A Web Application Model to Promote Tourism from the Educational Context: Case Study Ecuador

Liliana Enciso[1][a] and Pedro-Pablo Alarcón[2]
[1]*Grupo de Investigación Innovación Tecnológica Educativa, Departamento de Ciencias de la Computación y Electrónica, Universidad Técnica Particular de Loja, San Cayetano Alto, 1101608, Loja, Ecuador*
[2]*Departamento de Sistemas Informáticos, Universidad Politécnica de Madrid, Crta. de Valencia km.7, 28031, Madrid, Spain*

Keywords: LOXATOUR, Location, Mobile, Web, Tourism, Quick Response, Education, Innovation.

Abstract: In today's world, where the use of mobile devices has increased significantly, commerce is forced not only to offer its services through a web page or an office but through location-based services as a technology for fast information access. However, solutions for obtaining the specific location of the user or the service make it necessary to rely on additional hardware and/or software within the mobile device or as part of the system infrastructure. This work presents a localization model adapted to the city of Loja (Ecuador). The model combines several options of visualization to provide reliable services to the tourist: mobile, web and touch panel along with the application of Google Maps showcases data such as hotels location, museums, churches, cathedrals, and location-based ads. Furthermore, this combination allows an easy data access from any mobile telephone system by using QR (Quick Response). Additionally, consultations can be made through Touch Panels.

1 INTRODUCTION

Information and communication technologies (ICTs) are, fundamentally, tools to support the activities of organizations while allowing an optimal and rapid response to the processes of their systems. Moreover, since all economic sectors are being affected to a greater or lesser extent by ICTs, the tourism sector is not the exception. However, although the implementation of point-in-time systems such as the administration or management of resources is high in this sector, their acceptance is still incipient in some countries, especially with regards to end-user services and systems (Enciso et al., 2016). Currently, there are several initiatives in the field of localization that are linked to tourism, but each one of them is adapted to its own "reality" and to its specific requirements. This means, of course, that they tend to analyze their exploitation context, the actors involved and the technological, social and business barriers that may affect them (Wang et al., 2016). ICTs are indeed a way to innovate, effectively satisfy the needs, and design new services in a sector so representative in many national economies such as tourism (Czakon and Kawa, 2018), (Gavalas et al., 2014). Thus, in a context where supply is increasing, many companies linked to tourism have concentrated on the development and assembly of tourism products (Benur and Bramwell, 2015), (O'Cass and Sok, 2015), others on the value of their brand and the intrinsic added value of a tourism service provider (Gómez et al., 2015), (Banerjee et al., 2015). More importantly, new services will be a differentiating element for all the agents that somehow benefit from the tourism (kaisar et al., 2017). Complete and accessible information points, value - added services available at hotels, quality information in historic sites or support systems for tourist guides (Chiappa and Baggio, 2015), (Marine-Roig and Clave, 2015), are only some of the aspects in which localization technologies can contribute and undoubtedly attract more and more quality tourism (Enciso et al., 2016), (kaisar et al., 2017).

[a] https://orcid.org/0000-0002-2918-9033

Enciso, L. and Alarcón, P.
A Web Application Model to Promote Tourism from the Educational Context: Case Study Ecuador.
DOI: 10.5220/0008507004970505
In *Proceedings of the 15th International Conference on Web Information Systems and Technologies (WEBIST 2019)*, pages 497-505
ISBN: 978-989-758-386-5

1.1 Organization of Information

This document is structured in three parts. The first part reviews the localization technologies available to support tourism services. These, in turn, are divided into two main groups: those that use mobile and satellite networks and those designed to place the user in limited spaces that use wireless local area technologies. The second part synthesizes the characteristics of the Ecuadorian tourism sector to support the model proposed. Data such as mobile devices by operators, the percentage of smartphone users, and the percentage of population with Internet access is shown as well. The third part presents the business model of the services, establishing an architectural model and three forms of visualization of the application. Finally, business opportunities and possible obstacles for this implementation are discussed.

2 TOURISM LOCALIZATION SERVICE

2.1 Localization Technologies

2.1.1 Localization via Mobile and Satellite Networks

All methods described in the following lines are based on the technology for terrestrial mobile networks. Some of them can be implemented directly, others need to be modified in the network, while the rest also requires extended functionality in the user's terminal. Location information has always been present in GSM cellular networks since it is necessary for communication establishment and maintenance, but it was initially not accessible outside the network nodes. Nowadays, the necessary elements to do so have been introduced. On the other hand, for UMTS networks this information is already an integral element of the radio access network. At the same time, the network core includes all the necessary elements so that the position can be known both indoors and outdoors (Piccolo, 2008) (Cluzeaud et al., 2010). Due to advances in mobile technology, context-sensitive applications are steadily growing in importance. Therefore, the ability to develop accurate and reliable localization systems has become a necessity (Stella et al., 2014). In this regard, analyzing signal intensity based on the digital footprint is now widely adopted since most mobile devices comprise different wireless access technologies, making localization a relatively easy process.

2.1.2 Localization via Wireless Networks

Despite the limitations and drawbacks of outdoor localization techniques, they are still powerful enough to provide numerous end-user services. The challenge now is indoor localization. For instance, places where GPS (Global Positioning System) loses its precision due to obstacles such as walls and ceilings, and where the error of the systems studied for traditional mobile cellular networks is usually inadmissible. Nevertheless, valuable studies that debrief location via GPS with the help of smartphones remain in force (Chun et al., 2011). A thorough example is an indoor localization ecosystem called Guoguo (Liu et al., 2013). Parallel, applied research looks for other options such as the use of non-GPS phones through data records on connectivity and positions via an optimized Bluetooth network (Li et al., 2013).

- Bluetooth (Zhu et al., 2012), is a technology designed to offer personal network connectivity through a mobile device and at a low cost. It allows users to connect multiple devices: laptops, PDAs, mobile phones, etc., and it offers LAN or WAN connection through any access point. Bluetooth works at 721 kbps in a range of 10 meters and it is expandable up to 100 meters through repeaters. The frequency that it uses ranges between 2.4 and 2.48 GHz. In addition, due to its mobile and low-cost technology nature, it has low energy consumption; to effectively transmit at 10 meters, it uses 1mW of power, while to reach 100 meters it uses 100mW of power.
- Local Area Network (LAN) wireless technologies are experiencing a deployment boom. Numerous wireless network providers are installing their systems in hotels, cafes, airports and other buildings. These new infrastructures also support mobile devices localization (kaisar et al., 2017), so location-based services in LAN environments are viable (Aikawa et al., 2014). In the scope of heritage and tourism, different experimental networks have also been set up (Shang et al., 2011). For example, in museums, archaeological excavations, hotels and theme parks. These services are designed to provide information of interest linked to your current position. Other types of technology applications include integrated environments based on the measurement of the mobile network signal intensity and indoor localization systems based on Bluetooth connectivity (Chen and Wang, 2014).

2.1.3 Localization via GPS and TV Signal

In terms of localization effectiveness so far, no technology works with optimum performance in all environments. To cover this limitation, different solutions appear. One of them is based on the combination of the GPS system and a technique that allows locating a terminal through the synchronization signals of television(TV) (Chun et al., 2011). Another is a coordinated localization algorithm for mobile sensor networks that operates under the GPS, currently inefficient for indoor areas (Suh et al., 2014), (Katagiri, 2018). The system based on TV signals, depending on the applicability and the type of implementation, is effective for indoor localization where GPS usually fails on its own. High power and high bandwidth signals are used to determine the position in this system where they are continuously transmitted by analog or digital TV stations. However, final results depend on factors such as the coverage of TV stations, the different levels of attenuation and multipath propagation. On the contrary, GPS global coverage is critical when TV signals become weaker. (i Agustí, 2018),they applied a mixed-method approach, which included spatial analyses and cartography, to study the promotion of tourism.

3 LOCALIZATION SYSTEMS

Location-based services are not recent topics. In fact, many developers and researchers have constantly worked on innovation initiatives for localization and information access services. These include among others: Pelekis N. et al (Pelekis et al., 2008). Here the author develops a prototype system based on a powerful trajectory database query language, which allows the aggregation support 'Location Based Services (LBS)' to map the route that would make an object looking for another object in a specific place. This applied to finding the nearest taxi. Silva, A.P. and Mateus (Silva and Mateus, 2003). Based on optimization and simulation, this article presents a new approach to the problem of taxi assignment in a mobile. The objective is to predict the impact of the interaction between the allocation algorithm and that of the fleet. The approach and limitations of the proposal, and some results of the simulation such as the mean time of transportation and the average non-attendance of mobile users, are also scrutinized. Rashid Omer (Rashid et al., 2008). A system that can be used with any other mobile phone system to provide location-based and ad information to any Bluetooth-equipped mobile phone without the need for client-side software installation. The system is easily deployable without the need for users to do something complex with their Bluetooth switch. Martinez G. (Martinez et al., 2009). In this project, the authors show the relevance of a GIS application development for consultation and location of different points of interest in the city of Guayaquil-Ecuador. This, while allowing information access in a user-friendly interface. As a limitation, this project only offers searches via the Web. Bermúdez R. (Bermudez, 2013). Through the creation of a web application, accessible from any fixed or mobile device with Internet access, the author creates an environment that promotes both internal and external tourism in Ecuador while providing the user with as much information as possible. This, related to the closest tourist attractions. As a limitation, the application depends on the different municipalities of Ecuador uploading their tourist information.

4 TOURISM IN ECUADOR

Before focusing on the study of localization services and their application in the tourism sector, it is important to review the main characteristics of the Ecuadorian case. For this reason, this section compiles tourism and general data from governmental institutions in order to draft the best proposal for high-quality services. The study of tourism of the other cities development has been characterised by a troubled dialectic between applied studies of tourism's contribution to economic development and theoretically-informed political economy analyses(Bianchi, 2018). In Ecuador, various digital portals to publicize the most visited tourist places can be found. These, however, do not stress on localization services. Moreover, according to statistical data from both the Ministry of Tourism and the National Directorate of Migration, the most visited provinces are Guayas and Pichincha. Nevertheless, this data does not properly express reality, since statistics of tourists just in transit are included (both provinces have high-traffic international airports). The ICT-based model proposed for the province of Loja aims to boost the tourism sector of the region capitalizing on its great biodiversity and historical and cultural wealth. The design of a localization model using the current technologies will allow the operators of tourism services of Loja to provide a high-quality service. At the same time, the possibility for tourists

	enero		febrero		marzo		abril		mayo		enero - mayo	
Jefatura	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Pichincha	48.060	53.670	43.484	52.796	51.318	51.781	43.051	50.495	48.524	52.611	234.437	261.353
Guayas	27.663	30.578	26.403	29.079	26.884	29.427	19.986	25.557	23.871	26.418	124.807	141.059
Carchi	31.802	39.657	13.041	16.816	19.796	14.080	11.335	23.355	13.108	13.271	89.082	107.179
El Oro	18.359	19.840	17.836	20.433	11.736	12.117	9.933	11.985	10.119	12.228	67.983	76.603
Loja	1.208	1.268	1.095	1.356	881	1.054	831	1.155	828	1.206	4.843	6.039
Otras jefaturas	3.751	7.563	1.902	4.104	2.744	5.548	2.350	6.067	1.964	5.443	12.711	28.725
Total	130.843	152.576	103.761	124.584	113.359	114.007	87.486	118.614	98.414	111.177	533.863	620.958

Figure 1: Foreign visitors, per province (de Turismo de Ecuador, 2014)(INEC, 2014).

to independently locate a lodging service or a popular place may optimize their time and resources. In Ecuador, the entities that gather and publish official tourism indicators are the National Institute of Statistics and Censuses (INEC), the National Directorate of Migration and the Central Bank of Ecuador (BCE). In May 2014, sustained growth in foreign visitors' arrivals to Ecuador was maintained, reflected in a 13% increase in relation to the arrivals registered in May 2013. For the period, January-May 2014, 16% growth is also registered in relation to the same period of the previous year. The same logic applies to the statistics of foreign visitors who have entered Ecuador between the year 2013 and 2014.
The 42% of foreign visitors' arrivals is registered at the Mariscal Sucre International Airport corresponding to the province of Pichincha, 23% is registered at the José Joaquín de Olmedo International Airport corresponding to the province of Guayas, both airway. The remaining 30% of arrivals corresponds to terrestrial entrances, mainly through the provinces of Carchi and El Oro (Figure 1).

According to the record of Ecuadorian exports, the $1,038.7 million USD the country received in 2013 and the $1,251.3 million USD registered in 2014 put the tourism sector in the fourth economic position after two agriculture categories and processed seafood. More importantly, if we characterize the foreign tourist in relation to the national tourist, it will be clear that although a national tourist travels the Ecuadorian territory more often, the length of a stay for a foreign tourist is greater. Accordingly, the average expenditure/budget of a foreign tourist is always higher, Figure 2 and Figure 3. Another type of tourism that is considered in this work is the one attached to religious reasons. In the province of Loja, the pilgrimage of "La Virgen de El Cisne" takes place, obtaining a great influx of tourists from all over the country and even abroad. Other market niches linked to specific activities such as sports, cultural events, etc., can be considered as well. These groups, maybe non-representative from a quantitative point of view, may qualitatively be a considerable source of income if specific services are designed to fulfill their needs. As mentioned before, one of the most used devices for Internet access is the mobile telephone.

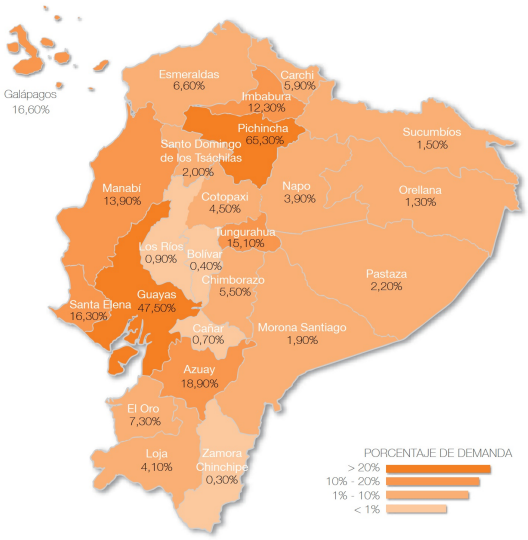


Figure 2: Percentages of foreign / international tourism demand per province (de Turismo de Ecuador, 2014).

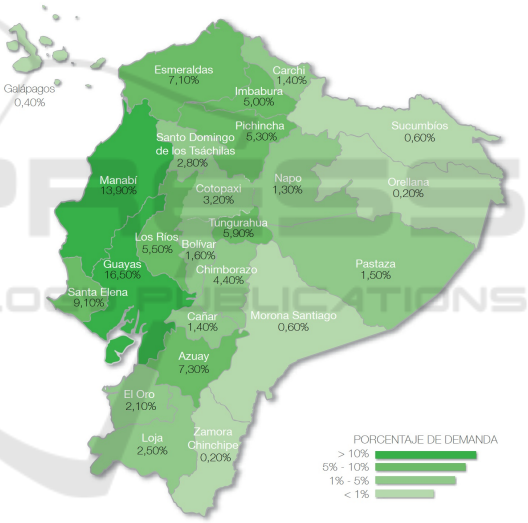


Figure 3: Percentages of national tourism demand per province (de Turismo de Ecuador, 2014).

Now, to specify the presence and growth of these devices, statistics have been extracted from the Ecuadorian Telecommunications Superintendence. This, until the year 2014 and for the 3 main operators currently providing telephone services in Ecuador (Figure 4). The usage of the Internet for information consultation, reservation of services and payments, is still limited for foreign tourists who choose Ecuador as their destination. Access to the same services is even more limited for national travelers. In addition, available applications in the market and their optimal use are relatively unknown. Considering that figures regarding the use of the Internet have increased significantly, it is extremely important

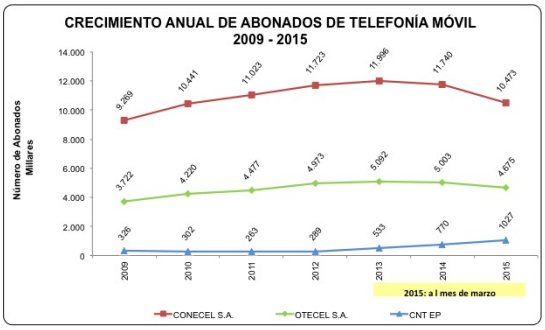


Figure 4: Mobile telephony in Ecuador per operator (SUPERTEL, 2014).

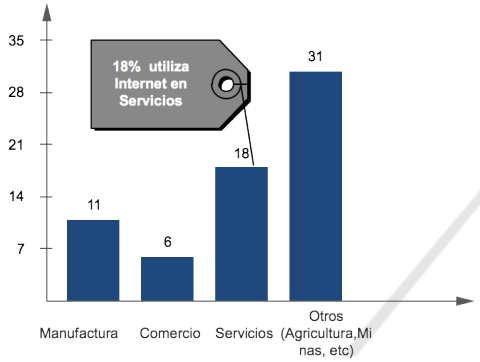


Figure 5: Percentages of Internet use in the Ecuadorian industry (INEC, 2014).

to showcase the different businesses and tourism services available. The National Economic Census conducted in the year 2010 reported the use of electronic media by companies at a national level. Thanks to this information, available for the first time in the country, the use of specific technology in the Ecuadorian industry can be identified. As shown in Figure 5, the percentage of Ecuadorian people that use the Internet for services access is 18%. This will later support the hypothesis that there are companies currently providing services of different types and that are already using these location-based technologies for commercial purposes. The usage of the Internet also differs between companies that take advantage of their electronic means for the promotion of their products and those who strictly use them for communication. The province of Galápagos, for instance, has the highest percentage of website and e-mail usage, with 31% and 12%, respectively, followed by Pichincha and Azuay. On the other hand, Loja has a 2% of e-mail usage and 11% of website usage [INEC, 2010] for its businesses. This also reflects that companies from Loja are betting on a new way of doing business by adjusting their services to the technology. According to the latest ICT INEC survey in Ecuador, 16% of all mobile telephones are

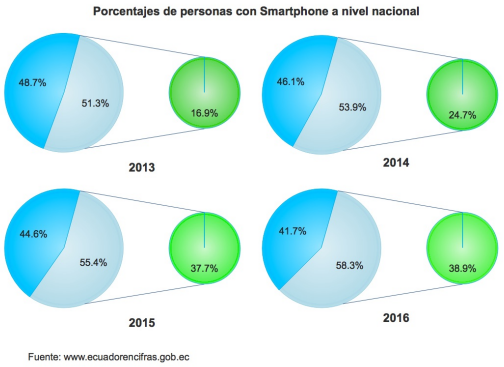


Figure 6: Percentages of smartphone use.

smartphones Figure 6, that is, they have an Internet connection, with a strong tendency to increase in the next years. In addition, as it is clear in all other ICTs, the use of smartphones is generational. The 16.9% (1,261,944) of people with mobile telephones in Ecuador have a smartphone, which represents a 141% growth compared to 2013, according to the latest data from the ICT INEC survey. The province with the highest number of people with an 'activated' mobile telephone is Pichincha with 60.9%, while the lowest is Chimborazo with 37.4%. It should be noted that the three telecommunication operators that currently exist in Ecuador do not offer services that support the tourism sector per se. Available packages must be downloaded and their purpose usually limits to transacting and finding information and service solutions that include: promotions, service centers by location, consultation, among others. In terms of Internet data, 40.4% of the Ecuadorian population has used it in the past 12 months. In urban areas, 47.6% of the population has used the Internet, while in rural areas a 25.3% compared to 17.8% of the previous year reflects a significant growth.

5 LOXATOUR - ARCHITECTURE

The main objective of LOXATOUR is to deploy a model that locates elements of interest for tourism services. This model will have three levels within its architectural frame Figura10.

The Figure 7, Figure 8 and Figure 9 shows the sequence diagrams that allow to visualize the interaction of the different objects and actors of the application over time. These describes the administrator's entry into the system to manage the content that is registered on the server, as well as updating and consulting the points of interest.

Database Level: In this part, the model will define all the data that is needed for the application, according

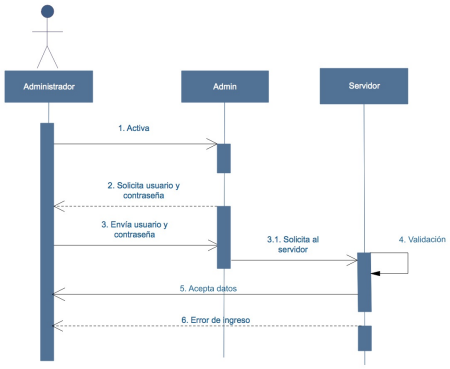


Figure 7: Sequence Diagram - Administrator.

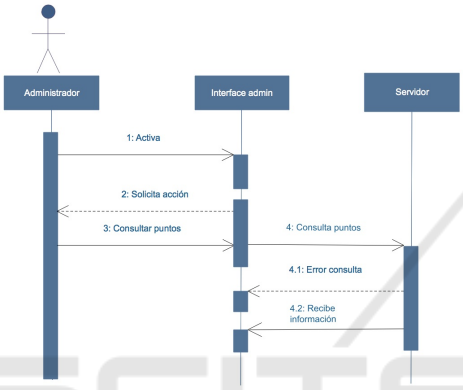


Figure 8: Sequence Diagram - Consult points of interest.

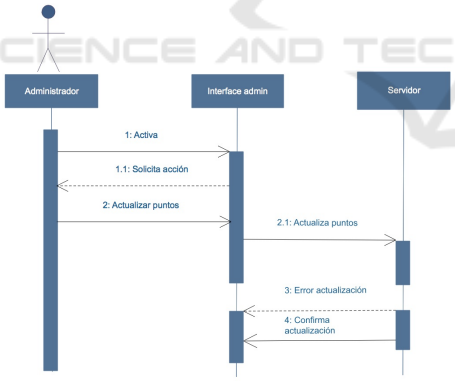


Figure 9: Points of interest update.

to the queries made by the user or the client. This level will support the model infrastructure. **Application Level:** For the model to have an advantage against other systems, this level will design, on top of Google Maps, the module that allows the visualization of the data. **Client Level:** Depending on the type of the localization service or the client software (e.g. desktop, mobile, touch panel; and hardware such as PDAs, smartphones, etc.), these components will allow the client to send requests and receive the corresponding responses.

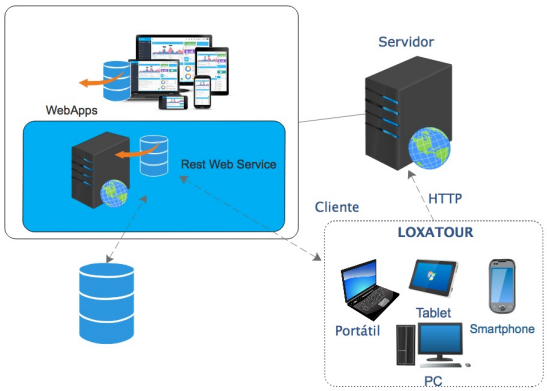


Figure 10: Architecture of LOXATOUR.

6 MODEL RESULTS

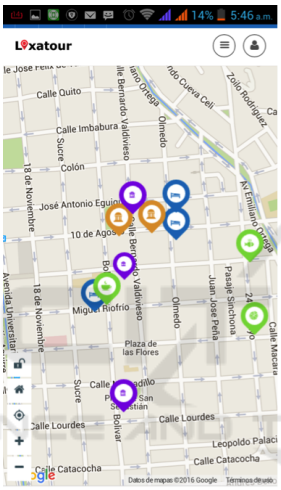
In the proposed model, users will be able to test the system by selecting the type of item to be located, which should be chosen from the tourism services required during their stay in the city (Loja) Figure 11. Locating a hotel at their arrival in the city for example. Taking this case, the scenario is as follows: Each hotel is in a location on the map of the city and from the exact place where the person is currently at, the person will make a consultation to locate the service required. This is in the case of doing it through a mobile device. If the person wants to make the consultation in the terrestrial terminal, it can be done directly on the touch panel, without needing a mobile device or Internet access. The decision to stay in any hotel will commonly consider the ranges of the hotel's costs, as well as the distances to the selected destination. In Figure 12 and Figure 13, the three representations of how the LOXATUR interfaces are displayed, also show a range of inquiries that could be made by a tourist, a business person or even a religious pilgrim.

7 WORK CONTRIBUTIONS

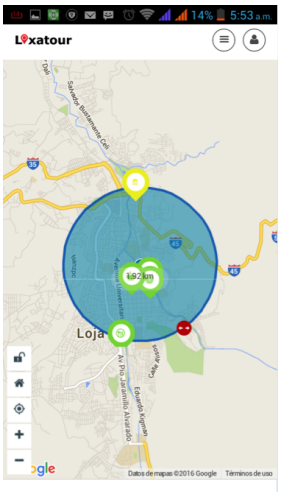
The present work is a novel proposal for the tourism sector of the city of Loja - Ecuador, since it offers three options of information access for the tourist or visitor. The main contributions of the proposed model are:

- Optimization of the time and resources of tourists and visitors.
- Access to reliable, accurate and timely information.

Figure 11: Design of Localization Model - LOXATOUR.

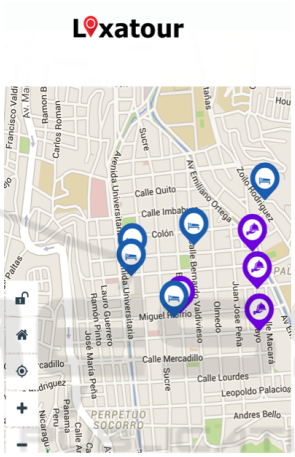


(a) Point of interest

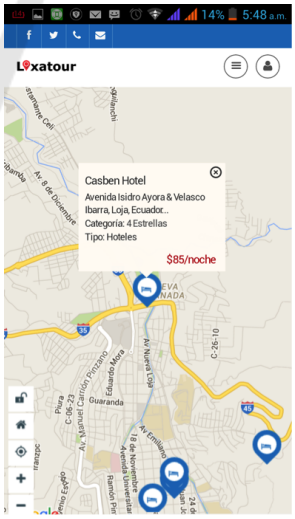


(b) Position usuario

Figure 12: Consultation of the user's position and points of interest- LOXATOUR.



(a) Location



(b) Information

Figure 13: Location of points of interest - LOXATOUR.

- The database for localization of promoted services and tourist sites will be continuously updated.
- Organization of the information according to tourist sites and services.
- QR (Quick Response) to download localization resources will be used.
- Information will be accessed without necessarily having a mobile device or Internet service (touch panel).

8 CONCLUSIONS

After the approach of the discussed model for localization of tourism services, it can be concluded: Reservation areas and the historical/cultural heritage of a country represent an important source for the development of location-based applications with the support of ICTs, as this can promote tourism. Considering the high rate of mobile telephony penetration, compared to other devices, mobile telephones represent a great opportunity to offer location-based services linked to tourism. These devices are also beginning to be compatible with any LAN/wireless technology, Bluetooth or GPS. A key factor for success in this regard is to not dismiss the accessibility and usability of the user interface. Moreover, no technique guarantees accuracy in all environments, but combining some of the available options makes it possible to provide high-quality services both in rural and urban areas (even indoors). The solution proposed throughout this piece, for different contexts (desktop, mobile, touch panel), will increase services options for the tourist and will allow the easy location of hotels, restaurants, tourist sites, cultural sites, gas stations, cash machines, parking lots, car rentals, tourist information offices, establishments in general, etc. Mobile operators will increasingly endorse localization services using cellular identity techniques. With the arrival of UMTS, the localization process will also be more efficient and simpler, as the positioning system is an integral part of the radio access network. As a note, today's services are accessible by voice, WAP navigation (either over GSM or GPRS) and text or multimedia messaging. The biggest challenge to offer localization services is that the companies offering services to the tourist have little confidence in the acceptance of this type of solutions because of the lack of quality and attractive content. To define the business opportunities offered by location-based services linked to tourism, it is necessary to carefully segment the type of visitor arriving in the country. There are niche markets that without explicitly representing a high number of users are great potential generators of income for the tourism sector.

ACKNOWLEDGEMENTS

The research team would like to thank Universidad Técnica Particular de Loja, to Grupo of research educational technological innovation of the UTPL, and the Polytechnic University of Madrid.

REFERENCES

Aikawa, S., Shigematsu, Y., Baba, R., and Kominami, T. (2014). Localization estimation system using wireless lan. In *General Assembly and Scientific Symposium (URSI GASS), 2014 XXXIth URSI*, pages 1–4.

Banerjee, O., Cicowiez, M., and Gachot, S. (2015). A quantitative framework for assessing public investment in tourism – an application to haiti. *Tourism Management*, 51:157 – 173.

Benur, A. M. and Bramwell, B. (2015). Tourism product development and product diversification in destinations. *Tourism Management*, 50:213 – 224.

Bermudez, R. (2013). Aplicación web optimizada para smartphone para la obtención de información de sitios turísticos del ecuador. In *Tesis de grado*. Universidad Tecnólogica de Israel.

Bianchi, R. (2018). The political economy of tourism development: A critical review. *Annals of Tourism Research*, 70:88 – 102.

Chen, Q. and Wang, P. (2014). Bluetooth-based room localization research based on nb and svm approach. *Advanced Materials Research*, 926-930:2458–2461. cited By 0.

Chiappa, G. D. and Baggio, R. (2015). Knowledge transfer in smart tourism destinations: Analyzing the effects of a network structure. *Journal of Destination Marketing and Management*, 4(3):145 – 150. Smart Destinations.

Chun, S.-M., Lee, S.-M., Nah, J.-W., Choi, J.-H., and Park, J.-T. (2011). Localization of wi-fi access point using smartphone's gps information. In *Mobile and Wireless Networking (iCOST), 2011 International Conference on Selected Topics in*, pages 121–126.

Cluzeaud, P., Bucaille, I., Sierra, A., and Choliz, J. (2010). Uwb in heterogeneous access networks: location-aware services. In *Positioning Navigation and Communication (WPNC), 2010 7th Workshop on*, pages 257–263.

Czakon, W. and Kawa, A. (2018). Network myopia: An empirical study of network perception. *Industrial Marketing Management*, 73:116 – 124.

de Turismo de Ecuador, M. (2014). La experiencia turística en ecuador. In *Catálogo Ministerio de Turismo 2012*,

El Telégrafo E7-58 entre El Tiempo y Av. De los Shyris - Quito, Ecuador. Ministerio de Turismo de Ecuador.

Enciso, L., Quezada, P., Barba-Guamán, L., Solano, L., and Alarcón, P.-P. (2016). *Open Drugstores Mobile App*, pages 797–806. Springer International Publishing, Cham.

Gavalas, D., Konstantopoulos, C., Mastakas, K., and Pantziou, G. (2014). Mobile recommender systems in tourism. *Journal of Network and Computer Applications*, 39:319 – 333.

Gómez, M., Lopez, C., and Molina, A. (2015). A model of tourism destination brand equity: The case of wine tourism destinations in spain. *Tourism Management*, 51:210 – 222.

i Agustí, D. P. (2018). Characterizing the location of tourist images in cities. differences in user-generated images (instagram), official tourist brochures and travel guides. *Annals of Tourism Research*, 73:103 – 115.

INEC (2014). Instituto nacional de censos y estadísticas de ecuador. In *Catálogo INEC 2010*, Juan Larrea N15-36 y José Riofrío - Quito, Ecuador. INEC.

kaisar, S., Kamruzzaman, J., Karmakar, G., and Gondal, I. (2017). Decentralized content sharing among tourists in visiting hotspots. *Journal of Network and Computer Applications*, 79:25 – 40.

Katagiri, F. (2018). Review: Plant immune signaling from a network perspective. *Plant Science*, 276:14 – 21.

Li, S., Liu, B., Chen, B., and Lou, Y. (2013). Neural network based mobile phone localization using bluetooth connectivity. *Neural Computing and Applications*, 23(3-4):667–675. cited By (since).

Liu, K., Liu, X., and Li, X. (2013). Guoguo: Enabling fine-grained indoor localization via smartphone. pages 235–248. cited By (since).

Marine-Roig, E. and Clave, S. A. (2015). Tourism analytics with massive user-generated content: A case study of barcelona. *Journal of Destination Marketing and Management*, 4(3):162 – 172. Smart Destinations.

Martinez, G., Zambrano, F., and Urquizo, J. (2009). Análisis, diseño e implementación de un sistema de información geográfico - web turístico. In *Tesis de pregrado*, Guayaquil, Ecuador. Universidad Politécnica del Litoral.

O'Cass, A. and Sok, P. (2015). An exploratory study into managing value creation in tourism service firms: Understanding value creation phases at the intersection of the tourism service firm and their customers. *Tourism Management*, 51:186 – 200.

Pelekis, N., Frentzos, E., Giatrakos, N., and Theodoridis, Y. (2008). Hermes: Aggregative lbs via a trajectory db engine. pages 1255–1258.

Piccolo, F. (2008). A new cooperative localization method for umts cellular networks. In *Global Telecommunications Conference, 2008. IEEE GLOBECOM 2008. IEEE*, pages 1–5.

Rashid, O., Coulton, P., and Edwards, R. (2008). Providing location based information/advertising for existing mobile phone users. *Personal and Ubiquitous Computing*, 12(1):3–10.

Shang, J., Yu, S., Gu, F., Xu, Z., and Zhu, L. (2011). A mobile guide system framework for museums based on local location-aware approach. In *Computer Science and Service System (CSSS), 2011 International Conference on*, pages 1935–1940.

Silva, A. P. and Mateus, G. R. (2003). Location-based taxi service in wireless communication environment. In *Proceedings of the 36th Annual Symposium on Simulation*, ANSS '03, pages 47–, Washington, DC, USA. IEEE Computer Society.

Stella, M., Russo, M., and Begušić, D. (2014). Fingerprinting based localization in heterogeneous wireless networks. *Expert Systems with Applications*, 41(15):6738–6747. cited By (since).

Suh, J., You, S., Choi, S., and Oh, S. (2014). Vision-based coordinated localization for mobile sensor networks. *IEEE Transactions on Automation Science and Engineering*. cited By (since); Article in Press.

SUPERTEL (2014). Superintendencia de telecomunicaciones del ecuador. In *Folleto*, Juan Larrea N15-36 y José Riofrío - Quito, Ecuador. Estadísticas abonados por operadoras.

Wang, X., Li, X., Zhen, F., and Zhang, J. (2016). How smart is your tourist attraction?: Measuring tourist preferences of smart tourism attractions via a fcem-ahp and ipa approach. *Tourism Management*, 54:309–320. cited By 2.

Zhu, J., Zeng, K., Kim, K.-H., and Mohapatra, P. (2012). Improving crowd-sourced wi-fi localization systems using bluetooth beacons. In *Sensor, Mesh and Ad Hoc Communications and Networks (SECON), 2012 9th Annual IEEE Communications Society Conference on*, pages 290–298.