

# CONSUMERS' PRIVACY CONCERNS TOWARD USING LOCATION-BASED SERVICES: AN EXPLORATORY FRAMEWORK AND RESEARCH PROPOSAL

Xu, Heng, Department of Information Systems, National University of Singapore, 3 Science Drive 2, 117543 Singapore, xuheng@comp.nus.edu.sg

Teo, Hock-Hai, Department of Information Systems, National University of Singapore, 3 Science Drive 2, 117543 Singapore, teohh@comp.nus.edu.sg

## Abstract

*Privacy concerns associated with the use of Location-Based Services (LBS) may ultimately prevent consumers from gaining the 'anytime anywhere' convenience. Through a psychological control lens, we examine whether individual difference variables such as locus of control (LOC) could have moderating effects on the relationship between privacy concern and three privacy assurance mechanisms in the LBS context. The paper develops a preliminary research model which conceptualizes the moderating effects of LOC by extending Xu and Teo (2004)'s research model. With an explicit focus on LOC, this study will not only add an important piece of information to our understanding of consumers' reactions to LBS but also can help frame the ongoing policy and scholarly debate surrounding the relative effectiveness of technology, industry self-regulation and government legislation in ensuring consumers' privacy. We believe that our findings will be able to offer practical implications for the various players in the LBS landscape: merchants, wireless service providers, wireless device manufacturer, privacy advocates and legislators.*

*Keywords: Location-Based Services (LBS), Information Privacy, Perceived Control, Locus of Control (LOC).*

# 1 INTRODUCTION

The emergence of mobile communication and positioning technologies has presented new opportunities and challenges to transform electronic commerce applications for the mobile arena. Spurred by employment of outdoor positioning technologies (such as global positioning system, GPS) and indoor positioning technologies (such as Radio Frequency Identification, RF-ID), service providers are offering consumers pervasive flexibility to be uniquely reachable and to access networks and services while on the move. These commercial location-sensitive applications and value-added services that utilize geographical positioning information to provide value-added services are generally termed as “Location-Based Services (LBS)” (Samsioe and Samsioe 2002).

Despite that global economy has reached an unstable situation and investments have been slowed down, the growth trajectory of LBS is striking. According to Allied Business Intelligence Inc’s (2004) findings, the worldwide LBS revenues are expected to increase from approximately US\$ 500 million in 2004 to over US\$3.6 billion by the end of the decade. Particularly in Asia, LBS have sold well because consumers in Asian countries (especially in South Korea and Japan) are often at the forefront of cellular technology, and have a greater need for the services (Gonsalves 2004).

Notwithstanding its commercial potential, the exploitation of location-based information in LBS has been accompanied by consumers’ privacy concerns. Misuse of location data and other personal identifiable data can be intrusive and offensive to consumers and become a major inhibiting factor for LBS adoption (Beinat 2001). Therefore, it is crucial to effectively address privacy issues in the LBS context by identifying the appropriate privacy assurance mechanisms that could assuage privacy concerns. Xu and Teo (2004) is one of the first research work that attempts to look into such issue. By acknowledging that the loss of control over information is central to the notion of invasion of privacy<sup>1</sup>, Xu and Teo designed an experimental study to test the proposition that whether the assurance of consumers’ perceived control over their personal information (via technology, industry self-regulation, or government legislation) has a considerable influence on alleviating their privacy concerns toward LBS.

While we are increasingly seeing research attempts to look into privacy concerns in the LBS context (e.g., Xu and Teo 2004), very few studies have looked at individual differences in identifying antecedents to privacy concerns in this new LBS environment. Thus, the question addressed in this investigation is whether individual difference variables moderate the relationship between the control assurance approaches and privacy concerns.

The locus of control (LOC) construct is one such variable. We believe that the LOC construct should have relevance for the current study because the perceived extent of privacy concern and the perceived effectiveness of three control assurance approaches depend, in part, on consumers’ general beliefs about whether they themselves, those in power, or other forces determine their privacy experiences. Hence, the aim of this research is to extend Xu and Teo (2004) by addressing the moderating effects of LOC. We believe that the further examination of the LOC construct will not only add an important piece of information to our understanding of consumers’ reactions to LBS but also can help frame the ongoing policy and scholarly debate surrounding the relative effectiveness of technology, industry self-regulation and government legislation in ensuring consumers’ privacy (Culnan and Bies 2003).

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<sup>1</sup> Extant literature in privacy studies generally supported the conceptualization of privacy as a psychological control concept (see Xu and Teo 2004, p.795).

## 2 THEORETICAL BACKGROUND

### 2.1 A perceived control framework

In psychology, the construct of control has often been treated as a perceptual construct because it is of greater interest than actual control when predicting behaviour (Skinner 1996). The conceptualization of perceived control, therefore, is a cognitive construct and as such, may be subjective (Langer 1975). *Perceived control* refers to the beliefs concerning one's ability to effect changes in a desired direction on the environment (deCharms 1968).

Based on the differentiation of three types of control agents<sup>2</sup>, Yamaguchi (2001) identified three types of control: 1) *personal control*, in which the self acts as the control agent, 2) *proxy control*, in which powerful others act as the control agent, and 3) *collective control*, in which the collective acts as the control agent. People who value autonomy would prefer exercising direct *personal control* as they "would especially feel themselves more self-efficacious when their agency is made explicit" (Yamaguchi 2001, p.226). However, when exercise of personal control is neither readily available nor encouraged, people might well relinquish their direct control preferences and seek "security in proxy control" (Bandura 1982, p.142). *Proxy control* is an attempt to align oneself with a powerful force in order to gain control through powerful others when people do not have enough skills, resources, and power to bring about their desired outcome or avoid an undesired outcome in the environment (Yamaguchi 2001). The third type of control is *collective control* in which individual attempts to control the environment as a member of a group or collective (Yamaguchi 2001).

Drawing on above typology of control agents, Xu and Teo (2004) identified three control assurance approaches that could assuage privacy concerns in the LBS context:

- The first control assurance approach is the *technology*-based assurance where consumers themselves act as control agents to exercise *direct personal control* over when and where their personal information is released and subsequently used through their mobile devices.
- The second and the third control assurance approaches (via *self-regulation* and via *legislation* respectively) are grouped as institution-based assurance where powerful forces (i.e., third party intervention and government legislator) act as the control agents for consumers to exercise *proxy control* over their personal information.

### 2.2 Locus of Control

The locus of control (LOC) construct derived from social learning theory (Rotter 1954), which refers to the extent to which people believe that they have the ability to affect outcomes through their own actions (Rotter 1966). *Locus*, the Latin word for "place", was dichotomized by Rotter into *internal* and *external*. People with an internal LOC orientation typically perceive themselves to have control over their future and believe that their actions produce predictable outcomes. In contrast, an external LOC orientation signifies a belief that the outcomes are the result of other powerful people's behavior or, perhaps, random occurrences, not influenced by anything other than fate, luck, or chance.

The LOC construct was initially conceptualized as unidimensional with internal and external LOC at opposite ends of a bipolar axis (Rotter 1966). However, a few investigators used factor analysis to demonstrate that the scale used as the LOC measurement was multidimensional rather than unidimensional (e.g. Lefcourt 1972). Levenson (1974) proposed that internality and externality were

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<sup>2</sup> The control agent refers to a person or a collective group who can cause a particular outcome. The control agent can be the self, powerful other(s), or a collective group or organization (Yamaguchi 2001).

different dimensions rather than opposite ends of the same dimension. She further suggested that externality itself is multidimensional and is categorized as a belief that control is in the hands of either human forces (i.e. powerful others) or nonhuman forces (i.e. chance and fate). For those people who believe in powerful others, outcomes are predictable and the potential for control (i.e. proxy control) exists; for those who believe in chance or fate, outcomes are unpredictable and controls not possible. Levenson (1974) developed the I, P, and C scales in which “powerful others externality” (P) was assessed separately from “chance externality” (C), and both of these were separate from “internality” (I). It is now generally accepted that LOC is a multidimensional construct and that internal, powerful others and chance control are theoretically independent constructs (Hoffman, Novak and Schlosser 2003; Skinner 1996).

### **3 RESEARCH FRAMEWORK**

To examine the moderating role of LOC, we drew on a base model developed by Xu and Teo (2004) that examined whether three types of privacy assurance approaches would result in lower privacy concern and greater intention to use LBS (see Figure 1). By using an experiment method, Xu and Teo drew on literature from information privacy and psychological control to justify the linkages among the constructs. For example, they drew on privacy literature (e.g., Johnson 1974; Margulis 2003; Wolfe and Laufer 1974) to justify the conceptualization of privacy as a psychological control concept. Based on Yamaguchi’s (2001) work on the differentiation of control agents, they hypothesized that the three privacy assurance approaches should lead to lower privacy concerns because: (1) technology-based assurance of control via mobile device in LBS would empower consumers’ direct control over the disclosure of personal information; (2) institution-based assurance of control via self-regulation in LBS would enable consumers to believe that they are able to exercise proxy control over the disclosure and subsequent use of personal information during and after an LBS transaction; (3) institution-based assurance of control via legislation in LBS would lead consumers to believe that the legal assurance of their privacy rights should safeguard them from potential loss of their personal information, which will in turn lead to consumers’ confidence in controlling the disclosure and subsequent use of their personal information. Furthermore, they drew on theory of reasoned action (Ajzen and Fishbein 1980) and some empirical studies from privacy literature (e.g., Chellappa and Sin forthcoming) to hypothesize that lower perception of privacy concerns would result in greater intentions to use LBS. According to their results, privacy concern is shown to have a negative impact on intention to use LBS. Their analysis further revealed that consumers do regard the availability of technology, self-regulation, or legislation on assuring control over personal information as important measures that could alleviate privacy concerns in LBS. Moreover, their results indicated that the technological assurance approach played the most important role in assuring consumers’ perceived control over personal information. However, identifying the three privacy assurance approaches did little to find out the nature of consumers’ privacy concerns. Should perception of privacy invasion be better thought of as an outcome of individual differences related to the LOC construct or as a global consequence of LBS use per se? To answer this question, we extend Xu and Teo (2004)’s research model (shown in Figure 1) by adding LOC as the moderator which may moderate the relationship between the three control assurance approaches and privacy concerns.

Generally speaking, whether people act on or are acted upon by their environment depends on their general expectancies of whether their own actions produce predictable results (Lefcourt 1966; Rotter 1966). It follows that the nature of perception of control over personal information (i.e., perception of privacy invasion) may be better understood as an outcome of individual differences related to the LOC construct rather than as a global consequence of LBS use per se.

In the LOC framework, internals are more likely to commit to innovative tasks (Hollenbeck, Williams, and Klein 1989; Howell and Avolio 1993) and believe in their own abilities to perform behaviors that are necessary to control events and consequently set their own goals (Phillips and Gully 1997). As a

result, internals put a great deal of effort into mastering situations (Brenders 1987; Ryff 1989; Zimmerman and Rappaport 1988) and derive more satisfaction from situations calling for personal control (Brenders 1987). In contrast, externals avoid those situations that require their active involvement (Brenders 1987) and it appears that the external belief (powerful others or chance) undermines people's beliefs in their own self-efficacy and their environmental mastery (Zimmerman and Rappaport 1988). However, the two types of externals think and behave differently. It was indicated that externals who believe in powerful others may prefer that powerful others make decisions for them and regulate the environment (Levenson 1981); whereas externals who believe in chance or fate may lack the desire for control because they believe that events are uncontrollable and unpredictable. They may become disengaged, helpless and hopeless about any form of order occurring since they appear to question the legitimacy of powerful others (Martin and Hall 1992).

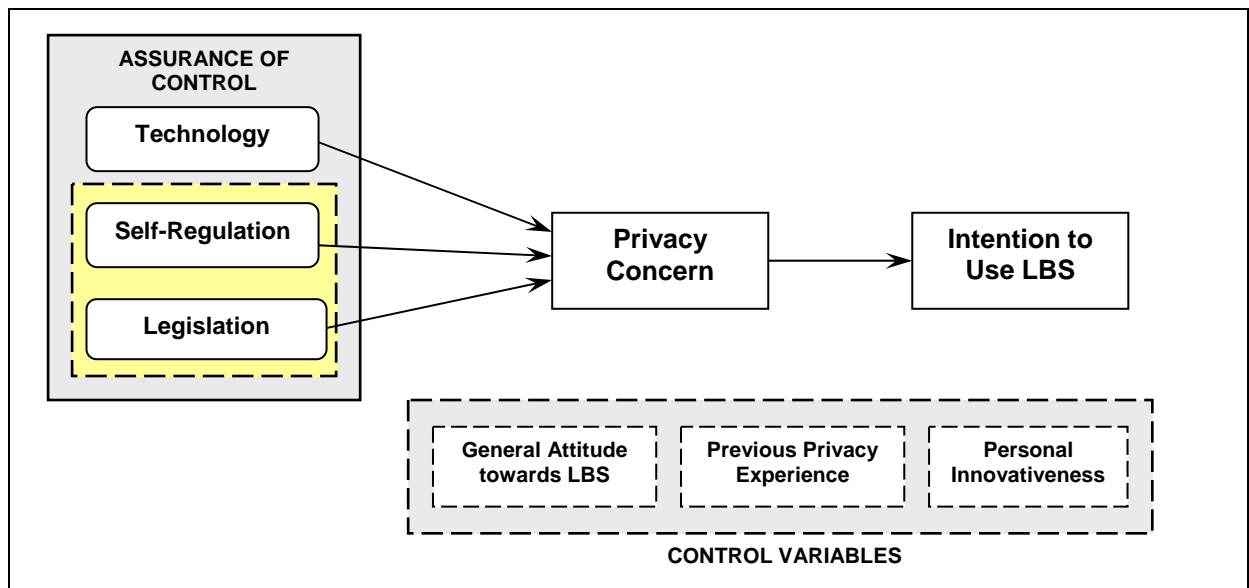


Figure 1. Base model of alleviating privacy concerns in LBS (adapted from Xu & Teo 2004).

In terms of how to assure their control over personal information in LBS context, since internals are more action oriented than externals are, internals should prefer to exercise direct personal control via mobile device than to relinquish their direct control attempts via exercising proxy control (either by industry self-regulator or by government legislator). In contrast, externals who believe in powerful others should prefer powerful others' intervention either in the form of self-regulation or legislation. For those externals who believe in chance or fate, they may not be able to have a single and consistent answer regarding how their control over personal information should be insured. Hence, we propose:

- Proposition 1:** The strength of the relationship between technology-based assurance of control and privacy concern should be stronger for **internal LOC** than for **external LOC/powerful others**.
- Proposition 2:** The strength of the relationship between institution-based assurance of control via self-regulation and privacy concern should be stronger for **external LOC/powerful others** than for **internal LOC**.
- Proposition 3:** The strength of the relationship between institution-based assurance of control via legislation and privacy concern should be stronger for **external LOC/powerful others** than for **internal LOC**.
- Proposition 4:** **External LOC/chance** should have no moderating impacts on these relationships between the three control assurance approaches and privacy concern.

## 4 PROPOSED RESEARCH METHOD

### 4.1 Experimental design overview

Followed by Xu and Teo (2004), the experiment method will be employed for the current study because it allows the testing of causal relationships between manipulated and theoretical constructs with minimal interference from extraneous variables. In our study, one specific LBS application – the Mobile Coupon (M-Coupon) service will be utilized as the scenario in our study because it, being one type of push-based LBS, is more controversial in terms of consumers' concerns about privacy and authentication (Levijoki 2001). The M-Coupon service involves recruiting customers by service registration and interest subscription: customers can register their mobile phone numbers and subscribe to a list of merchants who provide M-Coupon services, based on their interests and preferred period of time for receiving m-coupons. The profiling information is then used to target the subscribers by the network of telecom operators based on the "Cell-Identification (Cell-ID)" positioning technology. And subscribers will be sent related advertisements via Short Message Services (SMS) when they appear within the vicinity of the merchants. The consumers can bring their phone to the stores and redeem the received M-Coupon.

A 2 (present/absent *technology*) × 2 (present/absent *self-regulation*) × 2 (present/absent *legislation*) factorial experiment design will be employed. We will vary the three independent variables – *technology*, *self-regulation*, and *legislation* to construct multiple experiment scenarios. *Technology* will be manipulated by introducing a mobile device with an interactive graphical user interface (see Xu and Teo 2004) for specifying LBS-related privacy preferences. *Self-regulation* will be manipulated by providing a TRUSTe seal and privacy policy statement on the service provider's website. *Legislation* will be manipulated by presenting the subjects with a piece of local news reporting that LBS transactions would be governed by a recently activated location privacy protection law.

Our Web-based experiment system will generate the scenario randomly so that each respondent will have an equal and independent chance of being put into any of the eight scenarios. After logging into our Web-based experiment system, all subjects will begin the experiment by answering questions about their personal information as a form of control check. The subjects will then be asked to assume the role of a potential LBS user, and be presented with the M-Coupon scenario, and to read the descriptions in the corresponding manipulated condition carefully. The experimental system will log the accesses made by the subjects to these URLs to ensure that the subjects will have actually read the manipulated condition. After having read all the descriptions, the subjects will then be asked to complete a questionnaire regarding privacy concern, intention to use LBS, and LOC.

### 4.2 Operationalization of constructs

In this study, most of the measurement scales used to operationalize the constructs were adapted from scales used in prior studies to fit the LBS context. The questions measuring each construct were presented in the Appendix.

- **Privacy Concern.** Drawing on Smith et al. (1996), we operationalized privacy concern as a formative construct encompassing four areas of consumers' concerns about information privacy practices: collection of personal information, unauthorized secondary use of personal information, errors in personal information, and improper access to personal information. To keep the length of the instrument reasonable, we selected one item from each of the four perspectives of the information privacy concern instrument developed by Smith et al. (1996).
- **Intention to Use.** Based on Azjen and Fishbein (1980) and Venkatesh et al. (2003), intention to use LBS was measured by asking respondents to indicate whether they intended to use the particular type of LBS in the next 12 months, whether they predicted they would use the type of

LBS in the next 12 months, and whether they planned to use the type of LBS in the next 12 months. These questions incorporated actions (intend to use, plan to use), target (this type of LBS), and time (the next 12 months), which were essential elements of intention and behaviour.

- **LOC.** Among the two most popular instruments measuring LOC (i.e., Rotter's (1966) Internal-External scale and Levenson's (1974) multidimensional LOC scale), Levenson's LOC scale was used in this study because it recognizes the multidimensional nature of LOC. This instrument contains 24 items which measured Internal LOC, External LOC/powerful others and External LOC/chance respectively.
- **Control Variables.** *General attitude towards LBS* was measured by three questions taken from Okechuku and Wang (1988). *Personal innovativeness* was assessed by four questions taken from Agarwal and Prasad (1998). *Previous privacy experience* was measured by three questions adapted from Smith et al. (1996).

## 5 FUTURE WORK AND EXPECTED CONTRIBUTION

To date, a pilot study involving 24 IS postgraduate students in a large university in Singapore has been conducted. The main objectives of the pilot study were to test the workings of the experimental system, assess the clarity and conciseness of the experimental instructions and questions, and to gauge the duration of the experiments. Besides making minor changes to the instructions based on the feedback given, we also incorporated a few suggestions such as adding a time-recording feature to log the time subjects spent reading the treatment conditions, and increasing the text font size. Next, we plan to conduct the online experiment in China. The subjects are to be recruited by posting the URL of the experiment in the related online forums (e.g., forums discussing mobile device, mobile applications, and etc.) of several major portals in China.

Despite their high significance LBS have not been commercial exploited and widely diffused yet. We believe that a better understanding of individual difference variable such as LOC, and consumers' privacy concerns toward LBS will be useful to privacy advocates, regulatory bodies, and merchants to help shape or justify their decisions concerning LBS in China. Especially China is a country where currently there is no specific law to regulate individual's privacy in the context of E-Commerce and mobile applications (Jiang 2003; Liu 2003). Furthermore, this research will demonstrate whether individual difference variables such as LOC can explain people's perceived extent of privacy invasion, as well as people's view of whether and how the privacy assurance mechanisms should influence their reactions to LBS. Hence, our findings will potentially be useful for regulatory bodies to make decisions on whether legislation should be enforced to address consumers' privacy concerns toward LBS and other similar wireless technologies in China.

The advent of mobile and positioning technologies provides new value to consumers and simultaneously creates new vulnerabilities. It is important for researchers, managers, and policy makers to understand how consumers react to potential risks brought by adopting these new technologies. This research has provided preliminary evidence toward enriching our understanding in some of these aspects. Using the groundwork laid down in this study, future data collection and analysis could contribute to extending our theoretical understanding and practical ability to foster the acceptance of LBS and other similar technologies.

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## Appendix: Measures of Constructs & Sources (measured on seven-point, Likert-type scale)

<b>Intention to Use</b> (Venkatesh et al. 2003)	
INT1	I intend to use this type of LBS in the next 12 months.
INT2	I predict I would use this type of LBS in the next 12 months.
INT3	I plan to use this type of LBS in the next 12 months.
<b>Privacy Concern</b> (Smith et al. 1996)	
PC1	I am concerned that the service provider is collecting too much information about me.
PC2	I am concerned that the service provider may not take measures to prevent unauthorized access to my personal information.
PC3	I am concerned that the service provider may keep my personal information in a non-accurate manner in their database.
PC4	I am concerned that the service provider may share my personal information with other companies without notifying me or getting my authorization.

<b>Internal LOC Belief</b> (Levenson 1974)	
LOC_I1	When I make plans, I am almost certain to make them work.
LOC_I2	I can pretty much determine what will happen in my life.
LOC_I3	I am usually able to protect my personal interests.
LOC_I4	When I get what I want, it's usually because I worked hard for it.
LOC_I5	My life is determined by my own actions.
LOC_I6	Whether or not I get to be a leader depends mostly on my ability.
LOC_I7	Whether or not I get into a car accident depends mostly on how good a driver I am.
LOC_I8	How many friends I have depends on how nice a person I am.
<b>External LOC Belief in Powerful Others</b> (Levenson 1974)	
LOC_P1	I feel like what happens in my life is mostly determined by powerful people.
LOC_P2	My life is chiefly controlled by powerful others.
LOC_P3	People like myself have very little chance of protecting our personal interests when they conflict with those of strong pressure groups.
LOC_P4	Although I might have good ability, I will not be given leadership responsibility without appealing to those in position of power.
LOC_P5	Getting what I want requires pleasing those people above me.
LOC_P6	If important people were to decide they didn't like me, I probably wouldn't make any friends.
LOC_P7	Whether or not I get into a car accident depends mostly on the other driver.
LOC_P8	In order to have my plans work, I make sure that they fit in with the desires of people who have power over me.
<b>External LOC Belief in Chance</b> (Levenson 1974)	
LOC_C1	To a great extent my life is controlled by accidental happenings.
LOC_C2	Often there is no chance of protecting my personal interest from bad luck happenings.
LOC_C3	When I get what I want, it's usually because I'm lucky.
LOC_C4	I have often found that what is going to happen will happen.
LOC_C5	Whether or not I get into a car accident is mostly a matter of luck.
LOC_C6	It's not always wise for me to plan too far ahead because many things turn out to be matter of good or bad fortune.
LOC_C7	Whether or not I get to be a leader depends on whether I'm lucky enough to be in the right place at the right time.
LOC_C8	It's chiefly a matter of fate whether or not I have few friends or many friends.
<b>General Attitude towards LBS</b> (Okechuku and Wang 1988)	
ATT1	In general, LBS are attractive.
ATT2	In general, LBS are useful.
ATT3	In general, LBS are valuable.
<b>Personal Innovativeness</b> (Agarwal and Prasad 1998)	
INNV1	If I heard about a new information technology, I would look for ways to experiment with it.
INNV2	Among my peers, I am usually the first to try out new information technologies.
INNV3	In general, I am hesitant to try out new information technologies.
INNV4	I like to experiment with new information technologies.
<b>Previous Privacy Experience</b> (Smith et al. 1996)	
PPRE1	How often have you personally experienced incidents whereby your personal information was used by some company or e-commerce web site without your authorization?
PPRE2	How often have you personally been victim of what you felt was an improper invasion of privacy?
PPRE3	How much have you heard or read during the last year about the use and potential misuse of computerized information about consumers?