International Journal of Cultural and Digital Tourism
Volume 6, Spring 2020 (Special Issue)

ISSN (Online): 2241-9705
ISSN (Print): 2241-973X

The Design of "Smart" Systems and Applications and their Contribution to Tourism

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Abstract
Smartphones today have evolved into powerful handheld computers in the age of wireless communication. Mobile applications provide services which have reached the point where they are an integral part of users' lives. Their continuous development, their daily use and their flexibility, lead many sectors of the tourism industry to rely on mobile applications for their promotion and vice versa. These applications can be used even by small or large businesses such as hotels to better serve their customers. The main services of these tourism applications are Location-based Services, context-aware, Augmented Reality Applications and Recommendation Systems. This paper explores the contribution of smartphones, applications and their services to tourism.

Keywords: *smart tourism, mobile application, smartphones, Information and Communication Technologies (ICT), Local Based Services (LBS).*

JEL Classification:Z32 Tourism and Development

1. Introduction

The word tourism comes from the French word tour which is the movement of individuals or groups from the area of their residence to another in order to rest or for their entertainment (Paitsinis Costa, & Yfantidou, 2015) and interact with the people or objects of the destinations in which they move (Wang, Park, & Fesenmaier D., 2012). In recent years, tourists before each trip spend a lot of time searching on the internet about information about their trip and their destination. The contribution of Information and Communication Technologies (ICT) is now a predictable and necessary factor of tourism (Ceh-Varela, & Hernandez-Chan, 2015). Smart tourism is used to describe growing dependence of tourist destinations, of their industries and of their tourists, from the emerging forms of Information and Communication Technology (ICT), which allow the conversion of huge amounts of data into value propositions. The tourism sector and information technology development and information and communication technology are two areas that have been intertwined for many years. From the 1980s onwards, ICT contributed greatly to the global development of tourism in general. Over the years and the advent of the internet in the late 1990s, all businesses in the field of tourism and all their strategies have diversified enormously (Buhalis & Law, 2008).

The continuous development of information and communication technologies and its introduction and active participation in the field of tourism, in combination with the dissemination of the daily use of the internet, have resulted in this sector to constitute one of the most important global industries today. The

amount of information that tourists have at their disposal to organize a trip is huge. The integration of Information and Communication Technologies contributes greatly to the information management and search in all areas of tourism.

Research aims

This paper will present information and communication technologies and their impact on tourism as well as the role of smartphones in the tourist experience. Noteworthy is the contribution of mobile phones, which from simple devices for making calls have been evolved into very powerful handheld computers; smart phones with excessive configuration possibilities' of using the applications developed for them. The reader will learn about the functions and services provided by smartphone applications in tourism as well as other features. Smartphone travel apps provide travelers with information and help on any topic they are interested in or could be interested in on condition that suggestions could be made to them according to their smart phone's software. This information is available to tourists everywhere and in real time. In addition, this article presents the most common applications at this moment for mobile devices. Also, the contribution of mobile phone applications at the hotel sector is beginning to be significant, this paper presents a review on their purpose, capabilities and the extent to which they are integrated by hotels. Also, Location-based Services in combination with the Intelligent Transport Systems (ITS) play an important role in tourism and will be analyzed and presented extensively.

2. Smart Tourism: Information and Communication Technologies in the Field of Tourism

The tourism sector has been and still is a global industry, which provides a huge number of jobs worldwide and forecasts show that it will continue to flourish (Paitsinis Costa & Yfantidou, 2015). Many countries around the world rely mainly on the tourism industry as their main source of income. The internet as a technology has played a catalytic role in the development of tourism, as it has paved the way for small and large businesses but also has given many opportunities to travelers. The development of search engines has enabled travelers to organize and plan their travels on their own, more quickly and efficiently. Respectively, businesses operating in the field of tourism were given the opportunity to become competitive, because now anyone around the world could look for them, changing the way travelers and businesses interact (Buhalis & Law, 2008). Research shows that travelers looking online for information about their travels tend to spend more time at their destination than those who use another form of information (Ceh-Varela & Hernandez-Chan, 2015). Some interesting developments at the tourism sector are:

- Internet forums
- Information Societies Technology programs
- Cloud passports
- Connected hotels
- Travel and route applications
- Big data and TravelTech
- Flight price forecast
- Smartwatch
- Digital coaches
- AirBnb
- Smartphones, applications and tourist mobility

ICT and the internet have given consumers a wealth of options and information about their travels and destinations. Smart cities applications depend on user-friendly information and communication technologies developed by large urban industries and include six different features that focus on smart economy, smart people, smart governance, smart mobility, smart environment and smart living. With this opportunity, intermediaries began to be eliminated and the traveler could now have direct contact with tourism businesses and tourist destinations. The Smart City has been implemented with the following goals:

- The construction of a wireless city
- The construction of smart home

- The construction of smart transport
- The construction of social management
- The construction of smart city center management
- The construction of smart medical care
- The construction of green city

Travelers have begun to move away from the travel packages previously offered by travel agencies, which have been replaced by search engines and online businesses and can provide more competitive prices and individual options for their travels, far away from the mass and group trips (Buhalis & Law, 2008). With the use of the internet and ICT, travelers can now exchange views and information about destinations, hotels, rooms and anything else that interests them on their journey. Prior to the advent of the internet and ICT, travelers were not able to express their grievances and spread their opinions to other people all over the world about the pros and cons. They used only the complaint sheet of the company, without these complaints being disseminated to the next consumers. Respectively, the same happened with the positive comments of consumers, whose dissemination occurred mainly orally, with the results not being spread to those interested worldwide. With the consolidation of the internet, users - travelers can publish their positive or negative comments, with the result that other interested users can read and decide accordingly to their choices. In this way, the image of each business, store, hotel or destination in general is greatly affected, forcing them to act accordingly in order to improve a specific problem (Buhalis & Law, 2008).

Along with the continuous development of technology in software, hardware and telecommunications technologies, ICT increases its efficiency, resulting in better services in the field of tourism. Combined with the growing acceptance of consumers to provide more and more personal information for more targeted and better recognition and quality of services provided to them (Buhalis & Law, 2008). With the continuous development of communication technology and the constant need for networking and communication, the possibility of sharing and communication now extends to "things", ie everyday objects such as buildings, clothing, vehicles and parcels. This feature has been dubbed the "Internet of Things" and was first invented by Kevin Ashton of MIT in 1999. This concept refers to the ability of "smart objects" using sensors connected to the network per any time and place and being recognized, producing or collecting information (Buhalis & Amaranggana, 2013). For example, a means of public transport such as a bus may be detected or the user can be informed of the time of arrival at a bus stop (Dickinson et al., 2014).

ICTs have now become a part of strategic business planning in the tourism sector. Tourism is a sector that includes a huge amount of information which, with the use of ICT, is now easier to gather, process and distribute. Without the integration of ICT in both strategic planning and their day-to-day operations, they can no longer be competitive and fully efficient, as most travelers are looking for their travel destinations through ICT. The transformation of all processes and all links of the tourism chain into digital ones, such as hotels, food and more, is called e-Tourism (Ceh-Varela & Hernandez-Chan, 2015). It is therefore crucial that companies established in the tourism sector incorporate ICT into their strategic planning, train their staff in its use to provide targeted, specialized and improved services. In addition, traditional and small family businesses are under pressure to integrate ICT so that they can compete and cope in a progressive and competitive environment. An example of hotels is that all TVs in the rooms can be controlled with a central computer. A second computer organizes the information and purchases made by the customer, such as video on demand, display the account for the above uses, in order to transfer the charge to its central account as there is two-way communication of the systems. Many times, there is a combination of satellite TV and internet through the TV screen of the room.

According to Buhalis and Law (2008) the use of ICT in management and promotion reduces significantly the operating costs and increases the business efficiency. Big data is used in travel databases, with analytics tools that allow companies to track demographics and information, ensuring the best possible conversion rates. The travel industry is transformed by analyzing large data from various locations, such as reservations, routes, accommodation, transport, customer feedback (Yang et al., 2014). Innovation and technological change are two terms, who have begun to occupy a privileged position in the tourist area. Both terms are important to upgrade the competitiveness of businesses and destinations and, therefore, to improve the tourist experience. Technologies help us to renew the functions of our facilities and destinations, allow us to understand better and manage our customers before, during and after their stay and allow us to understand our competition greater.

3. Smartphones and their role in the tourist experience

In recent years, mobile phones from a simple device that make calls and send messages have been evolved into smartphones (smartphones), powerful computers, with unlimited possibilities, countless options in terms of prices, capabilities, screen sizes and many other features. This evolution of mobile phones and mobile devices in general has led to the creation of the term mobile tourism (m-tourism) (Budd & Vorley, 2013). The term "Smartphone" was first used in 1997 by Ericsson to describe the mobile phone which they created. Although there is no specific way to define which mobile phone is a smartphone or not, they are separated by the ability to install and use advanced applications over previous generation phones (Budd & Vorley, 2013). Smartphones combine and integrate all the functions of a mobile phone and a computer by incorporating technologies that previously had no power to support (Höpken, Fuchs, Zanker, & Beer, 2010; Wang, Park, & Fesenmaier D., 2012). Such technologies are the unlimited, fastest and most reliable internet connections, through the mobile network providers or via wireless connection using Wi-Fi and in addition the most powerful geographical location such as the well-known GPS (Global Positioning System) or the European Galileo Global Satellite Navigation System (GNSS) (Peng, J., 2008). Most smartphones today in their basic equipment and technologies provide more than eight sensors which are able to provide users with information depending on the type of each sensor. Each smartphone application can use one of these or a combination of these sensors and provide information and notifications to users - travelers about issues such as near-locations. The operation of these sensors and the information provided by the applications run in real time. The main sensors are:

- Global Positioning System-GPS calculates the position of the receiver according to longitude, latitude and altitude.
- Accelerometer recognizes the dimension and direction of a moving device. This recognition is calculated by the acceleration on one or more axes. This sensor serves the device's recognition, inclination and orientation with which the user holds the device. For example, if the user turns the device, the screen orientation also changes.
- Gyroscope provides the same information as the accelerometer but with much greater accuracy in the orientation of the mobile and its rotation.
- Proximity sensor is responsible for calculating the distance of the mobile phone from an object. For example, when the user passes his hand near the screen of the mobile phone, the screen is activated. Near field communication NFC (Near field communication) technology is also used to make payments with a smartphone or to synchronize a card with an application (Dickinson, et al., 2014).

The concept of "Internet of Things" (IoT), which was mentioned before, has become part of tourism, due to the ability of tourists to use their mobile phone to locate the attractions and activities that interest them. For example, the traveler can use his\her mobile phone to find out how long it will take a bus to arrive or what routes are available to be chosen to reach a specific destination (Dickinson, et al., 2014). This technology can also generate data from the tourists' usage. The data obtained from the use of this technology can help tourist companies and organizations to offer better services and better tourism experience, while improving their interaction with them (Buhalis & Amaranggana, 2013).

All of the above and more of these technologies are utilized and supported by many smartphone apps. These applications increase the functionality of smartphones in many areas and provide a variety of services to users such as information retrieval, navigation and social networking. All these technologies, applications and services help and assist users and travelers to have all the information needed at every time and place (Wang, Park, & Fesenmaier D., 2012).

The tourist experience is divided into three phases, anticipatory phase, experiential phase and reflective phase (Gretzel, Fesenmaier & O'Leary, 2006; Wang, Park & Fesenmaier, 2012). During these phases, travelers plan and carry out, record and reflect a set of activities. Smartphones play an important role during these phases in information retrieval, programming, as well as video and image recording. Smartphones now provide a huge range of features and services that contribute throughout a journey, even in very simple phases, such as finding a gas station or calculating the duration of a trip. During the anticipatory phase, the traveler can search for information about the destination, plan activities, see information, comments and pictures from other travelers. During the experiential phase, the traveler probably deviates from the pre-

planned activities based on suggestions of the applications due to location services, regarding restaurants or landscapes. Furthermore, tourists can also share photos and videos with friends or other travelers.

The mobile phone tourism applications can range from buying tickets for all means such as airplanes, ships, trains and more, to tour guides and room booking applications. The issue of a mobile phone app for a hotel is considered obsolete and perhaps not useful due to the large number of rooms booking applications that now exist and are used. A prospect of mobile phone applications for a hotel no matter how big or small it is, is the possibility to use the application beyond the room reservation process, before and during the stay (Adukaite, Reimann, Marchiori, & Cantoni, 2013). The number of surveys is small but there are hypotheses that the use of a hotel application can increase the connection and commitment of the customer - traveler with the specific hotel business or chain (Kim, & Adler, 2011).

One idea is the Cloud passports which are essentially mobile applications designed to offer thefollowing:

- The user will not have a traditional passport. Every tourist is the sole owner of an application on the device.
- The application works as a passport when the user travels abroad.
- The Visa of the passport can be taken as an image in the application.
- The user can use the mobile device as a passport with a valid Visa travel.
- The user flashes the mobile device to a specified reader and the passport is checked immediately and quickly (Sudarsanan, 2015).

Hotel applications in addition to booking rooms can support and serve customers and during their stay such as restaurant reservations or food orders in the rooms, spa appointments or other hotel activities in which the customer can take part in upgrading rooms or even operating room functions through the application, such as lighting, TV operation or even when cleaning staff can clean the room (Adukaite, Reimann, Marchiori, & Cantoni, 2013). The development of applications in the hotel sector is still at an early stage and has not been integrated by a large number of companies except for large chains and many of the elements they incorporate come from applications used by airlines, which incorporate new technologies and tactics with faster pace and ease than other sectors (Adukaite, Reimann, Marchiori, & Cantoni, 2013; Budd, & Vorley, 2013).

Too many 5-star hotels or hotel chains have already incorporated smartphone services into their services as opposed to individual hotels that are not part of a chain or rooms that do not use still the services provided through smartphones perhaps because they are not so flexible in changes in relation to the big hotel units and chains (Adukaite, Reimann, Marchiori, & Cantoni, 2013). Also, one more reason is the financial capital they have for the market. Many luxury hotels at the applications they use offer features such as recognizing the arrival of the customer at the hotel via GPS to send advice and suggestions based on tourist's location.

A research was conducted at hotels in German-speaking countries and more specifically in Austria, Germany and Switzerland, in relation to the use of mobile phone applications and specifically applications of Apple's iOS operating system. A large percentage of the services provided by the applications of these hotels gave information about the location of the hotel, the description of the rooms and the menu at the restaurant. A large percentage of hotel managers stated that they did not use a mobile phone application at the hotel. They stated that first it must be determined by the customer what is the profit of using such an application and then the integration will take place and the conservative attitude of the hotel owner will change (Adukaite, Reimann, Marchiori, & Cantoni, 2013). The conclusion of the above research is that although many hotels use mobile phone applications to serve their customers in terms of information and some other functions, the industry is not ready to develop applications for direct communication with customers as the main way of communication.

Smart tools, such as smartphones and their applications, have a lot of benefits and the ability to disseminate travelers' experiences by sharing their stories and experiences with others (Gretzel, 2010; Wang, Park, & Fesenmaier D., 2012). Tourists can simply use their mobile phones to explore the destination, navigate without the use of maps or guides and take information on tourism products through a variety of technological platforms. These smart tools offer user-friendly interface convenience, up-to-date information and affordability. They enrich the tourist experiences and enhance the competitiveness of the destinations. With the size and quality of the screens and the features of smartphones constantly increasing and improving, smartphones are used today as a replacement for the computer or digital camera (Höpken, Fuchs, Zanker &Beer, 2010; Wang, Park & Fesenmaier, 2012). Smartphones solve problems that arose during vacation and

help tourists to select more effectively activities. Also, in some cases, they boosted travelers' confidence, added new activities and destinations and strengthened their satisfaction (Wang, Park, & Fesenmaier D., 2012).

These applications should be designed and addressed to a wide range of users (first-time or not) with low, medium and high-performance devices and features, with a wide or not wide range of knowledge of new technologies (Kenteris, Gavalas, & Economou, 2009). Users expect such applications to have a pleasant and easy-to-use interface that responds to the features of the smartphone they have. For example, the screen of a smartphone is much smaller than that of a computer, so the functionality of the application interface plays a very important role in user satisfaction. This functionality of the interface is related to the ease of use of the application. In case the user is not happy with the functionality of such an application, the most likely scenario is not to use it again. An important factor is the time or speed with which the user can find the needed information, as well as the speed and ease of navigation within the application itself (Yus, 2013).

Initially, the use of mobile phone applications was limited to games, social media and communication. However, over time, various companies have identified and begun to take advantage of the benefits of developing and using such applications (Budd, & Vorley, 2013). In the field of tourism, it can be considered that there is a huge number of tourist applications as well as applications that are not directly related to tourism but serve users - travelers, such as planning and organizing a trip, finding information, advertisements, discount coupons (Kennedy-Eden, & Gretzel, 2012). Furthermore, there are many advantages for the travelers regarding the purchase of tourist products through the Information and Communication Technologies "ICT" (Baggio, & Chiappa, 2014). For example the ease of searching, scheduling and buying online (minimizing time), saving time associated with the convenience of online payment by credit card, instead of other payment methods, such as bank check or cash, which method may include extra time to visit and make payments at an office or bank. Further advantages are the competitive prices, special discounts and unlimited add-ons, access to extensive research and market information.

Mobile phone applications are now widely used in various destinations such as cities or as sightseeing guides (Höpken, Fuchs, Zanker, & Beer, 2010). Tourists are constantly becoming more demanding about the amount of information they receive, at any time and wherever they are. Such information cannot be covered by traditional and outdated methods of dissemination such as travel agents and brochures (Höpken, Fuchs, Zanker, & Beer, 2010). According to Dickinson et al. (2014), tourism applications can be divided into twelve categories depending on the type of information and services they provide. Some categories, for example, are tour guides, transport and travel-related applications, local transport applications, and food or restaurant-finding applications and room reservations (Dickinson, et al., 2014). A large percentage of travelers download tourist applications a few days before their trip or when they have already started their trip to the destination, so these applications play an important role in the travelers' choices during their trips (Kennedy-Eden & Gretzel, 2012). Most travel apps according to Kenteris, Gavalas, & Economou (2009) can be categorized into three main categories: a) Tourist guides or museum guides, which include pre-installed applications with checked content, which cannot be modified based on the user's preferences, b) Mobile devices with applications mentioned above and c) Electronic mobile devices as guides that can be connected wirelessly or to mobile networks, in order to provide context-aware services.

Context–aware

As mentioned, smartphones have a number of sensors that are able to use the applications that are installed on them, to process the data they receive and provide relevant information to the user (Höpken, Fuchs, Zanker, & Beer, 2010). Tourist applications with the resources at their disposal, such as data from all sensors and users' personal preferences, are able to filter the data and provide the traveler with information needed at a specific time, in a specific location (Höpken, Fuchs, Zanker, & Beer, 2010). The ability or service of devices and applications to perceive, predict, process multidimensional data such as user location, site conditions, location of other devices and users around it and even objects such as buildings and attractions and to be adapted based on them to provide relevant information to the user is called Context-aware. These applications act as a personal assistant if travelers require information that meets their personal preferences (Ceh-Varela & Hernandez-Chan, 2015). There are many travel apps that use context aware and mainly use GPS to get to know the user's location and provide suggestions and advice on nearby attractions and routes to follow. These applications can use weather data for the users' location and suggest solutions

depending on the time of day and options tourists have according to their preferences (Ceh-Varela & Hernandez-Chan, 2015).

Augmented Reality Applications

Another technology that has entered tourism with the huge contribution of ICT that constantly allows users to search for information in different and more interactive ways, is Augmented Reality (AR). Augmented reality technology allows the introduction of digital information, generated by a computer, in the real world and in real time, using appropriate devices and applications such as smartphones and their applications. The purpose of this technology is to incorporate useful information into the real world for a richer understanding (Ceh-Varela & Hernandez-Chan, 2015). This technology should not be equated with virtual reality (Virtual Reality). The Augmented Reality applications are used in tourism and tourists can use them at their smartphones, these applications provide information about museums, monuments and may also inform about a historical event. They also provide information about restaurants and other destinations or information related to the user's location, since they use GPS technology to locate the user's location in real time combined with other smart phone sensors. The information provided to the user can be videos, sounds or even 3D images that describe monuments that tourists visit (Ceh-Varela & Hernandez-Chan, 2015). For example, Holiday Inn gives its customers the opportunity through the augmented reality service to see Olympic and Paralympic athletes at the hotel areas (Adukaite, Reimann, Marchiori, & Cantoni, 2013).

Recommendation Systems

With the help of ICT, the traveler has access to a huge amount of information so as to better organize a trip to a desired destination. However, this large amount of information is difficult to be accessed and evaluated as it requires time and effort. For this reason, there are systems that provide users with information and help them to get organized and activities and options are suggested. Such systems are Recommendation Systems, which offer services and activities to users based on their personal preferences. These systems are applied in the field of tourism and help and inform the user - traveler to organize trips, propose options about the stay, the activities that can be included and the restaurants and also help tourists book tickets for their trip (Ceh-Varela & Hernandez-Chan, 2015).

A smart phone today, using its applications, contains all the information, options and preferences of the user based on previous choices, searches and purchases based on the smartphone sensors. This information can be used by applications with suggestion systems, in order to produce specialized and personalized suggestions to the user - traveler to meet his personal choices and preferences. These tourist app suggestions are intended to inform the user of options that the tourist has not discovered at a location or a destination to visit. At the same time, these applications use some filters on the basis of which this information is processed and separated, and the user can enter various personal options by creating a profile according to which all possible options will be suggested in real-time. In many cases, the application itself can ask the users for their preferences in order to create their profile (Ceh-Varela & Hernandez-Chan, 2015; Efraimidis, Drosatos, Arampatzis, Stamatelatos, & Athanasiadis, 2016).

A major issue in recommendation systems, which needs to be given a lot of attention, is the collection and processing of user's personal data. A user's profile in an application of recommendation systems containing a lot of personal data which can also be considered as sensitive personal data. It makes sense to raise the issue of data security, as these applications require the storage of these profiles to be processed by the recommendation system. In mobile phone applications this issue is more critical because this data contains much more personal information such as the user's location (Efraimidis, Drosatos, Arampatzis, Stamatelatos, & Athanasiadis, 2016).

Near Field Communication-NFC

Wireless electronic labels consist of a technology that uses tiny chips to locate and track distant objects. In the tourism industry, Radio Frequency Identification - RFID is used in supply chain management, electronic procurement as well communication with tourists doing adventure tourism. NFC technology is a combination of wireless radio frequency (RFID) and hardware recognition technology (Smartphones, tablets,

etc.) that facilitates a wireless connection. Not only are security and computing machines developed but infrastructures, secure and private virtual coupons and tag identifications. At software and applications in tourism, NFC is used in:

- check-in and check-out with NFC in accommodation companies
- NFC payment options
- ability to monitor the movements of visitors
- connectivity to social networks
- smart advertisement posts and destination labels
- pocket tourist guide and diary
- easier check-in
- games
- loyalty cards
- tickets and schedules

I-beacon technology

iBeacon uses a low energy Bluetooth sensor to transmit a universally unique identifier captured by a compatible application or operating system. It can be used from welcoming people as they arrive at a sporting event in providing information about a nearby exhibition museum. For example, at the sport and animation department at hotels, it can transmit to smartphones the sport schedule to tourists, promotions of programs, events at the hotel, proposals for personal exercise, gives the possibility to book an appointment or reserve a placement at a program. Also, it helps tourists to navigate to sport facilities and to find the one they are looking for through digital guidance.

4. Location-Based Services and Intelligent Transport Systems

Location-based Services – LBS are technologies which provide information and services based on the geographical location of the user in a mobile device (Anuar & Gretzel, 2011). The most common use of these services is in navigation systems for the road network. It is also common to combine navigation systems and travel apps to provide more comprehensive information. These services are an important factor in the field of tourism because they enable travelers to search and access tourist information and services related to their location at any time, whether they are at their destination or on the route for it. The current location is critical information, which significantly affects the displayed information and services provided to a traveler through a smartphone application (Berger, Lehmann, & Lehner, 2002; Eriksson, 2002).

In order to be able to provide these services, GPS technology or other similar technologies are used, to determine the location of the user. It should be noted that for the identification and description of the location, coordinates are not used on the map, but point and street names. This separation is important for the tourism sector because the location information needs to be processed and combined for example with hotels, attractions and restaurants. An important advantage of incorporating this technology for tourism is the fact that in planning phase of a trip, not all the necessary preparations can be taken in advance for the problems that may arise during it. For example, the search for a gas station on the way, or suggestions of the application for a nearby tourist attraction which traveler doesn't know about (Eriksson, 2002).

There are two categories of location-based services, those that are activated of a user-defined event and those that are activated by the user when, for example, the tourist is looking for a certain location (Anuar, & Gretzel, 2011). There is also a categorization of these systems: a) location-tracking services and b) location-aware services, the one has the ability to notify the user's location to third parties and the other notifies the user about the location at his / her request (Barkhuus & Dey, 2003). The possible application services based on the site and are applicable to tourism as reported by Zipf and Malaka (2001) are:

- traffic information, for example if there is traffic on a road,
- navigation,
- provide instructions for points of interest in a location such as bus stops,
- sightseeing or other tourist attractions,
- emergency services (ambulances, police, etc.).

A research system developed and funded by Europe through the IST (Information Societies Technology) program for tourism and based on tourism site services was CRUMPET "Creation of User-friendly Mobile Services Personalized for Tourism", with the aim of create user-friendly mobile device services personalized for tourism (Schmidt-Belz, Nick, Poslad, & Zipf, 2002). Key features of this system were a) the use of user preferences or user groups, b) the use of the tourist's current location via the GPS sensor to create suggestions about activities or other options provided at this current location, and c) the dynamic and preventive help in user (Schmidt-Belz, Nick, Poslad, & Zipf, 2002).

A major and critical issue of location-based services is the security of the data collected, processed and stored. As with all other information and personal data used by internet applications and services, the same applies to the site. Information about a user's location is considered personal data (Anuar & Gretzel, 2011). Nevertheless, the benefits to tourism from the use of these services overshadow the security issues of the site's personal data (Anuar & Gretzel, 2011). It is worth noted that men are more likely to share information about their location than women in certain age groups (Anuar & Gretzel, 2011). As mentioned above, there are two categories of LBS according to Barkhuus and Dey (2003), where location-aware services may provide greater security in the critical issue of personal data disclosure such as location.

LBS services are in many cases combined with Intelligent Transport Systems (ITS) in mobile phone applications. ITS is a system used in the field of transport and can provide travelers with valuable information on their travels. With ITS, drivers are informed about navigation issues and traffic, it is also possible to provide information on trains and pedestrians, which makes ITS very useful in the field of tourism and especially at the tourist destination (Eriksson, 2002). When a traveler is going to use public transportation to travel to tourist attractions or even beaches, he or she may receive the relevant information, such as itineraries and arrival and departure times (Eriksson, 2002).

5. Conclusion

Smartphones and mobile devices in general are a very powerful and useful tool in the field of tourism, to attract tourists and constitute a channel of communication with them to serve their needs (Wang, Park, & Fesenmaier, 2012). With the continuous development of technology and the quality of applications, the contribution and importance of smartphones and their applications in the field of tourism and its continuous development these new technologies are now recognizable (Dickinson, et al., 2014). Every business is benefited using even the simplest application, even if it is not directly related to tourism. New channels of communication with tourists and a better and easier promotion of the services are provided, in a short time and without much effort. These applications can be used at any time and place and with great ease unlike a website. Priority should be given to technologies that will save a lot of energy while protecting the environment. As far as promotion is concerned, information activities should be carried out regarding the new applications of technology in tourism and the current funding mechanisms through conferences, seminars, lectures, etc.

The travelers' tourist experience and their view of the use are now considered a critical factor and is an urgent need to consider them when designing tourist applications. The design of applications must be based on and considered the preferences, desires and the level of familiarity of tourists with such applications for more effective and repeated use. Finally, the contribution and impact of the use of mobile applications in the hotel sector should be extensively researched in the future, while it should be investigated the percentage of hotels that already use such applications and the benefits they receive.

Smart tourism initiatives around the world seek to create sustainable smart tourism ecosystems. The concept of smart tourism has evolved into a new way of thinking, which can now solve problems faced by large urban cities (Yfantidou, Spyridopoulou, Kouthouris, Balaska, Matarazzo, & Costa, 2017). The development of smart cities facilitates uninterrupted access to retail services, transportation, hotels, entertainment centers and many more, for the tourists of a city. Smart cities enrich tourism experiences, thus enhance the competitiveness of the destinations and reduce tourist costs by accessing digital information through free Wi-Fi services, translation services, innovative navigation in new and unexplored points of interest and generally fast, free and easy access to tourist information.

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