LOCATION-BASED SERVICES FOR TOURISM
- LITERATURE REVIEW

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ABSTRACT

This article review is going to review and talk about the development of mobile Location-Based Services (LBS) in Tourism. Since most of the tourists visiting any strange attractions need to consider various issues such as accommodation, restaurant, tourist attraction information, and so forth, the features of mobile LBS can provide right in the time and right in the place information, services, and suggestions for travelers use. Therefore the paper reviews and exams the articles with LBS for tourism, and organized this article review as what LBS is, what tourism LBS applications have, what users experience is from LBS, and what tourists attitude is about LBS.

KEYWORDS: Mobile, Location-Based Services (LBS), Tourism, Users Experience.

INTRODUCTION

Tourism is both an enjoyable and pleasurable activity for most of people globally and an enormous significant for the world economics. According to the World Tourism Organization (WTO) of United Nations, the international tourists visit reached 922 millions in 2008, and there is a 2 percent increasing rate contrast with 2007. However, tourists usually encountered problems when they are traveling in a strange destination, area, or city because of the lack of travel information. In Brown & Chalmers’s (2003) study in tourism and mobile technology, they figured several problems that travelers have usually faced. The first situation is that “what to do?” followed by “how they are going to do” and the last problem is that “finding where things are”. All of those situations irritate them deeply while they are visiting a new place. Although finding and figuring out those problems, organizing and planning itinerary before trips, and traveling at destinations are part of the gratification of tourism, tourists need a better services and method to resolve problems. Those problems are sometime frustrating travelers especially when the information of itinerary is different from practical situation or a lack of information attractions or events. Therefore, could mobile technology provide solution for those travel problems?

Since the Federal Communications Commission (FCC) of United States took action to improve the quality and reliability of 911 emergency services for wireless phone users in 1996 called Enhanced 911 rules (E911), the wireless network operators must provide at least 95% of all cell phone calls’ location by December 31, 2005 (cited from Wikipedia). This action provides the technological foundation for the Location-Based Services (LBS) (Junglas & Watson, 2008).
Moreover, lots of projects, applications, mobile carriers provide LBS for tourism in order to provide better information services. Could those LBS provide the better travel problem solutions? There are some articles and researches relating to LBS and tourism have been published globally. The following article review is worthwhile discussing in those sectors.

What the LBS are
What the LBS features in tourism are
What tourism LBS applications have
What users’ experience in LBS is
What tourists’ attitude of LBS is

After reviewing articles and discussions in those sectors, features, capacities, and services of LBS could be clearer for tourism industry. The general image about LBS for travel problems and tourism can be presented through this article review.

WHAT THE LBS ARE

As mentioned in the introduction, LBS are originally created by the rules of E911 asked from FCC of United States America. Except for knowing LBS affected by E911, what the LBS is also need to be verified.

According to Junglas & Watson (2008), LBS have four geographic location “entities.”

The firstly entity indicates the object having location information services. It can be human or non-human. Secondly, there are always at least two entities involved in a Location-Based Service request—just like there are at least two people on a phone conversation. Thirdly, one of the entities is always the object of LBS. In other words, it is the entity about which location information is recorded. Fourthly, one of the entities is always a recipient of the location information. LBS researchers distinguish between location-tracking services and position-aware services.

Location-tracking services provided information about a user’s whereabouts to entities other than the users, while location-aware services supply the users (the information requester) with personal location data.

Vrček, Bubaš, & Bosilj (2008) in the article of “User acceptance of location-based services” give two definitions of the LBS.

LBS definition 1: LBS is an information services available via mobile devices and use of mobile networks and are based on the capability of definition of location of mobile device.
LBS definition 2: LBS is a wireless IP service using the geographical information system (GIS) for the mobile user, i.e. each application service using the position of a mobile device. This definition describes LBS as an intersection of three technologies (Figure 1).

**FIGURE 1 LBS AS THREE INTERSECTION OF THERE TECHNOLOGIES (AS CITED FROM VRČEK, BUBAŠ, & BOSILJ, 2008)**

Two technologies can provide LBS functions, such as signal measurements, and the location estimate computation based on the measurements (Mitchell and Whitmore, 2003).

In order words, there are two techniques to approach the mobile device users. One is using radiolocation from cellular network, and the other one is a Global Positioning System (GPS.) Both of them can provide LBS. By using GPS techniques, the end users also need caller or handset with Global Positioning System receiver such as GPS Navigator, cell phone with GPS function and so forth. Subsequently, positioning techniques can be categorized into several varieties, each category with its own advantages and disadvantages. Those types are cell-location, advanced network- based, and satellite-based positioning (Barnes, 2003). The following Table 1 displays the advantages and disadvantages of the three different technique types.
### TABLE 1. ADVANTAGE AND DISADVANTAGE OF LBS TECHNIQUE TYPE

<table>
<thead>
<tr>
<th>Technique type</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell of Origin (COO) or Cell-ID,</td>
<td>Very Fast speed.</td>
<td>Very limited accuracy in areas with low cell radius</td>
</tr>
<tr>
<td></td>
<td>Typically around 3 seconds.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low cost.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No modifications needed to networks or handsets</td>
<td></td>
</tr>
<tr>
<td>Estimated Time of Arrival (ETOD) for GSM,</td>
<td>Fast speed.</td>
<td>Accuracy depend on</td>
</tr>
<tr>
<td></td>
<td>ETOD takes around 5 seconds.</td>
<td>the stations of signal measurement and number of Location Measuring</td>
</tr>
<tr>
<td></td>
<td>Moderate cost.</td>
<td>Units (LMUs)</td>
</tr>
<tr>
<td></td>
<td>Software modified handsets needed for positioning</td>
<td>Accuracy around 50m to 125m</td>
</tr>
<tr>
<td>Global Positioning System (GPS) and Assisted Global</td>
<td>High accuracy</td>
<td>High cost.</td>
</tr>
<tr>
<td>Positioning System (A-GPS)</td>
<td>(Outside of the buildings, approx. 10-20m; Inside of</td>
<td>New handsets needed for positioning</td>
</tr>
<tr>
<td></td>
<td>the buildings, approx. 50m</td>
<td>Variable.</td>
</tr>
<tr>
<td></td>
<td>A-GPS has high speed about 5 seconds.</td>
<td>GPS takes around 10-60 seconds to locate position and Signal degradation and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>reduced accuracy in certain environments, e.g., inside of the buildings or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>urban canyons</td>
</tr>
</tbody>
</table>

The types of technique which are Cell of Origin (COO), or Cell-ID includes Service Area Identity (SAI), and LocWAP and enhanced Cell-ID. It may also include enhancements with propagation time measurements. The advantages of COO comprise fast speed with low cost. It generally takes about three seconds to locate the position, and it does not need to be modified the networks or handsets so it turns out to be the most economical type. The shortage of the COO is that low accuracy if the area with low cell radius.
The second type is Estimated Time of Arrival (ETA) for GSM. The related techniques are Advanced Forward like Triangulation (AF-LT), Idle Period Downlink (IP-DL) for CDMA and WCDMA. Fast speed and moderate cost are the advantages of ETA. It takes about five seconds to relocate the position and the software needs to modify the handset position. The accuracy is about 50 meters to 125 meters depending on the visibility of base stations of signal measurement and number of Location Measuring Units (LMUs).

The last technique is Global Positioning System (GPS) and Assisted Global Positioning System (A-GPS). The advantage of GPS is accuracy positioning that could locate objects about 10 to 20 meters outside of the building and around 50 meters inside of the building. The shortages are high cost and variability. Since it needs a new handset for positioning, the cost is higher than others; the performance time are various from 10 to 60 seconds relying on applying environment.

Consequently, at the end users’ point of view, mobile devices or mobile handsets such as personal digital devices (PDA), mobile phone (Google’s Android smart phones, iPhone, and so forth), and the global positioning systems (GPS) can provide not only security issues but also carry lots of functions, such as navigation services, and tracking services.

WHAT LBS FEATURES IN TOURISM ARE

No matter which technique is applied in the service, LBS architecture consists of five basic components: Mobile Devices, Positioning, Communication Network, Service Providers and Content Providers (Steiniger et al. 2006). With those five components, LBS can provide a lot more functions and features for end users. Van de Kar and Bouwman (2001) figured out three types services of LBS which were emergency services, services of mobile operators and value added services, and focusing on the last category as a primary opportunity for development of m-business.

In the paper of “Foundations of Location Based Services,” Steinger, Neun, & Edwardes (2008) presented that LBS has several possible applications and can provide added value. The possible applications and added value of LBS are illustrated as table 2.

<table>
<thead>
<tr>
<th>TABLE 2: THE POSSIBLE APPLICATIONS AND ADDED VALUE OF LBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBS possible applications:</td>
</tr>
<tr>
<td>Requesting the nearest business or service, such as an ATM or restaurant</td>
</tr>
<tr>
<td>Turn by turn navigation to any address</td>
</tr>
</tbody>
</table>
Locating people on a map displayed on the mobile phone | Equipment, doctors, fleet scheduling
---|---
Receiving alerts, such as notification of a sale on gas or warning of a traffic jam | Finding someone or something, such as person by skill (doctor), business directory, navigation, weather, traffic, room schedules, stolen phone, emergency calls, etc.
Location-based mobile advertising | Proximity-based notification (push or pull). Targeted advertising, buddy list, common profile matching (dating), automatic airport check-in, etc.
Asset recovery combined with active RF to find, for example, stolen assets in containers where GPS wouldn't work | Proximity-based actuations (push or pull). Payment based upon proximity (EZ pass, toll watch)

Also, in the article review of a research from Vrček, Bubaš, & Bosilj (2008), they summarize the possibilities, features, and capacities from other papers into two fields which are services for business between company and end users (B2C) and services for business between companies (B2B). The Table 3 is classification of LBS modify from the paper of Vrček, Bubaš, & Bosilj (2008).

**TABLE 3. CLASSIFICATION OF LBS**

<table>
<thead>
<tr>
<th>Type of LBS</th>
<th>LBS for business to consumer (B2C)</th>
<th>LBS for business to Business (B2B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functions of LBS</td>
<td>Emergency calls</td>
<td>Vehicle tracking</td>
</tr>
<tr>
<td></td>
<td>Information services, Travel services</td>
<td>Product tracking</td>
</tr>
<tr>
<td></td>
<td>Navigation, Routing, Automotive assistance</td>
<td>Traffic management</td>
</tr>
<tr>
<td></td>
<td>People and pet tracking</td>
<td>Product replenishment</td>
</tr>
<tr>
<td></td>
<td>Transactions</td>
<td>Mobile sales</td>
</tr>
<tr>
<td></td>
<td>Intelligent advertising (Banners, Alters, Marketing)</td>
<td>M-customer support</td>
</tr>
</tbody>
</table>
Oertel et al. (2002) indicated that Location-Based Services are considered the crucial fact for success of mobile applications. It assumed that personalized services should be the essential of the mobile services. In other words, LBS on mobile phones and smart phones are expanding speedily. Since smart phone enriched satellite positioning features LBSs on mobile phones are popular and widely available. The downloadable applications are increasing in online stores and encouraging users to experiment with new services. Using smart phones to share information about themselves has becoming more comfortable for people (Wilson, 2010).

Since LBS through smart phone or handset devices have become popular, what LBS can be applied into tourism is the draw of this paper. In 2000, OpenGIS Location Service (OpenLS) conducted some possible applications of LBS relevant to tourism are quoted in Table 4.

**TABLE 4. POSSIBLE APPLICATIONS OF LBS RELEVANT TO TOURISM**

(AS CITED FROM OPENLS, 2000)

<table>
<thead>
<tr>
<th>Possible applications</th>
<th>Examples of case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Information</td>
<td>“there is a traffic queue ahead, turn right on the A3!”</td>
</tr>
<tr>
<td>Emergency Services</td>
<td>“help, I'm having a heart attack!”</td>
</tr>
<tr>
<td>Roadside Emergency</td>
<td>“help, my car has broken down!”</td>
</tr>
<tr>
<td>Law Enforcement</td>
<td>“what is the speed limit on this road where I am at?”</td>
</tr>
<tr>
<td>Classified Advertising</td>
<td>“where are nearby yard-sales featuring antiques?”</td>
</tr>
<tr>
<td>Object visualization</td>
<td>“where is the historic parcel boundary?”</td>
</tr>
<tr>
<td>Underground Object Visualization</td>
<td>“where is the water main?”</td>
</tr>
<tr>
<td>Public Safety Vehicle Management</td>
<td>“who is closest to that emergency?”</td>
</tr>
<tr>
<td>Location-Based Billing</td>
<td>“free calls on your phone, in a particular location”</td>
</tr>
<tr>
<td>Leisure Information</td>
<td>“How do we get to the Jazz Club tonight from here?”</td>
</tr>
<tr>
<td>Road Service Information</td>
<td>“Where is the nearest petrol station?”</td>
</tr>
</tbody>
</table>
Directions  | “I'm lost, where is nearest Metro station?”
---|---
Vehicle Navigation  | “how do I get back to the Interstate from here?”
Vehicle Theft Detection  | “my car has been stolen, where is it?”
Child Tracking  | “tell me if my child strays beyond the neighborhood.”

### WHAT TOURISM LBS APPLICATIONS HAVE

In the tourism industry, it is an industry that relies highly on integrated information service. Hinze and Voisard (2003) supposed that Tourism Information Providers (TIP) delivering travel information should base on location, time, profile, and using history. They have tried to combine with the LBS and Event Notification System (ENS) in tourism in providing the accurate information for tourists use.

Yu and Chang (2009) signified that user profile management, tourism information management, location-aware personalized recommendation of attractions and tour plans, tour plan management, as well as map-based positioning and visualization are the farmworks of functional requirements. From M-Taiwan project, TIP can deliver the richer and targeted information for end users. Mobile Learning, for instance, can offer services of diversified study, museum, and cultural center for travelers. The Mobile Living is providing precise traffic, shopping, and events information. The following are developing of several projects, applications, and apply of LBS for tourism from presented papers. This section is showing the features of those developments including Cyberguide system in USA by Abowd et al. (1997), GUIDE system in UK by Cheverst et al. (2000), CRUMPET in European from Zipf et al. (2001), Dynamic Tour Guide in Germany by Kramer et al. (2006), and after launching the smart phone in Jun 2007.

Cyberguide---California, USA. (Abowd et al., 1997)

Cyberguide is a mobile context-aware tour guide and one of the first mobile tour guides presented by Abowd et al. (1997). It works outdoor with GPS and indoor with infrared to determine context information like users’ position and orientation. The overall system is designed for providing four serves for tourist such as map component, information component, positioning component, and communication component. The map component can provide local information such as tourist attractions, restaurants, hotel locations around the tourists. The information component can support information relating to objects and people interested in physical world. The navigation component can use positioning to deliver accurate information for tourist location and orientation. The final component, communications component, creates a channel for tourist sending and receiving messages or information.

The GUIDE system integrates four features such as the use of personal computing technologies, wireless communications, context awareness and adaptive hypermedia so that the tourists need of the information and navigation needs can be supported (Cheverst et al, 2000). In more details, GUIDE is created for Lancaster, U.K., and it adopts a mobile wireless communications infrastructure in order to broadcast dynamic information and positioning information to portable GUIDE devices. The location-based navigation and information retrieval mechanisms are provided by the system. Both features are useful and functional. In the paper of Cheverst et al, (2000) show that visitors are able to use it to receive dynamic information, e.g. the ‘specials’ menu of a café, was a worthwhile experience.

CRUMPET---European (Zipf et al. 2001)

The CReation of User-friendly Mobile services PErsonalized for Tourism (CRUMPET) is a European Information Society Technologies (European IST) project. The main objects of CRUMPET are to implement and trial tourism-related value-added services for nomadic users across mobile and fixed networks and to evaluate agent technology in terms of user-acceptability, performance and best-practice as a suitable approach for fast creation of tough, scalable, seamlessly accessible nomadic services (Zipf et al. 2001).

FUNCTIONS OF CRUMPET

a) Recommendation of services

b) Interactive maps

c) Information on tourist attractions

d) Pro-active tips, giving an unobtrusive tip

The approaches of CRUMPET included:

a) tourism-related service content,

b) adaptive nomadic services responding to underlying dynamic characteristics, such as network Quality of Service and physical location;

c) a service architecture implementation that will be standard-based;

d) suitability for networks that will be those that typical tourist users might be exposed to now and in the near future (like GPRS and UMTS);

e) suitability for a range of terminal types, like next generation mobile phone;

f) services that will be trailed and evaluated by mobile service providers. (Zipf et al. 2001)
Belz et al. (2002) also pointed out the key features of the CRUMPET system.

Making use of personal interests

a) Domain-specific interests of the user serve as a basis for selecting and sorting service offers.

b) Interests of single users as well as groups can be considered.

c) The system learns the user’s interest over time, i.e. from the user’s interaction with the system.

Making use of the user’s current position

a) The user's current location is the observation on the basis of GPS sensor data.

b) The GPS data about the geo-coordinates are related to the data in Geo-Information Systems (GIS) of the region.

c) The current location serves the input of the service selection.

d) Location-Based Services (LBS) are offered, such as creating a tour, giving directions, creating maps.

Service mediation

a) The system has been analyzed as a multi-agent system, including middle-agents to mediate between users and distributed service agents.

b) The middle-agents integrate various support features of CRUMPET and facilitate the users’ interaction.

c) The system may explore several content providers for one request of the user.

d) Pro-active assistance is given, when enabled by the user (As cited from Belz et al. 2002).


In the paper of Mobile tourist guide services with software agents (Pavón et al. 2004), authors presented the application, The Mobile Tourist Guide Service, also called TOURIST GUIDE-USAL, provides a set of agents to assist potential tourists for organizing travel itinerary and enabled tourist to adjust their schedules on the move of using wireless communication systems. The system designed into several parts of features including Planner Agent, Tracker Agent, and Performer Agent. Planner Agent assesses tourists and helps them to identify tourist routes.
The Tracker Agent remains updated information about the attractions, restaurant information, public transportation conditions, and for meeting the requirement of the tourists. The Performer Agent acts an association role providing an easy interface for users.

Dynamic Tour Guide (DTG)---Görlitz, Germany (Kramer et al. 2006).

Dynamic Tour Guide (DTG) is a mobile agent that selects tourism attractions, plans individual tours, provides navigational guidance and offers location based interpretation. In contrast to existing tour guides the DTG computes an individual tour in real-time by considering available context information like personal interests and location based services (Kramer et al. 2006). The paper of Kramer et al. (2006) also indicated that tourists in Görlitz, Germany with one based on simulating tours using the gathered interested information and tour durations indicated that context-aware information will help to enjoy a destination at its full potential. Two facts of DTG provided by Author quoted below.

1. One can predict that it provided better information via a mobile device by the DTG, more tourists would visit attractions appropriate to their interests favorite.

2. The DTG may help tourists visiting destinations for the first time and able to pick up the sights and are more interested in from the start by providing all information that are invisible or inaccessible for tourists.

Launch of smart phone---In USA & Worldwide

Since Apple’s iPhone launched on Jun 26, 2007, smart phone which can support LBS features has boomed in the world. The selling amount of smart phone in 2009 is 174.2 million (ITD, 2010). According to the report of Market Intelligence & Consulting Institute (MICI), around 550 thousands smart phone could be sold in Taiwan in 2009. Moreover, more and more device companies also will introduce new smart phone products in the nearly future.

Farber (2008) reported the news showing that Google opens up LBS with plug-in for mobile technology. Following by the LBS mobile services, several businesses will have the opportunity to develop LBS from mobile sites using Google tools without having to pay any fees. Additionally, the open-source geo-location tools will launch soon. As a result, lots of mobile carriers can provide LBS through smart phones plus Google’s open-source. This phenomena of mobile and LBS became the trend of cell phone services. The case of LBS through mobile phone carriers in Taiwan is describes.

There are five major wireless network providers can act as Tourism Information Provider (TIP) in Taiwan. They are Chunghwa Telecom Company, Taiwan Mobile Company, Far Eastone Telecommunications Company, Asia Pacific Telecom Company, and Vibo Telecom Company as well. Only two companies provided LBS so far. The Chunghwa Telecom Company launched its LBS in 2003. At first, the target users contain logistic industries, security service companies, and broadcast companies. In February 2009, nevertheless, it designs a new LBS system for its own iPhone users named Hami. The Hami provides 500 thousands stores information and Google map function through its wireless networks. The second company is Vibo Telecom Company. Its LBS system began on September 26, 2008 called Map Daily. The users can utilize the LBS
function to record travel trails and post information on the website to share with their friends and families. Consequently, smart phone will probably be the most potential hand hold devices getting LBS through cellular phone carriers.

WHAT USERS’ EXPERIENCE IN LBS IS

The last section has discussed the LBS applications and projects proving lots of services and features for travelers. In this section, the paper will describe, exam, and analysis empirical research papers about the users’ experience, finding, or referring LBS from tourism.

In the survey finding from Freytag (2003), around 1,500 tourists in Heidelberg, Germany were asked about their activities during their visit of the city in 2003. The first important fact to mention is that most tourists explore the city by walking and on their own planning. Only 7% tourists decided join the group tours. The second finding indicates that most tourists move within a very limited area around old towns. Almost everybody visits the castle while all other sights receive less attention; some even less than 5% visits. This implies that most tourists visit only a few places. This is probably an effect of missing contextual information. Kramer et al. (2006) made a prediction like that the more appropriate information provided, e.g. via a mobile device by the DTG, more tourists would visit travel spots to their interested places. The following paragraphs are showing the papers that providing travel information through mobile devices.

In 2000, Cheverst et al. developed a context-awareness electronic tourist guide called “Guide” and did the experimental study. The study findings separated into five sections: validation of requirements, information presentation, GUIDE unit, visitor profile, and acceptance of awareness information are showed below.

1. VALIDATION OF REQUIREMENTS

Majority of users (53/60) valued the flexibility provided by the system such as able to use the system as a tour guide, a map or a guidebook. Two features, location-aware navigation and information retrieval mechanisms, provided by the system were both useful and reassuring. However, though user’s experience and expression, they thought the system was still not easy to use and wished its interface becoming simpler. The interactive service was unable to provide immediate reactions. When booking an accommodation through system, there are only five participants (5/60) would much rather speak to the hotel representatives. Most users (48/60) said that they would want some from the hotel to confirm that their reservation had been approved.

2. VISITOR’S SUBJECTIVE OPINION ON INFORMATION PRESENTATION.

All visitors appreciated to be able to link and receive greater levels of details on an information topic. Some users, nonetheless, said that they might have missed information on a particular topic. Most visitors (59/60) enjoyed using GUIDE to explore the city. And yet, they were frustrated because of information not available on a particular attraction when using the system. The visitors also expressed that they trusted the information presented by the system, including the navigation instructions.
3. VISITOR’S SUBJECTIVE OPINION ON THE GUIDE UNIT.

Visitors were glad to own a portable GUIDE unit. However, some users said that the GUIDE unit was too large and preferred a thinner device.

4. INTERESTING RESULTS BASED ON VISITORS PROFILE

Teenage users seem excited in the technology and visited more than once twice as many links as passable (per minute of usage). Moreover, visitors without web experience were still comfortable in using the system to follow a tour and retrieve information by navigating hypertext links.

5. VISITORS ACCEPTANCE OF AWARENESS INFORMATION

Users knew the GUIDE device might not be able to get the whole information since wireless connection might not be available in some areas. On the other hand, visitors were appreciated the function of positioning (Cheverst et al. 2000). The users’ experiences of GUIDE system experimental research by Cheverst et al. are analyzed and organized as table 5.

### TABLE 5. THE FINDING OF USERS EXPERIENCE FROM GUIDE
(EDITED FROM CHEVERST ET AL., 2000)

<table>
<thead>
<tr>
<th>Component of GUIDE</th>
<th>Positive experience</th>
<th>Negative experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Validation of requirements</td>
<td>Location-aware navigation and information retrieval were able to use the system as a tour guide, a map or a guidebook.</td>
<td>GUIDE was still not easy to use and wished its interface becoming simpler.</td>
</tr>
</tbody>
</table>
| Information Presentation | 1. Users appreciated the idea of being allowed to follow links to receive greater levels of detail on an information topic.  
2. Visitors stated that they enjoyed using GUIDE to explore the city.  
3. Visitors trust such a system when provided by a reliable source the apparent accuracy of the information. | 1. Some concern might have missed information on a particular topic.  
2. Users were frustrated because information was not available on a particular attraction. |
| GUIDE unit. (Device) | 1. GUIDE unit was portable. | 1. GUIDE unit was too large preferred a thinner device. |
| Visitor Profile | 1. Teenage users seem excited in the technology and visited more than once twice as many links as possible. | N/A |
2. Visitors without web experience also can comfortably using the GUIDE.

| Acceptance of Awareness Information | 1. Function of positioning is good and easy for users in knowing their location. | 1. Signal connections may be weak/or no signal in some areas. |

From the study of Users need for location-aware mobile services (Kaasinen, 2003). The study did in Finland and had 55 participants divided into 13 groups. The author got several significant responses from participants.

a) The attitudes of the users towards location-aware services were quite positive both in the group interviews and in the user evaluations.

b) The interviews and user evaluations, topical information turned out to be important to the users.

c) Yellow Pages service made no distinction between different kinds of restaurants.

d) The users in the interviews said that location-aware systems should not lead to a predestined and over-controlled the environment. The user should feel and be in control.

e) The users appreciated the possibility to generate and store their own information.

f) Since the contents may come from several separated service providers, consistency becomes very important.

g) Privacy is another important issue for LBS users.

The finding of Location-Based mobile tourist service-first user experiences (Schmidt-elz et al., 2003) adopted the CRUMPET (Creation of User-friendly Mobile Services Personalised for Tourism) as the LBS application. There were 77 people involved into this study and gave the feedback in the three sectors.

a) Transportation information in a very high ranks; users from interviews hope for receiving frequent update, reliable, and personalized transportation information.

b) Map functions need also ranks in a very high level. The map with highlighting current position of the users, a tour, or attraction was significant for tourists.

c) Location-Based Services (LBS) and transportation information would be the critical concern for the application for a mobile tourism support.
In 2004, Pavón et al. presented their experimental study, Mobile Tourist Guide Services (MTGS) with software agents. The experiment was executed the City of Salamanca, Spain in 2003; the participants were at the number of 6217 tourists who visited the city during the study. The methodology divided into three groups which were providing a professional tourist guide, using Mobile Tourist Guide Service (MTGS), and traveling by themselves. The finding showed that the travelers using Mobile Tourist Guide Service had the 62.7% high level satisfaction from traveling the city. The group providing professional tourists guide had 55.9% of a high level satisfaction; on the other hand, the group traveling by themselves has 16.7% of a high level satisfaction from traveling the city. Consequently, the degree of satisfaction in the tourists used the help of MTGS was higher than the other groups of tourists.

The users’ experience on the functions and features are mostly pleasure and enjoyable, and satisfied on the local navigation and information such as tour guide information, map information, and transportation information. Users gave positive feedback to the researches. For example, participants of the paper of Cheverst et al. (2000) stated that the system retrieved location information and map were useful and able to help in their visit. Kaasinen (2003) in his research got the significant positive feedback from users on the location-aware information services. In a research of Schmidt-elz et al. (2003) on the CRUMPET project in Europe, the study pointed out that this service is useful for travelers when they need transportation information. The MTGS project from Pavón et al. (2004) demonstrated that about 62.7% of a high level satisfaction from traveling the city when visitors used the mobile devices with LBS function. Accordingly, the feature of LBS has been accepted and recognized by participants and travelers.

From the topic information side, two papers, Cheverst et al. (2000) and Kaasinen (2003), showed users were enjoying their trips during traveling with information providing from mobile devices. Furthermore, illustrated the accuracy of the information needs improved such as the papers of Kaasinen (2003) and Schmidt-elz et al. (2003). For instance, the “Yellow Page Services” could not provide the information of different kinds of restaurants. The transportation information providing from the CRUMPET was needed to update in order to give the precise information for travelers. Some particular topics, moreover, concerned by users also had missed Cheverst et al. (2000).

There were also other several shortages responded form users such as difficult interface of applications, heavy mobile devices, unstable wireless signal, concerning personal privacy. The first shortage was the difficulty of using interface. From the feedback of participants of Cheverst et al. (2000), users feel like the interface of application was too complicated and not easy to use. They wished it could easier in order to enjoy their trips. The second drawback was the heavy devices union. The users, although, appreciated the portable mobile devices they had experienced, they also indicated that the devices were too big and heavy to carry during their trip (Cheverst et al., 2000). The third disadvantage was unstable wireless signal. The users said that they were frustrated when they could not have wireless signal. The wireless signal was also weak in some areas, and the reaction and speed was slow (Cheverst et al., 2000). The final shortcoming was the privacy issue. Since LBS can locate the individual position, users sensed that their personal information and position could be exposed openly. The papers of Kaasinen (2003) and Junglas & Watson (2008) implied that privacy issue was important for LBS users.
Their personal information might be gathered from functions of LBS. Therefore, when users experienced the LBS they worried about revealing their individual information as well.

**WHAT TOURISTS’ ATTITUDE OF LBS IS**

Mobile services were also widely assumed that it should be personalized (Short, 2000). In the paper of Schmidt-Belz et al. (2003), Location-based mobile tourist services first user experience, they claim that tourists have various interest profiles leading to the necessity of personalized interest profiles. In order to affect on the tourists behavior, computing and simulating from gathered profiles tours are essential.

Chang et al. (2006) investigated the users’ attitude toward five rudiments of LBS such as perceived usefulness, perceived ease of use, security and privacy, location information and context awareness, and device function. The finding illustrated that perceived usefulness, perceived ease of use, and security and privacy were associated with travelers' attitude toward using LBS.

In addition to the Vrček et al. (2008) presented the study of User acceptance of Location-Based Services (LBS). The study tested the users’ thoughts of LBS components counting emergency and safety services, navigation, information tracking, entertainment, intelligent, and advertising. The finding result suggested that emergency and safety services, and navigation services had a significantly higher rate of acceptance than other types.

In 2008, Junglas & Watson evaluating user perceptions of location-tracking and location-aware services showed that participants were highly motivated to partake in the experiment; even though, they had to spend more than three hours to complete experiment. The study found that the rank of participants’ enjoyment among remained high to extremely high (88%) rate. Thus, Authors referred that people were very interested in LBS with a technology innovation. Nonetheless, except the passion on features of LBS, privacy concerns were subsequently emerged. Since LBS could position individual location, it could also grasp information on personal locality. Junglas & Watson (2008) referred from their study about users having a strong tendency to reject LBS. As a consequence, privacy concerns could likely be a major determinant in the success of LBS.

**DISCUSSION AND CONCLUSION**

The limitation of this article review has several sectors. The majority sector is that the LBS technology and services are new innovation within the recent years so that there are some challenges of finding published articles and papers and many are not able catch up with the newest services provided in the market, it is especially in tourism fields. The second limitation is that the language barriers, some LBS papers or articles presented in other languages, such as Japan and Korea, the development and services of LBS are not involved in this review. The third limitation is that this review is focusing on academic papers regardless of news and magazine, so that the review is not covering much about smart phones or other news hand hold devices with LBS.
By reviewing the articles above, there is an interesting finding. The paper related in applying LBS into tourism are mostly presented by European scholars including Cheverst et al. in 2000, Zipf et al. in 2001, Kaasinen in 2003, Pavón et al. in 2004, and Kramer et al. in 2006. Only one paper is from United Stated (Table 6). What is the reason or why most of the papers have been presented by European authors? Does this case related to LBS services, does this situation correlating with tourism market or tourism style, or does researchers in Europe are more curious on LBS for tourism? This is an interesting issue and that it might need more attention to it in the nearly future.

**TABLE 6. THE LBS APPLICATION/DEVICE/PROJECT FOR TOURISM**

<table>
<thead>
<tr>
<th>Author</th>
<th>Adopted application</th>
<th>Paper retrieved from</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abowd et al., 1997</td>
<td>Cyberguide system</td>
<td>California, USA.</td>
</tr>
<tr>
<td>Cheverst et al., 2000</td>
<td>GUIDE system</td>
<td>Lancaster, U.K</td>
</tr>
<tr>
<td>Zipf et al., 2001</td>
<td>CRUMPET project</td>
<td>European</td>
</tr>
<tr>
<td>Kaasinen, 2003</td>
<td>Location-aware mobile services</td>
<td>Finland</td>
</tr>
<tr>
<td>Pavón et al., 2004</td>
<td>Mobile Tourist Guide (MTG) Services</td>
<td>Salamanca, Spain</td>
</tr>
<tr>
<td>Kramer et al., 2006</td>
<td>Dynamic Tour Guide (DTG)</td>
<td>Görlitz, Germany</td>
</tr>
</tbody>
</table>

Also, when review papers about tourists experience with LBS, those articles are mostly related to European countries. The four main papers of user’s LBS for tourism experience are also retrieved from Europe (Table 7). From the tourists’ experience, the finding stated that most users appreciated and glad to have LBS when they are visiting tourist attractions. Not only have they got the traveling information, but also the positioning function is helpful for them. Teenagers and youngsters people seem more exciting to explore the functions and features of LBS. The system applied on portable devices helps travelers get LBS services when they needed. However, the shortage and negative experience comprises that weak wireless signal and connection problems, inconvenience of big portable devices, and unfriendly interface.

**TABLE 7. EXPERIMENTAL RESEARCHES ON LBS USER EXPERIENCE**

<table>
<thead>
<tr>
<th>Author</th>
<th>Adopted application</th>
<th>Experimental location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheverst et al, 2000</td>
<td>GUIDE system</td>
<td>Lancaster, U.K</td>
</tr>
<tr>
<td>Schmidt-Belz et al., 2001</td>
<td>CRUMPET</td>
<td>European</td>
</tr>
<tr>
<td>Kaasinen, 2003</td>
<td>Location-aware mobile services</td>
<td>Finland</td>
</tr>
</tbody>
</table>
For the attitude of users in LBS, this review found that there are three primary fields affected users concerned. The first field is that the information usefulness such as result of paper from Chang et al. (2006). This concern is related with providing accurate information with right time, right place for travelers from LBS. Since travel information is one of most the important part for tourists, the correct information is significant issue for users. The paper of Vrček et al. (2008) indicated that the users valued on the functions of emergency & safety services, and navigation of LBS is related with providing accurate information and services. The second intend is the ease of use. The interface design is very important for LBS system designers, but it may not be the concern of users. The users want an easy device for getting LBS services Chang et al. (2006). Thus, the system of LBS needs an easy interface for tourists. The final concern is a privacy issue. Since the positioning function can be easy known when users are, the privacy issue is followed by the LBS services (Junglas & Watson, 2008). Thus, reducing the wariness of users, LBS providers should pay consideration on users’ privacy issue.

In conclusion, by reviewing the articles above, tourism is an important industry in the world. When tourists visit other countries, cities, or any tourist attractions, they will need to handle with the accommodation, restaurants, attractions, and even information of travel destinations. The features and capacities of mobile LBS could be one of the best problems solving for travelers. Thus, this paper reviews the features of LBS, capacities of LBS for tourism, the users’ experience of mobile LBS, and the attitude of users on LBS. This paper could be valuable references for who is interested in LBS for tourism.

REFERENCES


