

Modeling and Empirical Study of Users' Continuance Intention Toward Location Based Service

HAN Yaojun^{[a],*}; WANG Yongliang^[b]

^[a]Professor, School of Business and Management, Shanghai International Studies University, China. Main research directions are technical economics and management, information technology management, cloud computing.

^[b]School of Business and Management, Shanghai International Studies University, China.

*Corresponding author.

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Abstract

This paper proposes a theoretical extension of users' continuance intention toward Location Based Service (LBS) by adding perceived value into the Extended Expectation-Confirmation Model of Information Systems Continuance (EECM-ISC). The influencing factors and empirical study of continuance intention toward LBS are analyzed. The results indicate that users' LBS continuance intention is determined by their satisfaction, IT self-efficacy and post-usage usefulness. Users' level of satisfaction with LBS use is influenced primarily by their extent of confirmation and secondarily by perceived value. Users' extent of confirmation is positively associated with their post-usage usefulness of LBS use. Further, users' perceived value has a significant influence on their extent of confirmation.

Key words: Location based service; Perceived value; Continuance intention; Expectation-confirmation theory

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INTRODUCTION

Location Based Service (LBS) refers to obtaining location information of a mobile terminal user through the mobile telecommunications operator's radio communication network or an external positioning and providing the corresponding service under the support of geographic information system. The LBS industry in China is in a period of rapid growth, and the competition is becoming increasingly fierce. If the LBS Apps developers and operators want to achieve sustained profitability, they have to consider how to lead the users to accept and use application services continuously.

The study in the field of information system can be divided into two stages: initial acceptance and continuous using. In the first stage, many scholars had carried on the development of the technology acceptance model (TAM) in order to increase the explanatory power of the model, based on the theory of reasoned action (TRA) and the theory of planned behavior (TPB). However, people gradually realized that the success of the information system implementation did not lie in users' initial acceptance behaviors, but the users' continuance behaviors (Bhattacharjee, 2001). Thus, information systems study entered into the second stage. Bhattacharjee (2001) integrated the expectation-confirmation theory (ECT) and TAM and proposed Expectation-Confirmation Model of Information Systems Continuance (ECM-ISC). The model suggested that users' level of satisfaction, extent of confirmation and perceived usefulness with IS use are positively associated with their IS continuance intention. Results of the study supported ECT's contention that satisfaction with IS use is the strongest predictor of users' continuance intention, followed by perceived usefulness as a significant but weaker predictor. Users' extent of confirmation is positively associated with their perceived usefulness of IS use. Zhao, Liang and Wang (2013) developed the continuance usage of mobile commerce by adding perceived cost, trust, privacy

concerns and other constructs. The results showed that all of them significantly affected continuance usage of mobile commerce.

Bhattacharjee (2008) proposed a theoretical extension of ECM-ISC model (EECM-ISC) by linking continuance intention to behavior and elaborating the contingent factors that shape IT continuance intention and behavior (see Figure 1). It conceptualized perceived

behavioral control as consisting of two dimensions-IT self-efficacy and facilitating conditions and linked these two dimensions respectively to IT continuance intention and behavior. Based on EECM-ISC, Liu, Sun, Wang and Zhang (2011) proposed and empirically tested a model for explaining the continuance usage of mobile search. It validated the impacts of external and internal factors.

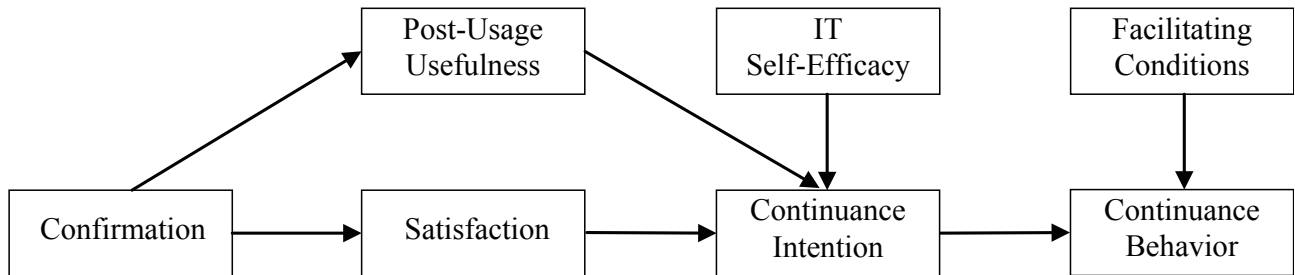


Figure 1
Extended Expectation-Confirmation Model of Information Systems Continuance (EECM-ISC)

Most of the literatures on LBS are about technology solutions and commercial models, compared with which, literatures on users' continuance intention toward LBS are less. Zhou (2013) examined continuous usage of LBS from the perspective of perceived justice. It showed that continuance usage was influenced by privacy risks and perceived usefulness.

The literatures on perceived value mainly focused on the conception of perceived value on mobile services and the relationship with other constructs so far. Pura (2005) analyzed the direct effect of perceived value dimensions (monetary, convenience, social, emotional, conditional and epistemic value) on attitudinal and behavioral components of loyalty: commitment and behavioral intentions to use location-based mobile services. Zhou, Lu and Zhang (2009) suggested that the ubiquitous connections, perceived fee and security risk significantly influenced perceived value.

Based on the above analyses, the impact of perceived value on continuance intention toward LBS is not clear. And

whether EECM-ISC is suitable for LBS continuance usage has to be verified. Hence, the objective of this paper is to propose and validate an extended model of LBS continuance intention by adding perceived value into EECM-ISC to discuss the impact among users' post-usage usefulness, confirmation, satisfaction, perceived value, IT self-efficacy and continuance intention. In addition, this paper provides references for the design, development and operation of LBS application service providers in China.

1. RESEARCH MODEL AND HYPOTHESES

1.1 LBS Continuance Model

LBS users balance benefits and costs to evaluate perceived value and decide whether to use service continuously. Hence, this paper theorized a model of LBS continuance intention by adding perceived value into EECM-ISC and considering actual use (see Figure 2).

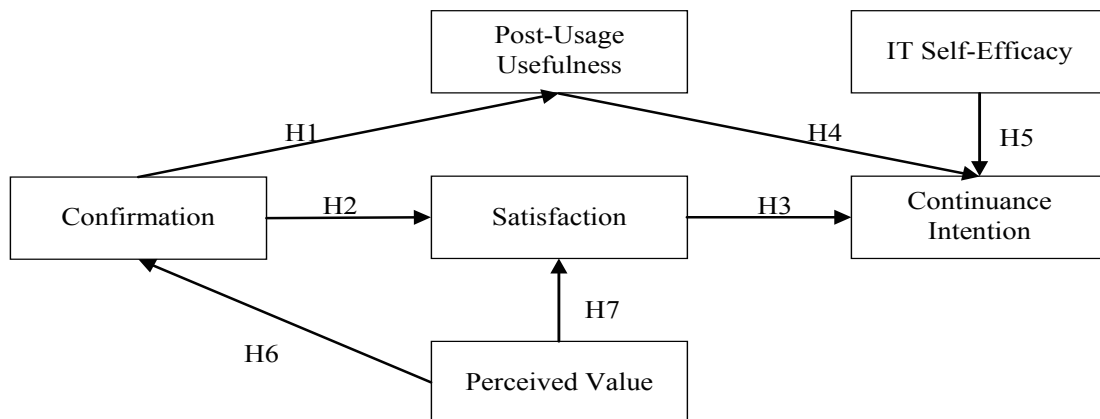


Figure 2
An Extended Model of LBS Continuance Intention

The six constructs in the extended LBS continuance model were post-usage usefulness, confirmation, satisfaction, perceived value, IT self-efficacy and

continuance intention. Table 1 provides operational definitions and sources for these constructs. (See Table 1 for details)

Table 1
Operationalization of Constructs

Confirmation (CF)	Users' perception of the congruence between expectation of LBS use and its actual performance.	Oliver, 1980; Tes & Wilton, 1988
Post-usage usefulness (PU)	Users' overall usefulness perceptions from LBS usage.	Davis, 1989; Bhattacharjee, 2008
Satisfaction (ST)	Users' affect with (feelings about) prior LBS use.	Oliver, 1980
IT self-efficacy (SE)	Users' confidence in their ability to use LBS.	Bhattacharjee, 2008
Perceived value (PV)	Users balance perceived benefits and costs to evaluate value from LBS usage.	Zeithaml, 1988
Continuance intention (CI)	Users' intention to continue using LBS.	Ajzen & Fishbein, 1980; Bhattacharjee, 2001; Bhattacharjee, 2008

1.2 Research Hypotheses

1.2.1 IS Continuance Model

Literatures on users' continuance intention based on ECM-ISC have been published widely in MIS Quarterly, Information Systems Research, Information & Management etc. and affirmed the value of the theory. This paper considers users' post-usage usefulness, confirmation, satisfaction as key factors which are associated with LBS continuance intention. ECM-ISC leads to the following four hypotheses:

H1. Users' extent of confirmation is positively related to their post-usage usefulness of LBS use.

H2. Users' extent of confirmation is positively related to their satisfaction with LBS use.

H3. Users' level of satisfaction with LBS use is positively related to their LBS continuance intention.

H4. Users' post-usage usefulness of LBS use is positively related to their LBS continuance intention.

Bhattacharjee (2008) proposed that self-efficacy focuses on users' personal skills and abilities that they are aware of after initial usage but prior to making a rational choice about their continuance behavior. It is likely that their self-efficacy perceptions will be reflected in their continuance intention rather than continuance behavior. Hence, based on ECM-ISC, this paper hypothesizes:

H5. Users' IT self-efficacy is positively related to their LBS continuance intention.

1.2.2 Perceived Value

Perceived value is the consumers' overall assessment of the utility of a product based on perceptions of what is received and what is given. Though what is received varies across consumers and what is given varies, value represents a tradeoff of the salient give and get components (Zeithaml, 1988). Users balance perceived

benefits and costs to evaluate value from LBS usage. The greater the value is, the higher the perceived performance is. Higher performance leads to greater confirmation which in turn positively influence customer satisfaction. Hence:

H6. Users' perceived value of LBS use is positively related to their extent of confirmation.

H7. Users' perceived value of LBS use is positively related to their satisfaction.

2. RESEARCH METHODOLOGY

2.1 Questionnaire Design

Each construct was measured using multiple-item scales. And each item was measured on a seven-point Likert scale anchored between "strongly disagree" to "strongly agree." The questionnaire also collected the basic data of the respondents including gender, age, education, monthly income and the most commonly used LBS application types. Through a large number of relevant literatures review and mature questionnaires analysis, the initial measurement items were determined. According to LBS users' valuable opinions from small-scale interviews, this paper modified the initial measurement items.

2.2 Data Collection

At present, the main consumer groups for LBS are young users. Shanghai, as China's economic and financial center, can accept mobile business easily. Therefore, respondents in this survey were young people who study or work in Shanghai. The questionnaires were distributed through sojump.com which is a famous online survey website in China and offline. The necessary condition of effective samples were that users had related experiences about LBS usage. Finally, through strict selections, 223 valid questionnaires were collected.

3. DATA ANALYSIS AND RESULTS

3.1 Descriptive Statistics

Respondents in this research were mainly young people. The male and female percentages were 40% and 60% respectively. People between 18 and 30 years old accounted for 87%. China Internet Network Information Center report showed that young people between 19 and 29 were the main consumers of mobile commerce. It is concluded that the survey data were representative. More than half of the respondents usually made use of route navigation and life services when it came to LBS applications.

3.2 Reliability Analysis

Reliability analysis is used to measure the consistency or stability of the results. Cronbach's α is generally used to assess the reliability. The larger the value of Cronbach's α is, the more reliable the result is. It indicates a reliable result when Cronbach's α of the total scale is more than 0.8. If Cronbach's α of the subscale is more than 0.7, it is more reliable. Nevertheless, if it is 0.6-0.7, it is also accepted. This study also used Corrected Item-Total Correction (CITC) index to purify the measurement items. This index can evaluate whether a certain item is consistent with the construct related. Selecting items is assessed using two criteria suggested by:

- (a) CITC of the item is less than 0.3.
- (b) After deleting the item, Cronbach's α value of the construct related will rise.

Calculating Cronbach's α and CITC using SPSS20.0. The CITC value of CI3 was less than 0.3. Maybe because CI3 was a reverse item. There is a reverse-item bias in the process of measuring the construct (Weijters, Geuens & Schillewaert, 2009). Especially in Chinese context, this bias is particularly evident. (Wong, Rindfleisch & Burroughs, 2003). Deleting CI3, the reliability of the total scale was 0.95 which meant a high reliability. The Cronbach's α of every construct is provided in Table 2.

Table 4
Exploratory Factor Analysis

Construct	Item	Rotated component matrix		Component score coefficient matrix	
		Component		Component	
		1	2	1	2
CF	CF1	0.918		0.289	
	CF2	0.883		0.304	
	CF3	0.875		0.292	
	CF4	0.798		0.264	
Total variance explained		75.624			
PU	PU1	0.903		0.282	
	PU2	0.885		0.290	
	PU3	0.859		0.296	
	PU4	0.844		0.277	
Total variance explained		76.202			

Table 2
Cronbach's α of Every Construct

Construct	Number of Items	Cronbach's α
PU	4	0.90
CF	4	0.89
PV	3	0.85
ST	4	0.90
SE	4	0.88
CI	2	0.60

The reliability of five constructs in this study were more than 0.8 except continuance intention, which elucidated a trusted result and a good consistency. Then the validity analysis can be made in the next step.

3.3 Validity Analysis

Construct validity of the measurement scales was assessed using an exploratory factor analysis (EFA). EFA is a technique within factor analysis whose overarching goal is to identify the underlying relationships between measured constructs. First, the model was examined using KMO and Bartlett's test of sphericity. If the KMO value is between 0.5 and 1, it indicates strong correlation among items. Then it is suitable for factor analysis. Hence, the data were suitable for factor analysis (KMO>0.5; P<0.001), as shown in Table 3.

Table 3
KMO and Bartlett's Test

Construct	KMO	Bartlett		
		Approx. Chi-Square	df	Sig.
CF	0.816	543.585	6	0.000
PU	0.798	543.893	6	0.000
ST	0.814	564.954	6	0.000
SE	0.824	458.107	6	0.000
PV	0.712	317.907	3	0.000
CI	0.500	44.251	1	0.000

Extraction method was principal component analysis. And rotation method was varimax with Kaiser Normalization. Results of this analysis are provided in Table 4.

To be continued

Continued

Construct	Item	Rotated component matrix		Component score coefficient matrix	
		Component		Component	
		1	2	1	2
ST	ST1	0.913		0.283	
	ST2	0.890		0.297	
	ST3	0.871		0.289	
	ST4	0.832		0.271	
Total variance explained		76.900			
SE	SE1	0.810	0.375	0.665	-0.282
	SE2	0.853	0.332	0.763	-0.385
	SE3	0.521	0.736	-0.064	0.505
	SE4	0.310	0.907	-0.503	0.951
Total variance explained		43.760	84.160		
PV	PV1	0.906		0.358	
	PV2	0.902		0.386	
	PV3	0.838		0.388	
Total variance explained		77.888			
CI	CI1	0.976	0.218	1.079	-0.242
	CI2	0.218	0.976	-0.242	1.079
Total variance explained		50.000	100.000		

According to the analysis, confirmation, post-usage usefulness, satisfaction and perceived value extracted a factor respectively. And cumulative variance explained was more than 50% which was the qualified requirement in the literature (Nunnally & Berstein, 1994). IT self-efficacy extracted two factors. Every component score is calculated based on component score coefficient functions. The component scores of confirmation, post-usage usefulness, satisfaction and perceived value were considered as their values respectively. The values of IT self-efficacy and continuance intention were calculated based on their two components' weights respectively.

3.4 Regression Analysis

3.4.1 Simple Regression Analysis

The next step in the data analysis was to test Hypothesis

H1-H7 using simple linear regression, as shown in Table 5. All of seven hypothesized associations in the model were significant at $p < 0.001$. Independent variable had a positive and significant effect on dependent variable in every hypothesized association, supporting Hypothesis H1-H7. The regression equations are as follows:

$$PU = 1.878 + 0.735 CF$$

$$ST = 1.838 + 0.685 CF$$

$$CI = 2.012 + 0.411 ST$$

$$CI = 1.963 + 0.397 PU$$

$$CI = 2.46 + 0.426 SE$$

$$CF = 2.543 + 0.594 PV$$

$$ST = 2.598 + 0.588 PV$$

Table 5
Simple Regression Analysis

Dependent variables	Independent variables	R square	F	t	Constant coefficients	Independent variable coefficients
CF	PU	0.592	320.671 ***	17.907 ***	1.878	0.735
CF	ST	0.539	258.330 ***	16.073 ***	1.838	0.685
ST	CI	0.257	76.457 ***	8.744 ***	2.012	0.411
PU	CI	0.251	74.078 ***	8.607 ***	1.963	0.397
SE	CI	0.229	65.524 ***	8.095 ***	2.460	0.426
PV	CF	0.382	136.846 ***	11.698 ***	2.543	0.594
PV	ST	0.429	165.757 ***	12.875 ***	2.598	0.588

Note. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

3.4.2 Multiple Regression Analysis

(a) A regression model relates satisfaction to a function of confirmation and perceived value (see Tables 6 and 7).

**Table 6
 Model Summary^b**

R	R square	Adjusted R square	Std. error of the estimate	Durbin-Watson	F	Sig.
0.777 ^a	0.604	0.601	0.696	1.873	167.882	0.000

Note. ^aPredictors: (Constant), Confirmation, Perceived Value.

^bDependent Variable: Satisfaction.

The overall linear significance level of this regression model is high (P<0.001). Further, serial correlation was examined using Durbin-Watson (D.W.)

test (D.W.=1.873, n=223, k=3, dL=1.738, dU=1.799). There was no serial correlation in this model (dU<D.W.<4-dU).

**Table 7
 Coefficients^a**

Construct	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
	B	Std. error	Beta			Tolerance	VIF
(Constant)	1.332	0.248		5.362	0.000		
CF	0.498	0.050	0.533	9.878	0.000	0.618	1.619
PV	0.292	0.048	0.325	6.020	0.000	0.618	1.619

Note. ^aDependent Variable: Satisfaction.

In general, if VIF (Variance Inflation Factor) value was between 0 and 10, there was no multicollinearity in the model (VIF=1.619). Further, heteroscedasticity was examined using White test with EVIEWS 3.1. (see Table 8)

The goodness-of-fit rised significantly (Adjusted R²=0.999). Confirmation and perceived value had a positive and significant effect on satisfaction (P<0.001). The regression equation is as follows:

$$ST = 1.279 + 0.295 PV + 0.504 CF$$

**Table 8
 White Test**

	Value	Sig.
F	7.182	0.000
nR ²	31.664	0.000

There was a heteroscedasticity in this model (P<0.001). Then, this model was modified using Weighted Least Squares (WLS). The results are provided in Tables 9 and 10 (w=1/|resid|).

(b) A regression model relates continuance intention to a function of post-usage usefulness, satisfaction and IT self-efficacy (see Tables 11 and 12).

**Table 9
 Model Summary^b (WLS)**

R	Adjusted R square	Std. error of the estimate	Durbin-Watson	F	Sig.
0.999 ^a	0.999	0.155	2.056	5044.126	0.000

Note. ^aPredictors: (Constant), Confirmation, Perceived Value.

^bDependent Variable: Satisfaction.

**Table 11
 Model Summary^b**

R	R square	Adjusted R square	Std. error of the estimate	Durbin-Watson	F	Sig.
0.601 ^a	0.361	0.352	0.718	1.929	41.223	0.000

Note. ^aPredictors: (Constant), Post-usage usefulness, Satisfaction, IT self-efficacy. ^bDependent Variable: Continuance intention.

**Table 10
 Coefficients^a (WLS)**

Construct	Coefficients	Std. error	t	Sig.
(Constant)	1.279	0.056	22.744	0.000
PV	0.295	0.006	47.993	0.000
CF	0.504	0.012	41.002	0.000

Note. ^aDependent Variable: Satisfaction.

The overall linear significance level of this regression model is high (P<0.001). Further, serial correlation was examined using D.W. test (D.W.=1.929, n=223, k=4, dL=1.728, dU=1.809). There was no serial correlation in this model (dU<D.W.<4-dU).

**Table 12
 Coefficients^a**

Construct	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
	B	Std. error	Beta			Tolerance	VIF
(Constant)	1.113	0.301		3.702	0.000		
PU	0.183	0.062	0.231	2.967	0.003	0.482	2.077
ST	0.172	0.064	0.213	2.680	0.008	0.462	2.164
SE	0.255	0.054	0.287	4.691	0.000	0.780	1.282

Note. ^aDependent Variable: Continuance intention.

There was no multicollinearity in this model ($0 < \text{VIF} < 10$). Further, heteroscedasticity was examined using White test with EVIEWS 3.1 (see Table 13).

Table 13
White Test

	Value	Sig.
F	8.109	0.000
nR ²	56.911	0.000

There was a heteroscedasticity in this model ($P < 0.001$). Then, this model was modified using WLS ($w = 1/|\text{resid}|$). The results are provided in Tables 14 and 15.

Table 14
Model Summary^b (WLS)

R square	Adjusted R square	Std. error of the estimate	Durbin-Watson	F	Sig.
0.999 ^a	0.999	0.087	1.969	17011.4	0.000

Note. ^aPredictors: (Constant), Post-usage usefulness, Satisfaction, IT self-efficacy.

^bDependent Variable: Continuance intention.

Table 15
Coefficients^a (WLS)

Construct	Coefficients	Std. error	t	Sig.
(Constant)	1.078	0.021	50.659	0.000
PU	0.166	0.005	31.956	0.000
ST	0.257	0.007	37.411	0.000
SE	0.193	0.011	18.029	0.000

Note. ^aDependent Variable: Continuance intention.

The goodness-of-fit increased significantly (Adjusted $R^2 = 0.999$). Post-usage usefulness, satisfaction and IT self-efficacy had a significant and positive effect on continuance intention ($P < 0.001$). The regression equation is as follows:

$$CI = 1.078 + 0.257 ST + 0.193 SE + 0.166 PU$$

4. DISCUSSION AND SUGGESTIONS

4.1 Discussion of Results

Based on the above analyses, all of seven hypothesized associations in the model were significant. In this paper, we have the following conclusions:

(a) Post-usage usefulness, satisfaction and IT self-efficacy have a significant and positive effect on continuance intention.

(b) Users' extent of confirmation is the strongest predictor of satisfaction, followed by perceived value as a significant but weaker predictor.

(c) Users' extent of confirmation is positively associated with their post-usage usefulness of LBS use.

(d) Users' perceived value of LBS use is positively related to their extent of confirmation.

4.2 Suggestions

Based on the results in this paper, LBS application service

providers should pay more attention to several factors affecting users' continuance intention including post-usage usefulness, confirmation, satisfaction, perceived value and IT self-efficacy. Specifically, they should improve users' productivity, performance and effectiveness beyond users' expectation when using LBS. They ought to promote users' experience and satisfaction in order to increase customer retention rate and customer loyalty. In addition, they are supposed to try their best to improve users' confidence in their abilities to use LBS. It will be better if providers reduce users' perceived costs and increase users' perceived benefits. Through the above means, LBS users' continuance intention can be improved, which will convert into continuance behavior.

CONCLUSION

This paper theorized a model of LBS continuance intention by adding perceived value into EECM-ISC. The results indicate that users' LBS continuance intention is determined by their satisfaction, IT self-efficacy and post-usage usefulness. Users' level of satisfaction with LBS use is influenced primarily by their extent of confirmation and secondarily by perceived value. Users' extent of confirmation is positively associated with their post-usage usefulness of LBS use. Further, users' perceived value has a significant influence on their extent of confirmation. However, this paper did not study users' continuance behavior, the further study can be made to modify and improve this model.

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