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EVALUATING ANTECEDENTS AND CONSEQUENCES OF LOCATION-BASED SERVICES

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ABSTRACT

In recent years, mobile device and mobile network usage have been rapidly growing. Location-based services (LBS), in particular, have become an indispensable aspect of future mobile commerce. In order to develop a model for the antecedents and consequences of LBS, this study used questionnaires to collect survey data. Analysis of this data occurred through the structural equation model (SEM). The data show that service function, media richness, and personalization of LBS help to generate value in LBS. This study concludes that LBS obtain their value through the "3Rs" of relevance, reliability, and recreation. The 3R values enhance users' customer engagement, purchase intention, and functional alternatives. Overall, recreation is the most influential value, with media richness being the key element of this value. These findings can help LBS research, as well as LBS providers and marketers, in discovering a more tactical approach.

Keywords: Location-based Services, LBS Mobile Commerce, Mobile Marketing, E-commerce

1. INTRODUCTION

The increasing functionality of mobile devices, coupled with the growing number of these devices, results in a unique type of service implementation; collectively, these services are known as location-based

services (LBS)[1]. LBS are usually delivered via a mobile device and a mobile Internet connection, which is used to confirm the given user's actual location, thus providing information services that can meet the user's local needs[2].

Gartner[3] reported that LBS will be among the top-three most popular mobile applications over the next few years and estimated that LBS have exceeded 526 million users as of 2012. eMarketer reported, however, that in many news programs from 2010, LBS were still in their infancy[4]. eMarketer also found that, although LBS provided attractive opportunities for marketers, in that they can be used as a more relevant and meaningful way to connect with their targets, marketers were generally maintaining a cautious attitude[5]. These marketers, however, ought to consider the adoption of this type of mobile marketing. Today's LBS technologies have matured, but the business model is not yet clearly defined.

Unfortunately, few empirical studies have been conducted to provide such definition. Although some scholars have begun to explore LBS users' perceptions of privacy risks and their effects on marketing adoption[6, 7, 8], these studies are not enough. This study aims to investigate the past literature that lacks information on behavioral effects level, such as customer engagement and functional alterative, and refers to LBS user perceptions and perceived behavioral literature. Therefore, little information is available to guide LBS providers today. This research further aims to fill this gap by (1) summarizing the key elements of LBS; (2) developing the key value of LBS; and (3) establishing a measuring model for investigating relationships between LBS key elements, LBS value, and the effect on users' behavior.

2. LITERATURE REVIEW

2.1 LBS characteristics

LBS can be defined as a service providing the mobile device location along with other relevant information services, which, when combined, provide additional value to users[9, 10, 11] LBS provide information to users based on the geographic location the user designates or the user is currently located[12]. Schiller and Voisard[13] believed that LBS provide value-added services to users via the integration of mobile device location with other local information, There are many applications of LBS. Jagoe[14] proposed that LBS include emergency and safety-related services, entertainment, navigation, directories and city guides, traffic reports, and location-specific advertising and marketing functions in a location-specific context, which

could potentially add significant value. Specifically, the most common application of LBS, such as Google Maps, is expected at first to specify the type of the desired service[15]. Users can navigate to restaurants, movie theaters, and other physical shops via Google Maps.

Though LBS with high potential, it still has a number of factors that influence users' usage. Kaasinen[16] proposed several factors of users using location-based services: contents, interaction, personalization, service entities, privacy, topical and comprehensive contents, smooth user interaction, personal and user-generated contents, and seamless service entities. Schiller and Voisard[13] proposed LBS security, privacy, data availability, and pricing. Unni and Harmon[17] stated that, to increase the acceptance of users using LBS, marketers must eliminate privacy issues and convey instant and location-specific marketing suggestion effectively; then LBS had used to provide decision-making for a traveler, which means that the wrong information may cause a wrong decision, wasting time and making the customer angry[17].

According to the aforementioned factors that may influence the use of LBS, we can sum up several LBS user demands: personalization, privacy, topical and comprehensive content, personal and user-generated content, smooth user interaction, and seamless services, which also tested the direct influence of privacy concerns on LBS usage intention[13, 16, 17].

2.2 Antecedents of LBS

Dickinger, Haghirian, Murphy, and Scharl[18] stated that mobile marketing generates value for all stakeholders through interactive wireless media, providing personalized information for the promotion of products, services, and ideas. Hosbond and Skov[19] suggested that marketing campaigns should provide relevant and interesting content for users. Xu et al.[7] pointed out that LBS based on users' interests, activities, location, and time, all send relevant information that provides contextual value to the user.

In addition to information relevance, it is also crucial for LBS to meet users' information needs at the right time and in the right place[20]. More specifically, LBS are used mainly for tourism services that support decisions that have already been made, so any erroneous information can cause incorrect decisions, wastes of time, and customer anger[21]. Cheng, Yang, and Xia[2] also suggested that, in order to provide successful LBS technology, providers must minimize the impact of network and equipment to enable accurate services at a lower cost. A study by Ho[6], meanwhile, showed that LBS users are also concerned about the hedonic effect. Indeed, there are many studies related to the value of LBS, and this paper organizes the above

studies and summarizes them into the three main LBS values, or the 3Rs: relevance, reliability, and recreation.

Dickinger, Haghirian, Murphy, and Scha Kaasinen[18] concluded that LBS are available for locating people, tracking property, getting route guidance, getting help, and having fun. Junglas and Watson[22] found that location tracking, location-aware functions, and information search functions could be useful LBS values. The relevance of LBS depends greatly on the situational task or the context of the given user's problem[23]. Schiller and Voisard[13] also discussed how LBS could greatly enhance the relevance of information based on location.

Hosbond and Skov[19] stated that, by making manufacturing marketing location-sensitive or location-based, the potential consumer could find better and more direct links to information. This means that LBS marketing has greater relevance than other forms of marketing. In addition, an eMarketer[24] survey indicated that, when consumers use LBS, they are much less likely to ignore marketing messages. Mathew et al.[25], meanwhile, concluded that, compared with browsing on the Internet, LBS users prefer to find the nearest service, stores, and locations in which to have fun. From the above literature, then, we can infer the following hypothesis:

H1a: More service function in LBS leads to a stronger perception of relevance.

H1b: More service function in LBS leads to a stronger perception of reliability.

H1c: More service function in LBS leads to a stronger perception of recreation.

In addition to the importance of LBS functions, the manner in which the services are presented is also an important factor. Rinner, Raubal, and Spigel[26, 28] pointed out that the usability and usefulness of LBS are highly dependent on the given user interface design, including the visualization[26]. This visual effect, which includes graphics, colors, images, icons, animations, videos, and other elements, is called media richness.

Media richness enhances the capacity of LBS to meet users' particular information needs and, in turn, leads to improved user perceptions[9]. This highly communicative media can reduce work uncertainty and ambiguity while also promoting the entertainment effect among users[9].With all of the above in mind, we can infer the following hypothesis:

H2a: More media richness in LBS leads to a stronger perception of relevance.

H2b: More media richness in LBS leads to a stronger perception of reliability.

H2c: More media richness in LBS leads to a stronger perception of recreation.

LBS also include the important properties of mobile commerce and personalization[29]. Personalization is based on a user's own purposes, interests, or habits, which allow the LBS to provide customer-specific recommendations[30]; Sheng, Nah, and Siau[31] noted that personalized service content is generated based on previous customer interactions with the LBS. Many companies provide personalized content in order to increase the relevance of information and to avoid an overload of information[6].

Personalized information is more relevant for consumers[29]. A study by Mittal and Lassar[32] confirmed that personalization creates an increase in reliability. Katerattanakul[33] also found that personal website content brings users a pleasant and fun experience. In light of the above, we can infer the following hypothesis:

H3a: More personalization in LBS leads to a stronger perception of relevance.

H3b: More personalization in LBS leads to a stronger perception of reliability.

H3c: More personalization in LBS leads to a stronger perception of recreation.

LBS are highly dependent on individual devices. Privacy concerns are also important issues that affect LBS value. Krumm and Shafer[34] noted that, because LBS have become popular, location privacy has become a hot research topic. Schiller and Voisard[13] pointed out that many studies have shown that consumers are concerned about their privacy and worried about any possible intrusions on it. They also recommended that LBS allow users to choose when to disseminate their location information, so as to eliminate privacy concerns.

Positioning accuracy, however, is highly dependent on the user location[35]. Therefore, for daily usage, privacy concerns need to be eliminated when supporting the sharing of contextual information[36]. Some scholars believe that research into privacy concerns is particularly relevant for the perceived value of LBS[17].According to literature cited above, we can

infer the following hypothesis:

H4a: Fewer privacy concerns about LBS lead to a stronger perception of relevance.

H4b: Fewer privacy concerns about LBS lead to a stronger perception of reliability.

H4c: Fewer privacy concerns about LBS lead to a stronger perception of recreation.

2.3 Consequences of LBS

Issues relevant to LBS user behavior include customer engagement, purchase intention, and functional alternatives.

Van Doorn et al. [37] pointed out that, while customer purchase behavior is important, other types of customer engagement behavior are equally important. Purchase intention, or repeat purchase behavior, has been the subject of considerable academic discussion[27, 57, 29]. Recently, scholars have explored the impact of perceived LBS risks on consumers' purchase intentions[7]. These studies have looked at LBS as a mobile marketing tool that can explore customers' purchasing intentions as necessary.

Verhoef, Reinartz, and Krafft[38] stated that a customer could easily interact with other customers and firms through social networks and other new media.In an increasingly networked society, non-transactional customer behavior is becoming increasingly more important. Customer engagement includes a variety of behaviors and behavior-related phenomena, such as word of mouth, blogging, customer ratings, etc. Many customers' engagement behaviors, such as referral and word-of-mouth behavior, are aimed at generating and disseminating information.[38] Customer engagement also includes customer co-creation. Engaged customers can bring long-term credibility and recognition to a given brand, participation in brand communities, and support for brand campaigns, such as charities and fund-raising[38].

Kuan et al. [39]stated that purchase intention means the probability that subjective judgments will lead to a purchase after a user experiences a website[39]. Kaasinen[16] found, from the comments of interviewed LBS users, that topical information is important. This kind of message may change as the user moves, and may cause other media, such as television, the Internet, and newspapers to no longer be relevant. Similarly, when blogs first appeared, some studies discussed whether they would cause a decline in traditional media usage. These traditional forms of media include online

news, radio, and magazines, in addition to traditional TV news, radio, magazines, etc.[40]. This phenomenon is also known as "functional alternatives."

The high relevance of mobile marketing content is bound to ensure greater customer recognition and response rates to marketing campaigns [9, 41, 42]. An eMarketer[24] survey indicated that consumers do not easily miss marketing messages delivered via LBS.

The high relevance of marketing messages delivered through LBS ensures that the consumer pays attention to his or her surrounding environment as well as to local news. Furthermore, should consumers have immediate needs, LBS also can make the services of nearby stores available. Even when the LBS contain ads, consumers still seem to love them. With all of the above in mind, we can infer the following hypothesis:

H5a: The perception of relevance for LBS enhances customer engagement.

H5b: The perception of relevance for LBS enhances purchase intention.

H5c: The perception of relevance for LBS enhances functional alternatives.

LBS can provide real-time decision-making for most people, and the widespread use of LBS can therefore generate significant benefits[26]. Kuan et al. (2008) believed that network technology is effectively able to understand customer needs, thereby creating correct and timely responses to customer queries[39]. Personal web pages, FAQs, features, fast response service, security guarantees, and return policies attract customers and convince them to reuse or to purchase a product or service. In addition, security, privacy, and clear information all have a big effect on buying behavior[27].According to the above information, we can infer the following hypothesis:

H6a: The perception of reliability for LBS enhances customer engagement.

H6b: The perception of reliability for LBS enhances purchase intention.

H6c: The perception of reliability for LBS enhances functional alternatives.

Mathew et al.[25] also believed that LBS users would be more interested than users browsing the Internet on computers to find nearby services, stores, or locations. There are also location-based entertainment services, such as location-based games or storytelling services, which include the user's current location as part of the game or story. These services allow the game or the story to no longer be abstract, but part of user's life, and therefore more interesting[29, 43].

Scholars also point out that, if an enterprise wants to gain the effect of customer engagement, the enterprise must provide interesting content[44]. Interesting content is the basic element of customer engagement[45]. An entertaining game can therefore result in customer engagement[46]. Past network research also confirms that users who are having fun will significantly change their personal shopping intentions and behavior accordingly[47]. Mathew et al.[25] also indicated that, compared with surfing the wired Internet, users often find it interesting to discover nearby services and stores or places through location-based commerce. According to what is stated above, we can infer the following hypothesis:

H7a: The perception of recreation for LBS enhances customer engagement.

H7b: The perception of recreation for LBS enhances purchase intention.

H7c: The perception of recreation for LBS enhances functional alternatives.

Bolton and Saxena-Iyer[48] pointed out that the interaction of customers with company technology is the essence of the customer engagement process, which can directly affect user behaviors, such as with service usage and purchase behavior. Customer engagement consists of multiple behaviors, such as the recommendations, word-of-mouth, and so on. These actions can affect purchase behavior, as well as other points of focus for the customer[37]. Lamalfa[49] found that the top-three benefits gained from customer engagement are referrals, frequent purchases, and regular feedback. Based on the preceding information, we can infer the following hypotheses:

H8: More customer engagement in LBS leads to increased purchase intention.

H9: More customer engagement in LBS leads to more functional alternatives.

3. MEASUREMENT

This research adopts the online questionnaire, which have three main benefits: (1) lower costs; (2) response efficiency; (3) sample collection without geographical restriction. Our study cooperated with InsightXplorer. The InsightXplorer survey and the Cyberpanel system were implemented to collect samples[61]. To ensure the sampling conforms to real mobile Internet users in Taiwan, the sampling ratio is for mobile Internet users from the Taiwan Network Information Center. Our study set the age and gender quota to meet recent mobile Internet users' profiles provided by TWNIC. This study adopted a 6-point Likert's scale as the measurement scale in the

questionnaires. In this research, 1,141 effective samples were collected. The sampling gender and age are shown in Table 1.

Table 1. Sampling gender and age

Gender	**Frequency**	**Proportion**
Male	738	64.7%
Female	403	35.3%
Age	**Frequency**	**Proportion**
12-19 years old	64	5.6%
20-24 years old	153	13.4%
25-34 years old	449	39.4%
35-44 years old	337	29.5%
Over 45 years old	138	12.1%

The KMO value in the questionnaires in this research reaches 0.95, which is an excellent level for executing the exploratory factor analysis (EFA)[50]. EFA results show that the characteristic constructs for the antecedents of LBS value are comprised of four factors: service function, media richness, personalization, and privacy concern elimination. All items' factor loadings are between 0.71 and 0.91, with the total explained variance being 77.43 %. The antecedents of LBS's factor loadings are shown in Table 2.

Dimensions of LBS value consist of 3R: relevance, reliability, and recreation, and the factor loadings of all factor items are between 0.62 and 0.87, whereas the total explained variance is 74.91 %. For the 3Rs of LBS factor loadings, see Table 3.

Table 2. Antecedents of LBS factor loadings

Factor Items	Item Factor Loadings			
	Service function	**Media richness**	**Personalization**	**Privacy concerns**
Information and messages sent to me notifications	0.76			
Show surrounding attractions, shops, and other industrial and commercial information	0.84			
Get local businesses to send shopping/promotional messages	0.78			
Augmented reality (AR) seems to be enough realistic picture		0.77		
Service seems to be enough stereoscopic picture		0.91		
Service seems to be enough vivid picture		0.88		
Service screen can display a variety of different forms of text, images, audio, and other media effects		0.71		
Refer to my intended use to provide recommendations or suggestions			0.87	
Default interest according to my preferences to provide information			0.88	
I will let service program when needed to obtain my current position				0.91
I will let service program when needed use the service to obtain my purpose				0.83
Eigenvalues	2.14	2.91	1.79	1.66
Explained variance (%)	19.49	26.49	16.31	15.13
Total explained variance (%)			77.43	

Table 3. 3Rs of LBS factor loadings

Factor Items	Item Factor Loadings		
	Relevance	Reliability	Recreation
Provide relevant information	0.70		
Provides local information on the most popular	0.68		
The cheapest offer local information	0.74		
Provide comprehensive information on the type of the ground	0.73		
Response to the current needs of rapidly		0.62	
Provide accurate information on the ground		0.71	
Use is reliable		0.83	
Use is controlled		0.81	
Use it to be honest		0.87	
Feel confidence to use it		0.83	
Makes me feel funny			0.75
I feel pleasure			0.74
I feel excited			0.81
I feel entertainment			0.75
Eigenvalues	2.62	4.39	2.96
Explained variance(%)	21.27	30.57	23.07
Total explained variance(%)		74.91	

Finally, behavioral dimensions are comprised of the three following factors: customer engagement, purchase intention, functional alternative, for which the loading factors of all factor items are between 0.59 and 0.86, while the total explained variance is 70.78%. For the consequences of LBS's factor loadings, see Table 4.

For examining the questionnaire's reliability, the overall Cronbach's alpha coefficient in the questionnaires analysis in this research is 0.97. All items in Cronbach's alpha exceed 0.80, which is an excellent level[52]. The results are shown in Table 5.

Table 4. Consequences of LBS factor loadings

Factor Items	Item Factor Loadings		
	Customer engagement	**Purchase intention**	**Functional alternatives**
I will be in more places check in/sign in	0.78		
I will immediately watch and participate in activities around	0.59		
I will check in and sharing information on social media	0.86		
I will be positioned at a position over put annotations, such as a story or photo	0.79		
I would be interested in other people's punch message	0.81		
I will respond to the message of others I check in comments or questions	0.85		
I will check in through in the business and recommend to others the business	0.81		
I will act to complete the transaction through LBS		0.67	
LBS let me buy more goods		0.71	
LBS makes me more often shopping		0.78	
LBS let me unexpectedly shopping		0.83	
LBS let me have the curiosity to explore while shopping		0.80	
LBS let me have targeted shopping		0.73	
LBS let me go to the same merchant shopping		0.72	
LBS let me have regular shopping		0.71	
LBS Let me repeat purchase certain goods		0.70	0.84
Because I would rather reduce the use of traditional media LBS query data frequency			0.80
I will use the network because LBS reduced the frequency of media query data			0.68
I would think that the information obtained in LBS is more useful than on TV or the Internet			0.84
Eigenvalues	5.04	5.83	2.58
Explained variance (%)	26.51	30.71	13.56
Total explained variance (%)		70.79	

Table 5. Questionnaire reliability results

Variable	Cronbach's α
Service function	0.81
Media richness	0.90
Personalization	0.82
Privacy concern	0.84
Relevance	0.86
Reliability	0.92
Recreation	0.90
Customer engagement	0.94
Purchase intention	0.95
Functional alternative	0.89
	> 0.80

In regards to criteria for construct validity analysis, the validity analysis results of 10 variables in this research are as follows: service function (CR = 0.78, AVE = 0.54), media richness (CR = 0.90, AVE = 0.70), personalization (CR = 0.75, AVE = 0.60), privacy concern (CR = 0.77, AVE = 0.63), relevance (CR = 0.86, AVE = 0.61), reliability (CR = 0.92, AVE = 0.67), recreation (CR = 0.90, AVE = 0.69), customer engagement (CR = 0.94, AVE = 0.70), purchase intention (CR = 0.95, AVE = 0.68), functional alternative (CR = 0.89, AVE = 0.74). All items completely standardized factor loading exceed 0.5, composite reliability (CR) surpass 0.70, and average variance extracted (AVE) surpass 0.50[53]. The results are shown in Table 6. This suggests that the validity analysis results for the 10 variables proposed in this research meet high criteria.

Table 6. Construct validity results

Variable	Item	Factor loading	CR	AVE
Service Function	Information and messages sent to my notifications	0.76	0.78	0.54
	Show surrounding attractions, shops, and other industrial and commercial information	0.78		
	Get local businesses to send shopping/promotional messages	0.77		
Media Richness	Augmented reality (AR) seems to be enough realistic picture	0.76	0.90	0.70
	Service seems to be enough stereoscopic picture	0.89		
	Service seems to be enough vivid picture	0.92		
	Service screen can display a variety of different forms of text, images, audio, and other media effects	0.75		
Personal-Ization	Refer to my intended use to provide recommendations or suggestions	0.84	0.75	0.60
	Default interest according to my preferences to provide information	0.84		
Privacy Concern	I will let service program when needed to obtain my current position	0.81	0.77	0.63
	I will let service program when needed use the service to obtain my purpose	0.89		
Relevance	Provide relevant information	0.75	0.86	0.61
	Provides local information on the most popular	0.77		
	The cheapest offer local information	0.81		
	Provide comprehensive information on the type of the ground	0.80		
Reliability	Response to the current needs of rapidly	0.71	0.92	0.67
	Provide accurate information on the ground	0.77		
	Use is reliable	0.85		
	Use is controlled	0.84		
	Use it to be honest	0.86		
	Feel confidence to use it	0.86		
Recreation	Makes me feel funny	0.83	0.90	0.69
	I feel pleasure	0.86		
	I feel excited	0.83		
	I feel entertainment	0.80		

Table 6. Construct validity results (Cont.)

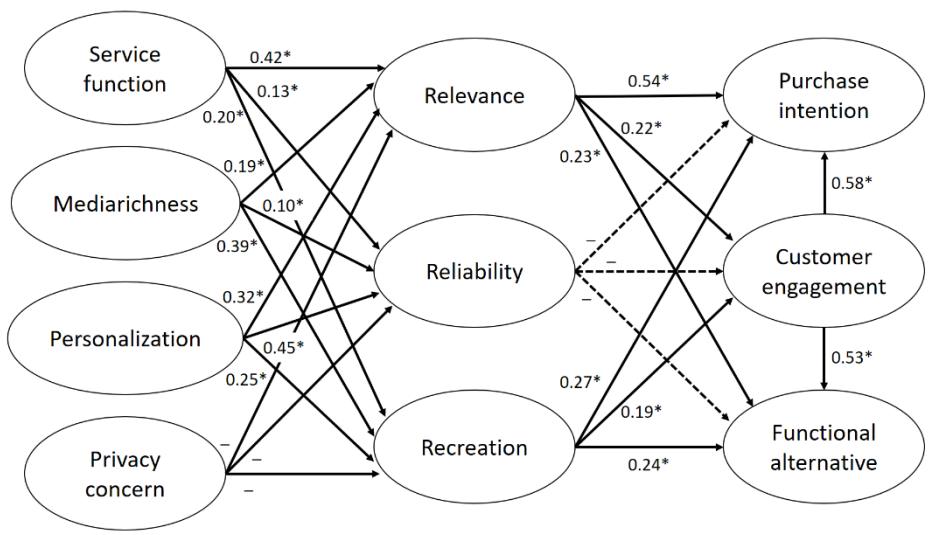
Variable	Item	Factor loading	CR	AVE
Customer engagement	I will be in more places check in/sign in	0.83	0.94	0.70
	I will immediately watch and participate in activities around	0.78		
	I will check in and share information on social media	0.87		
	I will be positioned at a position to add annotations, such as a story or photo	0.86		
	I would be interested in other people's punch message	0.84		
	I will respond to the message of others I check in comments or questions	0.84		
	I will check in through in the business and recommend to others the business	0.85		
	I will act to complete the transaction through LBS	0.81		
Purchase intention	LBS let me buy more goods	0.72	0.95	0.68
	LBS makes me shop more often	0.80		
	LBS lets me shop unexpectedly	0.81		
	LBS lets me have the curiosity to explore while shopping	0.79		
	LBS lets me have targeted shopping	0.9		
	LBS lets me go to the same merchant shopping	0.89		
	LBS lets me have regular shopping	0.86		
	LBS lets me repeat purchases of certain goods	0.84		
Functional alternative	Because I would rather reduce the use of traditional media LBS query data frequency	0.83	0.89	0.74
	I will use the network because LBS reduced the frequency of media query data	0.90		
	I would think that the information obtained in LBS than TV and Internet is more useful	0.84		
			> 0.70	> 0.50

In this research, the discriminate validity analysis of the correlation method and individual testing of the correlation between two constructs. The results are shows in Table 7. We can find that the square root of every AVE value belonging to each latent construct is much larger than any correlation among any pair of latent constructs, so discriminant validity of this study is supported. Thus, this study did not have any common method bias.

Table 7. Discriminate validity results

Factor	Service Function	Media richness	Personalization	Privacy concern	Relevance	Reliability	Recreation	Customer engagement	Purchase intention	Functional Alternative
Service function	0.73									
Media richness	0.61	0.84								
Personalization	0.68	0.56	0.77							
Privacy concern	0.50	0.37	0.57	0.79						
Relevance	0.77	0.59	0.74	0.59	0.78					
Reliability	0.52	0.46	0.64	0.50	0.74	0.82				
Recreation	0.61	0.65	0.62	0.43	0.73	0.56	0.83			
Customer engagement	0.51	0.42	0.41	0.46	0.48	0.29	0.48	0.84		
Purchase intention	0.49	0.46	0.42	0.32	0.43	0.22	0.51	0.73	0.82	
Functional Alternative	0.47	0.42	0.38	0.37	0.39	0.24	0.43	0.70	0.75	0.86

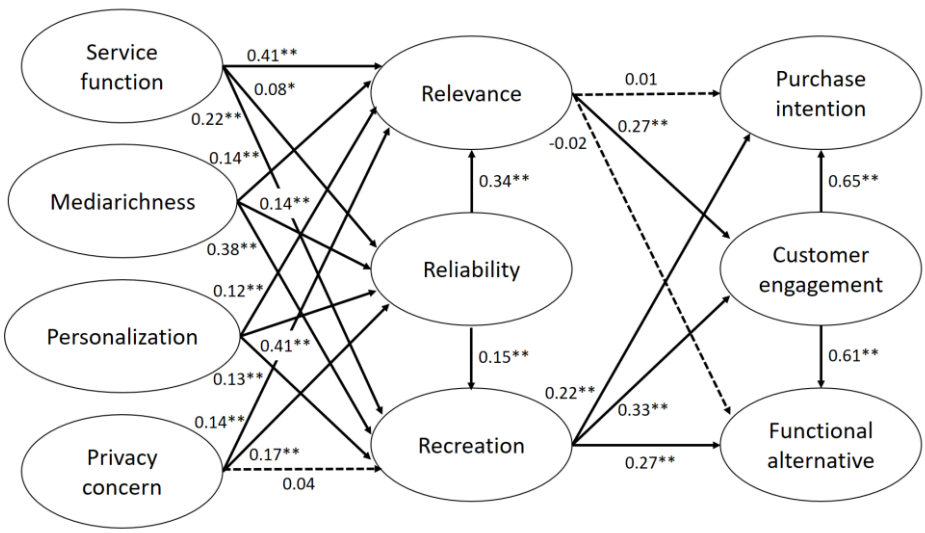
Before the SEM result analysis, we found the original model (see Figure 1), which contains a negative relationship among the LBS reliability and the three subsequent behaviors (purchase intention, customer engagement, and functional alternative). And the Lisrel guide indicates that this situation may be due to the mediating variables that exist between the reliability and its subsequent paths[53].



Note: *** : $p < 0.001(|t| > 3.090)$; ** : $p < 0.01(|t| > 2.326)$; * : $p < 0.05(|t| > 1.645)$

Figure 1. Original model

Thus, we revise the original model based on the possibility of mediating variables (see Figure 2). The analysis results of the revised model show that reliability leans significantly toward a relevance effect, as well as a recreation effect, on subsequent behavioral intentions. The revised model is also a better fit (according to a goodness-of-fit index). All the indices are well above the suggested standard of the fit of the model, and the AIC and CAIC indices are better than the original model (see Table 6). Therefore, we choose the revised model to discuss.



Note: *** : $p < 0.001(|t| > 3.090)$; ** : $p < 0.01(|t| > 2.326)$; * : $p < 0.05(|t| > 1.645)$

Figure 2. Revised model

4. RESULTS AND ANALYSIS

The analysis results suggest that (see Figure 2 and Table 7) the service function of LBS has an obvious influence on perception of relevance (γ_{11} = 0.41, t = 9.91, $p < 0.001$), supporting H1a. While the service function of LBS has obvious influence on perception of reliability (γ_{12} = 0.08, t = 1.87, $p < 0.05$), supporting H1b. The service function of LBS also exerts obvious effects on perception of recreation (γ_{13} = 0.22, t = 5.26, $p < 0.001$), supporting H1c. The media richness of LBS correlates positively and strongly with perception of relevance, which is indicated by the relationship (γ_{21} = 0.14, t = 4.30, $p < 0.001$), supporting H2a. Whereas the media richness of LBS correlates positively and strongly with perception of reliability, wherein (γ_{22} = 0.14, t = 3.68, $p < 0.001$), and the media richness of LBS exerts obvious influences on perception of recreation (γ_{23} = 0.38, t = 9.81, p

< 0.001), supporting both H2b and H2c.

Table 6. Model fit indices comparison

Goodness-of-Fit Index	Threshold (reference)	Original Model Fit	Revised Model Fit
$\chi 2$		1829.62	1745.94
df		74	744
NC($\chi 2$/df)	$1 < NC < 3$[54]	2.46	2.35
GFI	$\geqq 0.90$[55]	0.93	0.93
AGFI	$\geqq 0.90$[56]	0.91	0.91
RMSEA	$\leqq 0.05$[57]	0.036	0.036
NFI	$\geqq 0.90$[58]	0.99	0.99
IFI	$\geqq 0.90$[58]	0.99	0.99
NNFI	$\geqq 0.90$[58]	0.99	0.99
CFI	$\geqq 0.90$[59]	0.99	0.99
AIC	The smaller the values of these indices, the better the model[61]	2323.62	2306.26
CAIC		3815.42	3792.02

The analysis of personalization of LBS and perception of relevance implies that, obviously, the former factor correlates positively with the latter one, wherein (γ_{31} = 0.12, t = 2.81, p < 0.01), supporting H3a, whereas personalization of LBS correlates positively and strongly with perception of reliability, wherein (γ_{32} = 0.41, t = 8.43, p < 0.001), supporting H3b. Finally, personalization of LBS also correlates positively and strongly with perception of recreation, wherein (γ_{33} = 0.13, t = 2.81, p < 0.01), supporting H3c. Analysis of privacy concern of LBS and perception of relevance further suggests that has a strong negative link, wherein (γ_{41} = -0.14, t = 4.92, p < 0.001), supporting H4a. The analysis also suggests that privacy concern of LBS efficiency reduces the perception of reliability, wherein (γ_{42} = -0.17, t = 4.92, p < 0.001), supporting H4b. However, the privacy concern of LBS does not obviously influence perception of recreation (γ_{43} = 0.04, t = 1.33, p > 0.05), which is not supporting H4c.

Next, the discussions are aimed at the link between LBS value and users' behavior. First, more perception of relevance in LBS leads to more customer engagement, wherein (β_{11} = 0.27, t = 6.20, p < 0.001), supporting H5a. While more perception of relevance in LBS does not result in purchase intention (β_{12} = 0.01, t = 0.31, p > 0.05) as well as functional alternative (β_{13} = -0.02, t = 0.49, p > 0.05). Therefore, H5b and H5c are not supported.

Perception of recreation in LBS has an obvious influence customer engagement (β_{31} = 0.33, t = 7.32, p < 0.001), supporting H7a, and is likely to cause purchase intention (β_{32} = 0.22, t = 6.42, p < 0.001) as well as a functional alternative (β_{33} = 0.27, t = 6.05, p < 0.001) Therefore, H7a, H7b, and H7c are supported. While provide that more perception of reliability in LBS leads to more perception of relevance (β_{21} = 0.34, t = 10.20, p < 0.001) as well as leads to more perception of recreation (β_{22} = 0.15, t = 4.32, p < 0.001), reliability through perception of recreation and relevance indirectly affects subsequent behavior; therefore, H6a, H6b, and H6c are supported conditionally.

Finally, more customer engagement in the LBS leads to more purchase intention effect (β_{41} = 0.65, t = 19.60, p < 0.001), and leads to more functional alternative effect (β_{42}= 0.61, t = 15.86, p < 0.001), supporting H8 and H9. Additionally, an explanation (R^2) of dependent variables of the model is as follow: relevance 87.8%; reliability 47.7%; recreation 60.9%; customer engagement 30.3%; purchase intention 62.4%; and functional alternative 59.0%. Each dependent variable has a good explanation and is sufficient to prove that each dimension can be fully explained in this study, with a high reference value.

Table 7. Path analysis results

Hypothesis	Loading	t-value	Supported
H1a	0.41	9.91	Y
H1b	0.08	1.87	Y
H1c	0.22	5.26	Y
H2a	0.14	4.30	Y
H2b	0.14	3.68	Y
H2c	0.38	9.81	Y
H3a	0.12	2.81	Y
H3b	0.41	8.43	Y
H3c	0.13	2.81	Y
H4a	0.14	4.93	Y
H4b	0.17	4.92	Y
H4c	0.04	1.33	N
H5a	0.27	6.20	Y
H5b	0.01	0.31	N
H5c	-0.02	-0.49	N
H6a		Conditional supported	
H6b		Conditional supported	
H6c		Conditional supported	
H7a	0.33	7.32	Y
H7b	0.22	6.42	Y
H7c	0.27	6.05	Y
H8	0.65	19.60	Y
H9	0.61	15.86	Y

5. DISCUSSION

5.1 Antecedents of LBS value

The findings summarize that service function, media richness, personalization, and privacy concerns are the key elements for the 3R values along with customer engagement, purchase intention, and functional alternative behavior. This study therefore has three primary implications, which are detailed in the following sections.

Service functions, media richness, personalization, and privacy concerns all have a significant impact in terms of providing LBS reliability. The path coefficients of this model, however, show that the main contribution to reliability is personalization. Because LBS personalization allows the users to pre-configure what he or she demands and then records those desires, LBS can, in a personalized way, quickly and accurately provide the user with relevant information without delay. Because of this, LBS tend to have excellent reliability[32].

In addition to this, service functions, media richness, personalization, and privacy concerns will affect the relevance of LBS. The coefficient of the path associated with reliability shows that the service functions and personalization elements are higher than the other two. This is probably because the service itself can provide users with highly relevant local information, including popular and favorable information, local news, and so on. This is echoed by Kaasinen's[16] view. LBS are personalized based on a user's own purposes, interests, or habits, which provide the basis for recommendations. Therefore, LBS service functions and personalization can provide a high degree of relevance, whether for local information or for the user's own preferences.

As for recreation, the question arises whether service functions, media richness, or personalization have any influence. The path coefficients show that media richness is the main source of recreation. Media richness also will convey text enrichment information. Thus, LBS media richness allows users to receive information that is not just text but that includes vivid images, animations, or stereo sound effects. Users are therefore more interested and entertained, as a result[9].

In addition, the model (see Figure 2) also shows that LBS provide increasing relevance and recreation as reliability is enhanced. These findings echo the idea that LBS must exist in order to provide information at the right time and in the right place as well as when meeting mobile device

users' information needs.[20] Reliability is therefore the foundation of LBS.

5.2 LBS value: 3Rs (relevance, reliability, and recreation)

This study is the first to identify the three key values (3Rs) for LBS—relevance, reliability, and recreation—through a summarization of the literature and through factor analysis. The reliability of "3Rs" is a prerequisite value for LBS. The reliability enables users to receive accurate and correct local information and to further build trust. However, the relevance of "3Rs" is aimed at the adequacy, preciseness, and significance of available information of user's context, including the most popular, favorable, and comprehensive information, local news, and so on. Finally, the recreation of "3Rs" is the most important value for LBS. It means LBS users can access the interesting, entertaining, and cool local information and further make users feel good.

5.3 Consequences of LBS value

Because LBS users feel local information is more relevant, they will engage more as customers, purchase more often, and find other functional alternatives. This implies, therefore, that users will access more related information, will find it more fun to share messages, will make more recommendations to friends and family, and will interact directly with local businesses, thus creating a customer engagement effect[42].

Once LBS users have achieved engagement, they will not mind relevant marketing information for products and services that can be purchased at the local stores. In addition, when users can access relevant information for their own needs, traditional media and Internet media usage will not decline. This study finding does not correspond exactly with the view of Kaasinen (2003), which claims that topical information will result in functional alternatives, but this theme may be worth discussing in the future.[16]

The more LBS users engage in recreational activities, the more these customers engage with local businesses. Due to the pleasure that LBS users feel, they then generate goodwill toward local businesses. Furthermore, LBS users are more willing to interact with local businesses or to share their information with friends and family. This finding verifies that interest is the basic element for customer engagement[45], and when users feel entertained, it reduces the wary feelings often associated with promotional advertising and marketing information[47]. Finally, they provide the user with a desire for shopping. LBS also allow users to perceive information and feelings of pleasure at the same time, such as with Foursquare check-in games. In

contrast, users of traditional media or Internet media are willing to opt into LBS as an information access tool.

The results of this analysis show that relevance and recreation bring about customer engagement. LBS customer engagement increases purchase intention, and recreation is the most important factor for customer engagement and, therefore, for purchase intention. While the main source for recreation comes from media richness, this recreation not only directly enhances customer engagement but purchase intentions as well. These results, echoed by Ho (2010)[6], suggest that LBS providers should invest in hedonic rather than utilitarian features.

6. CONCLUSION

Based on the purposes of this study, its conclusions can be divided into two main sections.

First, in terms of academic research, this study focused on the antecedent of the LBS value that may have affected user behavior and intention. In this study, we established a theoretical model for LBS and, through structural equation modeling (SEM), we tested and verified the theoretical framework. The results can provide a foundation for LBS and mobile marketing related research in the future.

Second, this study also has significant suggestions for LBS operators and marketers. Reliability is the foundation for improving old LBS or implementing innovative forms of LBS. The primary consideration is enhancing LBS interest and entertainment through media richness. At the same time, LBS should provide the most popular and most favorable and diverse local information. These types of local information make the feelings of LBS users more relevant. We suggest that LBS operators enhance their reliability and relevance through service functions and personalization.

The LBS business should provide the user with accurate and reliable service. The user's entertainment experience should be the main consideration in order to enhance competitiveness.

It is also necessary to pay attention to whether the service allows users to use product-relevant experience—that is, relevant experience from local users that will allow them to receive the most popular business information. Enhancing the service function in terms of sending information, as well as interest based on user preferences or default recordings of personalized service usage factors, can enhance relevance.

In the past, LBS developers were concerned about privacy. This, however, did not have much of an effect on values. LBS developers should focus instead on other key elements in order to enhance competitiveness. We believe that marketers should engage users more before attempting to stimulate a user's purchase intention. An example would be to hold fun competitions with local businesses through LBS. Finally, LBS can enhance user propensity for shopping.

In this study, due to the premise of simplification, the research variables were reduced as much as possible. We suggest that future research be based on this model in order to increase the LBS categories, so as to then discuss path differences. We look forward to future research and proposed guides and measures for the improvement of different LBS.

7. REFERENCES

[1] B. Rao, and L. Minakakis, Evolution of mobile location-based services. *Communications of the ACM*, 46(12), p61-65, 2003. https://doi.org/10.1145/953460.953490.

[2] R. Cheng, Z. Yang, and F. Xia, iZone: A location-based mobile social networking system. *Paper Presented at the International Symposium on Parallel Architectures, Algorithms & Programming*, Dalian, China, December 18-20, 2010. http://dx.doi.org/10.1109/PAAP.2010.67.

[3] C. Pettey, *Location-based services 2nd in Gartners Top 10 consumer mobile applications*. Retrieved on June 29, 2015, from http://www.gartner.com/newsroom/id/1230413.

[4] eMarketer, *Why location is about more than the check-in*. Retrieved on June 29, 2015, from http://www.emarketer.com/Article.aspx?R=1008161.

[5] eMarketer, *Young men lead location-based service adoption*. Retrieved on June 29, 2015, from http://www.emarketer.com/%28S%28koxvqj45tvj4as55azyygxj0%29%29/Article.aspx?R=1008231.

[6] S.Y. Ho, The effects of location-based mobile personalization on users' behavior. *Paper Presented at th*e Pacific Asia Conference on Information Systems (PACIS), Taipei, Taiwan, July 9-12, 2010.

[7] H. Xu, X.R. Luo, J.M. Carroll, and M.B. Rosson, The personalization privacy paradox: An exploratory study of decision making process for location-aware marketing. *Decision Support Systems*, 51(1), p42-52, 2011. http://dx.doi.org/10.1016/j.dss.2010.11.017.

[8] H. Xu, L.B. Oh, and H.H. Teo, Perceived effectiveness of text vs. multimedia location-based advertising messaging. *International Journal of Mobile Communications*, 7(2), p154-177, 2009.

http://dx.doi.org/10.1504/IJMC.2009.022440.

[9] H. Bauer, T. Reichardt, and A. Schule, *User requirements for location-based services–an analysis on the basis of literature*. wissenschaftliches arbeitspapier Nr. W94, Institut fur Marktorientierte Unternehmensfuhrung, Universit Mannheim, 2005.

[10] S. Spiekermann, General aspects of location-based services. In J. Schiller and A. Voisard (Eds.), *Location-based services (p9-26).* San Francisco, CA: Morgan-Kaufmann, 2004. http://dx.doi.org/10.1016/B978-155860929-7/50002-9.

[11] G. Lee, and J. Yim, A review of the techniques for indoor location based service. *International Journal of Grid and Distributed Computing*, *5*(1), p1-22, 2012.

[12] H. Yun, D. Han, and C.C. Lee, Understanding the use of location-based service applications: Do privacy concerns matter? *Journal of Electronic Commerce Research*, 14(3), p215, 2013.

[13] J. Schiller, and A. Voisard, *Location-based services*. California: Morgan Kaufmann Pub, 2004.

[14] A. Jagoe, *Mobile location services: The definitive guide*. Upper Saddle River, NJ: Prentice Hall, 2002.

[15] E. Niforatos, E. Karapanos, and S. Sioutas, PLBSD: A platform for proactive location-based service discovery. *Journal of Location Based Services*, 6(4), p234-249, 2012. http://dx.doi.org/10.1080/17489725.2012.691671.

[16] E. Kaasinen, User needs for location-aware mobile services. *Personal & Ubiquitous Computing*, 7(1), p70-79, 2003. http://dx.doi.org/10.1007/s00779-002-0214-7.

[17] R. Unni, and R. Harmon, Perceived effectiveness of push vs. pull mobile location-based advertising. *Journal of Interactive Advertising*, 7(2), p28-40, 2007. http://dx.doi.org/10.1080/15252019.2007.10722129.

[18] P. Dickinger, J. Murphy Haghirian, and A. Scharl, An investigation & conceptual model of SMS marketing. *Proceedings of the 37th Hawaii International Conference on System Sciences* (p10-19). Los Alamitos, CA: IEEE Computer Society Press, 2004.

[19] J. Hosbond, and M. Skov, Micro Mobility marketing: Two cases on location-based supermarket shopping trolleys. *Journal of Targeting, Measurement & Analysis for Marketing*, 16(1), p68-77, 2007. http://dx.doi.org/10.1057/palgrave.jt.5750058.

[20] G.S. Kim, S.B. Park, and J. Oh, An examination of factors influencing consumer adoption of short message service (SMS). *Psychology & Marketing*, 25(8), p769-786, 2008. http://dx.doi.org/10.1002/mar.20238.

[21] A. Tsalgatidou, J. Veijalainen, J. Markkula, A. Katasonov, and S.

Hadjiefthymiades, Mobile e-commerce & location-based services: Technology & requirements. In Scangis (Ed.), *Proceedings of 9th Sc&inavian Research Conference on Geographical Information Sciences (ScanGIS'03)* (p1-14). Espoo, Finl&, 2003.

[22] A. Junglas, and R.T. Watson, Location-based services. *Communications of the ACM*, 51(3), p65-69, 2008. http://dx.doi.org/10.1145/1325555.1325568.

[23] S.S. Banerjee, and R.R. Dholakia, Mobile advertising: Does location-based advertising work, *International Journal of Mobile Marketing*, 3(2), p68-75, 2008.

[24] eMarketer, *Low Ad recall but high response for location-based services*. Retrieved on June 29, 2015, from http://www.emarketer.com/Article.aspx?R=1007677.

[25] J. Mathew, S. Sarker, and U. Varshney, M-commerce services: Promises and challenges. *The Communications of the Association for Information Systems*, 14(1), p1-11, 2004.

[26] C. Rinner, M. Raubal, and B. Spigel, User interface design for location-based decision services. *Paper presented at the 13th International Conference on GeoInformatics*, Toronto, Canada, August 17-19, 2005.

[27] G. Bressolles, F. Durrieu, and M. Giraud, The impact of electronic service quality's dimensions on customer satisfaction & buying impulse. *Journal of Customer Behaviour*, 6(1), p37-56, 2007. http://dx.doi.org/10.1362/147539207X198365.

[28] J. Steuer, Defining virtual reality: Dimensions determining telepresence. *Journal of communication*, 42(4), p73-93, 1992. http://dx.doi.org/10.1111/j.1460-2466.1992.tb00812.x.

[29] M.K.O. Lee, C.M.K. Cheung, and Z. Chen, Understanding user acceptance of multimedia messaging services: An empirical study. *Journal of the American Society for Information Science & Technology*, 58(13), p2066-2077, 2007. http://dx.doi.org/10.1002/asi.20670.

[30] D. Zhang, Delivery of personalized & adaptive content to mobile devices: A framework & enabling technology. *Communications of the Association for Information Systems*, 12(1), p183-202, 2003.

[31] H. Sheng, F.F.H. Nah, and K. Siau, An experimental study on ubiquitous commerce adoption: Impact of personalization & privacy concerns. *Journal of the Association for Information Systems*, 9(6), p344-376, 2008.

[32] B. Mittal, and W.M. Lassar, The role of personalization in service encounters. *Journal of Retailing*, 72(1), p95-109, 1996. http://dx.doi.org/10.1016/S0022-4359(96)90007-X.

[33] P. Katerattanakul, Framework of effective web site design for

business-to-consumer internet commerce. *Infor-Information Systems and Operational Research*, 40(1), p57-70, 2002. http://dx.doi.org/10.1080/03155986.2002.11732641.

[34] J. Krumm, and S. Shafer, Data store issues for location-based services. *IEEE Data Engineering Bulletin*, 28(3), p35-42, 2005.

[35] C.S. Jensen, A. Friis-Christensen, T.B. Pedersen, D. Pfoser, S. Saltenis and N. Tryfona, Location-based services: A database perspective. *Paper presented at the 8th Scandinavian Research Conference on Geographical Information Science*, Norway, June 25-27, 2001.

[36] G. Hsieh, K. Tang, W. Low, and J. Hong, Field deployment of IMbuddy: A study of privacy control & feedback mechanisms for contextual IM. *Paper presented at the 9th International Conference on Ubiquitous Computing (UbiComp)*, Innsbruck, Austria, September 16-19, 2007.

[37] J. Van Doorn, K.N. Lemon, V. Mittal, S. Nass, D. Pick, P. Pirner, and P. C. Verhoef, Customer engagement behavior: Theoretical foundations and research directions. *Journal of Service Research*, 13(3), p253-266, 2010. http://dx.doi.org/10.1177/1094670510375599.

[38] P.C. Verhoef, W.J. Reinartz, and M. Krafft, Customer engagement as a new perspective in customer management. *Journal of Service Research* 13(3): p247-252, 2010. http://dx.doi.org/10.1177/1094670510375461.

[39] H.H. Kuan, G.W. Bock, and V. Vathanophas, Comparing the effects of website quality on customer initial purchase & continued purchase at e-commerce websites. *Behaviour & Information Technology*, 27(1), p3-16, 2008. http://dx.doi.org/10.1080/01449290600801959.

[40] T.J. Johnson, and B.K. Kaye, Wag the blog: How reliance on traditional media and the internet influence credibility perceptions of weblogs among blog users. *Journalism and Mass Communication Quarterly*, 81(3), p22-642, 2004. http://dx.doi.org/10.1177/107769900408100310.

[41] A. Facchetti, A. Rangone, F.M. Renga, and A. Savoldelli, Mobile marketing: An analysis of key success factors and the european value chain. *International Journal of Management and Decision Making*, 6(1), p65-80, 2005. http://dx.doi.org/10.1504/IJMDM.2005.005966.

[42] K. Heinonen, and T. Strandvik, Consumer responsiveness to mobile marketing. *International Journal of Mobile Communications*, 5(6), p603-617, 2007. http://dx.doi.org/10.1504/IJMC.2007.014177.

[43] J. Samsioe, and A. Samsioe, Introduction to location based services markets and technologies. In R. Reichwald (Ed.), *Mobile kommunikation-wertschopfung, technologien* (p417-438). neue Dienste, Wiesbaden, Wiesbaden: Gabler, 2002.

[44] M.R. Williams, *Have you checked-in? An exploration of location-based social networks*. Retrieved on June 29, 2015, from http://www.scribd.com/doc/44727230/Have-You-Checked-In-An-Expl

oration-of-Location-Based-Social-Networks.

[45] Allegiance, *Engagement*, Retrieved on June 29, 2015, from http://www.allegiance.com/lp/whitepapers.php?t=Engagement%20Book&docid=144&_kk=7bfe46f6-a62d-4fa4-8a5e-aff50e957fd3&_kt=5533809494.

[46] T. Kohler, J. Fueller, K.Matzler, and D.Stieger, Co-creation in virtual worlds: The design of the user experience. *MIS Quarterly*, 35(3), p773-788, 2011.

[47] T. Ahn, S. Ryu, and I. Han, The impact of web quality & playfulness on user acceptance of online retailing. *Information & Management*, 44(3), p263-275, 2007. http://dx.doi.org/10.1016/j.im.2006.12.008.

[48] R. Bolton, and S. Saxena-Iyer, Interactive services: A framework, synthesis and research directions. *Journal of Interactive Marketing*, 23(1), p91-104, 2009. http://dx.doi.org/10.1016/j.intmar.2008.11.002.

[49] K. Lamalfa, *The positive economics of customer engagement*. Retrieved on June 29, 2015, from http://info.allegiance.com/WhitepaperInvitation_PositiveEconomics.html?mkt_tok=3RkMMJWWfF9wsRons6zBZKXonjHpfsX+4+krUaeg38431UFwdcjKPmjr1YoDS9QhcOuuEwcWGog8wQBUH+ecfY5D/w.

[50] H.F. Kaiser, and J. Rice, Little Jiffy Mark IV. *Educational and Psychological Measurement*, 34(Spring), p111-117, 1974.

[51] D.R. Cooper, P.S. Schindler, and J. Sun, Business research methods(8th ed.). Boston: McGraw Hill, 2003.

[52] C. Fornell, and D.F. Larcker, Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), p39-50, 1981. http://dx.doi.org/10.2307/3151312.

[53] K.G. Jöreskog, and D. Sörbom, *Lisrel 7: A guide to the program & applications (2nd ed.)*. Chicago, Ill: SPSS, 1989.

[54] R.P. Bagozzi, and Y. Yi, On the evaluation of structural equation models. *Academy of Marketing Science*, 16(1), p74-94, 1988. http://dx.doi.org/10.1007/BF02723327.

[55] J. Scott, The measurement of information systems effectiveness: Evaluating a measuring instrument. In ACM SIGMIS Database (Ed.), *Proceedings of the Fifteenth International Conference on Information Systems* (p111-128). 1994. http://dx.doi.org/10.1145/206476.206484.

[56] L. Hu, and P.M. Bentler, Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), p1-55, 1999. http://dx.doi.org/10.1080/10705519909540118.

[57] M. W. Browne, and R. Cudeck, Alternative ways of assessing model fit. In K.A. Bollen and J.S. Long (Eds.), *Testing structural equation models* (p136-162). Newbury Park, CA: Sage, 1993.

[58] P.M. Bentler, and D.G. Bonett, Significance tests & goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3), p588-606, 1980. http://dx.doi.org/10.1037/0033-2909.88.3.588.

[59] P.M. Bentler, *EQS structural equations program manual*. Los Angeles: BMDP Statistical Software, 1995.

[60] H. Bozdogan, Model selection and Akaike's information criterion (AIC): The general theory and its analytical extensions. *Psychometrika*, 52(3), p345-370, 1987. http://dx.doi.org/10.1007/BF02294361.

[61] InsightXplorer, *What is IX survey.* Retrieved on June 29, 2015, from http://www.insightxplorer.com/product/ixsurvey01.html.

[62] E. Kaasinen, User acceptance of mobile services: Value, ease of use, trust and ease of adoption. *VTT Information Technology*, 566, p1-137, 2005.

[63] T.P. Moran, The Command Language Grammar: A Representation for the User Interface of Interactive Computer Systems. *International Journal of Man-Machine Studies*, 15(1), p3-50, 1981.

[64] K. S. Suh, and Y. E. Lee, The Effects of Virtual Reality on Consumer Learning: an Empirical Investigation. *Mis Quarterly*, 29(4), p673-697, 2005.

[65] A. H. Huang, D. C. Yen and X. Zhang, Exploring the Potential Effects of Emoticons. *Information & Management*, 45(7), p466-473, 2008.

[66] L. Barkhuus, Privacy in Location-based Services, Concern vs. Coolness. *Mobile HCI 2004 workshop: Location System Privacy and Control.* Glasgow, UK, 2004.

[67] J. Raper, G. Gartner, H. Karimi and C. Rizos, A Critical Evaluation of Location based Services and Their Potential. *Journal of Location Based Services*, 1(1), p5-45, 2007.

[68] T. Zhou, Y. Lu, B. Wang, The Relative Importance of Website Design Quality and Service Quality in Determining Consumers' Online Repurchase Behavior. *Information Systems Management*, 26(4), p327-337, 2009.

[69] D. Gefen, The Role of Familiarity and Trust. *Omega*, 28(5), p725-737, 2000.

[70] H. Baumgartner, Toward a Personology of the Consumer. *Journal of Consumer Research*, 29(2), p286-292, 2002.

[71] J. Cazeneuve, Television as a Functional Alternative to Traditional Sources of Need Satisfaction. In J.G. Blumler&E.Katz (Eds.), *The Uses of Mass Communication*, Beverly Hills, CA: Sage, p286-292, 2002.

[72] R. Kraut, T. Mukhopadhyay, J. Szczypula, S. Kiesler and B. Scherlis, Information and Communication: Alternative Uses of the Internet in Households. *Information Systems Research*, 10(4), p287-303, 1999.

8. APPENDIX

LBS Characteristics	Measurement Items	Source
Service Function	Information and messages sent to me notifications	Tsalgatidou et al.[21]
	Show surrounding attractions, shops and other industrial and commercial information	Schiller and Voisard[13] Junglas and Watson[22] Rao and Minakakis[1]
	Get local businesses to send shopping / promotional messages	Kaasinen[62]
Media Richness	Augmented reality (AR) seems to be enough realistic picture	Moran[63]
	Service seems to be enough stereoscopic picture	Bressolles et al.[27]
	Service seems to be enough vivid picture	Steuer[28]
	Service screen can display a variety of different forms of text, images, audio and other media effects	Suh and Lee[64] Huang et al.[65]
Personalization	Refer to my intended use to provide recommendations or suggestions	Zhang[30]
	Default interest according to my preferences to provide information	Sheng, Nah, and Siau[31]
Privacy concerns	I will let service program when needed to obtain my current position	Barkhuus[66]
	I will let service program when needed use the service to obtain my purpose	Raper et al.[67]
Relevance	Provide relevant information	Lee et al.[60]
	Provides local information on the most popular	Mathew et al.[25]
	The cheapest offer local information	Kim et al.[20]
	Provide comprehensive information on the type of the ground	Kaasinen[16] Rinner et al.[26]
Reliability	Response to the current needs of rapidly	Zhou et al.[68]
	Provide accurate information on the ground	Gefen[69]
	Use is reliable	Kaasinen[16]
	Use is controlled	Kaasinen[62]
	Use it to be honest	
	Feel confidence to use it	

8. APPENDIX(Cont.)

LBS Characteristics	Measurement Items	Source
Recreation	Makes me feel funny I feel pleasure I feel excited I feel entertainment	Krumm and Shafer[34] Mathew et al.[25] Samsioe and Samsioe[43]
Customer engagement	I will be in more places check in/sign in I will immediately watch and participate in activities around I will check in and sharing information on social media I will be positioned at a position over put annotations, such as a story or photo I would be interested in other people's punch message I will respond to the message of others I check in comments or questions I will check in through in the business and recommend to others the business	Verhoef et al.[38] Van Doorn et al.[37]
Purchase intention	I will act to complete the transaction through LBS LBS let me buy more goods LBS makes me shop more often LBS lets me unexpectedly shop LBS lets me have the curiosity to explore while shopping LBS lets me have targeted shopping LBS lets me go to the same merchant shopping LBS lets me have regular shopping LBS lets me repeat purchase certain goods	Baumgartner[70] Kuan et al.[39]
Functional alternatives	Because I would rather reduce the use of traditional media LBS query data frequency I will use the network because LBS reduced the frequency of media query data I would think that the information obtained in LBS is more useful than on TV and the Internet	Cazeneuve[71] Kraut et al.[72] Johnson and Kaye[40]