



## EXPLORING USER ADOPTION OF LOCATION-BASED SOCIAL NETWORK IN INDONESIA

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**Abstract** — The main objective of this paper was to identify factors that influence the adoption of location-based social networks. The research was done quantitatively and a survey was used as the data collection method. Specifically, the statistical analysis was done using simple linear regression analysis and correlation. The research found out that there were 5 factors that influence the adoption of location-based social networks, i.e.: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Condition while Privacy Concern was only a significant factor depending on age. In addition, the strength of relationships between the variables is influenced by age and gender. It is also important to conclude that age played a significant role in determining the strength of the relationship between all of those factors while gender only played a significant role in determining the strength of social influence.

**Keywords** — Location-based Service, Location-based Social Networks, Unified Theory of Acceptance and Use of Technology

### 1. INTRODUCTION

The growth of mobile communication and information technology has changed the way people live. One of the most popular discussions amongst application developers in recent times has been the inclusion of location data in applications. Currently, it is possible to know the approximate location of the mobile device throughout the carrier network or by utilizing the global positioning system (GPS) receiver chip that is embedded in most modern smart phones. One of the most successful location-based services (LBS) in the world is Foursquare, the location-based social network that enables its users to share their location via ‘check-in’ and connect with their friends based on their respective locations. Ever since Foursquare’s inception, location-based social networking has become a trend. Facebook, the world’s largest social network also launched its location-based service in 2010 called Facebook Places.

Social networking is a major trend in Indonesia as evidenced by the fact that Indonesia is in second place in the world regarding Facebook usage with approximately 35 million users as of May 2011

[1]. Mirroring the global trend, local location-based social networks have also started to gain momentum such as in the case of Koprol, an Indonesian location-based social network. In 2010, Koprol became the first local technology start-up to be acquired by Yahoo. This shows that location-based social networking also has huge potential in Indonesia. The growth of location-based social networks in Indonesia is also further reinforced by the growing number of Indonesian mobile phone owners. Nielsen research, as quoted by the Jakarta Post [2], has shown that mobile phone penetration grew almost 300% from 2005 to 2010.

### 2. LITERATURE REVIEW

#### 2.1 Location-based Social Network

The availability of GPS for mobile devices and the huge growth of social networking sites has given birth to a myriad of location-based services and social networking sites. This proliferation necessitated a new term – location-based social networks - to describe the phenomenon. Being a relatively recent service, there are currently only a few formal definitions of location-based social



networks available. Amongst them is the definition from Turunen, Pyssysalo & Roning [3] who stated that it was “the merge of the social circle of the user with context gained from the location of the items within the service”. Location-based social networks are a subset of location-based services which combine the location property of LBS with the functionality of social networking to provide its users better networking capability with their peers. Location-based social networks can be classified as a pull-based LBS since the users of those location-based social networks share their current location with their friends when they explicitly ‘check-in’ [4]. Despite being a new service, location-based social networks have also started to be adopted in Indonesia. It is probably related to the fact that social networking sites are popular in Indonesia with the nation being the second largest user group of Facebook [5]. Amongst the most popular location-based social networks in Indonesia are Facebook Places [1], and then Koprol with 1 million predominantly Indonesian users (as of November 2010) and Foursquare with 312,000 Indonesian users (as of May 2011) [6,7].

## 2.2. The Unified Theory of Acceptance and Use of Technology

According to UTAUT, there are 4 major independent variables that determine user acceptance and use behavior of technology, which are Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. The authors of UTAUT also found out that the predictive ability of the model (coefficient of determination) increased after taking into account the moderating variables.

Performance Expectancy in the UTAUT model was defined as how individuals perceive that using the system will improve their job performance [8]. Performance Expectancy was moderated by two variables, which were Gender and Age. Based on literature, Venkatesh *et al.* [8] found that men place the accomplishment of tasks on a higher level compared to women while younger people tend to place reward on a higher tier compared to older people. Therefore, the effect of performance expectancy also depends on the gender and age of the individuals. Effort Expectancy was defined as the degree of ease of

use towards the system [8]. Effort Expectancy was also moderated by three variables, which were Gender, Age, and Experience. Social Influence is “the degree to which an individual perceives that important others believe he or she should use the system” [8]. Social Influence was moderated by four variables, which were Gender, Age, Voluntariness, and Experience. Lastly, Facilitating Conditions in the UTAUT model were defined as how individuals perceive that there is enough support to utilize the system from the existing organizational or technical infrastructure. Facilitating Conditions were moderated with two moderating variables, which were Age and Experience.

## 2.3. User Privacy Concern

With the ubiquity of the Internet, user privacy has become a major concern. Studies have found that privacy is amongst the top concerns of internet users [9,10]. User privacy concern is higher in the context of social networking sites because these sites have distinct vulnerabilities compared to other technologies. The users of those social networks voluntarily post their private information with little ability to determine to what extent their data will be used by the social network site providers [11]. Friedman *et al.*, [12] in their research regarding privacy also found out that women have more concerns regarding their privacy than men. Meanwhile, Paine *et al.*, [13] in their research - regarding internet users’ perception of privacy concern - found that older people have increased concerns regarding privacy. Hence, it can be hypothesized that gender and age will influence the relationship between privacy concern and usage behavior.

## 3. RESEARCH METHOD

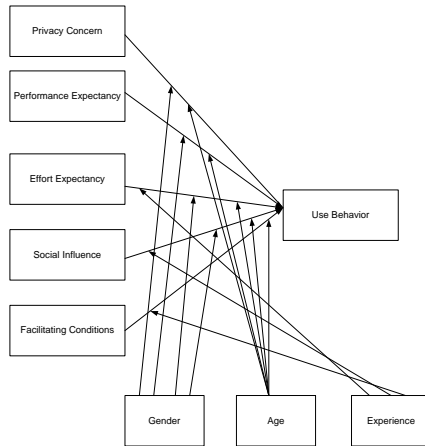


Figure 1. Theoretical Framework

In order to answer the research questions, some hypotheses are developed based on the literature review. The hypotheses are:

H1: Performance Expectancy (PE) will influence the usage of location-based social networks

H1.1: Performance Expectancy (PE), moderated by gender, will influence the usage of location-based social networks

H1.2: Performance Expectancy (PE), moderated by age, will influence the usage of location-based social networks

H2: Effort Expectancy (EE) will influence the usage of location-based social networks

H2.1: Effort Expectancy (EE), moderated by gender, will influence the usage of location-based social networks

H2.2: Effort Expectancy (EE), moderated by age, will influence the usage of location-based social networks

H2.3: Effort Expectancy (EE), moderated by experience, will influence the usage of location-based social networks

H3: Social Influence (SI) will influence the usage of location-based social networks

H3.1: Social Influence (SI), moderated by gender, will influence the usage of location-based social networks

H3.2: Social Influence (SI), moderated by age, will influence the usage of location-based social networks

H3.3: Social Influence (SI), moderated by experience, will influence the usage of location-based social networks

H4: Facilitating Conditions (FC) will influence the usage of location-based social networks

H4.1: Facilitating Conditions (FC), moderated by age, will influence the usage of location-based social networks

H4.2: Facilitating Conditions (FC), moderated by experience, will influence the usage of location-based social networks

H5: Privacy Concern (PC) will influence the usage of location-based social networks

H5.1: Privacy Concern (PC), moderated by gender, will influence the usage of location-based social networks

H5.2: Privacy Concern (PC), moderated by age, will influence the usage of location-based social networks in Indonesia

In this research, survey-based questionnaires were employed as a method of data collection. Data was collected online and by filling paper questionnaires. There were over 100 respondents and the majority of them were male (87%) and younger than 25 years old (73%). Based on their education background, most of them had a bachelor degree, and worked either as students or in companies in which they spent more than 5 hours per day on the Internet. The majority of them were users of Facebook and Foursquare.

To assess the reliability and validity, the internal consistency reliability ( $\alpha$  coefficient) of the four factors were calculated. The Cronbach's alpha all exceeded the recommended level of 0.7. To check the validity of the instrument, all corrected item total correlations were calculated and the values were all greater than 0.1. The corrected item total correlations ranged from 0.49 (an item in Social Influence) to 0.82 (items in Facilitating Conditions).

## 4. RESULT AND DISCUSSION

### 4.1 Descriptive Statistics

The sampling method that is used in this research is a non-probability sampling. Because of that, it is not possible to generalize the demographic of respondents in this research. The users of location-based social networks cannot be assessed from a statistical point of view since not all of the population were given the chance to be selected as respondents. Nevertheless, the results of these descriptive statistics provide a better



explanation about the profiles of the respondents in this research.

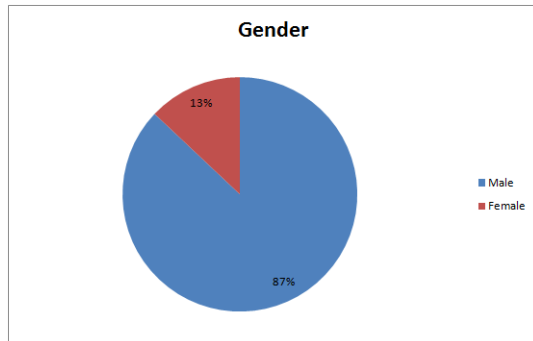


Figure 2. Respondent's Gender

As shown by the pie chart, the respondents of this research were predominantly male, accounting for 87% of the total respondents while female respondents only accounted for 13%. There is an obvious skew in gender distribution, but it does not mean that the users of location-based social networks are significantly dominated by males since this research used non-probability sampling. In addition, gender was used as a moderating variable in the inferential statistics.

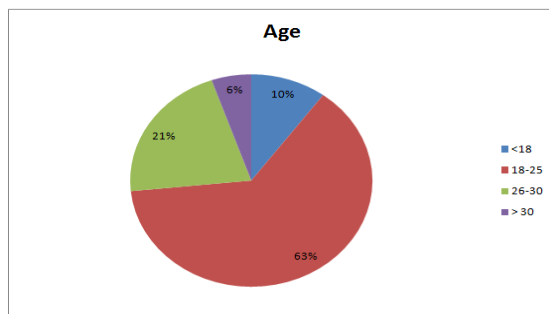


Figure 3. Respondent's Age

As for the respondents age, 63% of them were between 18 and 25 years old, followed by 21% from the age group of 26 to 30 years old.

The youngest age group and oldest age group contributed 10% and 6% respectively. Age was included in the inferential statistics as a moderating variable.

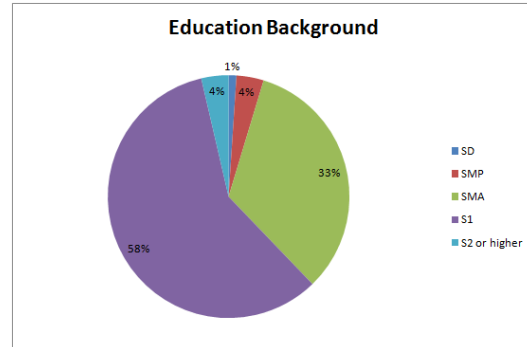


Figure 4. Respondent's Education Background

The educational backgrounds of the respondents mostly consisted of people that held a bachelor degree (58%). 33% of the respondents had a high school background. Junior high school graduates and Master's degree holders each contributed 4%.

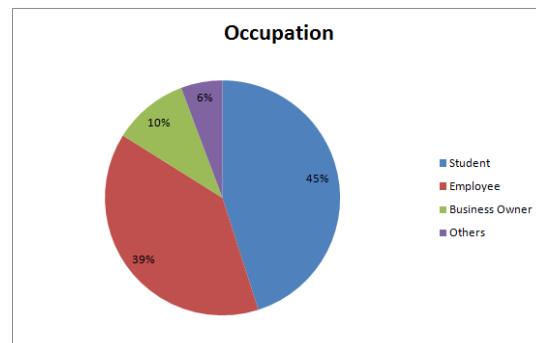


Figure 5. Respondent's Occupation

The majority of the respondent's – 45% - were students as shown in Figure 5. They were closely followed by employees - 39% - and business owners accounted for 10%. Some respondents stated 'other' without specifying their occupation.

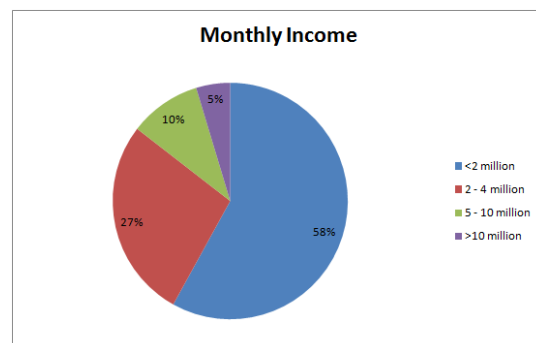


Figure 6. Respondent's Monthly Income



Regarding the monthly income of the respondents, the greatest share (58%) was people who have a monthly income of less than Rp 2 million per month (USD \$200). In second place (27%) are people who have an income of between 2 and 4 million rupiah per month (USD \$200-\$400), followed by people with a monthly income of 5 to 10 million rupiah (USD \$500-\$1,000) and more than 10 million rupiah per month (USD \$1,000).

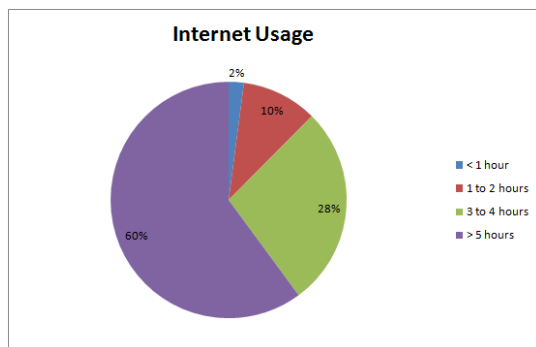


Figure 7. Respondent's Daily Internet Usage

The majority of respondents of this research were heavy internet users as shown in figure 7. 60% of the respondents accessed the Internet more than 5 hours per day. In second place (28%) were people with daily Internet usage of 3 to 4 hours followed by those with 1 to 2 hours and less than one hour. Based on these results, it can be said that most of the respondents have strong Internet usage experience.

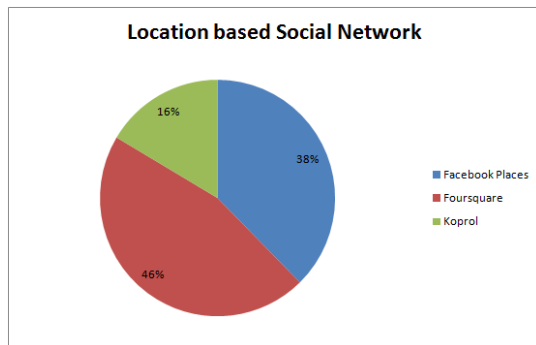


Figure 8. Location-based Social Networks Used

Foursquare was the location-based social network that was most used by the respondents (46%). Facebook Places followed closely with 38% while Koprol accounted for 16%. This figure

shows that most of the respondents preferred to use Foursquare compared with the other location-based social networks.

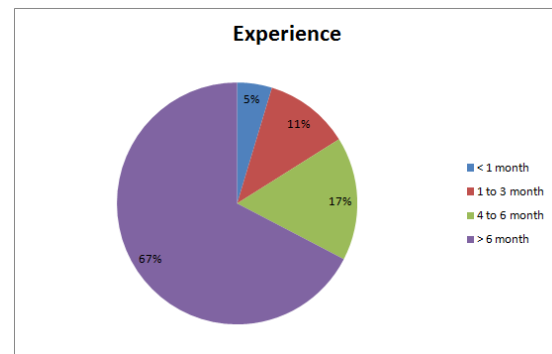


Figure 9. Respondent's Experience

Figure 9 shows the respondent's experience in using location-based social networks. Most of the respondents have a high degree of experience in using location-based social networks as evidenced by 67% having used it for more than 6 months. Some others have used it for between 4 and 6 months (17%) while the smallest proportion came from respondents that were still relative novices in the usage of location-based social networks. Experience was also used as a moderating variable in the inferential statistics.

#### 4.2 Regression Result

In order to explore the proposed relationships among the factors, we conducted a regression analysis. The results have been tabulated in Table 1. The p-value is less than 0.05, indicating strong evidence that the independent variable will influence users to adopt location-based social networks.

Based on the statistical analysis that is summarized in Table 1, it can be inferred that the Performance Expectancy of the system alongside with the Effort Expectancy, Social Influence and Facilitating Condition individually influenced the use behavior of location-based social network. Meanwhile, Privacy Concern was found not to significantly influence the usage of location-based social networks since  $p > 0.05$ . Moreover, it can also be inferred that the most determining factors of the usage of location-based social networks were Performance Expectancy, followed by Effort



Expectancy, Social Influence, and Facilitating Conditions respectively.

Performance Expectancy, as the most significant factor, means that the decision of whether to accept or reject location-based social networks is hugely dependent on how much they perceive that it will be beneficial. It can be said that people will use this kind of technology if they perceive it as useful and will reject it if it is being perceived as useless. This result is consistent with the research in the original UTAUT [8] that found that Performance Expectancy was the determinant of intention to adopt technology in most situations. Performance Expectancy as the next most determinant adoption factor is also supported by the research by Xu *et al.* [18] that found that Performance Expectancy is the most significant factor in the adoption of pull-based location-based services. This result implies that developers should try to make the location-based social network as useful as possible, by adding beneficial features, before considering other factors.

Effort expectancy as the second most determining adoption factor means that although people might perceive that using location-based social network is beneficial for them, they will not accept it if the effort required in using it is strenuous [17]. This shows the importance of the implementation of interactive design and friendly user interfaces.

With regards to social influence, it was quite unexpected that it only came in third place considering the context of social networks which emphasize the importance of other people and networks. This result might be related to the fact that location-based social networks are a relatively new innovation.

Most of its users might be categorized as early adopters or the early majority. Early adopters are the opinion leaders that try new innovations before the majority of people while the early majority has *willingness* to adopt innovation but rarely lead [19]. Based on those definitions, those kinds of users adopt new technology out of their own personal motivations and might be only moderately influenced by other people. This might explain why Social Influence significantly

affected the use of location-based social networks but only after Performance Expectancy and Effort Expectancy.

Facilitating Conditions was in last place regarding factors that significantly influenced the usage of location-based social networks. This suggests that as long as people feel that using location-based social network is beneficial, easy, and there was enough social influence, then he/she would start considering the facilitating conditions to support the usage, such as internet availability.

The insignificance of Privacy Concern is quite surprising as some studies found that privacy concern is a major issue amongst internet users [9, 10] with private data - along with location data - being available in the location-based social network. Nevertheless, this shows that users do not necessarily worry about their private data and other privacy concerns that might arise from the usage of location-based social networks. This result is similar with the results of the research conducted by Xu *et al.* [18] that suggested Privacy Concern only significantly influenced the adoption of push-based LBS and not for pull-based LBS. Their explanation regarding this result is that privacy concerns are dependent on the level of control that the user has. In the case of pull-based LBS, the users have greater control as they deliberately post their data and request the subsequent service while in push-based LBS, the user has less control, as the data is sent based on their current location without their request. This might be a plausible reason why privacy concern does not significantly influence the usage of location-based social networks.

Table 1 also shows the effect of each moderating variable towards the relationship between each construct. A moderating variable significantly influences the relationship between independent and dependent variables when it changes the state of the relationship from insignificant to significant or vice versa. Based on the table, Age significantly influenced the strength of relationship between all the models constructs, including Privacy Concern, on Use behavior while Gender only significantly influenced the strength of the relationship between Social Influence and Use behavior.



Meanwhile, no significant change in strength of relationship can be found when experience is used as a moderating variable. The age group in this research is divided into people with age < 25 and age > 25. The reason is because the prefrontal cortex, an area of brain that is related with ‘executive functions’ such as working memory, information processing, behavior, attention and judgment [14], is not fully developed until the mid-20s [15].

The moderating role of Age towards Performance Expectancy has been suggested by many previous studies, such as by Hall and Mansfield; Porter in Venkatesh *et al.* [8] Younger people tend to place reward on a higher tier compared to older people. Although it is not possible to measure which age group (younger or older) place reward on a higher tier based on the statistical analysis, that study might explain why the effect of age towards the strength of relationship between Performance Expectancy and Use is significant.

Some literature also supports the significant effect of Age towards Effort Expectancy, such as the study by Johnson, Deary, McGue & Christensen [16] that states that cognitive functions deteriorate as people age.

The significance of Age towards Social Influence simply means that people from different age groups will have different emphasis on the importance of social influence in their decision of using (or not using) location-based social networks. It has been theorized before that older

people tend to emphasize influence from other people [8]. In addition, Gender also plays a significant role in determining the strength of Social Influence, which shows significant differences between men and women regarding how they rank the influence of other people in their decision to use location-based social networks.

Age also significantly affects the strength of relationship between Facilitating Conditions and Use. This result merely shows that people from different age groups put different emphasis on the importance of having the sufficient conditions (resource or knowledge) in order to remove the barrier to use new technology. The significant effect of Age towards Privacy Concern is different from the rest of the model constructs. Before introducing Age, Privacy Concern does not have any significant effect towards use behavior. After age is introduced, Privacy Concern has a significant effect on use behavior. This shows that the users of location-based social networks have different perspectives regarding privacy concern depending on their age group. Users from one age group perceive that privacy concerns do not matter while others perceive that it does matter. Studies that support this result find that older people place more importance on privacy concerns compared with younger people [13].

Table 1. Regression Results

Hypothesis	R-sq	Adj R-sq	F	p
H1: PE to UB	0.162	0.157	36.216	< 0.05
H1.1:PE to UB moderated by Gender	0.023	0.018	4.4	< 0.05
<b>H1.2:PE to UB moderated by Age</b>	<b>0.002</b>	<b>-0.003</b>	<b>3.374</b>	<b>&gt; 0.05</b>
H2: EE to UB	0.145	0.141	31.924	< 0.05
H2.1:EE to UB moderated by Gender	0.022	0.017	4.296	< 0.05
<b>H2.2:EE to UB moderated by Age</b>	<b>0.003</b>	<b>-0.002</b>	<b>0.576</b>	<b>&gt; 0.05</b>
H2.3:EE to UB moderated by Experience	0.118	0.114	31.924	< 0.05
H3:SI to UB	0.068	0.063	13.655	< 0.05
<b>H3.1:SI to UB moderated by Gender</b>	<b>0.010</b>	<b>0.005</b>	<b>1.983</b>	<b>&gt; 0.05</b>



<b>H3.2:SI to UB moderated by Age</b>	<b>0.002</b>	<b>-0.003</b>	<b>0.343</b>	<b>&gt;0.05</b>
H3.3:SI to UB moderated by Experience	0.093	0.088	19.284	<0.05
H4:FC to UB	0.063	0.058	12.74	<0.05
<b>H4.1:FC to UB moderated by Age</b>	<b>0.000</b>	<b>-0.005</b>	<b>0.016</b>	<b>&gt;0.05</b>
H4.2:FC to UB moderated by Experience	0.092	0.087	18.955	<0.05
<b>H5: PC to UB</b>	<b>0.014</b>	<b>0.009</b>	<b>2.649</b>	<b>&gt;0.05</b>
<b>H5.1: PC to UB moderated by Gender</b>	<b>0.005</b>	<b>0.000</b>	<b>0.862</b>	<b>&gt;0.05</b>
H5.2: PC to UB moderated by Age	0.021	0.016	4.104	<0.05

**5. CONCLUSION AND FUTURE WORK**

Performance Expectancy, Effort Expectancy, Facilitating Conditions, and Social Influence significantly influence the adoption of location-based social networks. Privacy Concern only significantly influences the adoption of location-based social network in some of the age groups. It is also important to conclude that Age plays a significant role in determining the strength of the relationship between all those factors while Gender only plays a significant role in determining the strength of Social Influence.

In addition, Figure 10 will show the modified UTAUT framework that can be used to understand the adoption of location-based social networks.

In the future, it is recommended to conduct this research as a longitudinal study so that it is possible to measure the effect of intention towards actual usage that is being skipped in this research. Further research should also use probability sampling as the sampling method in the near future when the sampling frame is available. If probability sampling is used and the appropriate sampling size is used, the research result might be able to be generalized to the whole of the Indonesian population.

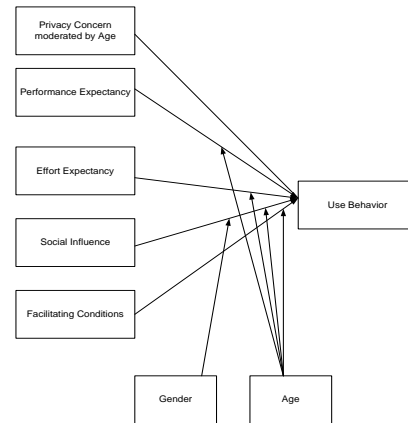


Figure 10. Modified UTAUT Framework for Adoption of Location-based Social Network

**6. ACKNOWLEDGEMENT**

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**7. REFERENCE**

- [1] S. Steiniger, M. Neun and A.Edwardes “Foundations of Location-based Services.” [Online].Available:<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.94.1844&rep=rep1&type=pdf> [Accessed Sept 19, 2011]
- [2] C. Boris. “Strong Growth Expected in Location-Based Services.” *Marketing Pilgrim*. June 29, 2011. [Online].Available:<http://www.marketingpilgrim.com/2011/06/strong-growth-expected-in-location-based-services.html>. [Accessed Sept 19, 2011]
- [3] T. Turunen, T. Pyssysalo, and J. Roning. “Mobile AR Requirements for Location-based Social Networks”. *The International*





- Journal of Virtual Reality*. Vol. 9, no. 4, p. 67-78. 2010. [Online]. Available: <http://www.ijvr.org/issues/issue4-2010/paper9.pdf> [Accessed September 27, 2011]
- [4] S. Scellato, R. Lambiotte, A. Noulas and C. Mascolo. "Socio-spatial Properties of Online Location-based Social Networks". *Association for the Advancement of Artificial Intelligence*. 2011. [Online]. Available: [www.cl.cam.ac.uk/~an346/papers/icwsm11.pdf](http://www.cl.cam.ac.uk/~an346/papers/icwsm11.pdf) [Accessed September 27, 2011]
- [5] *Facebook Users in the World*. Internet World Stats. [Online]. Available: <http://www.internetworldstats.com/facebook.htm> [Accessed Sept 26, 2011].
- [6] A. Masna. "Koprol hits one million users and is number three most active social network site in Indonesia". *e27*. November 15, 2010. [Online]. Available: <http://e27.sg/2010/11/15/koprol-hits-one-million-users-and-is-number-three-most-active-social-network-site-in-indonesia/> [Accessed September 29, 2011]
- [7] W. Wee. "Foursquare in Southeast Asia: Statistics, Culture and Marketing". May 20, 2011. [Online]. Available: <http://www.penn-olson.com/2011/05/20/foursquare-in-southeast-asia/> [Accessed September 29, 2011]
- [8] V. Venkatesh, M.G. Morris, G.B. Davis and F.D. Davis. "User Acceptance of Information Technology: Toward a Unified View". *MIS Quarterly*, vol.27, no.3, 2003 [Online]. Available: <http://search.proquest.com/docview/218137148/131E6F0F39A6CD13BE/1?accountid=31532> [Accessed Sept 20, 2011]
- [9] K.B. Sheehan. "Toward a Typology of Internet Users and Online Privacy Concerns". *The Information Society*. vol. 18, pp. 21-32, 2002. [Online]. Available: <http://web.ebscohost.com/> [Accessed on October 4, 2011]
- [10] C. Paine, U. Reips, S. Stieger, A. Joinson and T. Buchanan. "Internet users' perceptions of 'privacy concerns' and 'privacy actions'". *International Journal of Human-Computer Studies*. vol. 65, 2006, pp. 526-536. [Online]. Available: [http://people.bath.ac.uk/aj266/pubs\\_pdf/ijhcs.pdf](http://people.bath.ac.uk/aj266/pubs_pdf/ijhcs.pdf) [Accessed on October 4, 2011]
- [11] L. Qin, Y. Kim, X. Tan, and J. Hsu. "The Effects of Privacy Concern and Social Influence on User Acceptance of Online Social Networks". *AMICS 2009 Proceedings*. 2009. [Online]. Available: <http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1305&context=amcis2009> [Accessed October 4, 2011]
- [12] B. Friedman, P.H. Kahn Jr., J. Hagman and R.L. Severson. "The Watcher and the Watched: Social Judgement About Privacy in a Public Place". *Human-Computer Interaction*. Vol.21, pp. 233-274, 2006. [Online]. Available: [citeseerx.ist.psu.edu](http://citeseerx.ist.psu.edu) [Accessed October 15, 2011]
- [13] C. Paine, U. Reips, S. Stieger, A. Joinson and T. Buchanan. "Internet users' perceptions of 'privacy concerns' and 'privacy actions'". *International Journal of Human-Computer Studies*. pp.526-536, 2007. [Online]. Available: [http://people.bath.ac.uk/aj266/pubs\\_pdf/ijhcs.pdf](http://people.bath.ac.uk/aj266/pubs_pdf/ijhcs.pdf) [Accessed October 15, 2011]
- [14] A.C. Roberts. *The prefrontal cortex: Executive and cognitive functions*. United States: Oxford University Press, 1998.
- [15] D.R. Weinberger, B. Elvevag & J.N. Giedd. "The Adolescent Brain: a Work in Progress". 2005. [Online]. Available: <http://www.thenationalcampaign.org/resources/pdf/BRAIN.pdf> [Accessed December 19, 2011].
- [16] W. Johnson, I.J. Deary, M. McGue and K. Christensen. "Genetic and Environmental Links Between Cognitive and Physical Functions in Old Age". *Journal of Gerontology: Psychological Science*. Vol. 64b, no.1, 2009, pp. 65. [Online]. Available: <http://search.proquest.com/docview/210138247/fulltextPDF/133A1BFF9FF3FB80D6/2?accountid=31532> [Accessed December 12, 2011]
- [17] F.D. Davis. "Perceived usefulness, perceived ease of use, and user acceptance of information technology". *MIS Quarterly*. vol.13, no.3, 1989.
- [18] H. Xu, S. Gupta, and P. Shi. "Balancing User Privacy Concerns in the Adoption of Location-Based Services: An Empirical Analysis Across Pull-Based and Push-Based Applications". [Online]. Available:



<http://ischools.org/images/iConferences/LBS-Privacy1.pdf> [Accessed October 1, 2011]