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Methodology for the management technological innovation in tourist destinations

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ABSTRACT

Technological innovation has changed tourism management and practice, and tourism has become one of the largest industries in the world. As a result, tourism authorities must increasingly bet on the development of technology to accommodate tourists' new image and make them feel included in their destination. In this respect, there is an important effective management of technological innovation in tourist destinations. Therefore, through theoretical methods and statistical committee previously conducted research on this issue, in these research methods are lacking, so this work aims to propose a technological innovation management method for tourist resorts. Thus, we have an approach to managing technological innovation in tourism destinations, expanding and integrating the indicators to be considered, and proposing the scale to measure the indicators. All of these provide the right tools for this purpose and facilitate the development of smart travel destinations.

Keywords: technological innovation; methodology; smart destinations

1. Introduction

Tourism is a highly competitive and constantly evolving global industry, both on the supply side and on the demand side. New proposals are continually appearing to attract the attention of tourists, while at the same time they have more information and tools to select destinations.

Information and communication technologies are modifying the knowledge and the way of planning, organizing and managing trips, and the way in which tourists interact with the destination and share their experiences. The tourist, increasingly demanding, seeks and finds the best value for money, services and experiences more personalized and adapted to their tastes and needs, values the most environmentally friendly options and, particularly, demands to be permanently connected and to be able to make use of new technologies throughout the entire life cycle of the trip[1].

The changes in the environment have forced tourist destinations to adopt new forms of management focused on an intelligent model that involves "an innovative tourist space, accessible to all, con-

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solidated on a cutting-edge technological infrastructure that guarantees the sustainable development of the territory, facilitating the interaction and integration of the visitor with the environment and increasing the quality of their experience in the destination, as well as the quality of life of the residents."[2]

Smart destination management encompasses a set of dimensions, addressed by different authors. According to the analysis made by Labrada et al.[3], there is agreement in the scientific community that the most common dimensions to consider in the management of smart destinations are: technology, innovation, sustainability, accessibility and governance.

Given the new trends in tourism and the new profile of potential tourists, technology has become a fundamental factor in the success of tourist destinations. So much so, that technology, besides being an axis of action, is transversal to all other axes. In other words, the aim is not technology, it is not to turn tourist destinations into territories equipped with technological elements that do not add value, but to use ICTs as fundamental tools to improve their management and development and to add value to the destinations or resources. In short, technology must be the bridge to achieve the objectives set out in all the lines of action of a Smart Tourism Destination (ITD). Hence the importance of the promotion and development of technological innovation in destinations[4].

In the technological field, innovation is the invention or development of new technologies, which usually translates into more sophisticated tools, previously impossible capabilities and new knowledge. It is a concept specific to the contemporary approach to science and technology, the result of the great scientific-technological revolution that has occurred since the second half of the nineteenth century and continues to accelerate its progress to this day[5].

Since the management of technological innovation makes a significant contribution to the management of smart destinations and also has a cross-cutting effect on the other axes or dimensions, we proceeded to review previous studies that allow the management of this variable, finding that there are several authors who have proposed methodologies and indicators in this regard. Twenty-one proposals from different authors were analyzed using IBM SPSS (Statistical Package for the Social Sciences) software, and it was found that there is a great diversity of criteria regarding the indicators for managing technological innovation, as well as the scope of the aspects to be evaluated in each one of them; on the other hand, there is no consensus among the elements to be considered in the different indicators and they are not included with the relevance that another group of indicators should have given the current environment in which tourism organizations operate. In this context, the need arises for a methodological proposal to manage technological innovation in tourist destinations in order to contribute to their development as intelligent tourist destinations. Therefore, the objective of this paper is to propose a methodology for the management of technological innovation in a tourist destination.

2. Method

Theoretical and statistical methods were used for the elaboration of the methodology. Within the theoretical methods, the synthesis-analysis was used, since methodologies and previous works of 21 authors were analyzed, which allowed the analysis of previous proposals.

To determine the correlations between these authors, the IBM SPSS (Statistical Package for the Social Sciences) software was used for cluster analysis, Ward method and Chi-square measurement, resulting in the dendrogram shown in **Figure 1**.

From the results obtained, it can be seen how at a distance of 10 there are four groups, which are the most closely related to each other because they work with indicators in common. The first group of authors formed by Hernández and Baute[4], Muñoz and Sánchez[6], and Júnior et al.[7]; Espinosa[8] and García[9] worked five indicators in common. The second group formed by Baidal et al.[10]; (Baidal et al.[11],

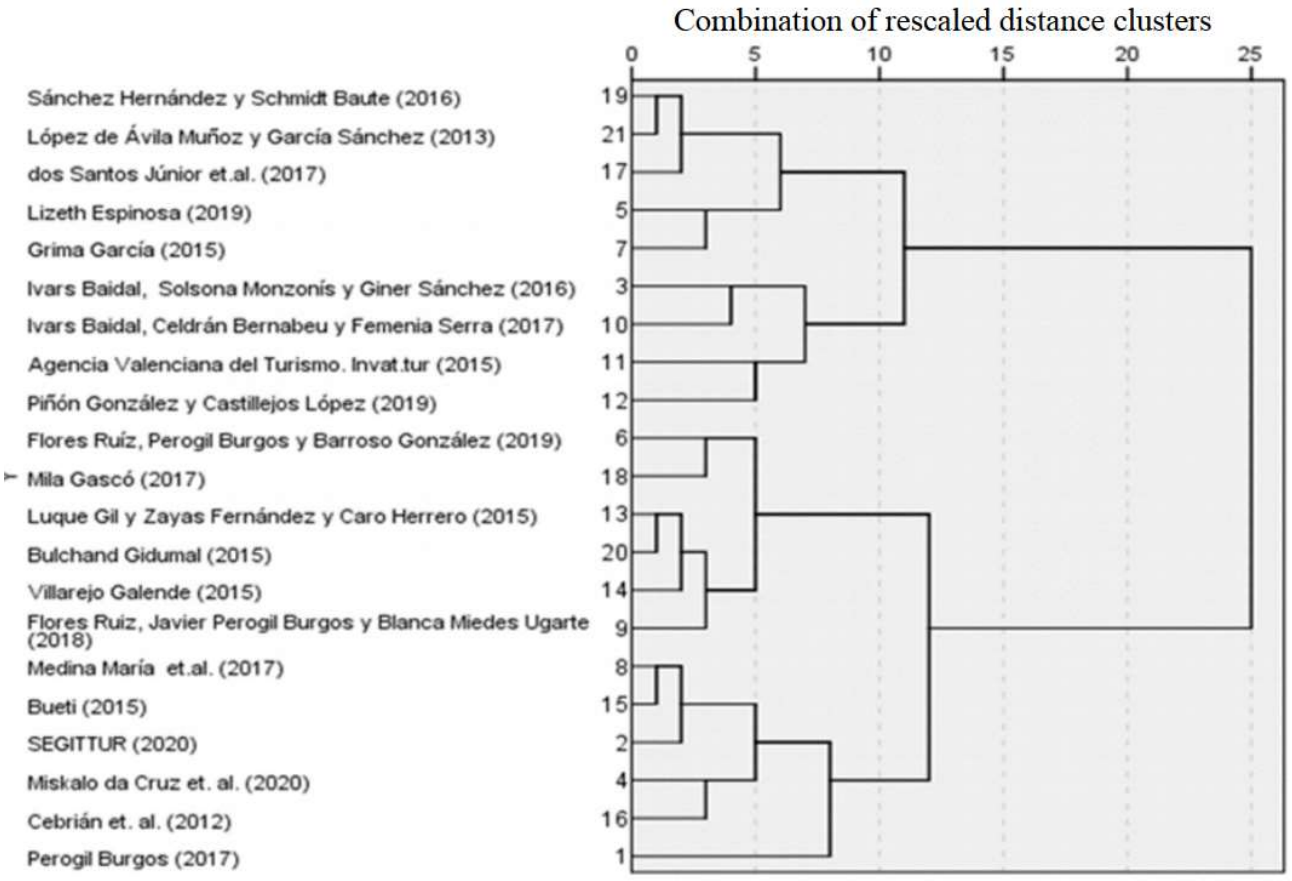

Figure 1. Dendogram graph. Hierarchical clustering.
Source: Own elaboration based on IBM SPSS software outputs.

Invat.tur[12] and González and López[13] worked two indicators in common. The third group formed by Ruíz et al.[14]; Gascó[15]; Gil et al.[16]; Gidumal[17]. Galende and Ruiz et al.[18,19] agreed not to consider 12 indicators of the study conducted. Finally, the fourth group formed by Medina et al.[20]; Bueti[21]; SEGITTUR[22]; Cruz et al.[23]; Cebrián et al.[24] and Burgos[25] worked on a common indicator.

Within these groups, in turn, there are authors who are more closely related because the less distance there is between them, the more indicators they propose in common. This is the case of (Munoz and Sánchez[6], Hernández and Baute[4], who, of the 10 indicators proposed by each, coincide in nine. The same occurs with Gil et al.[16] and Gidumal[17], who of the four indicators they propose, only differ in one. On the other hand, Burgos[25] and González and López[13] propose eight and nine indicators, respectively, and of these, they only coincide in two, so they can be seen in different groups in the dendrogram (**Figure 1**), with a greater distance between them.

To determine the coincidences between the criteria of the authors, a statistical method was used again with the UCINET software, based on a correlation analysis using the Statistical Package for the Social Sciences (SPSS) considering the similarity of a binary scale and the Jaccard method. As a result, there is an analysis of centrality between variables, as shown in **Figure 2**, which shows that the authors agree that, of the 24 indicators proposed in total, there are 18 fundamentals to evaluate technological innovation in a tourist destination.

These indicators, as shown in **Figure 2**, present greater centrality and connection with the rest and are reflected as: specialized web; ICT presence; social networks; online marketing; online marketing; digitized information service; promotion and infor-

mation systems; marketing system; mobile applications; geolocation systems; free access Wi-Fi; QR codes; audio guides; Big Data; Open Data; video-mapping techniques; holography technique; augmented reality and destination sensitization.

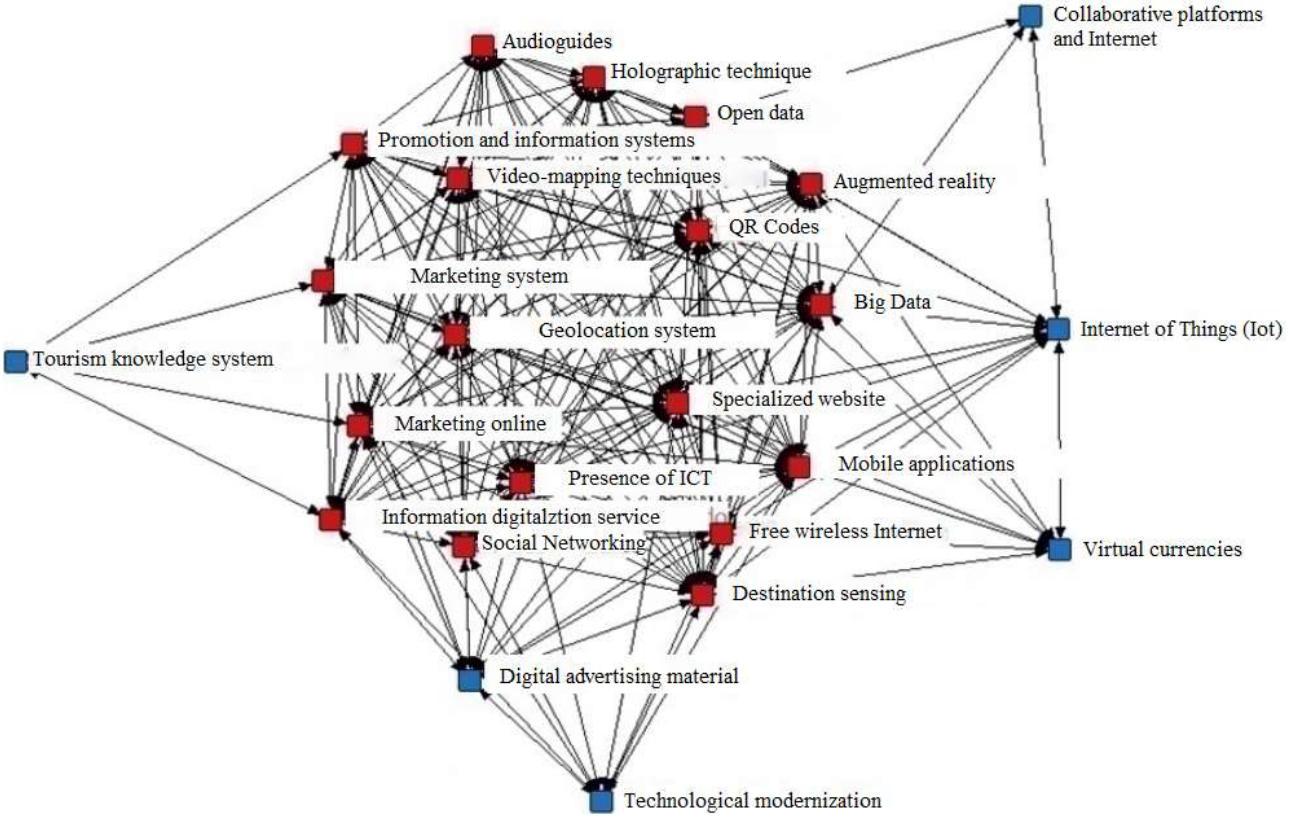

Figure 2. Centrality analysis.
Source: Own elaboration based on UCINET software outputs.

The following are further away from the central network: tourism knowledge system, digital advertising material, technological modernization, virtual currencies, Internet of Things and collaborative platforms on the Internet, which are the least correlated variables in the research.

From this analysis, the authors of this paper considered that despite the fact that the indicator: "technological modernization" was mentioned by only two authors, it will be taken into account in the new methodological proposal because of its importance for the management of technological innovation in a tourist destination and also it includes: presence of ICT and free access Wi-Fi, which complement in a more complete way the definition of the items to be evaluated in this indicator. On the other hand, the indicators: online marketing, promotion and information system and commercialization system will be analyzed jointly in the indicator: online commercialization of the destination due to the direct relationship between them.

For the analysis of the indicators: "Big Data" and "Open Data" the term will be used: "Data Management"; they will be evaluated jointly and, finally, the indicators: "video-mapping techniques, holography technique and augmented reality" were grouped together using the term: "use of intelligent techniques", which brings together the three elements.

In summary, in order to make a proposal that takes advantage of previous experience regarding the indicators to be used and covers the new variables demanded by the current context, the 18 most common indicators should be included, according to the opinion of authors who have previously addressed the subject, grouped in a more convenient way according to the definition and scope of each one; as

well as a new indicator, proposing in all cases the scale of measurement of each indicator and item.

3. Results and discussion

Based on the above analysis, a methodology consisting of six stages is proposed with the objective of ordering the necessary steps to manage technological innovation in a tourist destination. Its graphic representation can be seen in **Figure 3**.

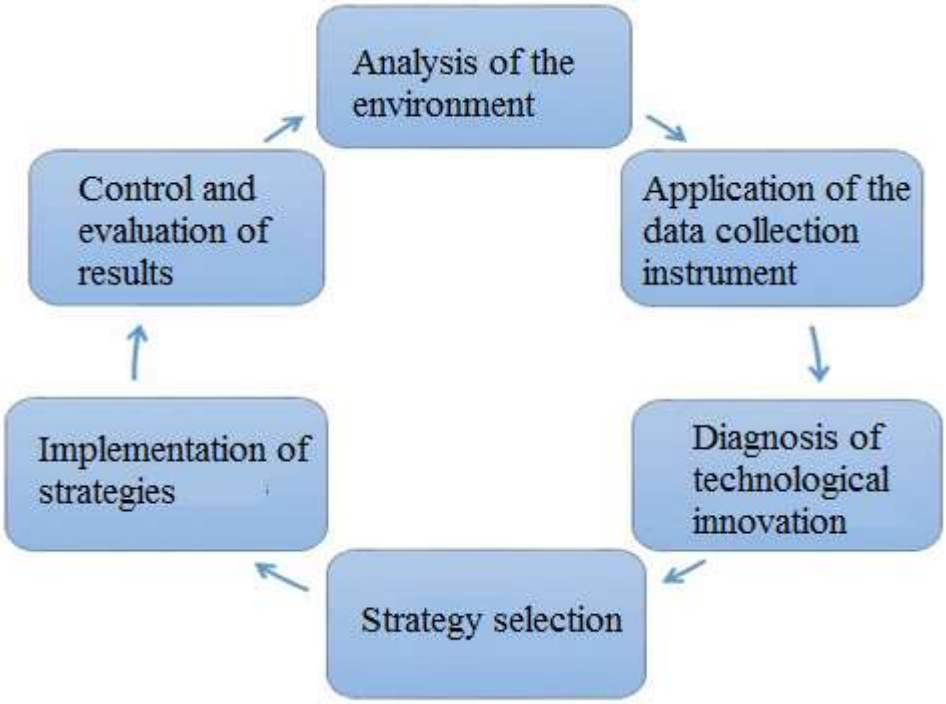

Figure 3. Graphical representation of the methodology for the management of technological innovation in a tourist destination.

The following is a description of the stages, steps and techniques and tools to be used for the development of the methodology.

Step 1: Analysis of the environment.

Description: In this first stage, a characterization of the destination's environment is carried out, determining the strengths, weaknesses, threats and opportunities in relation to the elements of technological innovation. Techniques such as documentary analysis, observation, interviews and the SWOT matrix (Strengths, Weaknesses, Threats, Opportunities and Threats) should be used for the development of this stage.

Stage 2: Application of the information gathering instrument

In this second stage, the instrument is applied using the "Checklist" shown in Appendix 1 to determine the degree of compliance with the indicators and items. In cases where the status of the indicator cannot be precisely determined, specialist judgment should be used.

Stage 3: Diagnosis of technological innovation.

This stage is developed from the execution of three steps.

Step 1: The calculation of the evaluation of the indicators is carried out individually from the score obtained in each item according to the scale applied in the previous stage. The following equation will be used for this purpose:

$$Evaluation\ Indicator = \frac{\sum_{i=1}^{n} W_i}{n \times 3}$$

Where:

W: value given according to the evaluation of the items (Optimal = 3; Average = 2; Worst = 1)

n: number of items.

Step 2: The calculation of the evaluation of technological innovation is made in a general way in the destination using the data obtained in the previous step and using the following equation:

$$Evaluation\ of\ Innovation\ technology = \frac{\sum_{i=1}^{n} Evaluation\ Indicator_i}{n}$$

Where:

n: number of items

Step 3: The result of the calculation obtained in the previous step is calculated as a percentage and the current degree of development of technological innovation in the destination is determined from the use of **Table 1**, where the range to be taken into account for such classification is specified.

Table 1. Ranges for determining the current degree of development of technological innovation in the destination

Degree of development	
1	Deficient = 0%-40%
2	Medium = 41%-80%
3	Optimal = 81%-100%

Stage 4: Strategy selection.

This stage is developed from the execution of two steps.

Step 4: Taking into account the deficiencies identified in the diagnosis of the destination's technological innovation, strategies that need to be developed to contribute to the improvement of the indicators that were most affected are proposed. These strategies should take into account the objectives to be pursued, as well as the resources needed to achieve them.

From the strategies formulated, a selection is made of those that can be implemented at the destination. The criteria for evaluation and selection of strategies are used for this purpose. These are:

Adequacy and consistency criteria: assessing whether the strategy is compatible with what is happening in the environment, whether it is capable of addressing its weaknesses and exploiting its strengths.

Feasibility criteria: assesses the possibilities of implementation, i.e. whether the strategy can be undertaken with the physical, human and financial resources available.

Acceptability criteria: assesses whether the consequences of adopting a given strategy are acceptable or not.

Step 5: An action plan is drawn up for the proposed strategies where the deficiencies detected, strategies to be carried out, costs of the strategies, who will execute them, period and those responsible for monitoring their implementation are defined.

Stage 5: Implementation of the strategies

In this stage, the solutions are implemented based on the action plan defined in the previous stage. This stage is executed according to the possibilities of realization of the same from the variations that may exist in the destination.

Stage 6: Control and evaluation of results.

In this stage, the development of the strategies implemented in the previous stage is controlled, as well as the evaluation of the results from the follow-up of their execution and the effects they have produced in the destination. In this way, the causes of any deviation from the established plan are established and the results are used to continue perfecting the actions to be carried out for the development of technological innovation in the tourist destination.

Among the most important authors who have addressed technological innovation are: (Garcia, 2015) and Espinosa[8,9]. García) conducts a study of this dimension in conjunction with others with the aim of exemplifying the degree of adaptation of the Smart Tourism Destination (ITD) concept in the cit-

ies of Malaga and Zaragoza[9]. For his part, Espinosa[8] performs a diagnosis of Quito as a DTI with emphasis on technological innovation. Both methodologies propose a set of indicators to evaluate it in a tourist destination, coinciding in a group of them and showing dispersion in others, but no specific proposals were found that addressed methodologies for innovation management. The present research proposes a specific methodology for the management of technological innovation, also proposes an expansion of the indicators to be measured, defines the items to be considered in each of them and formulates a scale for the measurement of these indicators and items. These results allow to broaden the theoretical support for a better management of technological innovation in an intelligent tourist destination.

4. Conclusions

The use of technologies has become very important in the management of Smart Tourist Destinations and within this concept, technological innovation plays a significant and transversal role, making it essential to apply methodologies that facilitate the management of technological innovation in tourist destinations. The bibliographic review of 21 previous studies shows the diversity of criteria on the indicators to be used and methodological shortcomings for the management of technological innovation. The proposed methodology for the management of technological innovation in a tourist destination, carried out in this research, includes the expansion and integration of the indicators to be considered according to the definitions and current context, as well as the measurement scale to be used in each case. All this makes it possible to have an appropriate tool that favors the development of intelligent tourist destinations.

Conflict of interest

The authors declare no conflict of interest.

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Appendix

Appendix 1. Instrument to evaluate technological innovation in the destination

Indicators	Items	Scale		
		Poor	**Average**	**Excellent**
Specialized website	Existence of the website of the destination	Does not have its own website	Has its own website but it works with insufficiencies	Has its own website and it works adequately
	Promotion of an attractive corporate image of the destination	Does not promote an attractive corporate image of the destination	Promotes an insufficiently attractive corporate image	Promotes an attractive corporate image of the destination
	Availability of updated information	The website does not have information about the destination	The website has outdated destination information about the destination	The website has updated information about the destination
	Interactivity with clients	Website does not allow interactivity with customers	Website allows limited interactivity with customers	Website allows unrestricted interactivity with customers
	Existence of a blog on the site	No blog is included on the site	A blog is included and is not managed adequately	A blog is included in the site and it is properly managed
	Content management on the page or site	No content is managed on the page or site related to the destination.	Some content is managed on the page or site but it is not updated frequently	Content is managed on the page or site and is constantly updated.
Social Networking	Active presence of the destination in social networks (Facebook, Twitter, Instagram, YouTube)	The destination does not use social networks to interact with tourists before, during and after their trip.	The destination moderately uses social networks to interact with tourists before, during and after their trip	The destination effectively uses social networks to interact with tourists before, during and after their trip
	Existence and execution of a long-term destination strategy on social networks	The destination does not have a long-term social media strategy	The destination has a strategy in place but does not execute it properly	The destination has and executes a long-term strategy in social networks.
	Leveraging user-generated content in destination marketing campaigns	User-generated content is not leveraged and analyzed to create marketing campaigns based on customer needs.	User-generated content is leveraged but this information is not used for marketing campaigns	User-generated content is optimally leveraged and analyzed for marketing campaigns
	Analysis of customer reviews on social networks	Customer reviews on social networks are not analyzed.	Customer reviews on social networks are occasionally analyzed	Customer opinions on social networks are analyzed frequently
Online marketing of the destination	Existence of virtual space for visitors to interact with the destination and with other users	No virtual space developed for visitors to interact with the destination and other users	A virtual space has been developed for visitors to interact with the destination and with other users but it works with shortcomings.	A virtual space for visitors to interact with the destination and with other users has been developed and is functioning adequately
	Monitoring of brands and media by the destination	No analysis of what is said about the destination and what the visitor's motivations are.	What is said about the destination and what are the visitor's motivations are analyzed irregularly	Optimal analysis of what is said about the destination and what are the motivations of visitors
	Design of innovative campaigns, sending of videos, animations, etc.	Not done	Occasionally	Frequent
	Publication of guides and unique, attractive promotional material	No guides or promotional material are published, properly structured and segmented according to according to current tourist profiles	Promotional is occasionally published without taking into account tourist segment profiles.	Guides and promotional material are frequently published according to current tourist profile segments
	Online catalogs	Not published	Occasionally published and updated	Published and updated frequently

Appendix 1. (*continued*)

Indicators	Items	Scale		
		Poor	**Average**	**Excellent**
Online marketing of the destination	Establish annual promotional plans, including an aligned Social Media Plan.	No annual promotion plans are established	Annual promotion plans are established but do not include a Social Media Plan aligned with objectives and strategies	Annual promotion plans are established including a Social Media Plan aligned with objectives and strategies
	Existence of independent websites for the destination's facilities with updated information on offerings	The destination's facilities do not have their own websites.	The destination's facilities have their own websites but they do not have updated information on their offers.	The destination's facilities have their own websites with updated information on their offerings.
	Existence of interactive platforms through which customers can customize their experience and purchase and pay for products and services.	There are no interactive platforms in the destination through which customers can customize their experience and contract and pay for products and services.	There are interactive platforms in the destination through which customers can customize their experience and purchase and pay for products and services, but they function with shortcomings.	There are interactive platforms in the destination through which customers can customize their experience and purchase and pay for products and services are functioning adequately.
Information services	Implementation of an integrated tourism information system.	The destination does not have an integrated tourism information system that allows for decision-making, creation and improvement of the offer	An Integrated Tourism Information System exists but is managed with difficulties to enable decision making, creation and improvement of the offer.	An Integral Tourism Information System is implemented in the destination that allows for optimal decision making, creation and improvement of the offer.
	Develop an informative platform for national and foreign tourists	The destination does not have an information platform for domestic and foreign tourists	There is an information platform for domestic and foreign tourists in the destination but it is not properly managed	There is an information platform for domestic and foreign tourists in the destination that is managed adequately
Mobile applications	Availability of mobile applications at the destination for information and promotion of the tourism offer	Mobile applications are not available in the destination for information and promotion of the tourism offer.	There are mobile applications available in the destination for the information and promotion of tourism offerings are available in the destination, but they are insufficient.	Mobile applications are available at the destination for the information and promotion of tourism products and services, and they are used appropriately.
	Availability of mobile applications at the destination for purchase and consume services	There are no mobile applications available at the destination for purchasing and consuming services, but they are not purchase and consume services	Mobile applications are available at the destination for purchasing and consuming services but do not cover the total number of services.	Mobile applications are available at the destination to buy and consume services and cover all services.
	Availability of mobile applications at the destination for sharing experiences	Mobile applications for sharing experiences are not available at the destination.	Mobile applications for sharing experiences are available at the destination but do not have the necessary reach.	Mobile applications for sharing experiences are available at the destination and work well.
Geolocation systems	Availability of mobile applications at the destination for the geolocation of the tourism offer	Mobile applications are not available at the destination for the geolocation of tourism offerings.	Mobile applications are available in the destination for geolocation of the tourist offer, but they do not have the necessary scope.	Mobile applications are available at the destination for geolocation of the tourism offer and cover the destination's products and services.
QR codes	Existence of QR codes on interpretive panels, promotional material, check-in/out processes and destination marketing campaigns.	There are no QR codes in the destination	QR codes are available on some tourist services	QR codes are available on interpretive panels, promotional material, check-in/out processes and destination marketing campaigns.
Audio guides	Existence of audio guides in attractions	There are no audio guides in the destination's attractions	Audio guides exist in some of the destination's attractions and are used infrequently.	Audio guides exist in the destination's attractions and are used frequently.

Appendix 1. (*continued*)

Indicators	Items	Scale		
		Poor	**Average**	**Excellent**
Data management	Use of Big data and Open data in destination management	Big data and Open data are not used in destination management	Big data is used for information processing but Open data is not used because destination data is not published, there is no free access to it.	Optimal use of Big data and Open data in destination management
	Publication of destination data on publicly accessible websites	Destination data is not published on publicly accessible websites	Limited publication of destination data on publicly accessible websites	Data are published on publicly accessible websites with interactive dashboard with key indicators for consultation and use of destination data
	Data management from customer feedback on social networks	No data is managed from customer information on social media.	Occasional data is managed from customer information on social networks	Constant monitoring of the official website and social networks is carried out to enable data analysis and management.
	Data analysis for the detection of market trends	No market trend studies are carried out through data analysis	Market trend studies are carried out through data analysis with constraints	Market trend studies are conducted through data analysis with effectiveness.
	Data management of destination organizations	Data in the destination organizations are managed in an unstable manner and no actions are taken with the results obtained	Data in the destination organizations are managed for periods of time and actions taken with the results obtained are made only on occasion	Data in the destination organizations are constantly managed, which enables real-time decision making.
	Use of mechanisms to capture tourist's online actions automatically	No mechanisms are used to capture the logs (actions that a user performs while browsing the destination's website or its social networks) automatically.	Mechanisms to capture logs automatically are occasionally used.	Mechanisms are frequently used to capture logs automatically, for example, through Google Analytics.
	A platform to collect and analyze sensor data, process it and upload it to a database in real time to provide an accurate view of the destination's events.	There is no platform for collecting and analyzing sensor data at the destination.	A platform is in place to collect and analyze data from destination sensors, process it and upload it to a real-time database to analyze indicators and make decisions, but it is not frequently used.	A platform is in place to collect data from destination sensors, process it and upload it to a real-time database to analyze indicators and make decisions to provide an accurate view of destination developments.
Use of intelligent techniques	Use of 3D (video mapping)	No use of video mapping at the destination.	Video mapping is occasionally used at the destination.	3D videos are frequently projected to simulate that the building in front of the tourists is actually changing and modifying in an attractive way.
	Use of holography	Holography is not used at the destination.	Occasional use of holography at destination	Holography technique is frequently used in which a hologram is formed that sends light waves to the viewer identical to those that would be reflected by the real object and thus creates the optical illusion of its presence
Use of intelligent techniques	Use of augmented reality in the information and promotion of the tourist offer	The augmented reality technique is not used in the information and promotion of the tourist offer.	The augmented reality technique is occasionally used in the information and promotion of the tourist offer, identifying and locating the attractions that surround the visitor.	The augmented reality technique is frequently used in the information and promotion of the tourist offer by identifying and locating the attractions surrounding the visitor.

Appendix 1. (*continued*)

Indicators	Items	Scale		
		Poor	**Average**	**Excellent**
Destination sensing	Use of sensors within the destination for monitoring public transport	Sensors are not used within the destination for public transport monitoring.	In-destination sensors are occasionally used for public transport monitoring	Sensors within the destination are used frequently for public transport monitoring
	Use of sensors within the destination for water and energy use by tourists	Sensors within the destination are not used for water and energy use by the customer in tourist establishments	In-destination sensors are occasionally used for water and energy use by the customer in tourist establishments	In-destination sensors are frequently used for customer water and energy usage in tourism establishments
	Use of in-destination sensors for monitoring a tourist's waste and carbon footprint of a tourist	Sensors are not used within the destination for waste and carbon footprint monitoring of a tourist	Occasional use of sensors within the destination for the control of a tourist's waste and carbon footprint	Frequent use of in-destination sensors to monitor a tourist's waste and carbon footprint
	Use of in-destination sensors in other processes	No use of in-destination sensors in other processes	In-destination sensors occasionally used in other processes	Sensors within the destination are frequently used in other processes
Technological modernization	Existence of adequate computerization and telecommunications infrastructures	The destination does not have an adequate computerization and telecommunications infrastructure.	The destination has a technological infrastructure with a medium level of development that facilitates the interaction and integration of visitors with the environment, but still has shortcomings.	The destination has a state-of-the-art technological infrastructure that guarantees the sustainable development of the tourist territory and facilitates the interaction and integration of visitors with the environment.
	Ease of connection to the Internet by the tourist demand.	There is no Internet connection facility for the tourist demand.	Tourist demand has access to the Internet but cannot access it from anywhere in the destination.	Tourist demand has access to the Internet and can access it from anywhere in the destination.
	Implementation of an open, powerful, free and fast-registration WiFi network in the places with the greatest influx of visitors.	An open, powerful, free and fast-registration WiFi network has not been implemented in the places with the highest number of visitors.	An open, free and fast-registration WiFi network has been implemented in the places with the highest number of visitors, but it does not have a powerful connection that allows a rapid response	An open, powerful (100 Kbps and low latency), free, fast-logging WiFi network has been implemented at the most popular visitor sites, so that users can share their experience in real time.
	Electronic commerce (ecommerce)	The conditions have not been created for the development of e-commerce in the destination through which consumers can make online contracts when purchasing tourist packages, transport services, accommodation, etc.	E-commerce is being developed at the destination, but with deficiencies and limitations in scope.	Conditions have been created for the development of e-commerce at the destination whereby the consumer can carry out online contracting when purchasing tourist packages, transportation services, accommodation, etc., and the process is completely successful.
	Tools for the computerized management of check in and check out.	The destination does not have computerized check-in and check-out management tools in its facilities.	The destination has in its facilities tools for the computerized management of check in and check out, but with limitations.	The destination has tools for computerized check-in and check-out management with a high level of development.
Technological modernization	Automation of processes related to tourist information.	There is no system to automate the collection of tourist information about the destination (information requests by type, number of users, etc.).	A system to automate the collection of tourist information about the destination (information requests by type, number of users, etc.) is in place but not implemented.	A system is in place to automate the collection of tourist information about the destination (requests for information by type, number of users, etc.).