# Continued Usage of Location-Based Services: Privacy Risk Impact on Motivation and Adoption

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## ABSTRACT

*The use of Location-based Services (LBS) has increased in recent years driven by the proliferation of mobile devices utilizing location-based technologies. However, the risk associated with the tracking, storage and the potential misuse of location information is a growing concern. In order to better understand how privacy concerns might impact continuance intention related to LBS, we propose and empirically test a model using expectation confirmation theory (ECT), motivation theory and the concept of perceived privacy risk. Results of this study indicate that perceived usefulness, perceived enjoyment and positive disconfirmation influences user satisfaction which in turn influences continuance intention. In addition, concerns over the disclosure of personal location information negatively influences both perceived usefulness and continuance intention. However, the impact of perceived privacy risk on perceived enjoyment is not significant indicating a possible difference in how hedonic and utilitarian services are viewed. This study adds to the body of knowledge by providing insight into the impact of perceived privacy risk on intrinsic and extrinsic motivation and continuance intention.*

**Keywords:** continuance intention, privacy, expectation confirmation, location-based services, extrinsic and intrinsic motivation.

## INTRODUCTION

The idea of utilizing location aware queries was originally introduced in the early 1990's as a way to provide increased value to users by facilitating searches relative to device location (Imielinski & Badrinath, 1992). Since that time Location-Based Services (LBS) have grown to be common on most mobile devices. LBS can be broadly defined as a class of software services that provide value to the user by leveraging the geographical position of a mobile device (Dhar & Varshney, 2011; I. A. Junglas & Watson, 2008; Virrantaus et al., 2001). These services leverage end-user location in order to "deliver relevant, timely, and engaging content." (Rao & Minakakis, 2003, p. 61)

LBS have been applied to a wide range of application areas. Some of these areas include: emergency services and early responders (I. A. Junglas & Watson, 2008), use and management of public transportation (Ferris, Watkins, & Borning, 2010), tracking and fleet management (Silva & Mateus, 2003), consumer marketing (Bauer, Reichardt, Barnes, & Neumann, 2005), and the creation and leveraging of dynamic ad hoc virtual networks based on proximity information. (Lu, Lin, Liang, & Shen, 2012). Some of the most common LBS in use today include:

- Social Networking - status or check in updates (e.g., Facebook, LinkedIn)
- Restaurant Locator / Reservation Service – locate restaurants and make reservations (e.g., Yelp Open Table).
- Entertainment – retrieve movie times, theater locations, and purchase tickets (e.g., Fandango, Flixter).
- Retail Advertising - advertising based on proximity to retail outlets (e.g., Bed, Bath and Beyond)
- Public Service Information - traffic and weather alerts (e.g., the Weather Channel)
- Navigation – "where am I", directions, and maps in real-time (e.g., MapQuest, Google Maps).

### *Barriers to LBS Adoption and Proliferation*

Several challenges have impacted LBS adoption and proliferation. These challenges include positioning technology and device capability (e.g., battery life), interoperability between services and providers, accuracy of location information, and privacy concerns (I. A. Junglas & Watson, 2008; Wang, Min, & Yi, 2008). In recent years privacy concerns in particular have been gaining more attention. Privacy concerns as they relate to technology in general have been referred to by some as one of the most important issues of the information age (Xu, Dinev, Smith, & Hart, 2011).

The acquisition and storage of an individual's location information gives service and application providers the data needed to track the user's current location and profile user movements, both of which give rise to the perception of risk. Further adding to this risk is the fact that many applications are capable of reporting device location passively without any interaction from the user. Many applications (e.g., FindMyPhone) can locate a target device and track its movements potentially unbeknownst to the individual in possession of the device.

The collection and storage of personal location information, raises questions with respect to both control and ownership of location information. Information passing between users and service providers will likely be transmitted across legal jurisdictions, city and state borders, and perhaps even national boundaries. This creates questions and confusion related to who has rights to the transmitted information. All of these factors raise concerns and ultimately impact the desire to use LBS.

On a given mobile device multiple LBS applications can be active at any given time operating either in the foreground or background. Each application often has its own set of preferences and privacy settings that must be configured separately thereby increasing service management complexity (Roßnagel & Zibuschka, 2011). The lack of understanding and knowledge regarding privacy setting management for each LBS application can lead to the

unintended broad disclosure of personal location information. This study explores how such privacy concerns can impact continuance intention with respect to LBS.

The remainder of this paper will begin with a review of literature related to LBS. The theoretical background used to support this study will be explained. Next, the study method and results will be presented. The paper will conclude with a discussion of findings, implications and conclusion.

## LOCATION BASED SERVICES

Much of LBS research to date has been focused on technology, adoption and system usage. Technology-centric research has explored areas such as the protection of user identities (e.g., anonymization, cloaking) (Ghinita, Kalnis, Khoshgozaran, Shahabi, & Tan, 2008; Gruteser & Grunwald, 2003; Kido, Yanagisawa, & Satoh, 2005; Kolsch, Fritsch, Kohlweiss, & Kesdogan, 2005), overcoming platform limitations (e.g., processing power, battery limitations, application design) (Kjasrgaard, 2012), and a broad range of potential application areas (Dey, Hightower, De Lara, & Davies, 2010; Fischer & Gellersen, 2010; Li & Du, 2012).

### *Technology-Centric*

A great deal of LBS research is focused on the technology underlying the services. Issues cover different areas such as overcoming device limitations, interoperability between service providers and carriers, optimization of search algorithms and cellular infrastructure (Dao, Rizos, & Wang, 2002; Sayed, Tarighat, & Khajehnouri, 2005; Tsalgatidou, Veijalainen, Markkula, Katasonov, & Hadjiefthymiades, 2003; Zheng, Xu, Lee, & Lee, 2005).

Several technical approaches have been explored that seek to protect user identity. Studies have suggested that third party intermediaries be positioned between the user and the service provider to protect user identities by anonymizing or encrypting data (Beresford & Stajano, 2004; Mokbel, Chow, & Aref, 2006). However, this approach may simply shift privacy concerns from the service provider to the intermediary (Ghinita et al., 2008).

Another solution proposed to protect user privacy involves the use of cryptographic techniques and partial keys to disassociate the user identity from LBS requests (Kolsch et al., 2005). Researchers have suggested intermixing true location information with false position data in order to mask individual user identity and location (Kido et al., 2005). Research has also been conducted on masking individual identities using proximity information of other subscribers in the same general area as well as temporal and spatial cloaking techniques (Gruteser & Grunwald, 2003; Mokbel et al., 2006).

### *LBS Adoption and Usage*

Studies related to LBS adoption and usage have covered many different domains. Junglas and Watson (2008) draw a sharp distinction between location-aware services and location-tracking services. Results of their study indicate that location-tracking capabilities are perceived as useful and easy-to-use. Participants are both excited by the technology and

concerned. They are excited by the capability of the technology, but concerned about the thought of being tracked (I. A. Junglas & Watson, 2008).

Other research has shown that in order to meet user expectations, LBS must be comprehensive, interoperable across carriers and platforms, easy to use and adaptable to the individual's life-style and desires (Kaasinen, 2003). Interestingly while this research highlights privacy and security concerns, it also indicates an apparent lack of awareness of security and privacy risks (Kaasinen, 2003).

## THEORETICAL DEVELOPMENT

In this study we focus on factors that influence individuals to either continue or discontinue LBS usage. We utilize ECT as our theoretical lens in conjunction with motivation theory. In addition, the impact of perceived privacy risk on continuance intention, perceived usefulness and perceived enjoyment are considered. Our research model is shown in figure 1.

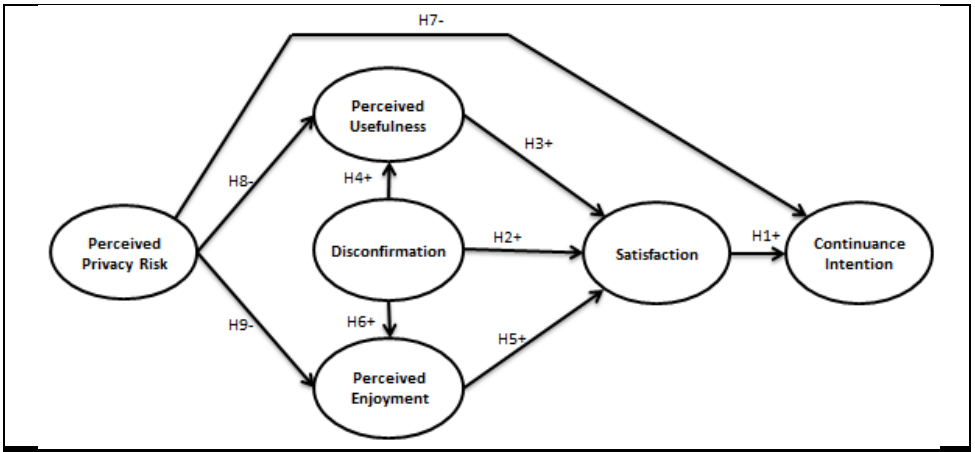


FIGURE 1: THEORETICAL MODEL

### *Continuance Intention*

When considering theoretical foundations that could be used for exploring continuance intention with respect to LBS several options were considered (Ajzen & Fishbein, 1973; Ajzen, 1991; F. D. Davis, 1989) . However, since LBS are widely used, we decided to use a variation of ECT as our theoretical lens (Oliver, 1977, 1980). ECT has been broadly used in IS studies and specifically explores how perceived performance and expectations influence user satisfaction which in turn influences continuance intention (Bhattacherjee, 2001a, 2001b; Karahanna, Straub, & Chervany, 1999; Oliver, 1977, 1980; Spreng, MacKenzie, & Olshavsky, 1996; Staples, Wong, & Seddon, 2002; Thong, Hong, & Tam, 2006).

### *Expectation Confirmation Theory*

ECT has been used to study a broad range of topics related to user satisfaction, and technology adoption and post-adoption continuance intention (Bhattacherjee, 2001a, 2001b; Karahanna et al., 1999; Oliver, 1977, 1980; Spreng et al., 1996; Staples et al., 2002; Thong et al.,

2006). It has been used to study a variety of web-based and mobile applications such as e-commerce (Bhattacherjee, 2001a), web-based services (Khalifa & Liu, 2003), mobile services (Zhou, 2011) and website usage (Lin, Wu, & Tsai, 2005).

ECT maintains that user expectations influence both satisfaction as well as the perception of performance. The perception of performance influences satisfaction and satisfaction directly influences continuance intention (Oliver, 1977; Oliver, 1980). In ECT the notion of confirmation can be viewed as a disconfirmation continuum ranging from a favorable to an unfavorable response. If the product or service exceeds expectations, then the influence is positive disconfirmation. If the product or service fails to meet expectations, then the influence is said to be negative disconfirmation (Oliver, 1977). ECT has been found to be extremely relevant when studying post-adoption usage continuance due in part to the fact that post-adoption expectation is enhanced as experience is gained through increased exposure to the product or service in question (Bhattacherjee, 2001b; Thong, Hong, & Tam, 2006). As such, using a variation of ECT to study continuance intention of LBS is appropriate. Consistent with ECT and prior research, we propose:

***H1: User Satisfaction has a positive effect on Continuance Intention.***
***H2: Positive Disconfirmation has a positive effect on User Satisfaction***

### *Extrinsic and Intrinsic Motivations*

Motivation is the force that drives an individual to do something. Motivation can vary both by degree or level and orientation (Ryan & Deci, 2000). Extrinsic motivation involves an individual being moved to do something because of some inseparable outcome or reward that is anticipated from the action. Intrinsic motivation involves the individual moved to do something without the influence of any inseparable outcome. They are moved to action based on the enjoyment or interesting nature of the activity itself (Deci & Ryan, 1985; Ryan & Deci, 2000). No outcome or reward other than the intrinsic enjoyment gained from the action is expected.

Extrinsic motivation can be viewed as being compelled to action, perhaps reluctantly, or as a self-adopted action driven by desire (Ryan & Deci, 2000). For the purpose of this study, we view extrinsic motivation as volitional action motivated by anticipation of some inseparable gain, outcome or reward.

Intrinsic motivation has been viewed in terms of the nature of the task or as the psychological satisfaction gained by the individual (Ryan & Deci, 2000). These two viewpoints were derived from operant theory (Skinner, 1953) and learning theory (Hull, 1943) respectively. For the purpose of this study and consistent with much of the IS literature, we view intrinsic motivation in terms of the psychological satisfaction or enjoyment derived from the act.

In IS research the aspects of extrinsic and intrinsic motivation have been explored in the context of hedonic and utilitarian aspects of technology (Hardin, 2010; Lin et al., 2005; Sledgianowski & Kulviwat, 2009; Van der Heijden, 2004; Wakefield & Whitten, 2006). When considering the breadth of LBS currently available it is clear that there are both hedonic and utilitarian aspects to these services. A service that utilizes the GPS capability of a device in

order to provide directions can clearly be considered utilitarian in nature whereas a social network check-in may be considered more hedonic.

Consistent with past research based on ECT, perceived performance found in the original ECT model (Oliver, 1977) has been expanded and replaced in order to capture both extrinsic and intrinsic motivations. Perceived usefulness, consistent with past ECT research (Bhattacherjee, 2001b; F. D. Davis, Bagozzi, & Warshaw, 1989; Sledgianowski & Kulviwat, 2009), is added to capture extrinsic motivation and is defined as the degree to which an individual believes that LBS will enhance their ability to perform a given task (F. D. Davis, 1989). Therefore, consistent with prior studies we propose the following:

***H3: Perceived Usefulness has a positive effect on User Satisfaction.***
***H4: Positive Disconfirmation has a positive effect on Perceived Usefulness.***

Also, consistent with previous studies on hedonic technologies and intrinsic motivation (Hardin, 2010; Sledgianowski & Kulviwat, 2009; Wakefield & Whitten, 2006), perceived enjoyment is added to capture the concept of intrinsic motivation and is defined as the perceived pleasure gained through the use of LBS (Van der Heijden, 2004). We propose the following:

***H5: Perceived Enjoyment has a positive effect on User Satisfaction.***
***H6: Positive Disconfirmation has a positive effect on Perceived Enjoyment.***

### *Perceived Privacy Risk*

Information privacy refers to the ability of the individual to control their personal information (Westin, 1967). It has been viewed as both a social and behavioral issue (Laufer & Wolfe, 1977). Several studies explore the concept of control and the subsequent impact of a perceived lack of control (Goodwin, 1991; Laufer, Proshansky, & Wolfe, 1973; Stone, Gueutal, Gardner, & McClure, 1983). Laufer et al (1973) consider how as perceived control over information increases, the concern about privacy decreases. While Stone et al (1983) show that decreases in perceived control leads to increases in privacy concerns.

As location-based technology becomes more ubiquitous it brings the promise of delivering significant benefit to the individual. While most would agree that the extremes of full and open disclosure to all and absolute privacy are impractical or perhaps impossible, individuals must somehow choose how to balance privacy concerns with potential benefits (Chellappa & Shivendu, 2007; Dinev & Hart, 2006; I. A. Junglas & Watson, 2008; Laufer & Wolfe, 1977). Technologies such as LBS are capable of delivering a wide range of useful context-aware information by constantly monitoring an individual's location and surroundings. This real-time context-aware capability can be viewed as both highly beneficial and somewhat frightening (G. B. Davis, 2002; Jessup & Robey, 2002; I. a Junglas, Johnson, & Spitzmüller, 2008; I. A. Junglas & Watson, 2008; Sheng, Nah, & Siau, 2008). Research in areas ranging from disclosure of health information (Angst & Agarwal, 2009; Bansal, Zahedi, & Gefen, 2010) to participation in e-commerce (Awad & Krishnan, 2006; Culnan, 1993; Malhotra, Kim, & Agarwal, 2004) has shown that privacy concerns can act as a barrier to technology adoption.

Cunningham (1967) proposed dimensions of perceived risk and maintained that perceived risk could be thought of in terms of performance and psychological characteristics. Performance risk in in this context can be thought of as the possibility that unintended use or disclosure of information may have a negative impact on performance. A performance impact will negatively impact the extrinsic motivation to use the technology by reducing the anticipated positive reward. The psychological risk can be thought of as a negative impact on the peace of mind and mental state. Psychological risk impacts the intrinsic motivation of using the technology by increasing internal anxiety and reducing enjoyment (Featherman & Pavlou, 2003). This conceptualization has been used by researchers studying adoption behavior in areas ranging from e-commerce (e.g., Featherman & Pavlou, 2003; Lee, 2009) to e-government (e.g., Horst, Kuttschreuter, & Gutteling, 2007). Therefore, we propose the following:

***H7: Perceived Privacy Risk negatively influences Perceived Usefulness***
***H8: Perceived Privacy Risk negatively influences Perceived Enjoyment.***

In addition, research has shown that privacy risks can negatively influence individual behavioral intention (e.g., Featherman & Pavlou, 2003; Horst et al., 2007; Lee, 2009). Therefore, consistent with prior research we propose:

***H9: Perceived Privacy Risk negatively influences Continuance Intention.***

## METHOD

Data were collected using a survey instrument administered in paper and online form to undergraduate students at a large university in the Southwestern United States. A total of two-hundred and ninety-five surveys were collected. Incomplete responses and responses from those who indicated that they did not use LBS were removed. This yielded two-hundred and twenty-seven useable responses, 77%.

Demographic information for respondents is shown in Table 1. 52.9% of respondents were male and 47.1% were female. Over 84% of the respondents in the study were between the ages of 18 and 25. Interestingly, almost 20% of the respondents responded that they had experience some type of information loss.

**TABLE 1: Demographic Information**

| Gender | | | Age | | Freq. of Weekly LBS Use | | Mobile Carrier | | Phone | | Time Owning a Smart Phone | | Victim of Info. Loss | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 120 | 52.9% | 18-21 | 137 | 0 | 0 | AT&T | 122 | Apple | 127 | 0-6 Mos | 27 | Yes | 44 |
| Female | 107 | 47.1% | 22-25 | 55 | 1 | 24 | Sprint | 37 | Samsung | 36 | 7-12 Mos | 26 | No | 183 |
| | | | 26-29 | 23 | 2 | 43 | T-Mobile | 38 | HTC | 23 | 1-2 Yrs | 50 | | |
| | | | 30-33 | 6 | 3 | 41 | Verizon | 24 | LG | 14 | 2-4 Yrs | 73 | | |
| | | | 34-37 | 2 | 4 | 27 | Other | 6 | Motorola | 8 | >4 Yrs | 51 | | |
| | | | 38-41 | 2 | 5 | 21 | | | Nokia | 3 | | | | |
| | | | 42-45 | 0 | >5 | 71 | | | RIM | 4 | | | | |
| | | | >45 | 2 | | | | | Other | 12 | | | | |

Survey development was accomplished by adapting scales from previously validated scales. Some scale questions were modified in order to better correspond to the context of the current study. All non-demographic items on the questionnaire use a six-point Likert scale.

## DATA ANALYSIS

Analysis was performed using SmartPLS (version 2.0.M3), a Partial Least Squares (PLS) analysis solution (Ringle, Wende, & Will, 2005). PLS is considered appropriate for studies early in the exploratory stage as with the current study (Ainuddin, Beamish, Hulland, & Rouse, 2007). Table 2 shows the descriptive statistics, loading factors, Cronbach's alphas, average variance extracted (AVE) and factor correlations.

Average variance explained (AVE) is used to test convergent validity. AVE greater than 0.50 indicates that the latent variable is able to explain at least 50% of indicator variance (Fornell & Larcker, 1981). In our model all AVE values are greater than 0.71, which indicates good convergent validity. Factor loadings are all above the recommended 0.7 threshold (Henseler, Ringle, & Sinkovics, 2009) with all values greater than 0.83 indicating good discriminate validity (Henseler et al., 2009). For each entry in the correlation matrix the square root of AVE, shown on the diagonal of the factor correlation matrix, is greater than the correlation value of latent variables with other latent variables (i.e., the off-diagonal values). This satisfies the Fornell-Larcker criterion and is a further indication of good discriminant validity (Fornell & Larcker, 1981).

Cronbach's alpha and composite reliability are well accepted measures of reliability. A minimum value of 0.7 for Cronbach's alpha is desired (Nunnally & Bernstein, 1994) with values less than 0.6 indicating a lack of internal validity. For this study Cronbach's alphas are all greater than 0.86 indicating satisfactory internal reliability (Henseler et al., 2009). Composite reliability values are all larger than 0.90 indicating satisfactory internal consistency (Henseler et al., 2009; Nunnally & Bernstein, 1994).

**TABLE 2: Descriptive Statistics, Factor Analysis, Cronbach's Alpha and Factor Correlation**

| Scale Item | Mean | Std. Dev | Std. Loading | Cronbach Alpha | AVE | Composite Reliability | Factor Correlations | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | USE | CFIRM | ENJ | SAT | CONT | P-RISK |
| USE1 | 5.01 | 0.90 | 0.76 | | | | | | | | | |
| USE2 | 4.39 | 1.12 | 0.88 | | | | | | | | | |
| USE3 | 4.56 | 1.09 | 0.91 | 0.92 | 0.75 | 0.94 | 0.87 | | | | | |
| USE4 | 4.67 | 1.00 | 0.90 | | | | | | | | | |
| USE5 | 4.34 | 1.19 | 0.89 | | | | | | | | | |
| CFIRM1 | 4.45 | 0.98 | 0.91 | | | | | | | | | |
| CFIRM2 | 4.30 | 0.96 | 0.91 | 0.87 | 0.80 | 0.92 | 0.55 | 0.89 | | | | |
| CFIRM3 | 4.70 | 0.82 | 0.86 | | | | | | | | | |
| ENJ1 | 4.26 | 1.04 | 0.91 | | | | | | | | | |
| ENJ2 | 4.16 | 1.15 | 0.91 | 0.94 | 0.85 | 0.96 | 0.55 | 0.65 | 0.92 | | | |
| ENJ3 | 4.09 | 1.16 | 0.95 | | | | | | | | | |
| ENJ4 | 3.90 | 1.20 | 0.91 | | | | | | | | | |
| SAT1 | 4.68 | 1.01 | 0.89 | | | | | | | | | |
| SAT2 | 4.68 | 1.00 | 0.92 | | | | | | | | | |
| SAT3 | 4.56 | 1.00 | 0.88 | 0.94 | 0.81 | 0.96 | 0.68 | 0.65 | 0.72 | 0.90 | | |
| SAT4 | 4.33 | 1.12 | 0.93 | | | | | | | | | |
| SAT5 | 4.10 | 1.21 | 0.88 | | | | | | | | | |
| CONT1 | 4.89 | 0.95 | 0.93 | | | | | | | | | |
| CONT2 | 4.98 | 1.02 | 0.86 | | | | | | | | | |
| CONT3 | 4.85 | 1.01 | 0.97 | 0.96 | 0.87 | 0.97 | 0.66 | 0.60 | 0.59 | 0.77 | 0.93 | |
| CONT4 | 4.91 | 0.96 | 0.96 | | | | | | | | | |
| CONT5 | 4.82 | 1.03 | 0.94 | | | | | | | | | |
| P-RISK1 | 4.01 | 1.25 | 0.86 | | | | | | | | | |
| P-RISK2 | 3.55 | 1.30 | 0.80 | 0.87 | 0.72 | 0.91 | -0.32 | -0.21 | -0.16 | -0.32 | -0.31 | 0.85 |
| P-RISK3 | 4.28 | 1.27 | 0.89 | | | | | | | | | |
| P-RISK4 | 4.31 | 1.35 | 0.83 | | | | | | | | | |

Notes: All off-diagonal correlations are significant at the 0.001 level (2-tailed).
Square root of AVE is shown on the diagonal of the factor correlations.

Several techniques were used to address common method bias. First, standard statistical techniques such as Harman's one-factor test were used. Marker variables were also include along with the creation of psychological separation through the use of context shifts in the questionnaire (Craighead, Ketchen, Dunn, & Hult, 2011). . Utilizing Harman's one-factor test we checked for the presence of common method bias (Harman, 1976). According to Podsakoff et al (2003), if common method bias is present, either a single factor will emerge from the factor analysis or one general factor will account for the majority of the covariance among the variables. The analysis did not indicate the emergence of a single factor nor did any one factor account for more than 50% of the covariance among the factors. Therefore, common method bias is not an issue.

### *Structural Assessment*

The structural model is shown in figure 2. According to the data analysis perceived usefulness, positive disconfirmation and perceived enjoyment account for 66.2% of the total variance ($R^2$=0.662) associated with satisfaction. The negative impact of perceived privacy risk together with perceived satisfaction account for 59.9% of the variance ($R^2$=0.599) association with continuance intention. Positive disconfirmation and perceived privacy risk account for 34.7% of the variance ($R^2$=0.347) in perceived usefulness and 41.7% of the variance ($R^2$=.0417) in perceived enjoyment.

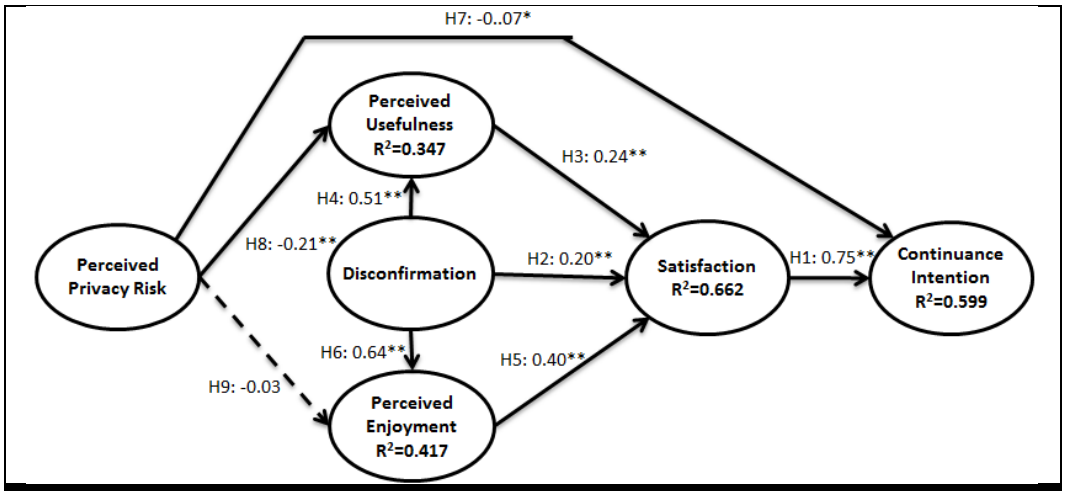


**FIGURE 2: STRUCTURAL MODEL**

**Note: * p < 0.05, ** p < 0.001**

### *Hypotheses Evaluation*

| | |
|---|---|
| H1: User Satisfaction positively influences Continuance Intention | Supported |
| H2: Positive Disconfirmation positively influences User Satisfaction | Supported |
| H3: Perceived Usefulness positively influences User Satisfaction | Supported |
| H4: Positive Disconfirmation positively influences Perceived Usefulness | Supported |
| H5: Perceived Enjoyment positively influences User Satisfaction | Supported |
| H6: Positive Disconfirmation positively influences Perceived Enjoyment | Supported |
| H7: Perceived Privacy Risk negatively influences Continuance Intention | Supported |
| H8: Perceived Privacy Risk negatively influences Perceived Usefulness | Supported |
| H9: Perceived Privacy Risk negatively influences Perceived Enjoyment | Not Supported |

## DISCUSSION

The goal of this research is to investigate factors that influence continuance intention related to LBS. In order to accomplish this, the study proposes and empirically tests a model based on ECT, motivation theory and the concept of privacy risk. Eight of nine hypotheses were supported.

The study confirms the strong relationship between user satisfaction and continuation intention (H1) as well as the relationship between positive disconfirmation and user satisfaction (H2). In addition, this study explores the influence of motivation within the context of ECT and found that both perceived usefulness (H3), extrinsic motivation, and perceived enjoyment (H5), intrinsic motivation, positively influence satisfaction. Therefore, the more useful and enjoyable LBS are perceived by the user, the greater the user's level of satisfaction.

Results also indicate perceived privacy risk has a significant negative impact on perceived usefulness (H8). This is consistent with psychology literature regarding the impact of perceived privacy risk the perception of benefit gained (Cunningham, 1967). This indicates

concerns over the disclosure of private information elevates concerns of potentially negative consequences and reduces the perception of usefulness of the LBS.

Interestingly, the impact of perceived privacy risk on perceived enjoyment was not significant (H9) suggesting that perceived risk with LBS does not cause anxiety that significantly diminishes perceived enjoyment gained. However, the influence of perceived privacy risk on continuance intention was significant and the path coefficient was negative indicating that perceived privacy risk negatively impacts continuance intention (H7).

### *Implications*

This study significantly extends the body of knowledge by creating and empirically testing a model based on ECT, motivation theory and the concept of privacy risk within the context of LBS. Most prior research has focused on technical aspects of LBS, such as anonymity and security protocols, or adoption and usage. Although privacy has been raised as a concern related to LBS adoption, exploring the actual aspects of motivation impacted by these concerns has received little attention.

This study highlights that both intrinsic and extrinsic motivations are important in predicting LBS continuance intention. It also suggests that the privacy concerns do indeed impact the perception of usefulness and continuance intention. Another interesting finding is the apparent lack of influence of privacy concerns on intrinsic motivation, perceived enjoyment. The findings may suggest that utilitarian LBS applications may be impacted more by privacy risk concerns than applications that are predominantly hedonic in nature.

## CONCLUSIONS

This study extends the body of knowledge by exploring the impact of intrinsic and extrinsic motivation and privacy concerns on the intention to continue using LBS. Findings indicate that the two forms of motivation positively influence user satisfaction that, in turn, influences continuance intention. In addition, the study confirms that exceeding expectations has a positive influence on intrinsic motivation, extrinsic motivation and satisfaction.

The study also integrates the concept of perceived privacy risk and explores its impact on continuance intention. Consistent with the psychology literature, perceived privacy risk negatively influences the individual's perceived usefulness of LBS. However, somewhat unexpectantly perceived privacy risk is not significant with respect to its influence on perceived enjoyment. This indicates that while there may be a perceived risk in disclosing location information, it does not cause anxiety that would diminish perceived enjoyment related to the use of LBS.

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