DESIGN OF AN INFORMATION SYSTEM TO IMPULSE A PROCESS OF TRANSFORMATION INTO A SMART TOURISM DESTINATION

Diseño de un Sistema de Información para Impulsar un Proceso de Transformación en un Destino Turístico Inteligente

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ABSTRACT

Planning for the transformation of a destination into a smart tourist destination must consider the use of state-of-the-art technology as an essential requirement. This article describes how to use technology to drive the process of transforming Costa Rica's La Fortuna destination into a smart tourist destination. The methodology was assumed through a multimethod design in which a case study was developed in La Fortuna destination in collaboration with the Arenal Cámara de Turismo y Comercio. Therefore, it was possible to determine and characterize the technologies used in the main smart tourist destinations, the Swot analysis factor of La Fortuna tourist destination with the greatest applicability of technologies and the design of an information system for La Fortuna. These results can be used as a reference point by other tourist destinations with similar characteristics to La Fortuna and that wish to start the process of transformation into a smart tourist destination.

KEYWORDS

Tourism; Smart Tourism Destination; Technology; Information System; La Fortuna, Costa Rica.

RESUMEN

La planificación para la transformación de un destino en un destino turístico inteligente debe contemplar el uso de tecnología de punta como un requerimiento esencial. Este artículo describe, cómo emplear la tecnología para impulsar el proceso de transformación del destino La Fortuna de Costa Rica en un destino turístico inteligente. La metodología fue asumido a través de un diseño multimetódico en colaboración de la Arenal Cámara de Turismo y Comercio. Por lo que, se logró determinar las tecnologías utilizadas en los principales destinos turísticos inteligentes, el factor del análisis FODA del destino turístico La Fortuna con mayor aplicabilidad de tecnologías y el diseño de un sistema de información para La Fortuna. Estos resultados pueden ser utilizados como punto de referencia por otros destinos turísticos con características similares a La Fortuna y que desean iniciar el proceso de trasformación en un destino turístico

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inteligente.

PALABRAS CLAVE

Turismo; Destino Turístico Inteligente; Tecnología; Sistema de Información; La Fortuna, Costa Rica.

INTRODUCTION

International tourist arrivals worldwide were 1.4 billion in 2019, growing 5% over the previous year. International tourism exports were $1.7 billion, up 4%. However, nearly 400 million international tourist arrivals were recorded worldwide in 2020, which was a notable decrease from the previous year due to restrictions stemming from the COVID-19 pandemic. Even so, the global importance of the sector remains unquestionable and therefore the challenges of competitiveness and continuous innovation must be strategically addressed (Organización Mundial del Turismo, 2021; Organización Mundial del Turismo, 2019; Komsic & Dorcic, 2016). Tourism is a relevant sector in Costa Rica, it contributed 8.2% of the Gross Domestic Product (GDP) in 2018 and the chaining of multiple economic agents (El Economista, 2018). TripAdvisor ranked La Fortuna de Costa Rica as the best tourist destination in the world in 2018 (Cubero, 2018). In 2020, it ranked among the top 10 destinations to visit in the world for its biodiversity, sustainability, species preservation, and natural beauty (Lonely Planet, 2020). These achievements represent an ongoing challenge to continue to stand out internationally.

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There is a trend to develop smart cities, which is transferred to tourism with the emergence of the concept of Smart Tourism Destinations [STD] (Sigala, Gretzel, Xiang, & Koo, 2015). The transformation to an STD implies achieving a series of characteristics through a planning process that contemplates state-of-the-art technology as an essential and strategic requirement (Boes, Buhalis, & Inversini, 2016; Instituto Valenciano de Tecnologías Turísticas, 2015a). This motivates to study the correct choice of technology for the conversion of a destination into an STD with an adequate interaction with the environment (Boes, Buhalis, & Inversini, 2016). The dynamism of society demands that tourist destinations innovate continuously if they wish to achieve success. In this sense, becoming an STD could become a requirement for success, since they rely on technology to improve aspects such as competitiveness, efficiency, and sustainability concerning traditional tourist destinations (Fernández Alcantud & García Moreno, 2021). Therefore, in order for Costa Rica and many other world-renowned tourism destinations to remain at the forefront, it seems essential to establish a strategy for the incorporation of technology for the

transformation to a STD.

As a consequence, we sought to solve the question, of how to employ technology to drive a process of transformation of the destination La Fortuna de Costa Rica into an STD? Therefore, the objective of this research was to design an information system to promote a process of transformation of La Fortuna into an STD supported by state-of-the-art technology. For this, we took as a starting point the preliminary results of the project called InteliTur: Technological innovation for smart tourist destinations developed by the Tecnológico de Costa Rica [TEC] (Treviño-Villalobos, Cardinale-Villalobos, Fernández-Mora, Víquez-Acuña, & González-Quirós, 2021). The methodology used was multimethod, specifically conducting a case study in the tourist destination of La Fortuna, Costa Rica. A literature review technique was used for data collection and a quantitative tool was developed to identify the technologies with the greatest applicability in this destination.

To achieve this objective, this study analyzes the main technologies used in the most outstanding STDs in the world and identifies the factor in the Swot analysis of La Fortuna tourist destination with the greatest applicability of STD technologies. The above is taken as input for the design of an information system called InteliTur for data management that contributes to improving the competitiveness of La Fortuna destination. This system considers the economic, social, and technical limitations of the destination and bets on the real and effective participation of the local population. These results are of high value because they can be used by other tourist destinations with similar characteristics to La Fortuna that wish to initiate the process of transformation to an STD. Since most of the existing works are oriented towards urban and consolidated or mature destinations in developing countries.

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LITERATURA REVIEW

An STD is a paradigm that requires tourism planning from the municipal to the national level, the value chain oriented towards sustainability, the insertion of technology in the activities and therefore in the tourist's experiences, and the operation of services for an effective and efficient management of the tourism sector to respond to the needs and behaviors of visitors (Instituto Valenciano de Tecnologías Turísticas, 2015a). Specifically, we have the following definition: "an innovative space, accessible to all, supported by a vanguard technological structure, which guarantees the sustainable development of the tourist territory, and facilitates the interaction

and integration of the visitor with the environment, increasing the quality of his experience in the destination" (De Ávila Muñoz & García Sánchez, 2013, p. 59).

A tourist destination must consider three aspects to approach the above concept (Instituto Valenciano de Tecnologías Turísticas, 2015a). The first is that the management of a STD responds to the needs of the destination, has a tourism strategy, willingness to change, business culture, openness to innovation and new business models. The second aims for the private and public sectors to take ownership of the destination's tourism management in order to achieve greater involvement and co-responsibility. The third emphasizes carrying out experiments linked to the creation of platforms or tools to contribute to the transformation into an STD, ensuring the viability of investments and the continuity of the business fabric. For this, it is imperative the articulation of actors such as local government, the business sector, universities and institutions.

The STD are based on 5 pillars: Innovation, Technology, Sustainability, Accessibility and Governance, which serve as the basis for ensuring competitiveness through a process of continuous improvement. A management model that also considers the transversally of tourism activity and the differentiating characteristics of each destination (Fernández Alcantud & García Moreno, 2021). The transformation into a DTI means for the tourist destination: (a) An increase in competitiveness, thanks to the better use of its tourism resources and the identification and creation of others; (b) An improvement in the efficiency of production and marketing processes; (c) A boost to the sustainable development of the destination in its 3 aspects: environmental, socioeconomic and sociocultural; (d) An improvement in the quality of stay of visitors and the quality of life of residents; (e) To make the tourism strategy the basis for the economic dynamization of the territory, guaranteeing its positive effects in the long term.

As indicated before, technology plays a key role in the transformation of destinations to STD. In this sense, information and communication technology [ICT] is defined as "technological devices (hardware and software) that allow editing, producing, storing, exchanging and transmitting data between different information systems that have common protocols" (Cerezo & Guevara, 2015, p. 53). ICT facilitate communication between the stakeholders of a tourism destination, through the generation, exchange, dissemination, management and access to knowledge. ICT in the tourism value chain reconfigure the production system from traditional tourism to the tourism of the future. In addition, they must focus on global demand, seek diversification and agility of goods, because visitors are more demanding and rely on obtaining a product that

conveys a unique, memorable and personalized experience (Rodríguez & Granados, 2017).

Digital resources are used by travelers at all stages of travel, and it has been shown that the internet is the main means of searching for information about destinations for those who intend to travel (Fernández-Cavia, Vinyals-Mirabent, Fernández-Planells, Weber, & Pedraza-Jiménez, 2020; Possebon, 2019; Valdez-Roca, 2018; Fundación Orange, 2016). In addition, the emergence of the internet and new ICTs has transformed the way tourists plan, book and live their tourism experiences, which has led to great opportunities in marketing, distribution, promotion and coordination by tourism and hotel companies (Jiménez, Allés, & Franco, 2018). Because of this, the tourism sector must have technological platforms focused on innovation and the design of new business models; oriented in the transformation of processes and activities. At the same time, competition in tourism is based on online presence, differentiation and reputation, aspects to contemplate in the strategy of a digital tourism company.

The global trend is for visitors to acquire a product autonomously, by researching and comparing destinations, scheduling trips, purchasing services through the Internet and carrying out activities supported by technology (Rodríguez & Granados, 2017). Hence, the importance of the tourist destination having a technological platform aimed at visitors. The STD concept includes tourism infrastructure and smart technology infrastructure, all of which together create a smart tourism ecosystem [STE]. Tourists in the destination use their smart devices to connect to the available STE resources and, at the same time, actively contribute data through their movements, inquiries, photos, and videos that are also included as major factors in the STE, as well as residents, government, and media (Afolabi, Adeshola, Ozturen, & Ilkan, 2020).

STE is defined as a tourism system that leverages smart technology to create, manage and deliver smart tourism services/experiences, and is characterized by intensive information sharing and value co-creation. Its main function is the collection, processing and exchange of tourism-relevant data for a destination to deliver enhanced/enriched, high-value, meaningful and sustainable tourism experiences (Gretzel, Sigala, Xiang, & Koo, 2015). The STE allows for a management approach sensitive to environmental, cultural and social issues, with the aim of facilitating the interaction of visitors with their environment (Pencarelli, 2020). Multiple actors interact with each other and participate to varying degrees in the STE, among these are: government, travel agencies, transportation and accommodation providers, tour operators, local residents and, above all, tourists (Arenas, Goh, & Urueña, 2019). Likewise, digital

ecosystems establish an analogy with natural ecosystems in the sense that the species that are part of the ecosystem are born, develop, relate, adapt and/or disappear (Ivars-Baidal, Femenia-Serra, Giner Sánchez, & Celdrán Bernabéu, 2018).

However, ecosystems cannot be created, but rather evolve over time (Gretzel, Werthner, Koo, & Lamsfus, 2015; Moore, 1993). Becoming a STD requires leadership, vision, patience, strategic management, evaluation, and continuous change. It is essential to perceive the STD as an ecosystem, having a vision and a clear set of goals for innovation is key in developing STD as a collective (Boes, Buhalis, & Inversini, 2016). Also, the construction of an STD has to be a very careful strategy and based on a model that sticks to the specific characteristics of the tourist destination, keeping its identity, values, particularities and therefore, achieving greater differentiation, which will ultimately be a competitive strength in the globalized world where one of the main characteristics is homogenization and standardization which is what has been subtracting competitiveness from mature destinations (Ivars-Baidal, Fuster Uguet, Casado-Díaz, & Navarro-Ruiz, 2021; Cano Heredia, 2021; Ivars-Baidal & Vera Rebollo, 2019).

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Thus, the line of this work is aimed at proactively taking advantage of ICTs to promote a process of transformation of the destination La Fortuna de Costa Rica into an STD through the design of an information system. Taking into consideration that the structural changes that are taking place in tourism make it advisable to apply an STD approach to local tourism management in which digital ecosystems are promoted and strengthened based on the specificities of their territories and their economic base, allowing the development of their own capacities and avoiding their dependence on technology companies or data owners (Ferrando, Rodríguez, & Cuéllar, 2020; Ivars-Baidal & Vera Rebollo, 2019; Ivars-Baidal, Solsona Monzonís, & Giner Sánchez, 2016). This is because tourism managers perceive the STE as an opportunity for entrepreneurship and local innovation, more direct interaction with the tourist and the creation of experiences (Ivars-Baidal, Femenia-Serra, Giner Sánchez, & Celdrán Bernabéu, 2018).

Because of the above, it is required that the destination La Fortuna has a specific plan, which considers the economic, social and technical limitations of the destination. In addition, with a high degree of flexibility, scalability and adaptability to the territorial environment in which it is committed to a real and effective participation of the local population so that it can be applied in other territories of rural scale, adapting it to its own identity. Since most of the existing works are oriented towards urban and consolidated or mature destinations in developing countries.

The design of this technological platform should include information related to the destination's tourism activities, dynamically interconnecting the stakeholders and focusing on the tourist. Coupled with this, it should consider smart technologies that are implemented in STE such as sensors, Big Data, open data, Internet of Things (IoT), RFID and NFC (Gajdošík, 2018; Dwivedi, et al., 2017; Hashem, et al., 2016; Buhalis & Amaranggana, 2015). Finally, it must provide adequate privacy, security, and data management mechanism (Yadav, Verma, Jangirala, & Srivastava, 2021).

METHODOLOGY

Research approach and methods - The methodology was multimethodical, since different procedures and strategies are used for the study inquiry through the different moments of the research process (Ruiz, 2008). Specifically, a case study was conducted in the tourist destination of La Fortuna in Costa Rica, since it allows the use of quantitative, qualitative or mixed research processes, deeply analyzing a unit to respond to the problem statement, test hypotheses and develop a theory (Durán, 2012). The type of research according to the planning of data collection is prospective because the data were obtained specifically for the writing of this article. The data collection has an empirical orientation because the reality of the tourist destination was investigated (Gil, 2006). Also, it is with a cross-sectional approach because the data were collected between February and June 2019 (Hernández Sampieri, Fernández Collado, & Baptista Lucio, 2010). The variables analyzed in the development of the research were the technologies and the prioritized factors of the Swot analysis of La Fortuna. These were processed from a mixed approach because of the quantitative data analysis and validation through a focus group. The output variable of the research is the interaction between these variables, which was defined as technology applicability.

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Working group and case study location - La Fortuna is a center of tourism development in Costa Rica (Instituto Costarricense de Turismo, 2019). It is a mountain and nature destination, with a differentiated, high value-added product and microenterprises predominate (Dirks & Keeling, 2009). This research was conducted in conjunction with the associates of the Arenal Cámara de Turismo y Comercio [ACTC], this is a business organization located in La Fortuna, which has 20 partners. These members are classified in the areas of lodging, food, theme parks and recreation, and travel agencies or tour operators. In addition, the objective of this organization is to position La Fortuna as the thermal capital of Central America (Zamora, 2017).

Determination of characteristics and functionalities of tourism technologies - This process was carried out with a bibliographic review that contemplates the delimitation of the subject matter, search, organization, and analysis of the information (Gómez-Luna, Fernando-Navas, Aponte-Mayor, & Betancourt-Buitraogo, 2014). Among the main data collected were the title of the publication, author's name, year of publication, number of citations and the criteria for selecting the articles were: publication between 2014 and 2019, indexing in academic databases such as Scopus, Ieee and Web of Science and the number of citations. A list of 92 scientific articles referring to STD was obtained, as a result of which 11 technologies were identified. Subsequently, the number of times the 11 technologies appeared in the list of articles was counted. When analyzing FIGURE 1, the technologies identified are ranked from most to least relevant by means of a Pareto diagram. This allows determining that 80% of the articles reviewed are concentrated in 4 technologies (Big Data, social networks, IoT and sentiment analysis), being these 20% of the most used technologies in the STDs. This allows us to know the trend that has led the main destinations at international level.

Figure 1. Most commonly used technologies in STD according to literature review
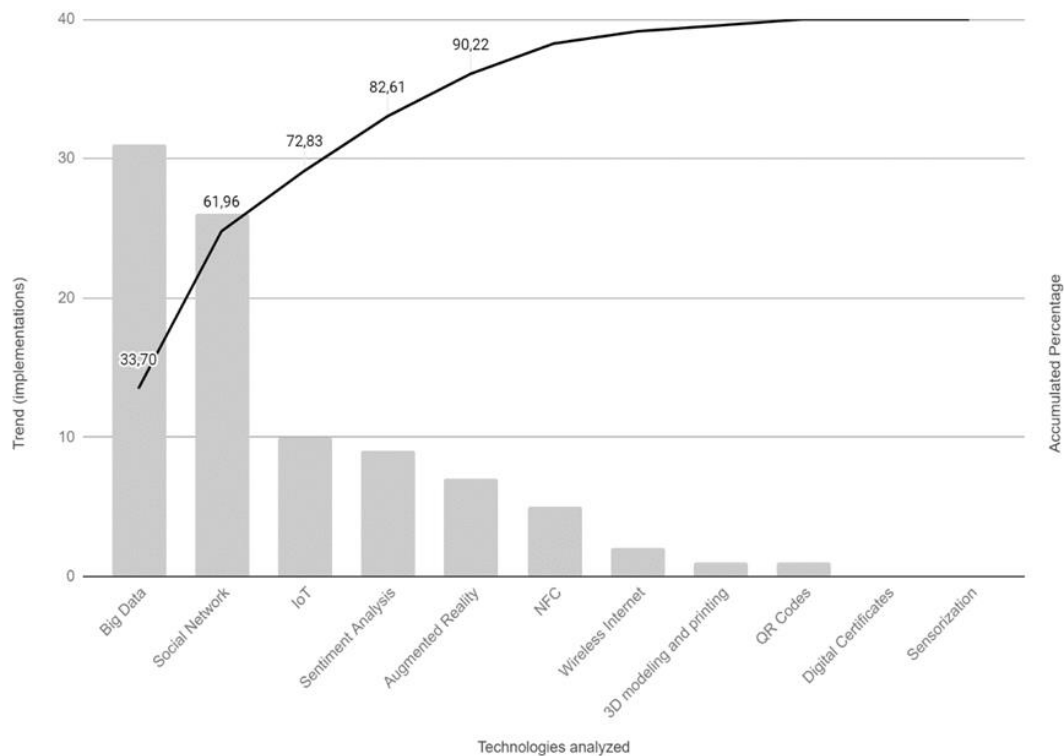
Source: Own elaboration.

Then, a total valuation was defined for each technology according to the variables impact, cost and trend. This is because the interest of implementing a certain technology depends on the relationship between the cost and the benefit obtained. The impact and cost variables were defined according to the Operational Manual for the configuration of a STD (Instituto Valenciano de Tecnologías Turísticas, 2015a). Among the costs of implementing a technology, the costs of developing the solution, implementation costs and maintenance costs should be considered. Economical technologies with effective and proven contribution have a high level of impact. As well as technologies that offer a new level of services to tourists. While on the side of low contribution to the STD, there are technologies that are not very mature or too undefined to have a substantial impact. These riskier technologies may be part of experimental projects, with the intention of evaluating the risk-benefits in the form of pilot initiatives before moving on to mass deployments.

The trend variable was defined based on the data obtained from the literature review according to the use of technologies in STDs (see FIGURE 1). Each variable was given a value on a scale of 0 to 5 (5 being the highest weight) and according to expert criteria was assigned a weight of importance (impact 40% and cost and trend 30% respectively). Finally, for each of the technologies, the total valuation (VT) was calculated (see TABLE 1) using equation (1).

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$$V_T = Impact \cdot weight\_Impact + Cost \cdot weight\_Cost + Trend \cdot weight\_Trend \qquad (1)$$

Table 1. Valuation of technologies according to Impact, Cost and Trend

	Characteristics	Impact	Cost	Trend (Pareto)	Total Valuation (VT)
Technologies	Big Data	5,0	4,0	5,0	**4,7**
	Social Network	4,3	4,6	4,2	**4,4**
	Internet of things (IoT)	1,0	2,7	1,6	**1,7**
	Sentiment Analysis	2,3	1,9	1,5	**1,9**
	Augmented Reality	1,5	4,5	1,1	**2,3**
	Near Field Communication (NFC)	4,5	1,8	0,8	**2,6**
	Wireless Internet	4,9	4,2	0,3	**3,3**
	3D modeling and printing	0,5	1,3	0,2	**0,6**
	Quick Response Code or QR Codes	5,0	5,0	0,2	**3,5**
	Digital Certificates	4,0	5,0	0	**3,1**
	Sensorization	1,8	2,2	0	**1,4**

Source: Own elaboration

Determination of the factor of the Swot analysis of the STD La Fortuna with the greatest applicability of technologies - Using the Strategic Management tool version 4.2 (Rodríguez-Barquero, 2016) a SWOT analysis was conducted in 2019 for the La Fortuna destination in which an evaluation of internal and external factors is performed using a Pestel analysis, a Porter's five forces analysis, and a value chain analysis (Treviño-Villalobos, Cardinale-Villalobos, Fernández-Mora, Víquez-Acuña, & González-Quirós, 2021). Subsequently, the identified factors are weighted in a SWOT evaluation matrix to determine the factors of greatest relevance to La Fortuna. Both the identification, justification and prioritization of the factors were obtained through the elaboration of participatory workshops. Table 2 shows the eight most relevant factors for this destination.

Table 2. Prioritization of factors of the SWOT analysis of La Fortuna

Opportunities	
1.	Prioritize marketing needs through the "La Fortuna" destination brand.
2.	Create a catalog of suppliers and products (local), as well as for customers to evaluate services, entrepreneurs to evaluate suppliers (digitization of suppliers, local partners).
Threats	
1.	Loss of competitiveness, because we do not sell ourselves as La Fortuna, but individually. We are the most expensive destination in Latin America.
2.	Continuous waste of resources due to poor state planning.
Strengths	
1.	The increase in resources, human talent and experience has made it possible to promote and sell the destination worldwide.
2.	ADIFORT (Asociación de Desarrollo Integral de La Fortuna) is available for the reinvestment of resources in public works, security, health, education, among others to support tourism.
Weaknesses	
1.	Tourist zone with limited free Internet connection.
2.	Business individualism prevails in the communication and marketing strategy, instead of a country strategy.

Source: Treviño-Villalobos, Cardinale-Villalobos, Fernández-Mora, Víquez-Acuña, & González-Quirós (2021).

The factors shown in Table 2 are complex to solve, require a high economic investment, different approaches for their possible solution and some of them cannot be solved in the short term with the use of technology. For the InteliTur system prototype to have a greater impact and considering that resources are limited, it was decided to select only the factor of the SWOT prioritization of La Fortuna in which a greater use of technology can be made. To determine the factor with the greatest applicability of technologies, the 8 prioritized factors of the Swot

analysis mentioned in Table 2 were taken as a starting point. To fill out the matrix, a rating scale was used for the partial applicability of the technologies (A_(P_(Tec_i))) ranging from 0 to 3 (0 is equivalent no applicability, 1 little, 2 medium and 3 a lot). Then, the total applicability of technologies (TA) was calculated for each factor, according to equation (2):

$$A_T = \sum_{i=1}^{i=11} V_{T_i} \cdot A_{P_{Tec\_i}}$$

(2)

Where:
i refers to each of the 11 technologies studied, with Big Data being the first technology (i = 1) and sensorization the last technology (i = 11)

V_{T_i} is total valuation. $A_{P_{Tec\_i}}$ is the partial applicability of each technology.

The factor with the greatest applicability of technologies obtained through equation 2 was validated by conducting a focus group with members of the ACTC. Similarly, the InteliTur prototype design proposal was presented and validated with a new focus group (Ivankovich-Guillén & Araya-Quesada, 2011).

RESULTS AND DISCUSSION

The results of the study are the link between the factors of the Sᴡᴏᴛ analysis of La Fortuna and tourism technologies and the design and analysis of an information system for La Fortuna.

Links between factors and technologies - This section links the factors of the SWOT analysis of La Fortuna with the 11 technologies used in the STD. In Table 3, the total applicability of technologies is calculated for each factor according to Equation 2, determining that the factor with the highest applicability of technologies corresponds to the threat called 'Loss of competitiveness, because we do not sell ourselves as La Fortuna, but individually. We are the most expensive destination in Latin America'.

Table 3. Internal and External factors linked to technologies

|	Technologies											Total applicability
	Big Data	Social Network	IoT	Sentiment Analysis	Augmented Reality	NFC	Wireless Internet	3D modeling and printing	QR Codes	Digital Certificates	Sensorization	
	5,0	4,4	1,7	1,9	2,3	2,6	3,3	0,6	3,5	3,1	1,4	
Strengths												
1. The increase in resources, human talent and experience has made it possible to promote and sell the destination worldwide.	3	1	2	3	1	1	3	1	1	3	3	**60,97**
2. ADIFORT (Asociación de Desarrollo Integral de La Fortuna) is available for the reinvestment of resources in public works, security, health, education, among others to support tourism.	3	2	2	1	2	1	3	1	3	3	2	**69,48**
Opportunities												
1. Prioritize marketing needs through the "La Fortuna" destination brand.	3	2	2	2	1	2	3	1	3	0	2	**62,40**
2. Create a catalog of suppliers and products (local), as well as for customers to evaluate services, entrepreneurs to evaluate suppliers (digitization of suppliers, local partners).	3	2	0	2	0	1	1	0	2	3	0	**49,86**
Weaknesses												
1. Tourist zone with limited free Internet connection.	0	2	0	1	0	1	3	0	1	0	0	**26,72**
2. Business individualism prevails in the communication and marketing strategy, instead of a country strategy.	2	3	3	3	3	3	3	3	3	2	3	**81,39**
Threats												
1. Loss of competitiveness, because we do not sell ourselves as La Fortuna, but individually. We are the most expensive destination in Latin America.	3	3	3	3	2	3	3	2	3	2	3	**83,47**
2. Continuous waste of resources due to poor state planning.	2	3	3	2	1	1	1	1	1	0	3	**48,52**

Source: Own elaboration

Description of the platform - The factor of the Sᴡᴏᴛ analysis of La Fortuna 'Lᴏss of competitiveness, because we do not sell ourselves as La Fortuna, but individually. We are the most expensive destination in Latin America' has greater total applicability of technologies, so an information system called InteliTur was designed to reduce the effect of this threat [Fig.2] (Ramos, Mendes Filho, & Lobianco, 2017). The objective of this system is to manage data through the use of ICTs used in the STD that contributes to improving competitiveness and functions as a catalyst for data generated by the use of sensors, the inclusion of companies, and

the system's own activity. The design of the InteliTur system was validated by ACTC members through a focus group. However, the complexity and time required for the implementation of the system led to the decision to develop a prototype so that it could be evaluated by ACTC. Therefore, the Offline sub-modules, Surveys and CRM, ERP, CRS components (highlighted in green in Figure 2) were not developed.

The InteliTur website is available at the link https://intelitur.arenalcostarica.cr/. The technologies used are Node.JS with Express, PostgreSQL with its PostGIS plugin, Angular and JavaScript. Also, a Raspberry Pi 3 was used to capture clear images of the Arenal volcano. The system is designed with the Responsive Web Design technique and makes use of systems under the concept of free software (I Hernàndez, 2019; González & Marcos, 2013). The system has three types of users: administrator, employer, and visitor. The administrator role manages data that will be stored, published, or rejected. Entrepreneurs have an administrative role where they submit information they wish to publish about their business. Likewise, visitors consult information stored in the system. The communication and storage component are the core of the system, it stores data produced by users and by sensors or external systems with which InteliTur interconnects to databases, Big Data or other data sources.

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Figure 2. Intelitur System Design for the tourist destination La Fortuna
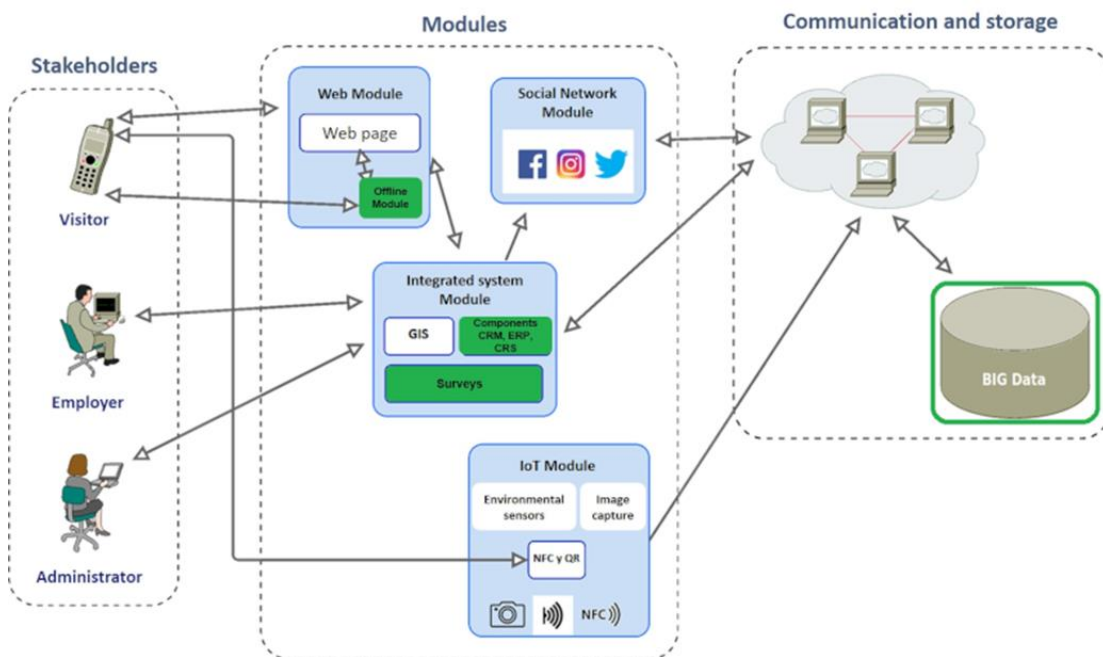
Source: Own elaboration

Modules and sub-modules, as well as sensorization generate a large amount of data that will be stored in Big Data. The processing of structured, unstructured or semi-structured data is in relational and non-relational databases, to achieve greater power and specialization capacity technologies such as MapReduce or Hadoop are used. The data warehouse needs a cloud service to achieve effective real-time data access. The information layers are visible only on the STD website, so it is advisable to consider models focused on security, such as: ISO [International Organization for Standardization], COBIT [Control Objectives for Information and Related Technology] and ITIL [Information Technology Infrastructure Library].

The benefits of including Big Data technology in the InteliTur system are the identification of behavioral patterns and consumption trends, better customer knowledge, product development, agility in decision-making, process optimization and customer attraction and loyalty (Galán, 2020; Naya, 2018; Valls, 2017; Instituto Valenciano de Tecnologías Turísticas, 2015b). In addition, it gives greater competitiveness to the destination, as it facilitates the experience and interaction between the territory and the visitor supported by the concept of STD (Ivars-Baidal, Celdrán Bernabéu, & Femenia-Serra, Guía de implantación de Destinos Turísticos Inteligentes de la Comunitat Valenciana, 2017). Finally, Big Data is considered to have a great impact due to the intensive use of data and because it is a complex phenomenon (Del Vecchio, Mele, Ndou, & Secundo, 2018; Demunter, 2017; Instituto Valenciano de Tecnologías Turísticas, 2015b).

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STDs should be characterized by the use of sensorization and Big Data to obtain information and knowledge of the tourist himself (Fernández-Alcantud, et al., 2017). In smart cities, sensorization gives the ability to reason using the data collected on the knowledge acquired, to improve the quality of life considering the principles of sustainability and safety (Fernandes, Silva, Analide, & Neves, 2018). The actors of the system interact with the following modules: web or initial system, social networks, integrated system and IoT. The web module is composed of four sections and allows the interaction of InteliTur stakeholders with the services offered by the La Fortuna destination (see FIGURE 3).

The first section of the system is directed to visitors, it is called 'Now in La Fortuna', it has updated data regarding photographs of the Arenal Volcano [collected in lapses during the day], weather conditions, events agenda and contests. Different media such as photographic images and videos are combined to jointly project shape and movement to the tourism product to

promote the tourist destination within the website and make it more attractive and useful for the user (Perinotto, Soares, & Soares, 2020). The second section is 'Explore in La Fortuna' and shows personalized maps, geographic data layers about the tourist offer and socioeconomic variables. In the third section, entitled 'My Trip', visitors can search for places of interest, make a schedule of their travel itinerary and share their itinerary on a social network to help others with their next trip. The fourth section is called 'We Can Help You', it is a space for users to find comments about the destination, so that visitors can express their opinion once their visit is over. Also, there are contact details of companies and information about the means of transportation in La Fortuna.

Figure 3. Sections of the Intelitur System Web Module

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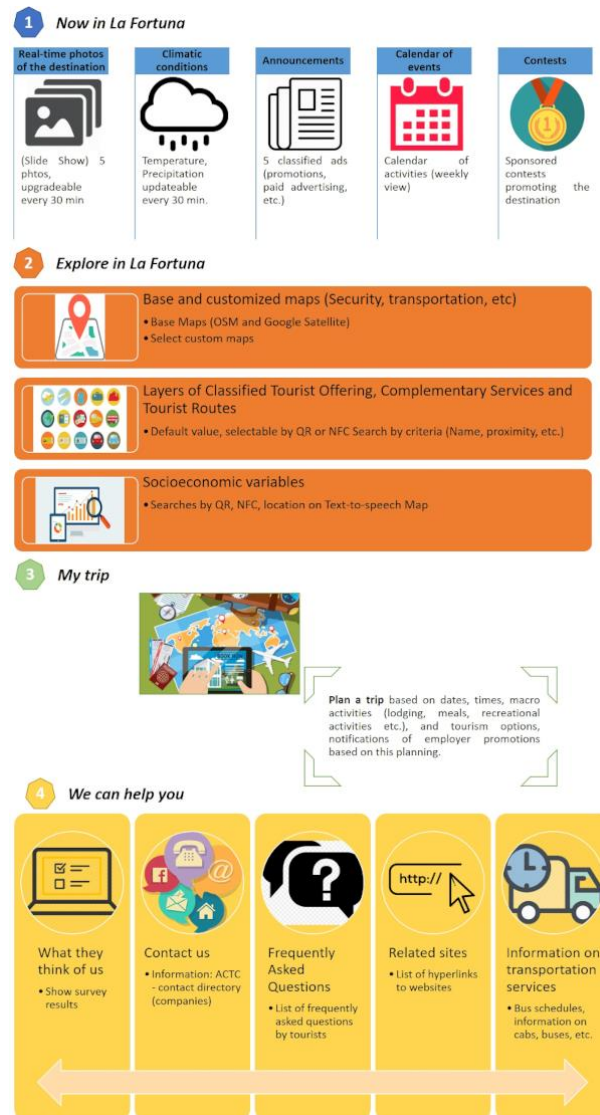
Source: Own elaboration

The IoT module uses sensorization to collect and store data in real time to generate climate projections. For this purpose, climatological variables are collected from the weather station of the Instituto Meteorológico Nacional [IMN]. In addition, sensors can be used to collect variables such as temperature, noise, humidity, energy, water, waste, among others to improve the tourist experience (Resch, 2013). The image capture sub-module is integrated into the IoT module, providing a communication interface that takes photographs using Raspberry Pi 3 hardware with an integrated 5-megapixel camera. Photographs are captured every 30 minutes and stored locally on the server. The images are then filtered using a machine learning algorithm that identifies in each photograph the silhouette of the volcano and discards it if it has clouds.

The ecosystem of devices that make up the IoT is immense and growing at great speed, making it a key technology for the development of smart urban environments (Ivars-Baidal, Celdrán Bernabéu, & Femenia-Serra, Guía de implantación de Destinos Turísticos Inteligentes de la Comunitat Valenciana, 2017; Atzori, Iera, & Morabito, 2010). The implementation of IoT in the La Fortuna destination requires the environment to have high-capacity ICT, connected to sensor networks. In addition, smart applications and services for citizens are needed (Instituto Valenciano de Tecnologías Turísticas, 2015a).

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IoT combined with Big Data foster the generation of new market opportunities and make citizens' lives more sustainable and intelligent (Nitti, Pilloni, Giusto, & Popescu, 2017). Also, it allows deploying anonymized data that can be analyzed for the design of a strategy in the destination (Rodríguez, Aragonés-Beltrán, Vivancos, & Pons, 2018). In addition, connectivity and sensorization in the destination allow better measurement of parameters related to sustainable tourism, knowing information about the environment and the management of procedures (Ivars-Baidal, Celdrán Bernabéu, & Femenia-Serra, Guía de implantación de Destinos Turísticos Inteligentes de la Comunitat Valenciana, 2017; López, Sánchez-Alonso, & Sicilia-Urban, 2015).

Moreover, QR codes and NFC tags will be used to provide access to site-specific information (promotions, campaigns or other activities). These will be combined with mobile technology to provide the destination with an efficient way to advertise its products (Çeltek, 2017). QR codes applied to tourism activities have the function of dynamizing tourism, promoting new practices and generating interaction with visitors (Gutierriz, Lopes, & Rodriguez, 2020). Also, they can be used to show information about local history, culture, flora, fauna, national parks, zoos, museums and tourist attractions (Katlav, 2020). Likewise, it can be employed to provide

information about calories and food recipes (Intal, Payas, Fernandez, & Domingo, 2020; Batra, et al., 2020).

The management of social networks focuses on the publications of the 'Now in La Fortuna' section, to generate and locate informative content of the products. In addition, they are a tool for image formation and positioning of the tourist destination and support the dissemination and attraction of customers (Feitosa, Tolentino, Pedroso, & Gianocário, 2019; Gomes & Mondo, 2016). It is intended that users share information of personal, inherent and intimate value in real time from their experiences, facilitating feedback and generating a repository of strategic knowledge and be a source of inspiration for travelers (Guerrero, Møller, Olafsson, & Snizek, 2016). On the other part, the rapid expansion, variety of interactions and content that characterize social networks, make it an important source of Big Data generation (Parady, et al., 2019; Jaakonmäki, Müller, & Vom Brocke, 2017; Oviedo, Muñoz, & Castellanos, 2015). The combination of Big Data and social networks creates value to realize smart tourism, improves decision making, enriches the tourist experience, develops new products and business models (Del Vecchio, Mele, Ndou, & Secundo, 2018).

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The off-line module implements certain system processes for the visitor to execute without being connected to the Internet. Likewise, the integrated system module is the back-office, it controls the technical and managerial management processes carried out at the destination. Among its components are a survey sub-module to periodically know the opinion of visitors about the products purchased at the destination. This involves the automatic design of surveys, the sending and storage of the results (Instituto Valenciano de Tecnologías Turísticas, 2015a). It also requires a sub-module for customer relationship management (CRM), personalized services and information for marketing based on hyper-segmentation and a much more dynamic and durable after-sales service management (Ivars-Baidal, Celdrán Bernabéu, & Femenia-Serra, Guía de implantación de Destinos Turísticos Inteligentes de la Comunitat Valenciana, 2017). It also includes an enterprise resource planning [ERP] system for the management of production and distribution processes of its products (Aguayo-Maldonado, 2015). These systems integrate information on sales, marketing, manufacturing, production, finance, accounting and human resources. It also includes a Computerized Reservations Systems [CRS] for consultations, reservations, sales and payment of tourism services (Bethapudi, 2013). Finally, a Geographic Information System [GIS] is required to manage georeferenced tourism information of the

destination for use in tourism planning, tourism resource evaluation, marketing, among others (Albuquerque, Costa, & Martins, 2018; Niño & Danna, 2016; Rahayuningsih, Muntasib, & Prasetyo, 2016).

Analysis of the Intelitur website - According to the model proposed by the UNWTO (Organización Mundial del Turismo, 2003), a consumer-focused website must meet 5 fundamental characteristics. These are: (a) The context about the site, the image galleries, the menu and the logo; (b) The appearance of the website; (c) The general information on the website [culture/history, climate, transportation, such as arrivals, geography, activities, events, telecommunications and FAQs]; (d) Activities; (e) Resources [Link to home page, Search results, Keyword search, Weather forecast, Context and location maps, List of contents]. Taking into consideration the 5 characteristics, it is observed that the Intelitur website provides information regarding the local context of La Fortuna, it also offers a historical context that can be explored through layers of geographic data on the tourist offer and socioeconomic variables. This data can be consulted in an interactive map located in the section called My Trip, which will allow visitors to plan their stay in the tourist destination of La Fortuna in an easier way.

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Another highlight is the image gallery on the home page, which immediately catches the visitor's attention. Likewise, the navigation menu is drop-down, divided and organized by blocks, prioritizing the most important aspects and facilitating the user's scrolling. In relation to the appearance of the website, it is intended to position La Fortuna as a destination with tourist attractions related to nature with mainly adventure activities and that develops its dynamics with technological themes, this keeps a harmonious relationship with the expectations that visitors bring to the destination. The combination of colors used were green-blue-gray tones, which determine aspects of freshness-technology and nature. On the other hand, a logo was designed that denotes an academic and professional aspect in which the circles joined together reflect connectivity (Costales Torres, 2010).

The website has information on the destination's weather conditions, transportation, bus schedules, events [carnivals, cultural and religious festivals, etc.]. It should be noted that all this information is accessible directly from the home page menu and through QR codes. In addition, Intelitur has in the section Explore La Fortuna an option to visualize through dynamic and interactive maps the tourist offers duly classified. As well as the different complementary services that can be found in the destination. The website contains a page with questions and

answers on various topics: lodging, holidays, general information, travel information, weather, transportation, among others. This improves the relationship between the user and the destination, giving more security in the search for information.

One of the most relevant features of the Intelitur website are the geographic maps, which show the location and provide direct access links to the tourist offer of the destination. The logo at the top of each page links to the home page. In addition, the user is provided with the possibility of performing simple searches by categories and filters on the website. The points described above lead to the conclusion that the Intelitur website largely complies with the 5 fundamental characteristics defined by the Unwto. However, if the website proposal is analyzed with other models, such as the evaluation model developed by (López, Altamirano, & Valarezo, 2016). In which accessibility criteria, multimedia resources, content and information and interactive spaces are evaluated. In the Intelitur website, the accessibility criterion should be strongly worked on, since it is only available in Spanish and English. Also, aspects related to "Access for people with functional diversity" were not identified. However, as a point in favor, it stands out that the website promotes its digital marketing in several digital platforms simultaneously.

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CONCLUSION

The literature review identified 11 technologies associated with STDs, with Big Data (33.7%), social networks (28.26%), IoT (10.87%) and sentiment analysis (9.78%) being the most cited in the scientific articles reviewed and together accounting for 82% of the citations. Therefore, according to the STD model, the transformation of La Fortuna towards an STD must contemplate the use and interaction between the different technologies. The factor of the Swot analysis of La Fortuna called 'Loss of competitiveness, because we do not sell ourselves as La Fortuna, but individually. We are the most expensive destination in Latin America', is the one with the greatest applicability of technologies associated with STD. To mitigate this threat, the InteliTur system is defined to unify the tourism offer through a more efficient data management to improve the experience of visitors to La Fortuna.

The design of InteliTur contemplates the use of technologies such as: Big Data, NFC, QR codes, IoT, sensorization and social networks to achieve a more competitive destination and boost the transformation process of La Fortuna de Costa Rica into a STD. This because the destination will have a better concentration and dissemination of information; with availability 24 hours a day,

365 days a year. Also, the destination improves online marketing processes to position its image, increase visualization and personalize the tourism offer. Another benefit is greater customer awareness and the generation of value-added products. The diversity and inclusion of images is fundamental in the website of a STD, so a sub-module of intelligent image capture in real time is contemplated to project an attractive image of the destination, sustained over time and generate content to inspire the visitor. In addition, it will be possible to promote the destination simultaneously on the web, blogs and social networks with the use of hashtags (#) appropriate to the promotion strategy.

The InteliTur system contemplates different types of users, so a strategic collaboration between these profiles is required to generate synergies and establish a systematic process of information that supports intelligent decision making and improves the visitor's experience. In addition, to ensure the success of InteliTur, it is important that those involved in the destination management process contribute to data management on an ongoing basis to make the system useful and viable. InteliTur is still under development and was funded solely by the public university. This system could be replicated in other tourist destinations with similar characteristics that are committed to its transformation into a STD. Technological evolution means that this type of system requires the technical support of a public and/or private organization for sustainability, maintenance and incorporation of new functionalities. Therefore, an implementation plan must be established in the tourist destination and a business model that considers financial stability and self-sufficiency, if possible, with the participation of the private sector or alternative income sources to public budgets.

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The InteliTur prototype requires a validation process to determine compliance with specifications and quality characteristics. In addition, at the end of its development, it is necessary to contemplate training as a strategy for continuous improvement. In order to broaden the scope of application and dissemination of InteliTur, it will be transferred to the Arenal Chamber of Tourism and Commerce to be used as a means for the transformation of La Fortuna into a STD. In conjunction with the implementation of the system, the ACTC must achieve the presence of WI-FI at least in public places in La Fortuna, since this issue is framed as a weakness in the prioritization of the SWOT analysis and is a requirement of high importance in the STD.

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