deloitte. (2016). The Global Impact Model: Report. London: Deloitte.
- Dickinson, J. E., Ghali, K., Cherrett, T., Speed, C., Davies, N., & Norgate, S. (2014). Tourism and the smartphone app: Capabilities, emerging practice and scope in the travel domain. *Current Issues in Tourism*, 17(1), 84–101. doi:10.1080/13683500.2012.718323
- Fatima, R., Zarrin, I., Qadeer, M. A., & Umar, M. S. (2016). Mobile travel guide using image recognition and GPS/Geo tagging: A smart way to travel. *IFIP International Conference on Wireless and Optical Communications Networks*. Academic Press.
- Fuentes, R., Moreno-Gil, S., León González, C., & Brent Ritchie, J. R. (2015). La creación y promoción de experiencias en un destino turístico. Un análisis de la investigación y necesidades de actuación. *Cuadernos de Turismo*, (35): 71. doi:10.6018/turismo.35.221511
- Germann Molz, J., & Paris, C. M. (2015). The Social Affordances of Flashpacking: Exploring the Mobility Nexus of Travel and Communication. *Mobilities*, 10(2), 173–192. doi:10.1080/17450101.2013.848605
- Gretzel, U., & Jamal, T. (2009). Conceptualizing the Creative Tourist Class: Technology, Mobility, and Tourism Experiences. *Tourism Analysis*, 14(4), 471–481. doi:10.3727/108354209X12596287114219
- Gretzel, U., Koo, C., Sigala, M., & Xiang, Z. (2015). Special issue on smart tourism: Convergence of information technologies, experiences, and theories. *Electronic Markets*, 25(3), 175–177. doi:10.1007/s12525-015-0194-x

- Harris, P. (2017). *Digital trends that are transforming the travel industry in 2017*. Huffington Post. Retrieved from https://www.huffingtonpost.com/entry/digital-trends-that-are-transforming-the-travelindustry_us_58c6cc3ae4b0c3276fb78790
- Hernández-Martín, R. (2016a). El empleo en los microdestinos turísticos de Canarias. *Revista Digital Canarias Emplea*, 6, 45–57.
- Hernández-Martín, R. (2016b). Metodología, fuentes y enfoques para el análisis del empleo turístico en Canarias. *Revista Digital Canarias Emplea*, 6, 105–114.
- Hirt, M., & Willmott, P. (2014). Strategic principles for competing in the digital age. *The McKinsey Quarterly*, 5(1).
- Höflich, J. R. (2006). The mobile phone and the dynamic between private and public communication: Results of an international exploratory study. *Knowledge, Technology & Policy*, 19(2), 58–68. doi:10.1007/s12130-006-1024-4
- Humphreys, L. (2010). Mobile social networks and urban public space. *New Media & Society*, 12(5), 763–778. doi:10.1177/1461444809349578
- Lee, K., Lee, H. R., & Ham, S. (2014). The effects of presence induced by smartphone applications on tourism: application to cultural heritage attractions. In Z. Xiang & I. Tussyadiah (Eds.), *Information and Communication Technologies in Tourism 2014* (pp. 52–72). Switzerland: Springer.
- Li, Y., Hu, C., Huang, C., & Duan, L. (2017). The concept of smart tourism in the context of tourism information services. *Tourism Management*, 58, 293–300. doi:10.1016/j.tourman.2016.03.014
- López de Ávila, A. (2015). Smart destinations: XXI Century Tourism. En ENTER2015 Conference on Information and Communication Technologies in Tourism. Lugano, Switzerland.
- Martorell Cunill, O., & Mulet Forteza, C. (2009). *Las empresas hoteleras. La actividad turística española en 2008*. Asociación Española de Expertos Científicos en Turismo.
- Mazursky, D. (1989). Past experience and future tourism decisions. *Annals of Tourism Research*, 16(3), 333–344. doi:10.1016/0160-7383(89)90048-0
- Melián González, S., & Bulchand Gidumal, J. (2015). Competencias requeridas por el nuevo trabajo en turismo. *Revista Investigaciones Turísticas*, 10(10), 76–89.
- Neuhofer, B., Buhalis, D., & Ladkin, A. (2013). Co-creation Through Technology: Dimensions of Social Connectedness. In *Information and Communication Technologies in Tourism 2014* (pp. 339–352). Cham: Springer International Publishing. doi:10.1007/978-3-319-03973-2_25
- Nichols, J. (2017). *Seven mobile marketing opportunities for the travel industry*. Retrieved from <https://www.forbes.com/sites/forbescommunicationscouncil/2017/02/10/seven-mobilemarketing-opportunities-for-the-travel-industry/#34cf650860d6>
- Pearce, P. L. (1982). Perceived changes in holiday destinations. *Annals of Tourism Research*, 9(2), 145–164. doi:10.1016/0160-7383(82)90044-5
- Pichler, M. (2016). Cognitive computing and big linked data as next steps for Big Data in Tourism? Position statement. *IFITT Workshop on Big Data & Business Intelligence in the Travel & Tourism Domain*. Academic Press.
- Shafiee, S., & Ghatari, A. R. (2016). Big data in tourism industry. *Proceedings of the 2016 10th International Conference on e-Commerce in Developing Countries: with focus on e-Tourism (ECDCE)*. Academic Press.
- Sirgy, M. J., & Su, C. (2000). Destination Image, Self-Congruity, and Travel Behavior: Toward an Integrative Model. *Journal of Travel Research*, 38(4), 340–352. doi:10.1177/004728750003800402
- Stabler, M. (1995). The Image of Destination Regions: Theoretical and Empirical Aspects. Marketing in the Tourism Industry: The Promotion of Destination Regions (pp. 133-159). Academic Press.
- Torres, T., Sala, M., & Farré, M. (2014). La demanda turística de la economía española: Caracterización cíclica y sincronización. *Cuadernos de Turismo*, 33(33), 335–356.
- Um, S., & Crompton, J. L. (1990). Attitude determinants in tourism destination choice. *Annals of Tourism Research*, 17(3), 432–448. doi:10.1016/0160-7383(90)90008-F

- Walmsley, D. J., & Jenkins, J. M. (1992a). Cognitive Distance: A Neglected Issue in Travel Behavior. *Journal of Travel Research*, 31(1), 24–29. doi:10.1177/004728759203100106
- Walmsley, D. J., & Jenkins, J. M. (1992b). Tourism cognitive mapping of unfamiliar environments. *Annals of Tourism Research*, 19(2), 268–286. doi:10.1016/0160-7383(92)90081-Y
- Wang, D., Xiang, Z., & Fesenmaier, D. R. (2016). Smartphone use in everyday life and travel. *Journal of Travel Research*, 55(1), 52–63. doi:10.1177/0047287514535847
- Wang, H., Jin, T., & Zhou, B. (2012). *Smart tourism* (pp. 10–12). Beijing: Tsinghua University Press.
- Wang, DanLi, X. & Li, Y. (2014). China’s “smart tourism destination” initiative: A taste of the service-dominant logic. *Journal of Destination Marketing and Management*, 2(2), 59-61.
- Woodside, A. G., & Lysonski, S. (1989). A General Model of Traveler Destination Choice. *Journal of Travel Research*, 27(4), 8–14. doi:10.1177/004728758902700402
- Yang, S. B., Hlee, S., Lee, J., & Koo, C. (2017). An empirical examination of online restaurant reviews on Yelp.com: A dualcoding theory perspective. *International Journal of Contemporary Hospitality Management*, 29(2), 817–839. doi:10.1108/IJCHM-11-2015-0643