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The Role of Information and Communication Technologies in the Creation and Support of Touristic Routes

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Abstract

The tourism sector has become one of the most important engines of economic growth for many countries. With the evolution of Information and Communication Technologies, new opportunities have arisen for a reengineering in the way the various tourism and hospitality industries interact with tourists. Equally, new possibilities open to the entities that vision to promote the patrimony and endogenous products of their regions. Information and Communication Technologies are today one of the most critical areas for the success of tourism and how tourist destinations can be promoted.

Tourists, increasingly a digital generation, expect that the access to information and services be done in an innovative, immersive and contextualized way, through the use of technologies that are embedded in their daily lives.

This article discusses the touristic routes creation process and the role of Information and Communication Technologies in the creation and support of touristic routes. Also, a technological model is presented in its conceptual perspective, as well the functional modelling of its main components and features.

Keywords: Tourism, Touristic routes, ICT, Model, IoT.

Introduction

Touristic routes are an attraction and a resource used by tourism, inciting the visitor to go for a tour across the territory, facilitating access to other attractions or places (Maia & Baptista, 2011). According ICOMOS (1999) a cultural route goes beyond mere communication or the character of tourism product, constituting a heritage associated with collective memory. The route is thus "a product or destination that is born of the combination of resources and services, gather and organize the set of elements of interest of the visiting public, under a certain theme" (Salvador & Baptista, 2011). The route defines a path, specifying the places of passage and proposing a series of activities and services (Gómez & Quijano, 1992), is a specific type of route consisting of a trunk functioning as the main axis and by complementary branches of that, traversed in a determined time, thematically autonomous or linked to another route, organized with a very objective geography, and developed in a certain direction, being able to be consumed as a route directed to the dominant theme and adding several attractions and activities that enrich it as a singular tourist product (Figueira, 2010).

Routes can be considered a resource, destination or product; as a resource, constitute an attraction, which can be visited and can motivate the movement of people, which may exist only in culture and not be part of the tourism world; as a destination and, from a purely geographical perspective, may lead and motivate the choice of that region to be visited during the trip, either in accompanied visits or through dissemination material; and, as a product may constitute an attractive and appealing offer, which satisfies the motivations of the demand and can therefore be commercialized and offered by tour operators or other agents and be materialized in touristic packages, circuits or excursions (Bernier 2006). Regardless of the prospects, the route product is usually centred on a heritage component oriented to aggregate the endogenous resources of a region and compete for the final design of itineraries and circuits.

The promotion and the create of value in touristic routes can advantage hugely with the use of ICT. Tourists are growing demanding agents of information and services. In this demand, tourists don't expect less than innovative and immersive experiences in the three stages of travel – before, during and after the visit. The use of ICT is changing the way destinations and touristic routes are promoted and supported. There is a wealth of opportunities for tourism providers but also, an all-new world for the fruition of a tourist experience. To bridge this gap, innovative (but suitable) models must be draw, implemented and evaluated.

Routes Creation

In order to create a route, it must be selected a central theme that constitutes a guiding thread and, underlying it, there must be a comprehensive, versatile and attractive touristic offer that includes public and private services (Molina, 2014); activities of a touristic nature such as accommodation, catering, travel agencies, information and transport; activities of tourism application, generating of cultural motivations, that attract tourists, like the animation and the touristic information; and tourism support structures such as infrastructures, communication routes and transport services (Bernier, 2009), according to figure 1:

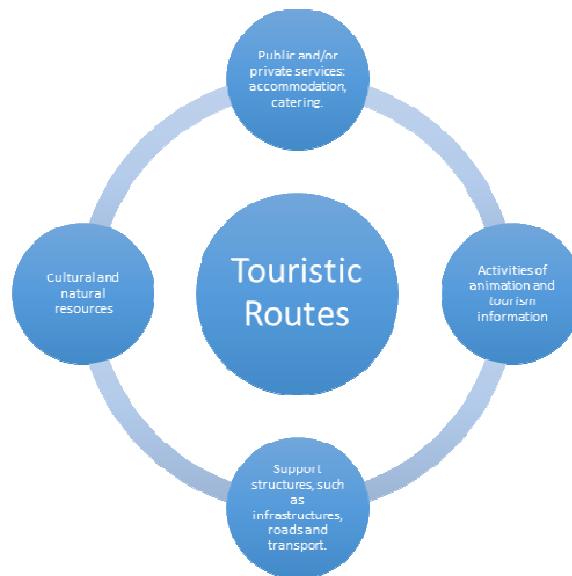


Fig. 1: Subsidies for creating routes. Based on (Bernier, 2006; Molina, 2014).

In the analysis of figure 1, we can verify that there are several components of a route, highlighting the theme, an itinerary developed based on the road network or other type of communication; the existence of a specific management model; information and promotion; and a map containing

information about the route (Fernández & Guzmán, 2005). Its elaboration must comprise four stages: to define which route to implement, to present the touristic points that will compose the route, to carry out the geographic and access survey that links the touristic points and to apply a program that will trace the route (Paula & Bastos, 2002). In Figueira (2010), are showed further details of the process about how implementing a route and indicate, as a first stage, the definition of the theme based on previous studies; in the second stage, considers the definition of points of interest; in the third stage, considers the fundraising to be fundamental (one cannot dispense with the survey of accessibility that leads to points of interest); fourth and last stage, the records consider the programming and the interpretation of the route, according to figure 2:

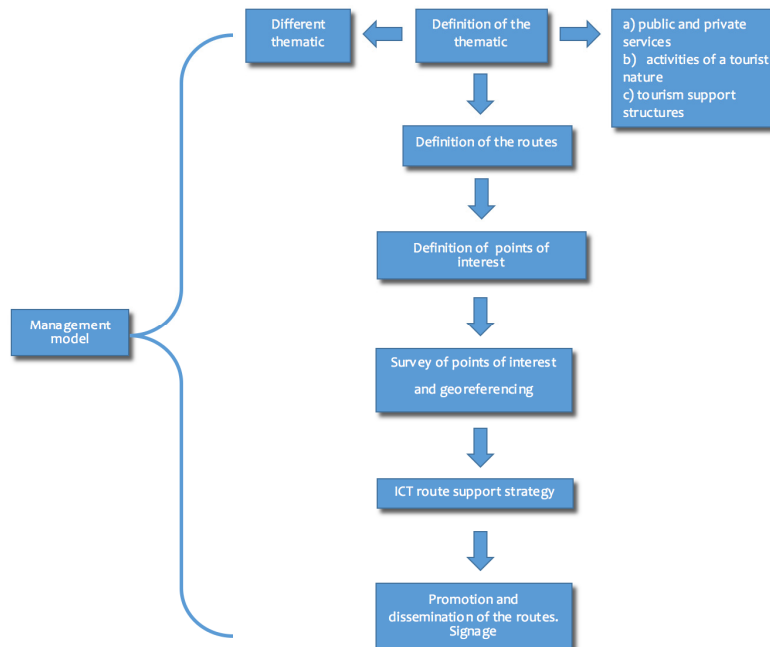


Fig. 2: Creating routes. Based on (Paula & Bastos, 2002; Fernandez & Guzmán, 2005; Bernier, 2009; Figueira, 2010; Molina, 2014)

The first stage for route programming is directly linked to the geographic survey and the application of a program to delimit the route layout, in this step, the routes are defined. According to Figueira (2010), itineraries can be organized according to:

- a) The tourist product (sports, historical, artistic, ethnographic, educational, ecological, health, thermal, other therapeutic practices, community, holiday camps, holiday, adventure, cultural and religious);
- b) The means of transport used (pedestrians, road, sea and inland waterways);
- c) Thematic;
- d) The course design (linear or nodal)
- e) Geographic extent (local, national, regional, international);
- f) The duration (Short duration, medium duration, normal duration and long duration).

The construction of routes has inevitably to be oriented to the question of knowledge, organizing a genuine narrative, capable of competing in the global market and responding to the interests of the stakeholders, among them tourists, operators, service providers and communities (Figueira, 2010). The main differentiating factors of cultural routes are: the active character in comparison with other segments, such as sun and beach or sports, where the visitor is a mere spectator or just "enjoys" the environment, without participation in the surroundings instead of the routes that are linked to knowledge and pleasure, assuming a certain cultural level by its target market (Bernier, 2006). The diversity and heterogeneity of the cultural routes contribute to the satisfaction of a diversity of motivations, promoting the passage from the economic status of hikers to tourists and increasing the time of stay of visitors in the territory. The touristic routes also allow to consolidate the regional productive culture; sensitize and raise the awareness of local people and visitors of the importance of heritage; incorporating them into other national circuits, other tourist circuits located in marginal, peripheral spaces and preserving the heritage (Fernández & Guzmán, 2005).

According to Bernier (2006), the cultural routes are among the generic segments that more frequently exist and conceptualize routes of cultural character. For instance, the culture of religion and its great role in the development of civilizations, the tangible and intangible aspects transmitted through patrimony, maintain an abundant cultural heritage that can be enhanced by the creation of thematic routes (e.g. religious routes), promoting and developing the territory with gains for regions, capable of reversing the inherent reality of low-density territories. However, Pulido (2006) points out that cultural routes face some problems to become tourist products; among the various problems, it emphasizes the existence of valid assets, but with little tourist infrastructure; some heritage elements are difficult to access and are often closed to the public; the high seasonality; and the verification of low territorial marketing, makes the route somewhat static; sometimes the design of the route is purely intellectual, with little information or large differences in the provision of the basic tourist offer along the territory, making it difficult to perceive the route as a homogeneous product. Sometimes, too, there is an absence or deficiency of signalling on routes of different territories and non-uniform signalling and lack of true interpreters of cultural heritage. In view of the above, it is understood that a good management of the routes, through the raising of potentialities, needs, awareness and participation of the local inhabitants, valorisation and reinforcement of heritage identity, good practices of interpretation and promotion, innovation and creative and innovative tools. Thus, associated with the collaboration of the public and private sectors, of an economic, social and academic nature, can be good tools in their conceptualization, implementation and management. According to Bernier (2006), there are historical, artistic and monumental Routes; folk and craft routes; gastronomic routes; memory routes and historical interpretation; routes of cultural events and religious routes.

Create routes is, for the new tourist profile – that is more and more starving for information and services, before, during and after their travel – an increasing challenge. Tourists demand new innovative ways to consume culture, heritage and their travel-experiences. The role of Information and Communication Technologies (ICT) emerge as important and differentiator – an important competitive advantage and a critical success factor.

ICT Role in Tourism

Understanding the tourist mobility is fundamental for tourism management practice and tourism research (Zheng et. al, 2019). Considering the nature of travel experiences that many times imply intensive and close interaction with service providers and local community, the interaction between locals and guests emerges as an important component of tourist experience in travel destinations (Buhalis, 2000; Cetin & Bilgihan, 2016; Steel, 2012; Alrawadieh et. al, 2019). Smartphones, sensor devices, new High speed communication infrastructures, and the Internet of Things (IoT) are technologies that provide new mobile location based services (Almobaideen et. al, 2017) and more immersive experiences. The development of Social Media and ICTs has driven important changes in the behavioural of tourists and also in the way they search, assess, produce, purchase and consume information, products and services (Bizirgianni & Dionysopoulou, 2013). The applications of smart

techniques in tourism have led to profound changes in the tourist behavior and demand, as well as how tourism industry structure itself (Buhalis and Law, 2008, Connell and Reynolds, 1999; Wang et. al, 2016). In the predictable future, it seems valid to assume that tourism will continue growing and changing significantly with smart devices and technologies applied more widely and frequently in various tourism sectors (Koo et. al, 2013; Wang et. al, 2016). An increasing part of the reason for tourism service providers to develop smart tourism is to improve tourist experiences. Thus, it is critical to understand the new profile of tourists and their needs in the smart Era (Wang et al, 2016), being able to give them innovative experiences on their travels.

In the context of tourism ICT evolution, many technologies have emerged for support new ways to deliver information and services to tourists. In this roll of technologies, a mix-technology approach capable of creating immersive experiences and a completely new approach in the way that tourists interact with their surrounding environment, has appear. The called Internet of Things (IoT), is combining several technologies for creating smart spaces and feature an all new paradigm for manage information and services. In the tourism sector this is not an exception. Mobile applications, sensors, and small “invisible” technologies (e.g. embedded systems) are creating a link between the physical and the virtual world.

Some major technologies, that are been used standalone or combined, are described in the followed list, and represents an inventive and teeming world of opportunities both for tourists and tourism service providers:

Global Positioning System (GPS)

The GPS is a satellite-based radio navigation system designed, financed, developed and operated by the U.S. department of defense as a military navigation and positioning system, but soon opened it up for civilian use. It allows users to determine their three-dimensional position, speed and time 24h a day, under all weather conditions. The use of GPS receivers alone or with hand held devices such as smartphones is very common nowadays. Currently, GPS technology acts more and more importantly in daily life, especially in vehicle and ship navigation and pedestrian user.

RFID (Radio-Frequency Identification) Tags

Radio Frequency Identification (RFID) is the term given to a set of technologies that use radio frequency (RF) to transmit data. Currently RFID technology is used among others in: point of sale (POS), automatic vehicle identification systems, access control to buildings or spaces in buildings, warehouse management and logistics, tracking goods in supply chains of many other uses. An RFID system basically consists of two components: a transponder (RF tag) and an Interrogator (RF reader). The transponders are known as tags, labels or chips.

NFC (Near Field Communication) Tags

NFC is a short-range, standards-based wireless connectivity technology that uses magnetic field induction to enable communication between electronic devices in close proximity. The NFC can operate in either of two modes: active and passive. In active mode, both devices generate their own radio field to carry and transmit the data. In passive mode, only one device generates a radio field. The passive mode of communication is very important for battery-powered devices like smartphones need to prioritize energy consuming. NFC devices' mode of operation, can be categorized as, ticketing and payment, peer-to-peer, and service initiation. Contactless tickets or cards have already begun to revolutionize the speed and ease with which all consumers can consume products and services.

2D Visual Tags

Another technology explored for accurate and reliable real-time position and routing information on site is the 2D barcode system. 2D barcode system also has the ability to deliver any information, which may include text, audio, video, and graphics (2D/3D), on location. Every day, we see barcodes in the world around us. Barcodes are in supermarkets, on labels, greeting cards and consumable goods. Since their invention in the 20th century, barcodes have slowly become widespread. The main advantage of using 2D barcodes is that a large amount of easily and accurately read data can ride with the item to which it is attached, but also, can be and URL (Unified Resource Location) based system to reach digital information and services. In this sense, visual tags can also provide an attractive and transparent way to enable user access to product-oriented contextualized information and services, as stated in (Gao et. al, 2007; Cunha et. al, 2010), which allows the creation of innovative interface between companies and customers: new CRM (Customer Relationship Management) and B2C (Business-to-Consumer) opportunities.

VR (Virtual Reality)

VR is an interface technology between a user and a system 3D-based graphics or 360° images whose goal is to create a sense of presence, even virtual, that the user is in a real environment. This interaction is performed in real time, using ICT that help in increasing the user's presence in the virtual environment. This sense of presence is as immersive experience.

AR (Augmented Reality)

It is called AR the integration of elements or virtual information to real-world views through a camera and with the use of motion sensors such as gyroscope and accelerometer, for instance, widespread in today's smartphones.

Beacons

A beacon is a small Bluetooth radio transmitter; it repeatedly tr. A Bluetooth-equipped device like a smartphone can detect a beacon once it's in range and receive its data transmission. This can be used to start an event (e.g. show information).

Understanding how tourism players can better take advantage of ICT, by developing new ICT models for support routes, generate business, support the tourist needs and educate the tourist for the cultural and heritage; is, in our opinion, a challenge for all tourism players.

A Proposed ICT Model for Support Touristic Routes

Touristic routes being, as already stated, an attraction and a resource used by tourism, have several particularities such as: they can be easily travel by a single tourist or small groups without having professional human guides; also, the tourist, nowadays, expect that it is easy to get information about what attracts is attention and equally an easy access to services that support a pleasant travel experience.

ICT models for support tourist's expectations are a driver for travel destinations success, and can be a positive shift for the business generation, heritage education and territorial marketing. This is special relevant in rural regions, where exists mainly micro enterprises and a low capacity for innovate. In this case, cooperative networks should be created in order to increase the enterprises competitiveness (Mendonça et. al, 2015).

For create innovative ICT models for support touristic routes we must rely on IoT and all the mix technologies that support this concept. Tourists nowadays, typically, have mobile devices and fulltime internet connection (e.g. the end of roaming special high charges in Europe); also, mobile devices have several embedded technologies, such as NFC support, GPS, Bluetooth, VR and AR capabilities. Smartphones are powerful tools for support, almost, any innovative approach for getting information and services and interact with a surrounding ICT environment. Major gains can be achieved by touristic routes stakeholders, public organizations and tourism organizations that have common goals in supporting the tourist needs at the same time that they achieve economic objectives, national policies or territorial marketing.

Tourists are increasing “free spirits” in the sense that people tend to desire travel in more unstructured ways – grab a suitcase and fast buying an airplane ticket to go abroad without a big plan is no more an improbable event. But, this new reality is very demanding for ICT, because tourists expect to have all information and services available once they arrive to destinations.

For tourism service providers, independently of have a more economical interest or a more educational/promotion interest, the fact of exist an effective ICT approach, increase their strategies opportunities, by easing the interaction between tourists and their services. This, in our opinion, show that the use of innovative and effecting ICT models is always a win-win approach.

In Figure 3 we present a proposed model for support touristic routes. The model is based in a ubiquitous ICT approach and rely on the existence of mobile devices and surrounding smart spaces, powered by IoT technologies.

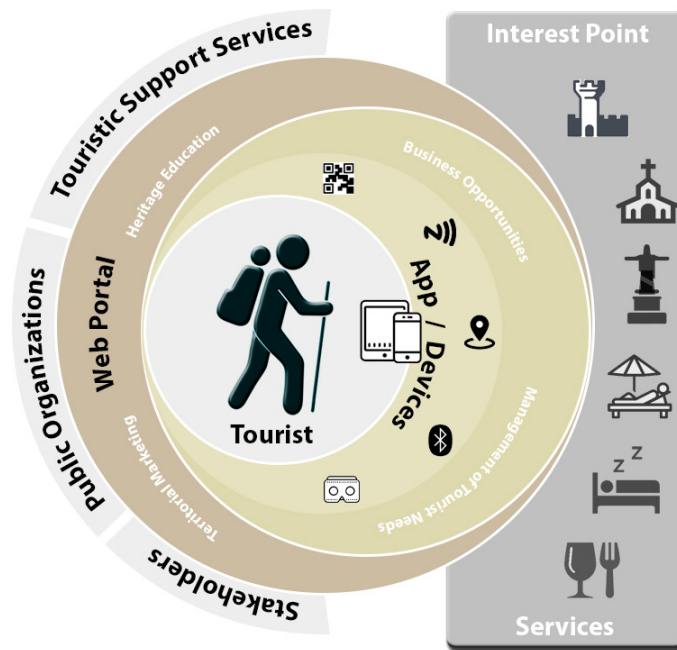


Fig. 3: A Proposed ICT Model for Support Touristic Routes

This model has two main perspectives: tourism services providers and the tourist itself. The first ones, having information and services about their own business, desiring to have effective and innovative channels for distribute their services or products, even when tourists don't know their services or products, or even know them at all. The second ones, are starving for information about everything they see and want an easy access to services and information that they need. Also, tourists

don't want to spend too much time searching for information until they find it. To accomplish both sides expectations, the proposed model present a central web portal that always to the first one, to insert all information about their business. For tourists, an information system based in IoT with mix contextualizing technologies can support easy, automated and site-specific information and services. Reserve and hotel, getting information about heritage or find the best restaurant to lunch, can be an automatic and simple action. Or, in some cases (e.g. with beacons), with no action needed, at least to see a pop-up information. Also, the use of AR and VR will allow to tourist interact in a more immersive way with the surrounding environment, understand past time lapses experiences and see the recreation of today's inexistent infrastructures.

In this context, we propose the development of technological tools that allow to apply the previously proposed model. As such, we suggest the development of a web portal, illustrated in Figure 4 and Figure 5, and a mobile application illustrated in Figure 6.

The features that we indicate to include in the web portal's Back-End are modelled in the use case diagram shown in the following Figure 4.

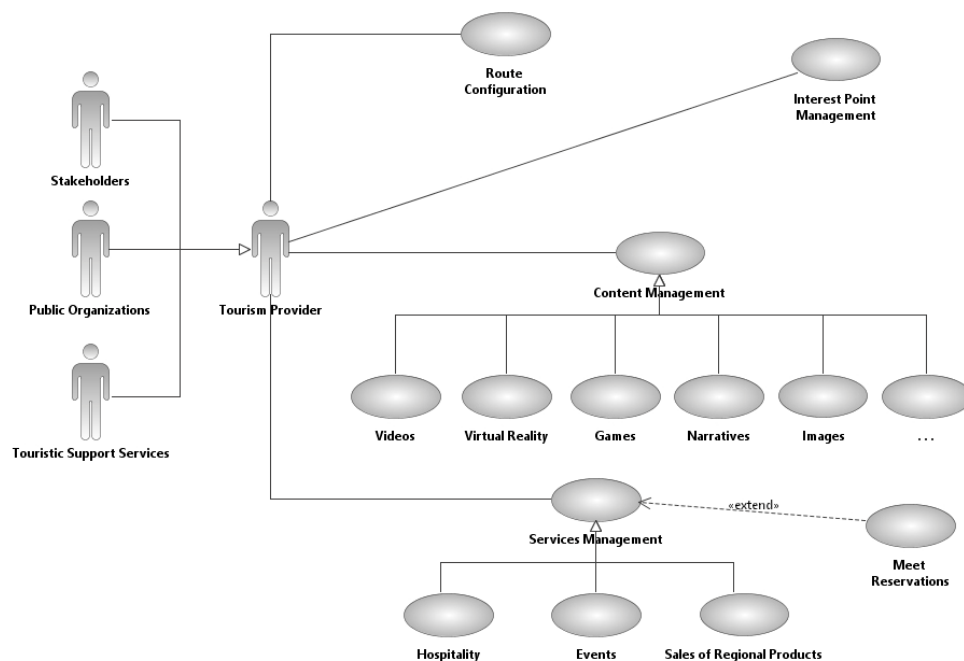


Fig. 4: Use Case Diagram - Web Portal: Back-End

Thus, as can be seen in the figure 4, the Portal Back-End supports the necessary functionalities that will allow different providers (Stakeholders, Public Organizations and Touristic Support Services) to interact with the system, allowing the configuration of tourist routes, management of points of interest, management of various content of tourist interest (Videos, Virtual Reality, Games, Narratives, Images, among others). Finally, the Back-End also includes a set of features that will enable service providers to manage and disseminate a range of tourism support services, such as Hospitality, Events, Sales of Regional Products.

Figure 5 presents the Front-End diagram of the web portal that we propose, which summarizes the functionalities that will be available to the tourists that use the portal. These features promote that the tourist can consult a particular tourist route, as well as the points of interest that are associated with it.

The tourist can also check the services that can be used when traveling in the tourist route, and if he wants to, make services reservations.

We also highlight that the tourist can also download the Mobile App "companion" that will accompany him during the tour.

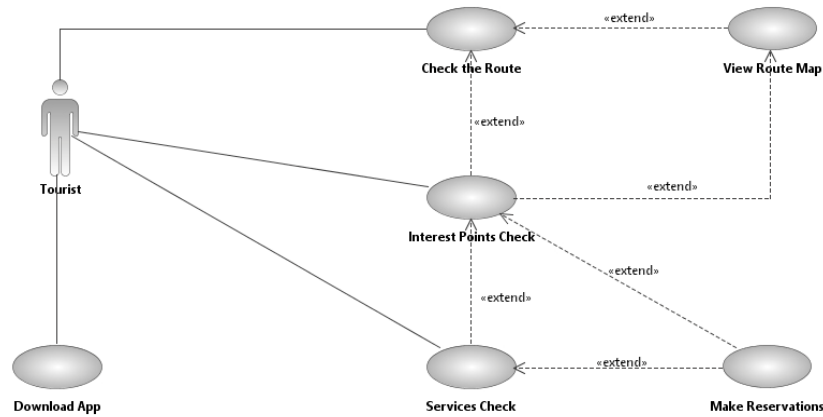


Fig. 5: Use Case Diagram - Web Portal: Front-End

The mobile application, represented in Figure 6, aims to be a technological artefact that will allow to enrich the tourist experience by providing a set of digital contents complementary to the visit of the points of interest. It should be emphasized that the availability of content should consider contextualization mechanisms. These contents can be diverse, such as: videos, audios, narratives (e.g. myths and legends), games, images, virtual reality and augmented reality.

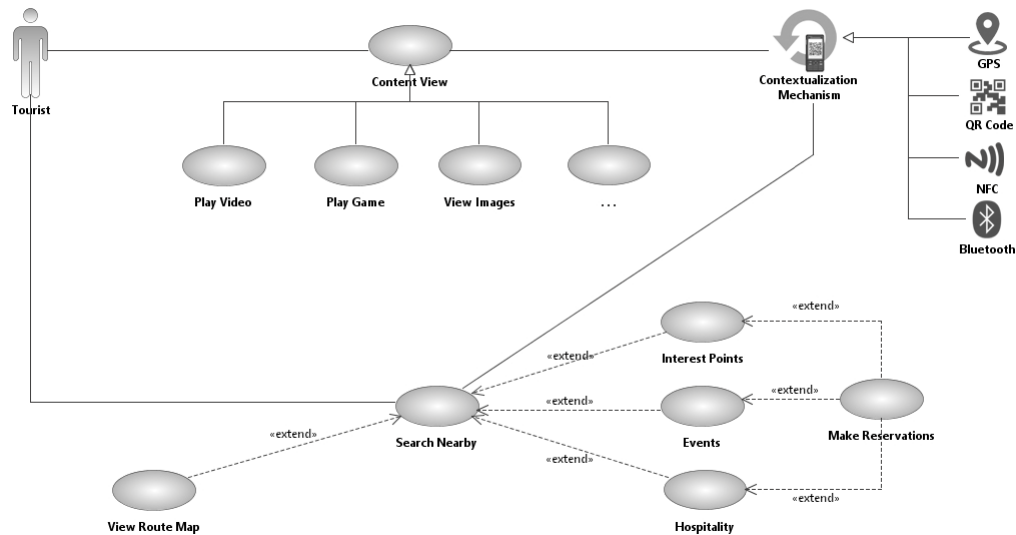


Fig 6. Use Case Diagram - Mobile App

The "Search Nearby" feature aims to streamline and facilitate the search for nearby points of interest, events that the tourist may experience, or search for hospitality services. Eventually, the tourist may also express an interest in making reservations for the services available.

Conclusion and Final Remarks

This paper discusses the touristic routes – tourism attraction and resource – discussing the ICT needs to their effective creation and support. The role of ICT in a new growing digital tourists' market, with new and innovative demands, is also discussed. A conceptual model for support touristic routes was presented, capable of support innovative ways of disseminate/get information and services, both for tourism provider and tourists. This model, that is also modelled in a macro functional perspective, through an Use Cases approach, is a contribution for the implementation of innovative ICT applications capable of using IoT growing potential creating an immersive experience for tourist and a new world of opportunities for tourism providers promote their services and products, and also, for public entities, an effective territorial marketing – sell touristic destinations and their touristic routes.

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