

THE EFFECT OF CONSUMER INNOVATIVENESS ON ADOPTION OF LOCATION-BASED SERVICES

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ABSTRACT

This study applies the view of domain specific innovativeness (DSI) to examine the relationships between consumer innovativeness, lifestyle, knowledge, exploratory buying behavior tendencies, and the intentions to adopt location-based services (LBS). It is found that consumers with different levels of innovativeness toward LBS have different lifestyles and adoption intentions for LBS. Specifically, innovators have higher willingness to adopt LBS, and they tend to be leaders, price-oriented, and stylish. Consumers' knowledge of LBS partially mediates the relationship between their innovativeness toward LBS and the intentions to adopt the service. However, consumers' exploratory buying behavior tendencies do not play the mediating role between consumer innovativeness toward LBS and the intentions to adopt the service. The study not only explains the role of consumer innovativeness as the antecedent of LBS adoption, but suggests that the characteristics of consumer personality could be more important than expected in the adoption of LBS.

Keywords: location-based services; innovativeness; exploratory buying behavior; consumer lifestyle; innovation adoption

1. INTRODUCTION

In recent years, mobile phone, together with other handheld devices or mobile appliances (such as PDAs), has deeply influenced people's lifestyle mainly because it empowers people with its ease of use "anytime and anywhere" (Hong and Tam, 2006; Chang and Heng, 2006). While electronic commerce (e-commerce) has become a business phenomenon due to the popularity of PCs and the internet, the rapid development of modern wireless technologies, accompanied with an increasingly high penetration rates of mobile phones and the internet, is making mobile commerce (m-commerce) an important application for both enterprises and consumers (Lee and Park, 2008; Chang et al., 2009). M-commerce can be viewed as e-commerce transaction carried out through at least one kind of mobile/wireless terminal equipments on the mobile telecommunication networks (Lee and Park, 2008; Chang, 2009). Nowadays, in addition to enabling commercial transaction activities via mobile devices, m-commerce also improves the quality of our daily life by enhancing the effectiveness and efficiency of our communication and navigation activities. Some companies even use mobile technologies to not only promote latest products or send e-coupon to consumers as part of their marketing efforts (Chang et al., 2006), but enhance their overall profits and performance by automating and streamlining business processes to

increase productivity, lower operational costs, increase customer satisfaction, and improve decision-making (Lee and Park, 2008). One of the most popular m-commerce applications is location-based services (LBS), the real-time services providing users with exact location and relevant information about their destination. Barnes (2003) illustrated that the key applications of LBS include services related to safety, navigation and tracking, transactions, and locale information. According to the survey conducted by MIC Institute (MIC Institute, 2007), the top three mobile phone information services preferred and valued by customers in Taiwan were food, traffic, and travel related information services. Furthermore, it is found by ABI Research (2008) that the number of LBS subscribers have been increasing and the number of LBS subscribers adopting personal navigation services will exceed 80 millions by 2013 (see Fig. 1). The aforementioned LBS development trends echo the study results from prior research suggesting that one major future market for LBS is in the tourism industry when more and more people try to travel independently with various needs of human tracking, assets and valuables tracking, and customer-focused adaptation (e.g., user-adaptive e-maps) for tourism services (Zipf, 2002; Chang and Chou, 2007; Öztayşi et al., 2009).

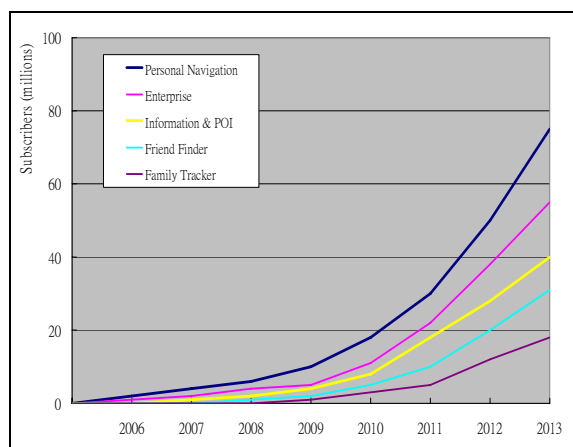


Fig. 1. LBS subscribers by application (world market: 2006 to 2013)

It is undoubted that the development of LBS is

prospering. For example, many organizations in charge of promoting traveling spots have started to collaborate with LBS providers to provide relevant information to the travelers. However, LBS is still not widely adopted by the general public in Taiwan. Although a high penetration rate (111.3%, i.e., 25.67 million active mobile phone subscriptions) of mobile phones is observed in Taiwan (Institute for Information Industry, 2009), consumers may hesitate to adopt LBS because they do not have sufficient prior experience using such innovation to judge whether or not it would suit their needs. Nevertheless, there are still consumers that would like to try the new product or service first, and those consumers can be called innovative consumers. Therefore, we are motivated to (1) identify the innovative consumers who are more likely to use LBS, (2) explore innovative consumers' lifestyle and their exploratory buying behaviors, (3) examine consumers' knowledge of LBS and the relationship between consumer innovativeness and their intentions to adopt LBS, and (4) investigate the role of exploratory buying behavior and consumers' knowledge in the LBS adoption process.

2. ADVANTAGE AND DISADVANTAGE OF LBS

There exist several advantages of using LBS, and it is mentioned by Pura (2005) that the ability of LBS to point out users' present location is one of the most promising applications in m-commerce. In addition, mobile users can utilize LBS to explore local environment for reducing unfamiliarity (Barnes, 2003). Nowadays, the service providers can even develop the social network market via LBS for creating more value to their subscribers, and LBS-enabled communication and entertainment applications are preferred services in this particular market (Roza and Bilchev, 2003). It is pointed out by Chircu and Mahajan (2009, p. 464) that LBS adapted to local needs may create mobile

innovation opportunities for mobile operators and content providers to expand their mobile technology

service breadth and attract new mobile services adopters.

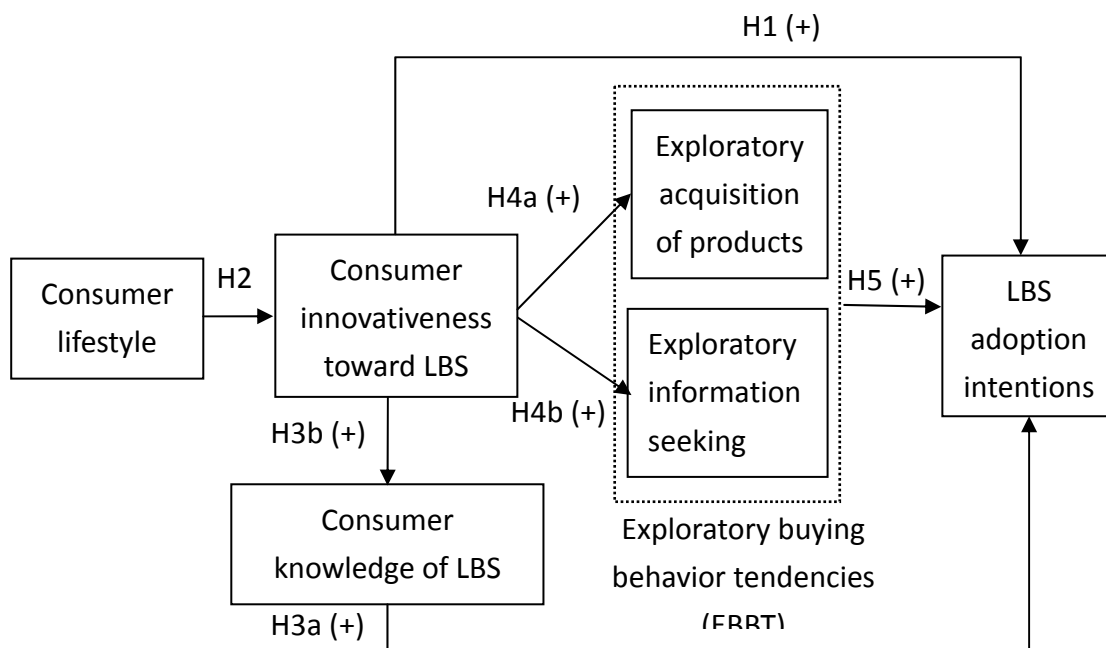


Fig. 2. Hypothesized model to analyze the effect of consumer innovativeness on LBS adoption intentions.

On the other hand, using LBS may lead to certain disadvantages. Firstly, privacy issues are brought out. Several prior studies indicated that privacy is LBS users’ major concern. For example, users are afraid that using LBS would reveal their location and personal information which might consequently affect their decision to adopt LBS (Duckham et al., 2007). Ahas and Mark (2005) also indicated that the most pertinent issue in this filed is surveillance. Secondly, the accuracy of position is questioned by some users; they not only worry about the quality of the acquired LBS information but are afraid of obtaining wrong information which may cause serious consequences (Chang et al., 2007).

3. HYPOTHESES

Through a thorough literature review effort, it was found that very limited studies had discussed the consumers’ intentions to adopt LBS from the perspective

of the new product adoption behavior or process; most of them are from the technology acceptance perspective (e.g., Chang et al., 2007). Realizing the factors that influence consumers’ adoption intentions is important; however, identifying the potential target consumers may be an even more important research topic. As a result, our hypotheses are discussed and proposed in the following subsections. The proposed hypothesized model appears in Fig. 2.

3.1 Consumer Innovativeness toward LBS

In the filed of consumer innovativeness research, classifying consumers into innovators and non-innovators was coined by Midgley and Dowling (1978). There exist several definitions for consumer innovativeness. For example, consumer innovativeness can be defined as the tendency for consumers to have extensive technical knowledge and willingness to understand technological innovations in the market (Saaksjarvi, 2003); it can also be referred to as the degree to willingly increase the chance to try new products or

services (Hirunyawipada and Paswan, 2006). In his study of online shopping, Goldsmith (2001) found that innovators have greater usage of internet and the likelihood of purchasing goods online for them is also higher than other consumers. Later, Im et al. (2003) showed that the relationship between consumer innovativeness and the new technological application adoption behavior is positively related. Moreover, Hirunyawipada and Paswan (2006) found that domain-specific innovativeness enhances the actual adoption of the high-tech product. As a result, our first hypothesis was proposed as follows:

Hypothesis 1. Consumer innovativeness toward LBS has a positive effect on consumers' intentions to adopt LBS.

3.2 Consumer Lifestyle

Consumer lifestyle reflects the linkage from specific product perceptions to cognitive categories and becomes personal value eventually (Brunsø et al., 2004). This concept constructs the way affecting consumers' behaviors and reflecting their values toward events happening around them (Blackwell et al., 2005). Individuals may even adopt their lifestyle in accordance with the social groups which they hope to belong to (Gonzalez and Bello, 2002). Lindgreen and Wynstra (2005) mentioned that consumers with different lifestyles might value a particular good or service differently, and it would be valuable to understand how consumers make decisions by measuring consumer lifestyles and then categorizing consumers into different lifestyle segmentations. In the research of online banking adoption, Lassar et al. (2005) indicated that innovative consumers tended to be not only general market leaders but also internet leaders and opinion leaders. According to Wang et al. (2008), innovators are also prone to make decisions independently. On the other hand, innovative consumers are venturesome in trying something new even if they are unfamiliar with it

(Bowden and Corkindale, 2005). Lee et al. (2009) found that consumer lifestyle is a direct antecedent of the intention to adopt high-tech products. Consequently, innovators may own unique lifestyle that is different to other consumers. Hence, our second hypothesis was posited as follows:

Hypothesis 2. Consumers with different lifestyles have different levels of innovativeness toward LBS.

3.3 Consumer Knowledge of LBS

Consumer knowledge is the knowledge related to products or services that consumers are interested in. In general, the knowledge is provided by firms to help consumers make decisions when making purchases (Garcia-Murillo and Annabi, 2002; Moreau et al., 2001). Schreier and Prügl (2008) found that users with more consumer knowledge in an innovation tend to be ahead of its market trend and expect high benefits from innovating, and such users would adopt new commercial products faster and more intensively than ordinary users. Phau and Suntornnond (2006) showed that, when making purchases, consumers with higher objective knowledge of the product have less concerns in its country of origin or brand since they are already quite familiar with the product. This result echoed the study results from Cordell (1997) stating that consumers' knowledge of the existing product or service category is a leading factor that affects the adoption process. Marcketti and Shelley (2009) also pointed out that consumers' knowledge of products has a significantly positive effect on their adopting intentions. Therefore, the following hypothesis was posited:

Hypothesis 3a. Consumers' knowledge of LBS has a positive effect on their intentions to adopt LBS.

On the other hand, Rogers (1995) indicated that consumers with higher innovativeness have stronger tendencies to adopt innovation as a result of their deep

knowledge of the innovation. Some studies showed that innovative consumers were those who liked to crave knowledge and learned new things (e.g., Hsu et al., 2008). It was mentioned by Schreier and Prügl (2008) that consumers with innovative personality are more likely to cope with uncertain usage situations at the leading edge of the new product market, question current commercial product offers, and search room for promising improvements. Innovative consumers are prone to communicate with others to get more information related to the latest trends in products (Schiffman and Kanuk, 2003). Therefore, the following hypothesis was postulated to reflect that innovative consumers own better understanding of an innovation:

Hypothesis 3b. Consumers with higher level of innovativeness toward LBS own more knowledge of LBS.

3.4 Consumer Exploratory Buying Behavior

Exploratory behavior was defined by Berlyne (1963) as “the behavior with the sole function of changing the stimulus field.” Consumers tend to explore novelty goods, search innovative information, or even try to adopt unfamiliar products to acquire stimulus increase. Categorizing consumers’ purchase tendencies into four categories: innovative behavior, variety seeking behavior, cognitive responses to ads, and information seeking, Baumgartner and Steenkamp (1996) developed the Exploratory Buying Behavior Tendencies (EBBT) scale to measure consumers’ exploratory behaviors and purchase tendencies. The EBBT scale consisted of two forms of buying behavior: Exploratory Acquisition of Products (EAP) and Exploratory Information Seeking (EIS). According to Hsu et al. (2008), innovative consumers tend to seek uniqueness and take risks, and their purchase patterns are different from others as well. They are prone to gain stimulation through exploring something new in the market. In addition, Ruvio and Shoham (2007) showed that consumer innovativeness

and exploratory behavior were positively related for Asian. In this respect, two hypotheses were proposed as follows:

Hypothesis 4a. Consumer innovativeness toward LBS has a positive effect on the tendency of exploratory acquisition of products.

Hypothesis 4b. Consumer innovativeness toward LBS has a positive effect on the tendency of exploratory information seeking for products.

Roehrich (2004) showed that consumers with higher EAP scores are more likely to purchase unfamiliar products and the behaviors are highly connected with their stimulation needs. Schiffman and Kanuk (2003) also mentioned that consumers generally search related information first before making their final decisions to adopt an innovation. Furthermore, Chrysohoidis and Krystallis (2005) indicated that consumers who purchased organic food more often have significantly higher EBBT scores than those who do not. As a result, the following hypotheses were posited:

Hypothesis 5a. The tendency of exploratory acquisition of products has a positive effect on consumers’ intentions to adopt LBS.

Hypothesis 5b. The tendency of exploratory information seeking for products has a positive effect on consumers’ intentions to adopt LBS.

4. METHODOLOGY

4.1 Measures

The construct of consumer innovativeness toward LBS was measured with six items, which were adapted from the scale of domain specific innovativeness (DSI) developed by Goldsmith and Hofacker (1991). The lifestyle of consumers was measured via questions from the scale suggested by Wells and Tigert (1971). There are thirty-five questions adapted to measure various facets of the lifestyle including activities, interests, and

opinions. To measure consumers' knowledge of LBS, four questions designed by the experts were used to test respondents' objective knowledge of LBS. Recommended by Abdellaoui et al. (2005), when testing consumers' knowledge of LBS, each respondent was asked to check his/her level of affirmation when answering. Each respondent's objective knowledge of LBS was then measured by the knowledge score calculated by the correctness of the answer (correct: 1, incorrect: 0) multiplied by the level of affirmation for that answer (ranging from 1 to 4). A ten-item scale measuring the consumer's tendency of exploratory acquisition of products, and another ten-item scale measuring the consumer's tendency of exploratory information seeking were also constructed for this research; they were adapted from the EBBT scale to measure respondents' exploratory behaviors and purchase tendencies. It is mentioned by Yeh et al. (1998) that Asian consumers tend to avoid expressing negative or positive opinions in answering the questionnaire. Therefore, unless otherwise specified, each questionnaire item was measured on a four-point Likert scales (ranging from "strongly disagree", "disagree", "agree" to "strongly agree") to avoid neutral answers. Last, consumers' intentions to adopt LBS were measured by yes/no questions. The measurement items used in this study are listed in Appendix.

4.2 Data Collection and Sample

This study employed a questionnaire survey approach to collect data for testing the validity of the model and research hypotheses. A pilot test, recruiting 29 respondents living in a metropolitan area located in northern Taiwan, was conducted to ensure the reliability of the scales. Several modifications were made based on the feedback from the pilot test. Before the questionnaire was finalized, two experts familiar with the topic area further reviewed the questionnaire, and slight revisions in wording were made based on their

suggestions. A final version of the questionnaire including background information and measures related to the constructs discussed earlier was used to ask consumers living in two major metropolitan areas in Taiwan. The convenient and random sampling method was used in this study. Respondents need to have experience in using mobile devices. The authors first illustrated the purpose of the study and provided assistance to the respondents but did not interfere with answering. A gift worth of about NT\$30 (about US\$0.93) was provided to each respondent who was willing to participate in the survey. In addition, the order of the questions was re-arranged to minimize order effects (Klink and Smith, 2001). Several questions were also reversely coded to reduce the common method bias. A total of 208 questionnaires were collected, and among them 16 were deemed incomplete. The remaining 192 valid and complete questionnaires were used for the quantitative analysis.

5. RESULTS AND ANALYSIS

A total of 208 respondents were surveyed and valid samples were 192, with 16 samples regarded as invalid due to inconsistent or incomplete answers. The total valid samples were 192 respondents, with 55.21% of male respondents. Detailed demographics of the respondents were listed in Table 1. The average age of respondents was 28.63 years old, while the majority of respondents were single (75.00%). Over 90% of respondents have educational level of college or above. About 36.65% of respondents were students, and the remaining were those who worked in business (23.56%) or services (17.28%) sector. The average monthly disposable income was NTD 27,947.37. The respondents of this study were relatively young, unmarried and own higher educational level.

Table 1 Factor analysis of lifestyle

Respondents (n=192)	
Gender (%)	
Male	55.21
Female	44.79
Average age (years)	28.63
Marriage (%)	
Single	75.00
Married	25.00
Educational level (%)	
Senior high school	8.90
College	54.45
Graduate school and more	36.65
Occupation (%)	
Public/Military/Education	9.42
Industry	4.71
Business	23.56
Services	17.28
Housewives	2.09
Students	36.65
Others	6.28
Average monthly disposable income (NTD)	27,947.37

The respondents with lifestyle of “knowledge-broadening” tend to broaden their knowledge, for example, by living or traveling overseas, surfing on the internet, and reading. The “leaders” own the characteristic of leadership; they usually share with friends their purchase experience and discuss innovative products or services with them. The respondents that are “ad-appealing” are easily attracted by the advertisement which may even influence their purchase decisions. The respondents who are price-sensitive in making purchase were categorized as “price-oriented” consumers. They often delay shopping and wait for discount; they also notice news of sales, and are prone to buy the product with lower price within the same product category. Similarly, the individuals who own fashion goods and pay more attention to the latest trends in

products or services are defined “stylish”. Last, the “self-imagined” consumers tend to be independent and more self-confident.

As suggested by Rogers (1995), the K-means clustering approach was conducted to categorize the respondents into five groups with different levels of innovativeness according to their DSI scores. As shown in Fig. 3, the respondents were classified as innovators (6.25%), early adopters (19.27%), early majority (44.79%), late majority (21.36%), and laggards (8.23%) in terms of their innovativeness toward LBS. It is worth mentioning that the distribution of the five innovativeness classes was close to that Rogers (1995) predicted. The corresponding DSI score for each group was also illustrated in Fig. 3. Our analysis results also showed that there existed significant difference in DSI scores among different groups of respondents ($F = 716.39, p\text{-value} < .01$).

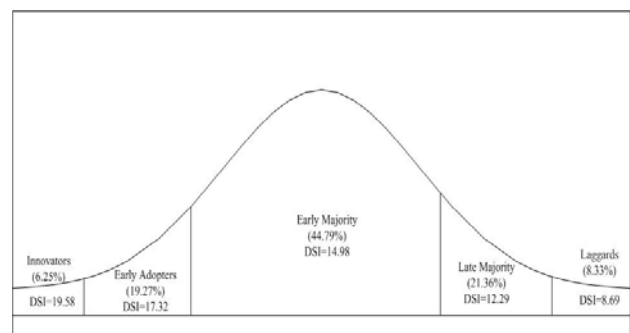


Fig. 3. Distribution of consumer innovativeness and corresponding DSI scores.

The results of multivariate analysis of variance in Table 2 showed that hypothesis 2 was supported ($F = 2.89, p\text{-value} < .01$), indicating that respondents with different levels of innovativeness toward LBS would have different lifestyles. Furthermore, a closer inspection of the results reveals that those who own higher level of innovativeness tend to be leaders,

Table 2 MANOVA test results (consumer innovativeness vs. lifestyle)

	Innovators	Early Adopters	Early Majority	Late Majority	Laggards	F-statistics	Scheffe's comparison
Knowledge-broadening	0.3682	0.1734	-0.1243	-0.0130	0.0152	1.02	
Leaders	0.8399	0.3401	-0.0834	-0.1366	-0.6326	5.62***	1>(2,3,4)>5
Ad-appealing	-0.4184	0.1602	0.0485	-0.1148	-0.0272	0.95	
Price-oriented	0.5212	-0.2927	-0.0086	0.0119	0.3020	2.02*	
Stylish	0.3230	0.3180	0.0677	-0.1290	-1.0147	6.26***	(1,2,3,4)>5
Self-imaged	0.3311	0.0737	-0.0129	-0.2209	0.2022	1.04	

Note: Scheffe's comparison: (1) innovators; (2) early adopters; (3) early majority; (4) late majority; (5) laggards.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

price-oriented, and stylish. It is also interesting to find that among the five groups of respondents, those with knowledge-broadening, ad-appealing, or self-imaged lifestyle were not significantly different in innovativeness toward LBS. Besides, Scheffe's test results indicated that innovators and laggards were two extremes in leadership. Laggards were also significantly behind others in paying attention to the latest fashion trends. The above results were consistent with the findings from Rogers (1995) and Hsu et al. (2008), and confirmed that innovators are playing very important roles in the new product adoption, i.e., innovators, who usually act as opinion leaders, exert their influence in their peer groups to increase the speed of innovation diffusion process (Barczak et al., 1993).

Regarding the demographics of the respondents, it was shown that male respondents accounted for 83.33% of the innovators, whereas 31.25% of the laggards were male. Indeed, there existed significant gender difference when categorizing respondents in terms of innovativeness toward LBS (Chi-square = 12.38, p -value < .05). However, there were no significant differences in age ($F = 1.70$, p -value > .10) and average monthly disposable income ($F = 1.18$, p -value > .10) among respondents with different levels of innovativeness. In fact, Rogers (1995) also mentioned that lack of evidence was found to show that there was age difference between early adopters and late adopters. Furthermore, it was shown that 91.67% of the innovators were willing to

adopt LBS whereas only 58.54% of the late majority and 75% of laggards were willing to adopt LBS. The intentions to adopt LBS were also significantly different (Chi-square = 8.71, p -value < .10) among the five groups of respondents. Nevertheless, regarding the preference for the four major LBS applications of locating, tracking, navigation, and commerce, the results showed that no significant differences (at the level of .05) exist among the five groups of respondents. Especially, laggards had quite low interest in using the application of locating (16.67%), tracking (8.33%), and commerce (5.79%).

To check if consumers' knowledge of LBS has a positive effect on their intentions to adopt the service, we conducted a logistic regression analysis. The result indicated that respondents' knowledge scores of LBS were significantly and positively related to their intentions to adopt it (Wald Chi-square = 11.36, p -value < .01). Hence, hypothesis 3a was supported. The result was consistent with the findings from Cordell (1997) finding that product category knowledge was a leading factor influencing the innovation adoption. The result was also consistent with the finding from Phau and Suntornnond (2006) showing that consumers with higher objective product knowledge had higher chances to make

Table 3 ANOVA test results for EAP, EIS, and EBBT

	Innovators	Early Adopters	Early Majority	Late Majority	Laggards	F-statistics	Scheffe's Comparison
EAP	22.33	24.68	24.06	24.54	23.19	1.60	
EIS	26.25	25.76	25.12	25.34	23.13	2.42*	1>(2,4,3,5)
EBBT	48.58	50.44	49.18	49.88	46.32	2.09*	

Note: Scheffe's comparison: (1) innovators; (2) early adopters; (3) early majority; (4) late majority; (5) laggards.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

their own purchase decisions instead of relying on other external recommendation.

As predicted by hypothesis 3b, the result of the regression analysis showed that consumers with higher DSI scores own more knowledge of LBS; the result was also significant ($t = 4.45$, p -value $< .01$). That is, the more innovative the consumers are, the more knowledge of LBS they own. This result was consistent with the findings from Lüthje (2004) claiming that consumers with higher innovativeness paid more attention to the product-related knowledge. In addition, consumers with different levels of innovativeness toward LBS obtained significantly different scores on the knowledge test ($F = 6.81$, p -value $< .01$). As shown in Table 3, Scheffe's comparison results indicated that innovators and early adopters had significantly better knowledge of LBS than others. The results agreed to an extent with Rogers (1995) mentioning that early adopters looked for innovation information more actively and were more capable of dealing with the abstract information.

Regression analysis was used to examine the relationship between consumer innovativeness and the tendencies of exploratory acquisition of products and exploratory information seeking. Hypothesis 4a, which hypothesized a positive relationship between consumer innovativeness and the tendency of exploratory acquisition of products, was not supported ($t = 0.04$, p -value > 0.10), although the sign was in the expected direction. Hypothesis 4b for predicting a positive relationship between consumer innovativeness and the tendency of exploratory information seeking was supported ($t = 2.88$, p -value $< .01$). The result showed

that consumers with higher innovativeness toward LBS were more inclined to seek relevant information. This result was in line with Lüthje's (2004) finding that innovators had intensive information searching behaviors.

Table 3 shows that there exists no significant difference in the tendency of EAP among different groups of consumers. However, their tendencies of EIS and overall EBBT were significantly different. In particular, innovators had a significant higher tendency of EIS than others.

Logistic regression analysis was used to check hypotheses 5a and 5b. Unexpectedly, hypothesis 5a for the relationship between consumers' tendency of exploratory acquisition of products and their intentions to adopt LBS was not statistically significant (Wald Chi-square = 0.24, p -value $> .10$), although the sign was in the expected direction. In contrast, hypothesis 5b for linking consumers' tendency of exploratory information seeking and their intentions to adopt LBS was supported (Wald Chi-square = 2.94, p -value $< .10$). The above results collectively indicated that consumers' exploratory information seeking behavior had a positive effect on their intentions to adopt LBS, but the tendency of exploratory acquisition of products had just partial effect on their intentions to adopt LBS. These findings corresponded to the arguments from two recent studies stating: (1) exploratory buying behavior explains consumption behavior (Legohérel et al., 2009), and (2) the causes for a consumer's interest in innovations and for their adoption are based on preconditions related to exploratory consumer behavior tendencies (Helm and

Landschulze, 2009). The results of hypotheses testing are summarized in Table 4.

Table 4 Summary of hypotheses testing

	Hypotheses	Supported
1	Consumer innovativeness toward LBS has a positive effect on consumers' intentions to adopt LBS.	Yes
2	Consumers with different lifestyles have different levels of innovativeness toward LBS.	Yes
3a	Consumers' knowledge of LBS has a positive effect on their intentions to adopt LBS.	Yes
3b	Consumers with higher level of innovativeness toward LBS own more knowledge of LBS.	Yes
4a	Consumer innovativeness toward LBS has a positive effect on the tendency of exploratory acquisition of products.	Partially
4b	Consumer innovativeness toward LBS has a positive effect on the tendency of exploratory information seeking for products.	Yes
5a	The tendency of exploratory acquisition of products has a positive effect on consumers' intentions to adopt LBS.	Partially
5b	The tendency of exploratory information seeking for products has a positive effect on consumers' intentions to adopt LBS.	Yes

As suggested by Baron and Kenny (1986), regression analyses were used to further investigate the mediating roles of consumer's knowledge of LBS, EAP, and EIS between consumer innovativeness toward LBS and the intentions to adopt the service. Firstly, the regression result (shown in columns 1, 2 and 3 of Table 5) reveals that the two are significantly related except for the mediator of EAP. Secondly, regarding the effect of consumer innovativeness on the adoption intentions, it was also significant (shown in column 4 of Table 5). Thirdly, the mediator must affect consumers' adoption intentions on the introduction of the mediator into the regression equation. However, it was found that the

mediator of EIS failed in this requirement ($\beta = 0.11$, p -value $> .10$). The above results illustrated that only consumer's knowledge has the mediating effect between their innovativeness toward LBS and the adoption intentions. A Sobel test (Juddy and Kenny, 1981a; 1981b) confirmed this mediation effect of 37.76% ($z = 2.44$, p -value $< .05$). That is, consumer innovativeness toward LBS affected the intentions to adopt the service partially through consumer knowledge of LBS.

Overall, our results showed that the most preferred LBS application was navigation (80.71%), followed by locating (53.57%) and commerce (47.86%). The result was close to the prediction by ABI Research (2008), suggesting that personal navigation will be the most promising LBS application by the year of 2013. This study also revealed that 72.92% of the respondents were willing to adopt LBS but only 26.49% of them would pay higher prices for mobile phones with the function of LBS. Furthermore, 50 % of the innovators were willing to pay more to purchase mobile phones with LBS, whereas only 6.25% of laggards were willing to make such purchase. The result was not due to the difference in their buying power as we demonstrated earlier that no significant difference in the average monthly disposable income was observed among different groups of consumers.

6. DISCUSSION AND CONCLUSION

This study has the following managerial implications, as well as certain limitations that draw directions for future research. First, in this study we showed that consumer innovativeness toward LBS was positively related to the intentions to adopt LBS. That is, consumers with higher level of innovativeness were

Table 5 Test of mediation for consumer knowledge of LBS, EAP, and EIS

Dependent variable	Consumer knowledge of LBS	EAP	EIS	Adoption intentions for LBS	Adoption intentions for LBS (when mediator is also added as another independent variable)
Independent variable	β (<i>p</i> -value)	β (<i>p</i> -value)	β (<i>p</i> -value)	β (<i>p</i> -value)	β (<i>p</i> -value)
	0.307 (0.000)	—	—	0.217 (0.016)	0.141 (0.136)
Consumer innovativeness	—	0.003 (0.967)	—	0.217 (0.016)	0.216 (0.017)
	—	—	0.204 (0.004)	0.217 (0.016)	0.194 (0.036)

Note: β : standardized estimates

more willing to adopt LBS. Second, our results indicated that consumers who owned higher level of innovativeness (i.e., the innovators) had different lifestyle and they tended to be influential on others in making purchase decisions; they were also sensitive to price and paid more attention on the latest trends in products and services. In other words, innovators tended to be leaders in their peer groups, and they were also price-oriented and stylish. Also, there exist no significant differences in age and disposable income between innovators and others. However, there is a difference in gender between innovators and others. Third, we found that innovators owned more knowledge of LBS than others. Furthermore, consumer knowledge of LBS plays an important role in the adoption process as they were positively related. In fact, consumer innovativeness toward LBS affected the adoption intentions partially through consumer knowledge of LBS. Therefore, the provision of LBS related knowledge by the service providers may contribute to eliciting consumers' adoption intentions for LBS. Especially, the service providers can take the advantage of the innovators' influence on their peers (e.g., through word-of-mouth) to help LBS better accepted by the potential users. Fourth, innovators were prone to

seek related information to obtain more knowledge of LBS. Also, consumers with higher tendencies in seeking LBS related information were more willing to adopt the service as they obtained more knowledge about it in this information seeking process. In sum, LBS providers are encouraged to identify first the innovative consumers and then take the advantage of their influence among peers to accelerate the diffusion process of LBS adoption. In addition, promoting the application of navigation is also suggested as it is confirmed to be the most preferred LBS application in this study.

While our results help broaden our understanding of consumers' intentions to adopt LBS, several limitations are of note. First, the study only investigates consumers living in the metropolitan area (with population over one million), so potential demographic differences may exist between them and those who live in the rural area in adopting this new technological application. Second, it might be desirable to extend the research framework for increasing the explained variance of the *intention* to adopt LBS by incorporating other important factors in future studies. Based on prior studies regarding the adoption intention of innovative information technologies, additional factors which may be

incorporated into the extended framework include *subjective norm* (or *social influence*), *fun* (or *enjoyment*), *system quality*, perceived usefulness, perceived ease of use, and others (Hong and Tam, 2006; Koivumäki et al., 2008; Chang et al., 2009). Third, this research was carried out in Taiwan, and our findings only provided the perception specific to Taiwanese people. It would be interesting and valuable to conduct similar surveys in other regions for comparative studies. Fourth, heterogeneity among consumers (intrapersonal factors) might also account for part of the unexplained variance; characteristics of consumers might explain how the intention held by one consumer is higher than that held by another consumer. Last, methodological questions are susceptible to generate errors and affect the validity of the study. The methodology led to the selection of the scales for each variable, sampling method, fieldwork area and statistical techniques. In order to verify whether the methodology process produces consistent results, alternative techniques deserve further attention.

In respect to the aforementioned research limitations, it would be valuable to expand this study by investigating potential demographic differences, enhancing the research framework to cover additional important factors, conducting comparable studies in other regions, considering the heterogeneity among consumers (intrapersonal factors), and adopting alternative applicable methodologies. The reconfirmation from such expanded studies would make the research results and related implications more general in their nature.

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