Assessing the Needs of an Innovation Resource to Promote the Touristic Sector of a Small Andean City. Riobamba, Ecuador

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Abstract. To address the challenge of sustainable development, the use of technology and innovation tools is imperative for tourism stakeholders. This paper examines the needs of an innovation resource to promote the touristic sector of Riobamba (Ecuador), through an approach to the global trends of technologic innovation globally used in tourism, the identification of the perception about the needs of an innovation resource to promote the touristic sector, and based in those results, describes the profile and preferences of touristic cycling users, the main natural sites of tourist interest near to Riobamba as well as the offer of MTB (mountain bike) routes provided by the Tourism Ministry of Ecuador. Our findings support the statement that cooperation between touristic destinations is a key factor to implement innovation resources in touristic regions, evidencing that in Riobamba is pertinent the implementation of a resource of innovation to promote tourism based on a sustainability paradigm.

Keywords: Technology · Tourism · Riobamba · Ecuador · Innovation

1 Introduction

The integration between information and communication technologies (ICTs) and tourism is known as smart tourism. I that sense, organizations, and people involved in touristic activities use to work together to build social ecosystems that allow information exchange via internet [1].

Nowadays, the increasing development of emerging ICTs is contributing to restructuring processes and systems, altering the way in which products and services are offering and operating in the touristic market [2–4]. Thus, technology has become a main aspect of the touristic industry, and it is integrated into daily operations related with the provision of services and products of organizations that pursue to satisfy customer expectations. In this context, destinations are implementing actions to consolidate a smart tourism system which is associated to the use of technologies to collect data and to provide support to the stakeholders [1, 5, 6].

There are several technologic trends associated with tourism like robots, artificial intelligence, chat-bots, internet of things, recognition technology, virtual reality (VR),

and augmented reality (AR) [7], being mobile technologies, especially the use of smartphones one of the most relevant for the development of smart tourism [5].

Globally, it is evident that to face the challenge that implies a development based on a sustainability paradigm, the use of technology and innovation is a key factor, and the touristic sector is no exception. Therefore, dynamic changes are being implemented by businesses and localities that aim to satisfy the needs of tourists.

This study aims to assess the needs of an innovation resource to promote the touristic sector of Riobamba, through an approach to the global trends of technologic innovation used in tourism, the identification of the perception about the needs of an innovation resource to promote the touristic sector, the description of the user's profile, the identification of sites of interest and presenting the offer provided by the tourism official agency of Ecuador.

2   Methodology

2.1   Study Area

Riobamba is an inter-Andean small city of Ecuador located in the center of the country (Fig. 1); its coordinates are 1°40′00″S−78°39′00″O. There are several large mountains and volcanoes (Chimborazo, Carihuayrazo, Altar, Igualata, Tungurahua, Sangay) surrounding Riobamba. Administratively, Riobamba has 5 urban parishes (Velasco, Veloz, Maldonado, Lizarzaburu, and Yaruquíes) and 11 rural parishes (Licto, San Juan Cubijíes, Punín, Cacha, Licán, Calpi, Flores, Pungalá, Químiag, and San Luis).

Riobamba has an altitudinal average of 2750 m.a.s.l. and an annual temperature average of 12 °C. The main natural touristic attraction around Riobamba is the Chimborazo volcano, which is the highest mountain in Ecuador with 6.263 m.a.s.l.

Fig. 1. Location of the study area

2.2   Methods

To assess the needs of an innovation resource to promote the touristic sector of Rio-bamba, we structured our work in three sections: the first part comprises an approach to the global trends of technologic innovation used in tourism; a second section that identifies the perception about the needs of an innovation resource to promote the touristic sector of Riobamba and, a third part that based on the previous results obtained, describes the profile and preferences of touristic cycling users, the main natural sites of tourist interest near to Riobamba as well as the offer of MTB (mountain bike) routes provided by the Tourism Ministry of Ecuador.

The data were collected between July and December 2020, throughout structured questionnaires, that provided elements that contributed to understanding the topics under study. The process entailed sending the questions and receiving the responses by mail, to respect the healthy protocols applied during the Covid-19 pandemic.

The research was based on two questionaries: The first questionary was directed to non-governmental organizations (NGOs), regional and local governmental organizations, and universities located in the region to identify their perception about the needs of an innovation resource to promote the touristic sector of Riobamba. A total of 85 questionnaires were applied. While the second questionary was directed to touristic cycling users to identify their profile and preferences. A total of 143 questionaries were applied.

3   Results

3.1   Global Trends of Technologic Innovation Used in Tourism

The first part of the study is an approach to the global trends of technologic innovation used in tourism and are listed in Table 1, which includes the resource, a brief description, and its uses in the tourism industry. The main resources identified include: voice search & voice control, robots, contactless payments, virtual reality, chatbots, internet of things, recognition technology, augmented reality, artificial intelligence, and mobile apps.

Voice search and voice control are based on technology with spoken conversational systems allowing users to obtain the information they request with a spoken query [8], and for tourism sector, voice search is becoming a useful tool with a growing impact on tourist experience through several options like simplify the booking process and providing a quick response to tourist request of information [9]. Studies reporting their application in the tourism sector e.g. [7, 9] demonstrate that voice search has nowadays a significant role in tourism.

Robots play an increasing role in tourism and hospitality services, and their participation includes the use of robots in reception assistants, security robots, and robots that serve food and drinks to visitors. Their use is well documented in cases as the Henn-na Hotel located in Nagasaki (Japan), which has been recognized as the first hotel with robots in the world and uses robots at reception [10, 11]; Hilton, which have implemented a robot called Connie [12, 13]; and HMSHost, which have launched a robot that welcomes tourists to restaurants, providing menu details, and even is able to offer recommendations [7].

Table 1. Trends of technologic innovation associated with tourism.

Resource	Description	Uses in tourism
Voice search & voice control	Application used in smart speakers, smartphones, and AI assistants to pay actions or duties based on voice commands	Booking airline tickets Obtaining tourist information Controlling hotel devices
Robots	Automatically operated machines that replace human effort	Providing information Cleaning Luggage handling Food preparation Booking systems
Contactless payments	Technology associated to process that includes the reduction or elimination of contact during payments	Payment process
Virtual reality (VR)	Devices that allow experimenting situations similar or completely different from the real world	Experiencing far away locations VR tours 360 tours
Chatbots	Software application used to conduct an online chat conversation instead of providing direct contact with a live human agent	Swift answers to questions on a 24/7 basis, regardless of staff availability
Internet of Things (IoT)	Network of objects embedded with software, sensors, and other technologies to connect and exchange data with other systems and devices	Connecting several devices in touristic locations Data analytic platforms
Recognition technology	Technology employed to authenticate users through ID verification services (includes fingerprint recognition, retina scanning, facial recognition, and other biometric identifiers)	Safety and easy purchasing Accessing defined spaces by tourists Automatic payment systems Providing quick and complete information of tourist and passengers
Augmented reality (AR)	Interactive experience where the objects are enhanced by computer-generated perceptual information	Enhancing the customer experience, providing valuable information of touristic locations
Artificial intelligence (AI)	Machines programmed to simulate the human intelligence	Accurately and continuously sorting and processing data to decisions making in aspects that include business trends and customer satisfaction
Mobile app	Applications with software designed to mobile devices	Integrating several utilities to assist and satisfy the needs of tourists

Contactless Payments includes technology that contributes to touristic services through the reduction of transaction costs and adapting process that increase the confidence of the parties involved. Contactless technology enables travel without physical documents, making a mobile phone all that a visitor needs at a touristic destination [14]. In fact, studies like the presented by Basily et al. [15] describe a wide range of services integrated into an app, demonstrating a wide range of opportunities in the future for mobile technology associated with contactless payment.

Virtual Reality (VR) includes technology offering several opportunities to the tourism business. VR allows to tourists have experiences associated with extreme activities as kayak, rafting, or snowboard [7]. It also makes it possible to visit virtually inaccessible destinations like caves, waterfalls, or archeological sites. Advances in this technology will generate new opportunities and several possibilities of application for the tourism industry [3].

Chatbots make it possible to obtain quick responses to customer inquiries being available 24/7 (24 h/7 days of the week), regardless of human staff availability. Chatbots have gained importance with several applications including Amazon's Alexa or Apple's Siri [16]. Nowadays many tourists make their bookings through internet chatbots, and trends point out that the potential of chatbots in diverse areas of the tourism industry is vast [17].

Internet of Things (IoT) aims to maintain a connectivity system that allows them to be controlled by interned [18], and devices equipped with IoT are able to share their information online making it possible that any physical object can have a virtual reflection in the service space. This provides a huge space for developing and applying new business models and will have a major impact on the development of e-Tourism services [19]. Nowadays is common to find users integrating sensors for heating and cooling systems, devices for room service, and car rental.

Recognition Technology has already begun to be implemented in an experimental way in some hotel companies (e.g. Bluebay Group) and, in Spain, the Campanile hotel chain use sensors that allow to recognize facial expressions of emotions to evaluate and improve the protocols used in customer services [20].

Augmented Reality (AR) could be explained as the technology that augments the real world with virtual components. Instead of replace the reality, this technology superimposes virtual objects onto the physical world though the integration of object recognition technology with computer programs [21]. AR is a technology that provides useful information to visitors about the destinations they selected. Museums, galleries, and touristic attractions are using it to view historical exhibitions in their original form through the use of virtual overlaying and maps.

Artificial Intelligence (AI) is a growing trend in touristic business and can be used to design a personalized and adapted proposal for customers and to help in the analysis of business data. The potential of artificial intelligence (AI) technologies in the tourism sector is huge and some travel business are already using elements of artificial intelligence to analyze large volumes of data learning from their own and from the experience of other people to fulfilling customer needs [22].

Mobile Apps are able to integrate several of the resources mentioned above and have been designed for a wide gamma of touristic services as accommodation (Airbnb, Homeaway, 9Flat), transport (Uber, Grab), dining (VizEat, EatWith), and travel

experiences (ToursByLocal, Contexttravel). The use of internet is increasing and there are uncountable possibilities to enable online platforms day by day. Therefore, the popularity of mobile technologies and applications is growing day by day and undoubtedly changing the behavior of consumers and providers [5].

Even when the use of technology and innovation resources is highly recommended and valuated, some voices consider it as a risk for the maintenance of employees. So, there are authors e.g. [23] that conclude that is better to implement these technologies in activities that will make easier the work of employees instead of replacing them completely.

3.2 Perception About the Needs of an Innovation Resource to Promote the Touristic Sector of Riobamba

In the second part of our study, we identified the perception about the needs of an innovation resource to promote the touristic sector of Riobamba. The statements with the highest percentages obtained when we applied the questionaries are available in Table 2.

Table 2. Perception about the needs of an innovation resource to promote the touristic sector of Riobamba.

ID	Question	Statement with the highest percentage
Q 1	At which level the tourism sector has been affected by the COVID-19 pandemic?	Tourism has been highly affected by COVID-19 (82%)
Q 2	How important do you consider the implementation of an innovation resource in Riobamba for the reactivation of tourism?	The implementation of an innovation resource is very important for the reactivation of tourism (56%)
Q 3	Would an innovation resource benefit the tourism in Riobamba?	An innovation resource would highly benefit tourism in Riobamba (79%)
Q 4	In which tourism category do you consider priority the implementation of an innovation resource?	It is a priority the implementation of an innovation resource in tourism of nature (52%)
Q 5	Which innovation resource, you consider appropriate for its application in Riobamba?	Smartphone App is a resource appropriate for its application in Riobamba (48%)
Q 6	Do you consider that the use of the innovation resource should be free or paid?	The use of the innovation resource should be free (83%)
Q 7	Which organization should manage the innovation resource?	The innovation resource should be managed by the University Nacional de Chimborazo (46%)
Q 8	In which activities could be an innovation resource applicable?	An innovation resource could be applicable in cycling routes (37%)

An 82% of interviewed consider that the tourism industry has been highly affected by COVID-19; 56% consider very important the implementation of an innovation resource to reactivate tourism, and 79% point out that an innovation resource would highly benefit tourism in Riobamba. When we ask about the category that is considered a priority for the implementation of an innovation resource, most of the interviewed (52%) select tourism of nature, and considering that a mobile application (48%) will be the resource appropriate to its implementation in Riobamba. Additionally, the interviewed mentioned that the use of the resource should be free of pay (83%), managed by the Universidad Nacional de Chimborazo (46%), and applied to cycling routes (37%).

3.3 Profile and Preferences of Touristic Cycling Users, Natural Sites of Interest and, the Official Offer of Bike Routes

Based on the results obtained in the analysis of the perception about the needs of an innovation resource to promote the touristic sector of Riobamba, we identified: the profile and preferences of touristic cycling users (Table 3), the main natural sites of tourist interest near to Riobamba (Table 4) and the offer of MTB routes provided by the Tourism Ministry of Ecuador (Table 5).

Table 3. Profile and preferences of users of touristic activities (cycling).

ID	Feature	Statement with the highest percentage
Q 1	Age	21−40 years old (40%)
Q 2	Preferred schedule	Morning (68%)
Q 3	Days of the week preferred to practice	Weekends (79%)
Q 4	Time spending on cycling or trekking activities	2−3 h (74%)
Q 5	Preferred routes	Second-order pathways (54%)
Q 6	Preferred places	Natural areas (47%)
Q 7	Preferred surface of the road	Paved road (42%)
Q 8	Key elements in a Mobile App	Altitude, distance, and difficulty level (87%)
Q 9	Preferred characteristics of the App	Touristic information, hydration points, type of route, informative audio and image (91%)
Q 10	Relevant element to choose the routes	Type of road (34%)
Q 11	Preferred operative system for an App	Both IOS and Android (81%)
Q 12	Availability to use an App in a demo phase	Yes (89%)

Table 4. Natural sites of tourist interest near to Riobamba.

Chimborazo Fauna Production Reserve

Interest point	Short description
Chimborazo Volcano	The highest volcano in Ecuador (6268 m.a.s.l.)
Carihuairazo Volcano	Three peaked volcanic boiler (5018 m.a.s.l.)
Last Ice Merchant Route	Millenary route where the Ice Merchant extract ice from the old glaciers
Whymper's Needles	A rock formation named in honor of Edward Whymper
Machay Temple	Sacred cave of volcanic material, used by indigenous people as a ceremonial center
Solitary Tree	Large bush (5 m high and 6 m in diameter) located in the middle of the moor, surrounded by dunes
Polylepis Forest	Remnant of Polylepis forest
Chorrera Canyon	Rocky formation with a waterfall of approximately 25 m high
Inca Fortress	Archeological site considered a ceremonial center
Cunuyaku	Thermal water spring: considered as a healing center
Sangay National Park	
Sangay volcano	One of the highest active volcanoes in the world (5230 m.a.s.l.). It has a cone shape and the top is covered by glacier
Altar volcano	An extinct stratovolcano (5321 m.a.s.l.). It was active about 2 million years ago and contains a caldera open to the west, where there is a lake
Tungurahua volcano	An active volcano (5023 m.a.s.l.) its activity has been characterized by frequent powerful explosions and ash emanation
Ozogoche	Complex of 45 lakes that are deep, cold, and have a striking dark blue color

The highest range of age in users is 21–40 years old, presenting a preference to develop biking activities in the morning (68%) during the weekends (79%) for a period ranging between 2 and 3 h (74%). The preferred routes are second-order pathways (54%), located in natural areas (47%) with a paved road (42%). The elements considered key in a mobile application were: altitude, distance, and difficulty level (87%); while as preferred characteristics of the applications were mentioned: touristic information, hydration points, type of route, informative audio, and image (91%). The main element when users select a route was the type of road (34%), and use both operative systems (IOS and Android). Finally, most of the users (89%), mention to be able to use the application in a demo phase.

There are two main natural sites classified as protected areas that influencing the tourism activities around Riobamba: The Chimborazo Fauna Production Reserve which was created in 1986, has a length of 58560 hectares and, an altitudinal range from 3200 to 6268 m.a.s.l., this reserve is home to a large population of vicuñas, llamas, and alpacas; and the Sangay National Park which was created in 1975, has a length of

517765 hectares and, an altitudinal range from 1000 to 5230 m.a.s.l., in 1983 UNESCO declared it a World Heritage Site due to this unique geography and extraordinary biodiversity. Both sites have several interest points and the main have been identified in Table 4.

Table 5. MTB routes of Chimborazo

No.	Route	Distance (km)	Average time (hours)	Height (m)		Level (high-medium-low)	
				Max	Min	Physical	Technical
1	Urbina - Guano - Riobamba	37,8	4	3.618	2.750	Medium	Medium
2	Riobamba - Tunshi - Riobamba	36,7	3	2.839	2.657	Medium	Medium
3	Riobamba - Licto - Chambo - Riobamba	50	3,5	3.214	2.657	Medium	Low
4	Riobamba - Chambo - Quimiag - Riobamba	36	2,5	2.904	2.545	Medium	Low
5	Laguna de Colta	37	4,5	3.574	2.763	Medium High	Low
6	Riobamba - Guano - Riobamba	21,2	2	2.862	2.650	Low	Low
7	Riobamba - Batzacón - Guano	26,2	2,5	3.071	2.748	Low	Low
8	Penipe - Palitahua	28,6	2	2.503	2.401	Low	Low
9	Tzalaron - Laguna de Colta	27,7	2	3.591	2.948	Low	Low
10	Guamote - Riobamba	38,6	35	3.228	2.702	Medium	Low
11	Chimborazo - San Juan	32	1,5	4.800	3.200	Low	Low
12	Chimborazo Tambohuasha	36,8	3	4.840	3.290	Medium	Low
13	Chimborazo - Urbina	40	3,5	4.800	3.335	Medium	Medium

Finally, it is presented a list of MTB routes in the province of Chimborazo (Table 1), which were considered by the Tourism Ministry of Ecuador in a published document [24] with the aim of increase competitiveness, attractiveness, profitability, and benefits for the stakeholders involved in touristic activities related with cycle routes.

4   Conclusions

New technologies have been developed and it has led to transformations in the tourism industry and it is imperative to face global challenges and opportunities. Moreover, in the global context of the COVID-19 pandemic, technological innovation associated with tourism has become highly appreciated for the potential to reduce human-human contact and for the possibility to reactivate and dynamize the economic sector. This study supports the statement that tourism destinations should cooperate between them to implement innovative resources in touristic regions.

When we analyze the perception about the needs of an innovation resource to promote the touristic sector of Riobamba, it was evidenced that the stakeholders consider that the implementation of a free use mobile application that allows the integration of nature tourism and cycle routes could benefit and dynamize the touristic activities in Riobamba. Then, we identified the profile of the cycle routes users and found a clear tendency pointing to well-informed young people that enjoy developing this activity in natural places and willing to integrate a mobile application that should have included data like altitude, distance and, difficulty level to support their performance. Therefore, 14 points of interest that belong to the two main natural sites influencing tourism activities in Riobamba were briefly detailed and were consistent with the structure of MTB (mountain bike) routes provided by the Tourism Ministry of Ecuador.

The information presented in this study evidence that in Riobamba it is pertinent the implementation of a resource of innovation to promote tourism based on a sustainability paradigm. Therefore, our work plans include as the next step, the technical design of a mobile application including the parameters here identified.

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