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Continuous Usage Intention of Location-based Services (LBS) Technology Among Smartphone Users in Malaysia

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ABSTRACT

Mobile phone utilisation is changing from basic communication features and location-based services (LBS) has become an important feature. In developing countries such as Malaysia, the development and implementation of LBS can be important for the public since an LBS does not only boost individual decision making, but also supports the business functionality depending on its operation policy. We conducted a research to investigate users' expectation and intention to use the LBS. Developing the work based on Unified Theory of Acceptance and Use of Technology (UTAUT). The findings show the roles of effort expectancy and social influence in predicting the intention to use of LBS.

Keywords: Information system use, intention, location-based service acceptance, location-based services

INTRODUCTION

Mobile phones are no longer used only for the purpose of making e voice calls and sending messages. Remarkably, through an unprecedented revolution and innovation in technology, mobile phones have become pocket-sized computers and entertainment devices. Called smartphones come with powerful hardware and software, and thereby expand the opportunity of mobile service providers to release variation of services, such as mobile instant messaging (IM), mobile games, mobile payment, and LBS.

As an emerging service, LBS is called the killer application and its usage has received attention from researchers studying user behaviour of services and technologies (Junglas & Watson, 2008). According to Zhou (2013), LBS can show optimal and

customized information and services to users based on their current location. By sharing information, regardless of their locations, Chang and Chen (2014) have discovered that most users reveal their location. . The most imperative advantage of LBS is the capability to track a person's location at anytime and anywhere, however, this location information also generates a risk for the individual's privacy (Junglas, Johnson, & Spitzmüller, 2008). Both the development of the LBS market and advances in LBS innovation have raised privacy concerns because of the potential misuse of users' location information (Junglas & Watson, 2008). We aimed to examine what factors influence users' intention to continuously use the LBS in the Malaysian setting.

Location-based Services (LBS)

According to Perusco and Michael (2005), LBS can be defined as services that use the current location information of a mobile user to offer individualized services. These personalized services can give a new experience to users, the most is locatability. Locatability is the ability of mobile servers to learn the current physical position of wireless devices which will be the principal enabler of an appealing mobile business operation (Junglas & Watson, 2008). By using LBS, users must agree to reveal their current locations to the service provider, thus risking their privacy. The LBS will request the users' locations, and this information is sent to a Third Service Provider (TSP), following which the latter will respond with the information needed by the users, be it to locate Places of Interests (PoI), petrol station, banks, shopping malls, hospitals, and navigation services.

A drawback of this technology is the potential abuse of location information and data stored in the devices such as emails, texts, or photos could be misused for theft, for example bank cards and credit card numbers, stalking, hackers, blackmail and other abuse (Junglas & Watson, 2008).

Unified Theory of Acceptance Use of Technology (UTAUT)

Zhou (2013) stated to understand usage behaviour mobile service providers need to know the factors affecting user acceptance of a particular technology. UTAUT constructs can be applied to understand the acceptance of individuals who adopt LBS (Venkatesh et al., 2003). The purpose of this research is to determine the relationship between UTAUT constructs and continuous usage of LBS. The four key constructs which determine technology usage intention and behaviour are: performance expectancy, effort expectancy, social influence, and facilitating conditions according to UTAUT (Venkatesh, Morris, Davis & David, 2003).

However, the facilitating conditions construct is excluded from the analysis in this research because the concern is more on the personal influences rather than organizational influences. According to Yun, Han and Lee, (2013), UTAUT provides a strong theoretical foundation which is also supported with empirical evidence.

Performance expectancy. Performance expectancy in this study is defined in terms of usage of LBS technology to enhance task performance (Venkatesh et al., 2003). Hence, when using LBS an individual would reduce his or her time and effort required to search needed information or services. Moreover, according to Davis (1989) individuals believe when using this system job performance will improve. According to Junglas and Watson (2006) performance expectancy assumes the capability of LBS to correctly stipulate the intended services. Following from the above the hypothesis was developed:

H$_1$: There is a significant relationship between performance expectancy and continuous usage intention of LBS

Effort expectancy. Effort expectancy refers to the level of simplicity associated with a particular system (Venkatesh et al. 2003), and which in the case of LBS refers to the effort needed to operate LBS. If the procedure of LBS subscription encompasses many steps or uninteresting documentation such as registration, reading the privacy policy and service terms and conditions, then the more effort may inhibit a user to subscribe for such services. The greater the effort required to adopt a system can affect its adoptability. Based on this, we developed the following hypothesis:

H$_2$: There is a significant relationship between effort expectancy and continuous usage intention of LBS

Social influence. Social influence can be defined as a measure by which a user perceives that others believe he or she should use a particular system (Venkatesh et al. 2003). According to Venkatesh et al (2003), the social influence affects user actions through acceptance, internalization and identification.

Furthermore, subjective norms significantly influence distinguished usefulness via both internalization and identification. The former incorporated social influences into users' own usefulness perceptions and the latter, in which user uses a system to pick up status and influence within the work group and thus increase their job performance (Venkatesh & Davis, 2000). Thus, the following hypothesis was constructed:

H$_3$: There is a significant relationship between social influence and continuous usage intention of LBS

Continuous Usage Intention

Continuous usage intention can be defined as the degree to which LBS is planned for future use (Baek, Park, & Lee, 2011) which is measured by UTAUT constructs. A similar study by Zhou (2011) which utilised the UTAUT to examine the variables influencing the mobile Internet continuation in China concluded that performance expectancy had the most important effect on continuous usage as compared to the other UTAUT constructs.

RESEARCH FRAMEWORK

Figure 1 represents a relationship between the constructs of UTAUT and continuous usage intention of LBS. The independent variables of this study are the constructs of UTAUT which consist of performance expectancy, effort expectancy and social influence. The dependent variable of this study is continuous usage intention.
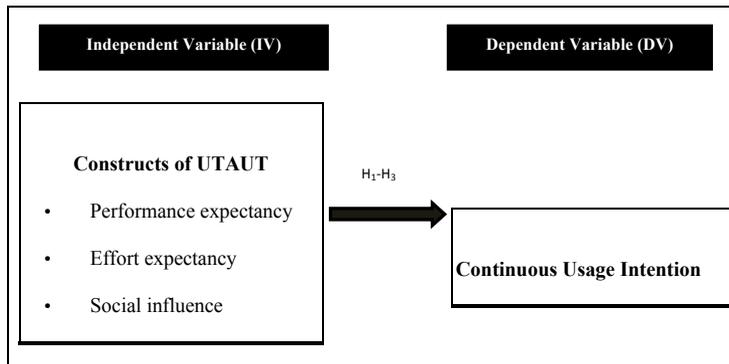

Figure 1. . Research Framework on the perspective of Unified Theory of Acceptance and Use of Technology (UTAUT) and continuous usage intention of Location Based Services (LBS) (Adapted from: Venkatesh, 2003)

RESEARCH METHODS

The research framework in Figure 1 was designed to verify the relationship between UTAUT constructs of performance expectancy, effort expectancy and social influence with continuous usage intention of LBS. The framework was tested by using non-experimental research which is the correlational method.

Instruments

A questionnaire in two languages: English and Bahasa Melayu was designed. The questionnaire was divided into three sections. Section A consists of respondent's demographic profiles, which include respondent gender, respondent age, type of smartphone uses and the main purpose of using LBS. Section B assesses respondent perceptions of the indicated independent variables, while Section C on the perceptions of intention to use LBS. The items were used to measure independent variables and dependent variable were adopted from Venkatesh et al., (2003).

Data Collection

The respondents in this study were employees working at one of the government institutions with a total of 69 respondents as shown in Table 1.

Table 1
Demographic profiles

Demographics	n = 69	
	Frequency	Percentage (%)
Gender		
Male	14	20.30
Female	55	79.70
Age		
<= 20 years	4	5.80
> 20 years	65	94.20
Smartphone		
IOS (Iphone)	31	44.90
Android (Samsung, Sony, Lenovo, etc)	37	53.60
Others	1	1.4
Reasons of using LBS		
Information Search/ Directory Services	41	59.40
Location-Based Social Network	7	10.10
Emergency Services	5	7.20
Tracking & Navigation Services	16	23.20

RESULTS AND DISCUSSION

Data from the survey was analysed by structural equation modelling using the AMOS (Analysis of Moment Structures) software.

Assessing Validity and Reliability

A test on normality distribution yielded the items' coefficients were within the ±2.00 skewness and/or kurtosis range which indicated for an assumption of normality. In order to assess for the instrument validity, two methods were performed. First, a principal component analysis as a procedure of exploratory factor analysis was conducted. The principal axis factoring and Varimax with Kaiser Normalization rotation was used. The results produced a total variance of 78.602%. In addition, the KMO result of 0.885 indicated factor analysis was appropriate. As the MSA>0.5, it was suggested all variables should be included in the factor analysis. As suggested by Beavers, Lounsbury and Richards, (2013), only items with a loading of .40 or greater were considered.

Further analyses on the instrument validity were performed to assess the convergent validity, composite reliability and discriminant validity. The instrument was also checked for its reliability. The Cronbach's alpha scores indicated that the questionnaire was reliable (Hair et al., 2010). Thus, the data can be used for further analyses. Table 2 shows the results of the factor loadings, composite reliability, average variance extracted (AVE) to assess the convergent validity and the descriptive results.

All item loadings surpassed the required cut-off level of 0.60 as suggested by Bagozzi and Yi (1988). The composite reliability values exceeded 0.70 as recommended by Hair et al. (2006) and the AVEs were above 0.50 as suggested by Fornell and Larcker (1981).

Confirmatory Factor Analysis (CFA)

The discriminant validity was tested by comparing the constructs' correlations and the square root of the average variance extracted. The results shown in Table 3 indicate for an adequate convergent and

Table 2
Factor loadings, reliability and descriptive results

	Item Loadings	Mean	SD	α	AVE	CR
Performance Expectancy				.866	0.623	0.868
Increases life productivity	.710	3.8116	.69187			
Increases work productivity	.896	3.7681	.78861			
Improves life efficiency	.769	3.7826	.72497			
Improves work efficiency	.770	3.6377	.74697			
Effort Expectancy				.901	0.697	0.902
Learning is easy	.887	3.9130	.70166			
Skill is easy	.819	3.8261	.80360			
Easy to use	.820	3.8406	.81571			
An easy task	.811	3.7826	.70439			
Social Influence				.873	.635	.874
People who are important to me think I should use	.702	3.4493	.91613			
People around me help me to use						
Family supports to use	.825	3.6232	.84194			
Friends support to use	.806	3.5217	.77855			
Continuous Usage Intention	.847	3.5942	.86294	.926	.810	.927
Will be using LBS regularly	.870	3.7681	.79748			
Intend to use LBS continuously	.918	3.8406	.87691			
Will continue using in the future	.911	3.8551	.91194			

discriminant validity as the square root of the AVE is greater than the construct's correlation coefficient. In addition, there were significant correlations between all the determinant factors and usage intention.

A Confirmatory Factor Analysis (CFA) was run using AMOS to test on the associations between all variables. The results yield a CFA model that is acceptable [χ^2/df = 1.259, CFI = 0.969, GFI = .824, TLI = 0.961 and RMSEA = 0.062]. The Bollen-Stine bootstrap p –value based on 200 resamples is 0.054, which is > 0.05.

Thus, the model "correctness" is acceptable. It indicates that there is sufficient cross validation of the model. Based on the results, all variables are significantly related to one another. The highest association is between social influence and continuance usage intention (r=.656, p < .05) followed by the association between effort expectancy and continuance usage intention (r=.569, p<.05) and performance expectancy and continuance usage intention (r=.527, p < .05). The results are shown in Table 3.

Table 3
Inter-construct correlation

	1	2	3	4
Performance Expectancy	0.789			
Effort Expectancy	0.743	0.835		
Social Influence	0.531	0.463	0.797	
Continuance Intention	0.527	0.569	0.656	0.900

The Measurement Model

Structural equation modelling analyses were run to test the hypotheses. In this procedure, all constructs were loaded simultaneously. The results of the hypothesis testing are shown in Table 4.

Table 4
Results of the hypotheses testing

Hypotheses	Relationship	Coefficient	C.R	R^2	Results
H1	PE -> CUI	0.056	0.502	0.401	Rejected
H2	EE -> CUI	0.375	3.200		Accepted
H3	SI -> CUI	0.507	4.063		Accepted

Referring to the table, all hypotheses, apart that on the relationship between performance expectancy and continuance usage intention, were accepted. Comparing effort expectancy and social influence, the latter plays the most influential role in determining continuance usage intention (β = .507, p=.000) while the former plays less role, even though it is still β = .375, p = .001. Overall, the predictors explain 40.1% of the variance in continuous usage intention.

The results from the relationship analysis between effort expectancy and continuous usage intention show that most of smartphone users have relatively high self-efficacy and therefore, using LBS does not mean a difficult task for them (Xu, Gupta, & Pan 2009). It also found that the social influence affects users' actions through acceptance, internalization and identification (Ventakesh, 2003). According to Xu, Gupta and Pan, (2009), social influence is the point at which a user perceives that peers opinion is important when considering LBS usage. However, the research found that there was no relationship between performance expectancy and continuous usage intention of LBS in terms of life and work productivity and efficiency. The result contradicts with the finding of related studies by Zhou (2011) as well as Xu et al. (2009).

CONCLUSION

In the perspective of UTAUT, the study recognized the factors affecting continuous usage intention of LBS. Nevertheless, the

predicament of these factors might also depend on determinants such as attitudes, individual cognition ability and experience which demand further exploration. Since the study only involves small samples of smartphone users, the results may be biased because most of the respondents have some experience with LBS. Future study will include other factors as moderating factors such as privacy, that might influence the continuous usage intention of LBS. The study needs to be generalized to the larger population, such as among youngsters in order to provide more insights on the usage intention.

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