The Impact of WiMAX on Developing Location-based Services in Tourism
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Abstract
During the last decade, a great development has been occurred in mobile phones. This development has resulted in increase of Location-Based Services (LBSs). The study emphasizes the importance of location-based services for tourism sector, difference between Wi-Fi and WiMAX technology, and impact of WiMAX on location-based services in tourism. The methodology of the research depends on both quantitative and qualitative approach. This study concludes that there is a need to integrate efforts of some governmental bodies such as the ministry of tourism, the ministry of communication and technology, the ministry of monuments, and the technology operators. This integration would help to produce a robust database of the monuments, hotels, restaurants, road maps, etc., which could, in turn, boost the application of WiMAX in tourism location-based services.

Keywords: Location-based services, Wi-Fi, WiMAX, technology

1-Introduction
Over the recent years, wireless technologies are gradually coming to the core of tourism suppliers’ strategies, as a tool to enhance their competitiveness by maximizing productivity and saving costs (Buhalis and Pistidda, 2008). The appearance of different technologies such as wireless networks, Internet, Geographical information systems (GIS) and Global positioning systems (GPS), have introduced a new type of information technology called location-Based Services (Abulleif and Dossary, 2011). Location based services are defined as “information services that provide users with customized contents, such as the nearest restaurants/hotels/clinics, retrieved from a dedicated spatial database. They make use of technologies such as Global Positioning System (GPS), triangulation/trilateration etc.” (Pingley, 2008, p.1).
Tourism can take advantage of LBS. The main reason for this is that tourism can benefit from the use of mobile technology that provides new services to travelers while moving. The primary functions of LBS for tourism are usually detecting positions of persons, objects, and places, routing between them, search for nearest restaurants, shops, hotels, or points of interest, and information about traveling conditions, such as traffic-related data. It also facilitate the reservation of last-minute trips, rental cars, and hotels; and provide information about changes and delays of flights and trains, offer guides on restaurants, events, and sightseeing opportunities at the destination (Antikainen et al., 2006).

Wireless technologies such as WIMAX (World Wide Interoperability for Micro Waves) seem to represent the future of wireless communications; WIMAX is expected to offer the highest possible coverage up to 30 miles. WIMAX will gradually be employed and made available for the mass market, for positioning systems and location –based applications. This technology is predicted to have its largest impact in areas such as developed countries or rural, remote locations characterized by low population density in which wire has not been developed or cannot be developed for economic reasons. WIMAX is cheaper, simpler, and more convenient to install and to use than both fixed broadband and WI-FI (Buhalis and Pistidda, 2008). The present study, hence, aims to emphasize the importance of WIMAX for tourism in developing location based services.
2- Literature review
The development in portable devices and wireless communication technologies enables a new form of services named location-based services (LBS) which deliver information that depends on location to mobile users. Typical examples of such services include local maps, local weather, traffic condition, tour guide, and shopping guide, etc…. (Wu et al., 2003). Location-based services aim to provide new services to their users based on the knowledge of their locations. Examples of these services include live traffic reports (“Let me know if there is congestion within five minutes of my route”) and store finders (“Where is my nearest restaurant”) (Levandoski et al., 2010). The origin of location-based services dates back to 1995, when the Federal Communications Commission (FCC) issued a mandate requiring that wireless carriers should be able to locate 911 callers within 50m of their location (Zipf and Jost, 2012). Shankar et al., (2012) mentioned that location-based services face two key challenges, how to collect up-to-date information about places, and how to rank places because information about any place changes frequently. For example, a restaurant can enter its menu, chef, management, quality of food, prices in the yellow pages, and, as a result, its popularity can change over time.

The future of wireless technology seems to rest with worldwide Interoperability for Microwave Access (WiMAX). Since this technology is expected to offer the greatest possible coverage—up to thirty miles, it could have a great impact in locations where wired infrastructure has not been developed or cannot be developed for economic reasons, it can also support the end-user without having to pay extensive data roaming charges, and it is available 24/7. WiMAX would operate similar to Wi-Fi but, at higher speeds. Greater distances and serves greater number of users (Ali and Frew, 2013).

Isa (2010) claimed that, as the wireless technologies develop further, many useful and promising applications have been brought into our daily life. In recent years, location and positioning (L&P) based services are among the most promising applications which provided great convenience to users. For instance, by knowing a mobile station (MS) position many new applications often called as Location Based Services (LBS) can be enabled. IE Market Research report (2011) forecasted that total spend in Egypt GPS Navigation and Location Based Services Forecast to reach $28.6 million in 2016 for eight categories: Voice-Guided In-Car Navigation, Voice-Guided walker Navigation, Mobile Maps, Mobile Maps Applications (weather, restaurant guides, traffic, etc.), People Tracking, tracking and tracing (commercial applications), Location Enabled Search and Advertising, and Other LBS Applications.

2.1 location-based services: definition and background
Location-based service has no universal definition. The terms “location-aware services”, wireless location services” and mobile location services” are often used as synonyms for location-based services (Wang, B., 2008). Zipf and Jost (2012) defined Location-based services are defined as follows: “From a user-centric view one can define location-based services (LBS) as services for mobile users that take the current position of the user into account when performing their task. From a more system-oriented view, one can identify location-based services as an intersecting field of various technologies, namely Geographic Information Systems (GIS), Internet, and mobile networks/ devices. In addition, Essayad (2011) reported that “Location-based Services (LBS) as services are to provide information stored in a database. This information can be created, compiled, selected, or filtered in the light of the current location of the mobile use
From the previous definitions it is apparent that location-based services require some elements (Modern mobile devices (smart phones), Positioning technologies, Wireless networks (Bluetooth, WI-Fi, WiMAX, mobile telecommunication network or indeed a combination of these), and LBS provider, including the software (e.g. GIS).

2.2 location-based services taxonomy

Analysts and researchers have taken several approaches to classify LBS applications according to the several categories, service model: push or pull, person-oriented LBS and device-oriented LBS and market segments: consumer business, public sector, events, etc.

According to (Sornig 2008; Vrček et al., 2009; Barbosa, 2005; Karam, 2011; Sataøen and storm, 2008) Push services imply that the user receives information without direct or active request. The information may be sent to the user with prior consent (e.g., subscription-based) or without prior consent (e.g., advertising message). On the other hand, Pull services deliver information actively requested from the users. This means a user actively uses an application and pulls information from the network. For pull services a further separation can be done into functional services, like ordering a taxi by using a service on the device, or information services, like the search for Point of Interests (POIs).

Analysts and researchers have taken several approaches to classify LBS applications. A major distinction of services is whether they are person-oriented or device-oriented (Spiekermann, 2004). Person-oriented LBS comprise all of those applications where a service is user-based. Thus, the focus of application use is to position a person or to use the position of a person to enhance a service. Usually, the person located can control the Service (e.g., friend finder application). Device-oriented LBS applications, on the other hand, are external to the user. Instead of only a person, an object (e.g., a car) or a group of people (e.g., a fleet) could also be located. In device-oriented applications, the person or object located is usually not controlling the service (e.g., car tracking for theft recovery).

Turner (2013) classified LBSs into four categories, Business-to-consumer which provides targeted ads, discounts, coupons and offers delivered directly to consumers based on their location. Business-to-Business which includes applications such as fleet/asset management or courier tracking services. Consumer-to-Business which provides services that consumers access when they want to connect with their favorite brands and. Consumer- to-Consumer that allows friends to connect with one another and, in the process, allow businesses to connect with them, too.

2.3 Location-based services applications and tourism

Chang (2009) indicated that there are different ways to classify location-based services applications according to their functionalities and identified six types of mobile location-based: services, emergency, safety and medical/health services, information services, navigation / routing, transactions and billing, asset tracking and fleet management, mobile office, entertainment and proximity services. Raper et al., (2007) added an application to location-based service which is mobile guides.

2.3.1 Examples of location-based services scenarios in tourism sector

Antunes da Rocha (2004) provided a scenario for location-based services. A coffee shop sends advertisements to mobile users within the neighborhood of 1 km. The advertisement is a publication in a publish/subscribe system, informing that the coffee shop is selling cappuccino. A
consumer wants to receive notifications about coffee, but he does not like to drink more than 2 cups of coffee in 5 hours. The consumer registers his interest in the system by a subscription and eventually receives notifications with the coffee shops advertisement. Virrantaus et al., (2001) also provided a scenario for location-based services. In a scenario for finding a restaurant, you want to find a "near-by" restaurant where to eat. Using your mobile terminal you query for close moderately priced restaurants offering vegetable food. As a response, a map is presented on your terminal, displaying your current location and the locations of a few close restaurants offering vegetable food. By selecting a particular restaurant symbol on the map, you can get information about that restaurant, for example, the contact information and a lunch offer. After choosing one, you can ask for turn-by-turn navigation instructions to guide your way along the trip to the restaurant.

2.3.2 Applications of location-based services in the Egyptian tourism sector

LBS application for tourism ranges from tour planning, navigation support to yellow page services and m-commerce. To make interactive maps for internet applications in tourism has become widespread. Most LBS for tourism have been designed for use in urban settings or along a road network with the purpose of making routing easier in built-up areas, and improving access to different services, such as restaurants, pharmacies, museums, banks or ATM (Zipf, 2002). Location-related information is important in tourism. Since it can influence the tourist decision-making process by swaying their choice of destination, behavior, movements that occur at the destination and evaluation and communication of experiences gained, the use of LBS can promote greater tourist satisfaction, offering huge opportunities to optimize the tourist's experiences by personalizing these services and becoming more customers focused and flexible in their information and service delivery, this is essential for tourism to be more responsive to tourists (Prideaux and Carson, 2011).

Location-based services like mobile tourist guides provide two main services: They point out potential points of interest in the surroundings of the user and can provide users with detailed background information on these on demand. This functionality is useful because people often only recognize what that they explicitly look for. Because the production effort for content of current location based services is significant such information is often only available for touristic areas, where the high cost of content production can be apportioned on a large number of users (Paelke et al., 2012). Moreover, most airports have, or are moving toward, implementing wireless infrastructures that can scale for both the ongoing needs of their passengers, their tenants and airport administration. Given this additional capacity, which was initially installed to support Internet access, a host of new functionalities have become available. Next on the list for most airports is the application of Location-Based Services (LBS), which creates a significant opportunity to further create connections and enhance operational needs (Phillips, 2013).

Location-based services have so far seen very limited take-up by either airlines or airports. Based on research of the various airline and airport websites and associated applications, there are many which enable travelers to check-in en route to the airport, book car parking, find their way through the terminal, make advance retail purchases, etc. etc. but few, if any that leverage the native geo-location information that consumer devices can provide (Orton, 2010). AT&T (News - Alert) and Sabre are collaborating to offer solutions using Hybrid, AT&T’s location information services (LIS), to enable developers to build geo-aware mobile applications. Sabre (News - Alert) is a travel technology company that provides software to travel agencies, airlines, hotels, and car, rail, cruise and tour operator companies through its four businesses:
Imagine an application that can alert airline staff when a high-status passenger is still clearing security when their flight is due to depart; or that notifies travelers of special promotions as they approach an airport bookstore; or warns a passenger if he is in the wrong terminal for his connecting flight. The two companies are exploring technology that could underpin these types of apps across almost all types of smart phones, tablets and operating systems. Any services developed as part of the trial will meet location services best practices guidelines when it comes to customer privacy including customer opt-in (CASTLE, 2014).

Zipf and Malaka (2001) listed a number of potential applications in tourism as Traffic Information, e.g., there is a traffic queue ahead, turn right on the A3. Emergency Services, e.g., “Help, I’m having a heart attack”. Roadside Emergency, e.g., “Help, my car has broken down”. Law Enforcement, e.g., “What is the speed limit on this road where I am”? Classified Advertising, e.g., “Where are nearby yard-sales featuring antiques”? Object visualization, e.g., “Where is the historic parcel boundary”? Underground Object Visualization, e.g., “Where is the water main”? Public Safety Vehicle Management, e.g., “Who is closest to that emergency”? Leisure Information, e.g., “How do we get to the Jazz Club tonight from here?” Road Service Information, e.g., “Where is the nearest petrol station”? Directions, e.g., “I'm lost, where is nearest Metro station”? Vehicle Navigation, e.g., “How do I get back to the Interstate from here”? Vehicle Theft Detection, e.g., “My car has been stolen, where is it”? Child tracking, e.g., "tells me if my child strays beyond the neighborhood.”

### 2.4 Short-Range Technologies

Wireless networks have been making tremendous progress during the past two decades (Chen, 2008). The implication of wireless technology and networks for travel and tourism are extremely important and tourism presents ample opportunities to exploit these technologies, through wireless access huge opportunities for interaction with the customer and the creation of personalized destination-related information are created at the destination (Ali and Frew 2013).

#### 2.4.1 Wi-Fi technology

Roshan and Leany (2004) claimed that Wi-Fi is changing the world around us, the way we work, play, and interact with each other. The economics of Wi-Fi are rapidly changing the landscape for the delivery of high-speed wireless data services. It allows you to stay connected, compressing time by allowing you to be productive no matter where you are. Prasad and Velez (2010) added that Wi-Fi is the first high speed wireless technology is deployed on long scale. It’s very popular as hotspots around the world including home, offices coffee shops, gas stations, hotels and airports. Wireless Fidelity (Wi-Fi) permits connectivity to the Internet from virtually anywhere at speeds of up to 54 Mbps Gunasekaran and Harmantzis, 2007).

Federal Communications Commission (2012) LBS leverage the Wi-Fi technologies in handheld devices that scan their surroundings for known or open networks. Wi-Fi LBS rely on active surveys of an area to note the unique identifier and location of each Wi-Fi base station. These may include everything from hotspots in coffee shops and hotels to residential and business networks. When a Wi-Fi enabled device accesses a location service, the browser or application may send to the service the coordinates of Wi-Fi networks it currently “sees,” enabling the current location to be triangulated.
Benefits of using Wi-Fi
Abel and Rambally (2011) mentioned the benefits of Wi-Fi technology as a cost-effective and convenient alternative to a wired network. Wi-Fi provides increased mobility to their users. Doctors, Lawyers, Airline travelers and other professionals view Wi-Fi as a very effective tool to get information readily. Members of a project can communicate with one another and keep one another informed of their progress in addition to also getting information from the Internet. Wi-Fi helps in increasing revenues in Businesses like restaurants and other public places by creating hotspots to attract customers. This can be achieved at a low cost by onetime investment in the Wi-Fi infrastructure. Connection to Wi-Fi by employees and guest visitors does not present any technical difficulty.

Drawbacks and potential threats of Wi-Fi technology
Kioridou and Kaufmann (2011) stated that among the drawbacks of the use of Wi-Fi is the fact that it cannot guarantee a truly secure connection, especially at hotspots. Wi-Fi networks don’t have protection from potential hackers. Wi-fi suffers from limited range 75 to 150 feet indoors and a few hundred feet outdoors. Nearby microwave ovens and cordless phones, particularly older models can slow down Wi-Fi transmissions.

The main disadvantages of using Wi-Fi network would be the lower coverage as it operates in public groups so that the wireless signals are so weak to avoid interference. On the other hand, WiMAX, an emerging technology, promises to offer data speeds faster than current 3G wireless networks and over much longer distances than comparably fast Wi-Fi technology; hence, WiMAX can be considered a solution to fill gaps in Wi-Fi hotspots coverage and enable wireless connectivity on trains or buses (Li and Jhan-Li, 2010).

2.4.2 WiMAX technology
WiMAX stands for worldwide interoperability for microwave access (Johnston and Chirstensen, 2007). WiMAX technology is a telecommunications technology that offers transmission of wireless data via a number of transmission methods; such as portable or fully mobile internet access via point to multipoint links (free WiMAX information, 2013).

In early 2001, the WiMAX Forum developed the most modern wireless technology named WiMAX, which is a telecommunications protocol that provides fixed and fully mobile Internet access (Khan and Light, 2012). There are many positive aspects of this technology (GARG, 2007), it can provide fast and cheap broadband access to markets that lack infrastructure such as rural areas and unwired countries. It can also support data rates from 500Kbps to 2 MPs. Plunkett research (2006) added that WiMAX has the capability to deliver extremely fast internet connections to wireless devices, such as laptops and mobile telephones. WiMAX can provide higher flexibility, security, performance, and reliability in service delivery (Angelov and Rao, 2006). Khan et al., (2012) differentiated between Wi-Fi and WiMAX technology referring that WiMAX would operate similar to Wi-Fi but at higher speeds, Greater distances, and for a greater number of users.

3. Methodology
To maximize the knowledge yield of research endeavor, the choice of the mixed method approach (quantitative and qualitative research) was taken for the current study; the study employed the quantitative approach, using fully structured questionnaire and employed qualitative approach using semi-structured interview this survey was conducted in July / August /September 2013.
3.1 Validity and reliability
Validity and reliability are two properties to measure the quality of research. To increase the level of collected data validity, the following standards were adopted in this research: The forms of interview and questionnaire were initially pre-tested for its validity to get feedback regarding the clarity of the instructions and accuracy of the questions in the instrument. The initial questionnaire was prepared and a pre-test was conducted and presented to two identified groups for comments. The two identified groups were 5 academic staff and 7 tourists. The purpose of the pre-test was to detect potential problems in questionnaire design, clarity, and wording. Pre-test respondents suggested some changes in the questionnaires. Through this process, items which were not clear, or were not relevant to the travel industry, were re-worded or deleted.

3.2 Instruments
A well-structured questionnaire was designed and distributed to Luxor tourists, these questionnaires were distributed in Luxor because it is the only city which applied the WiMAX technology. These questionnaires were administered first in order to gain an overall picture on the uses and applications of WiMAX for tourism. The questionnaire administered to the respondents was designed after an extensive literature review particularly pertaining to the quality issues and the experience gained from the pilot testing. The questionnaire was divided into three sections. These sections extend to include the Demographic information, tourist's experience about location-based services, and the impact of WiMAX on developing location-based services.

A total number of 100 questionnaire forms were distributed to a convenience sample of Arab and Foreign tourists. Only 92 were completed with a response rate (92%). Both, the little number of questionnaires because the political conditions in Egypt.

In addition, multiple interviews were conducted in order to help achieve research objectives. Interviews were conducted with academic staff and experts in tourism and wireless technology to identify staff attitude toward location-based services and WiMAX, benefits, opportunities and barriers of location-based services, and the impact of WiMAX on location-based services for tourism. Six interviews were conducted. Semi-structured interview typically refers to a context in which the interviewer has a series of questions (Bryman, 2008).

4- Results and discussion
The results indicated that out of the 92 respondents, 45 (48.9%) were females and 47 (51.1%) were males. Only 18 (19.5%) of the respondents were over 40 years old, 30 (32.6%) belong to the 20-30 years old group, and the majority 31 (33.6%) were belong to 30-40 years old and 13 (14.3%) were less than 20 years. The result also indicated that only 10 (10.8%) of the respondents were visiting alone, only 19 (20.6%) were with their friends, 29 (31.5%) of the respondents were visiting with their family, and the majority 34 (36.9%) were visiting with their family or friends.

The findings indicate that the majority of respondents (tourists) about 89% were visiting with their family or / and family, and subsequently the majority of their needs were connecting with others and this reveal the need to an innovative tools that form an integrated system of software and networked equipment that facilitates data processing, information sharing, communication and the ability to search and select from an existing range of products and services for the user/tourists, and the study can rely on the respondent's results because of their youngest age as about 46.9% their ages are less than 30 years old which indicate that they keep up with the up-to-date technology.
Moreover, the results revealed that percentages of tourists who use their portable devices on a daily basis as a guide are 30.43%, and about 28.26% of the total sample use it once a week. This underlines the importance of portable devices and its vital role in the process of tourists' guidance.

Also, the results showed that the current system of the users' smart phones are four systems, and can be sized as; Blackberry system is used by 29% and the Android system has the top percent by 54%. Then comes the IOS system and Windows system by 11% and 6% respectively. Android system was identified as the main system used by tourists in their smart phones.

The results revealed that 78% of tourists are familiar with location based service while only 22% are not. Meanwhile, 73% of the respondents have used location based service application before. This means that most of the tourists are aware of new technologies and can easily use them. This issue makes Egypt a destination qualified to support LBS which most probably satisfy tourists during their stay.

Tourists are increasingly demanding fast, flexible and convenient information. They are not satisfied with any delay, poor service or inaccurate information; they are also expecting to have access to information whenever they need. The development and use of LBS can lead to increased tourist satisfaction.

<table>
<thead>
<tr>
<th>Impact of WiMAX on location-based services</th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
<th>Mean</th>
<th>SD</th>
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<tbody>
<tr>
<td>The used portable devices offer up-to-date information about places and its rank.</td>
<td>2</td>
<td>5</td>
<td>14</td>
<td>42</td>
<td>29</td>
<td>4.385</td>
<td>0.430</td>
</tr>
<tr>
<td>I think that mobile device connected with WiMAX technology is more beneficial for tourists.</td>
<td>13</td>
<td>18</td>
<td>17</td>
<td>33</td>
<td>11</td>
<td>3.300</td>
<td>0.466</td>
</tr>
<tr>
<td>WiMAX technology allowing tourists to obtain valuable information.</td>
<td>4</td>
<td>11</td>
<td>5</td>
<td>47</td>
<td>25</td>
<td>4.150</td>
<td>0.449</td>
</tr>
<tr>
<td>WiMAX technology enable users to move from one location to another, and still connect to information, people and data in their company's information system.</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>37</td>
<td>34</td>
<td>4.233</td>
<td>0.432</td>
</tr>
<tr>
<td>WiMAX technology makes the tour more attractive and effective.</td>
<td>12</td>
<td>8</td>
<td>23</td>
<td>25</td>
<td>24</td>
<td>2.933</td>
<td>0.739</td>
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<tr>
<td>I think WiMAX technology is a lower cost technology.</td>
<td>10</td>
<td>7</td>
<td>19</td>
<td>37</td>
<td>19</td>
<td>3.442</td>
<td>0.449</td>
</tr>
<tr>
<td>There is higher flexibility in service delivery</td>
<td>2</td>
<td>5</td>
<td>10</td>
<td>47</td>
<td>28</td>
<td>4.533</td>
<td>0.730</td>
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<td>Speed of WiMAX technology has a higher speed (you make a search easily).</td>
<td>6</td>
<td>9</td>
<td>15</td>
<td>32</td>
<td>30</td>
<td>3.966</td>
<td>6.075</td>
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<tr>
<td>Convergence of WiMAX in a wide spread.</td>
<td>4</td>
<td>7</td>
<td>10</td>
<td>35</td>
<td>36</td>
<td>4.000</td>
<td>0.702</td>
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<tr>
<td>Quality of data range is high.</td>
<td>9</td>
<td>12</td>
<td>17</td>
<td>36</td>
<td>18</td>
<td>3.766</td>
<td>0.430</td>
</tr>
<tr>
<td>WiMAX technology grantee security and privacy to the user</td>
<td>4</td>
<td>6</td>
<td>12</td>
<td>35</td>
<td>35</td>
<td>4.033</td>
<td>0.718</td>
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<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.979</td>
<td>1.066</td>
</tr>
</tbody>
</table>

SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree
Table indicates that the mean of this dimension is 3.979 which is considered high degree and standard deviation 1.066. This indicates that the subordinates reported a relatively high great impact of WiMAX on location-based services for tourist.

3.2 Semi-structured interviews
The research made six interviews with the academic staff, tourism managers, and experts in wireless technology
The semi-structured interview includes the profile of the staff working in the field of wireless technology. The aim of the interview is to identify staff attitude toward location-based services and WiMAX, Benefits, opportunities and barriers of location-based services, the impact of WiMAX on developing location-based services for tourism.

<table>
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<th>Table3: Fact sheet</th>
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<td>Fact Sheet</td>
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<td>Current post held</td>
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<td>Individual One</td>
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<td>Individual Four</td>
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<td>Individual Five</td>
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<tr>
<td>Lecturer</td>
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<tr>
<td>Tourism Manager</td>
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<td>undersecretary of</td>
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<td>state for information</td>
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<td>Government sector</td>
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<td>sales manager</td>
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<td>Sales Manager</td>
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<td>Lecturer</td>
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<td>Vice President</td>
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</table>

- **Staff attitude toward location-based services and WiMAX technology.**
All of the staff members (industry experts, wireless technology experts and academic staff) have very good positive attitude toward location-based services, as they see the location-based services as a valuable resource for providing real-time information for tourists.

      Of course location-based services consider an effective tool for providing information for tourists .......
      location-based services provide tourists with information during their trip, travel agencies with information to promote their products and DMOs to promote the destination .......
This means a good opportunity for applying LBS intensively by getting the support of industry experts, wireless technology experts and academic staff.

- **Benefits, opportunities and barriers of location-based services.**
- **Benefits of location-based services.**
A number of location-based services benefits stated by the interviewees can be summarized as; LBSs will be seen as a mechanism for providing real-time and correct information to the tourists while they are on their trip, proximity site information and obtaining up-to-date information. Tourists traveling to destinations in marginal regions are mainly seeking adventure and excitement provided by nature, the main focus of services supporting this purpose is to enable better accessibility to nature, which denotes guidance, delivery of up-to-date information about the surrounding environment and safety related services, such as the ability to send emergency messages with accurate position information. In addition to these three aspects, tourism location-based service offers huge opportunities for personalization of services and for matching services to the required tourists’ needs and becoming more customer-focused ,as well as being flexible in their information and service delivery ....*Using location-based services for tourism will give a chance for both travel agencies and tourists to benefit from the information ........*

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This results came to agree with the findings of Swann., et al., (2003) study which indicated that Location Based Services (LBS) will play a key role in the future development of the tourism market, as they represent the ultimate synergy between communications and positioning technologies in order to deliver to the mass market a wide variety of new services.

Opportunities of location-based services
Most interviewees see the most important applications of location-based services are navigation, proximity services, road service information and leisure information.

.... Navigation considers the most important used application of location-based services in tourism ..........
This means that there is a big opportunity for potential applications of location based services in tourism sector.

Barriers of location-based services
The barriers of delivering successful location-based services ' perspective was summarized as accuracy of database, accuracy of digital maps and the greatest barriers to deliver successful location-based services is the lack of integration between destination management organizations (tourism ministry, the ministry of monuments) and wireless companies to build database about monuments, hotels, restaurants to give tourists up-to-date information. Also one of the great barriers of location-based services is the availability of GPS enabled phones and Accuracy of digital maps.

....... delivering successful location-based services require accuracy of database, accuracy of digital maps ..........
All members of the interviewees assured that the government should facilitate the license and the infrastructures.

....... Government should facilitate license and infrastructure ......
These barriers needs more than the support of business experts or stakeholders. Its needs the governmental support and interference, this includes the infrastructure and data base availability.

- The impact of WiMAX on developing location-based services.
Most members of interviewees see that WiMAX technology will have a useful impact of location-based services for tourism. WiMAX networks are capable of locating and tracking users with sufficient accuracy for most of LBS provided by service providers, depending only on network resources and without relying on GPS or similar systems. WiMAX will provide fixed, nomadic, portable, and eventually, mobile wireless broadband and without base station line-of-sight. WiMAX will also provide high security, quality of service, highest coverage and speed up to 74 MPs.

.......using WiMAX technology for location-based services in tourism will improve the quality of services ........
As for the difference between Wi-Fi and WiMAX technology
A number of differences stated by interviewees as the following:
WiMAX would operate similar to Wi-Fi but at higher speeds, greater distances, for a greater number of users, cheaper and simpler.

.........WiMAX with higher bandwidth and longer reach is planned to be used for connecting Wi-Fi hotspots with each other and to other parts of the Internet, providing a wireless alternative to
cable and DSL for last mile (last km) broadband access, providing high-speed mobile data and telecommunications services (4G)........
As for the contribution of WiMAX to the development of location-based applications of tourism The Interviewees see that applying WiMAX technology will maximize:
WiMAX technology will maximize the quality of services in location-based services
.....WiMAX is really a good replacement for existing networks.........
... WiMAX location based service is a promising alternative to 3G or wireless LAN for providing last-mile connectivity by radio link due to its large coverage area, low cost of deployment and high speed data rates......
As For The main stakeholders of WiMAX in Egypt
Members of interviewees said that the only stakeholders is Inotek Systems
...... Inotek Systems implemented in 2007 the only available WIMAX network in Luxor for providing Internet access for tourists on the go in partnership with TE DATA and NTRA and USAID............... 
All above results give answers to the question of the research which are Do location-based services play an effective role in tourism?, Do WIMAX technology has an impact on developing Location-Based Services?.Location based services do play an important role in tourism and in the same time applying Wimax technology will greatly affect it in a positive way.

Conclusions
The results obtained from the research it can be assumed that location-based services face two key challenges, how to collect up-to-date information about, places, and how to rank places. A location-based service depends on cutting-edge technologies, Wireless location and mobile internet. Moreover it offers significant opportunities for a broad range of markets ; they present users significant privacy threats. There are three approaches for regulating privacy in LBSs applications : through law , technology , and self-regulation, or some combination of these applications . Tourism consider the first industry taking the advantages of location-based services , the main reason of this is that tourism can intrinsically benefit from the use of mobile technology that provides new services to travelers on the move . WiMAX Technology can provide ( High security , Quick development , Low cost , Flexible architecture , Mobility , High Capacity , Wide converge , Quality of service ). Results also revealed that tourists have a very good positive attitude toward location-based services as a valuable resource for providing real time information for tourists.
Location-based services will be seen as a mechanism for providing real-time and correct information to the tourists and travel agencies, obtaining up-to-date information. The most important applications of location-based services are, Navigation, Proximity marketing, Road services information and the barriers of delivering successful location-based services were accuracy of database and accuracy of digital maps. Finally, WiMAX would operate similar to Wi-Fi but at higher speeds, greater distances, for a greater number of users, cheaper and simpler.

Recommendations
Based on the literature reviewed and the study results, the following recommendations should be taken in the consideration for a successful applying of WiMAX technology for location-based services in tourism.
Egyptian tourism ministry, Egyptian ministry of communication and technology and ministry of monuments,
• Application of location-based services for tourism need integration between the Egyptian tourism ministry, Egyptian ministry of communication and technology, ministry of monuments, and the technology operators to build a database about the monuments, hotels, restaurants, road maps, .... etc., and make a website to allow the tourist browsing and using applications of location-based services, one of the most important elements to make successful location-based services the accuracy of databases.

• Egyptian ministry of tourism can use Location based service is an effective tool to attract tourists to a distinct destination.

• Tourists need to become aware and educated on what LBS means and what it can accomplish for them before that they can start using it.

• Tourists always looking for the newest more and more. Innovation is a big challenge for LBS providers, it must be noted that being creative is a necessary but not sufficient factor for facilitating innovation but rather it is the ability to develop novel ideas that are useful for solving problems and satisfying the user needs.

Egyptian ministry of communication and technology

• GIS and GPS can also be built into LBS to allow the tourist to locate sustainable destinations whereby the tourists can run a query to determine “hot spots”. A GIS system also allows the presentation of different types of tourist information such as hotels, trails, maps, event location and determines the distances between points of interests.

• Introducing digital interactive based maps located at different points of the destination instead of paper based maps with accurate and extensive coverage in Egypt. GIS information portal (http://www.digitaleg.com/Digital_Egypt/index.html) introduce the service to view a detailed map of Egypt superimposed on high resolution satellite imagery, search for landmarks such as hotels and universities, find commercial services, look for real estate, explore new residential developments, view 360 degree panoramic images and photographs, check the live weather, and analysis tool. Accuracy of digital maps is a very important issue should be taken in the consideration.

• LBS can provide mobile service providers with additional revenue stream option in a highly competitive marketplace. Trends indicate that many consumers who use LBS sign up for more than one location application.

Egyptian Government

Government should consider implementation of WiMAX technology for location-based services as a vital issue to improve the quality of location-based services, High Security, Flexible Architecture, etc. Travel agencies

• Travel agencies should benefit from using location-based services in advertising and promoting their products to tourists, create greater pricing flexibility to address discrete market segments, increase customer loyalty. LBS give tourists as well as travel agencies with information which they need and give it a chance to promote their products.

Further research

The recent study focused on studying the impact of WiMAX on location-based services in tourism, whereas; future studies can be taken to survey Li-Fi technology and its impact on location-based services, Li-Fi or optical Wi-Fi - is the major breakthrough technology for the
mobile Internet community and for the indoor Location-Based Services (LBS). Li-Fi consists of using the lighting networks as wireless communication networks

References


environment-would-be-changing-as-fast-as-it-has-over-the-past-year-or-two  


الملخص العربي

تأثير الواي ماكس على تطوير خدمات تحديد المواقع السياحية

خلال العقد الماضي قد حدث تطورا كبيرا في الهاتف النقالة، هذا التطور أيضا أدى إلى ارتفاع استعمالات الخدمات المعتمدة على تحديد الموقع (LBSs). حيث تقوم الدراسة بالتعريف بأهمية خدمات تحديد الموقع في قطاع السياحة وأيضا معرفة الفرق بين تكنولوجيا الواى فاي وتكنولوجيا الواى ماكس، وإيضا معرفة أثر الواى ماكس على خدمات الموقع في مجال السياحة. وتقوم الدراسة بالإجابة على التساؤلات هل خدمات تحديد الموقع لها دورا فعالا في مجال السياحة؟ هل تكنولوجيا الواي ماكس لها دور في تطوير خدمات تحديد الموقع. وقد اعتمد البحث على الاستبان الكمي والتوقع لتحديد مدى فعالية استخدام تكنولوجيا الواي ماكس في تطوير خدمات تحديد الموقع في مصر. كما توصي الدراسة بأهمية التعاون بين وزاره السياحة ووزاره الاتصالات ووزاره الآثار وشركات تكنولوجيا المعلومات والجهات المعنية في ذلك المجال لبناء قاعدة بيانات للمعلومات الدالة: خدمات تحديد الموقع، الواي فاي، الواى ماكس، تكنولوجيا، مصر.