Abstract

Purpose – As a smart service, location-based advertising (LBA) integrates advanced technologies to deliver personalized messages based on a user’s real-time geographic location and needs. However, research has shown that privacy concerns threaten the diffusion of LBA. This research investigates how privacy-related factors (i.e. LBA type, privacy self-efficacy (PSE) and consumer generation) impact consumers’ value-in-use and their intention to use LBA.

Design/methodology/approach – This study developed and examined an LBA value-in-use framework that integrates the role of LBA type, consumers’ PSE and consumer generation into the technology acceptance model (TAM). Data were collected through two experiments in the field with a total of 374 consumers. The proposed relationships were tested using PROCESS modeling.

Findings – The results reveal that pull (vs push) LBA causes higher value-in-use in terms of perceived usefulness and perceived ease of use, leading to greater usage intention. Further, the differences in the mediated relationship between pull- and push-LBA are larger among consumers of low PSE (vs high PSE) and Generation Z (vs other generations). The findings suggest that the consumer value-in-use brought about by LBA diminishes when using push-LBA for low PSE and Generation Z consumers.

Originality/value – This research is the first to integrate the privacy-related interactions of LBA type and consumer characteristics into TAM to develop a TAM-based LBA value-in-use framework. This study contributes to the literature on service value-in-use, smart services and LBA by clarifying the boundary conditions that determine the effectiveness of LBA in enhancing consumers’ value-in-use.

Keywords Smart service, Location-based advertising, Consumer value-in-use, Technology acceptance model, Privacy self-efficacy, Generation Z

Paper type Research paper

Introduction

Location-based advertising (LBA), which integrates advanced technologies to deliver personalized marketing messages or services based on a user’s real-time geographic location and needs (Bruner and Kumar, 2007; Unni and Harmon, 2007; Xu et al., 2011), is an example of smart service. Smart service refers to service provided to or through a connected object or interface that can autonomously monitor its environment, thus allowing real-time data gathering and analysis, ongoing communication and interactive responses (Allmendinger and Lombreglia,)
As a smart service, LBA also leverages data-driven intelligence to analyze and dynamically respond to user behavior. It can effectively target audiences in specific locations and automatically deliver targeted content, aligning with the key attributes of smart services such as personalization, automation and effective use of contextual information.

Given that LBA enables marketers to engage with individual consumers in a personalized way whenever and wherever they are ready to purchase (Kenny and Marshall, 2000), the global LBA market is experiencing rapid growth, with an estimated USD$80.5 billion in 2022 and is projected to reach USD$133 billion by 2026, indicating a compound annual growth rate of 12.8% (ReportLinker, 2022). However, like other smart services, LBA is a double-edged sword for consumers. Although LBA enhances the personalization, flexibility, mobility, timeliness and locatability of information access (Feng et al., 2016; Kenny and Marshall, 2000; Xu et al., 2011), consumer privacy concerns about disclosing personal information, loss of control and intrusion are a drawback (Gutierrez et al., 2019; Jung and Heo, 2021; Pura, 2005; Xu et al., 2011). Hence, considerable literature has investigated privacy issues associated with LBA and found that, in general, consumers’ concerns about privacy are strong, which, in turn, threaten the value and diffusion of LBA (Bauer and Strauss, 2016; Unni and Harmon, 2007; Xu et al., 2011).

For this reason, privacy management is identified as a significant success factor for the development of LBA (Huang, 2012). The question is, thus: How can we manage LBA privacy issues? One approach is to regulate the ways that companies access and use consumers’ personal information through legislation so that governments in many countries develop data protection regulations (Pura, 2005; Sanchez-Rola et al., 2019). Another approach is to clarify the circumstances under which privacy issues would be particularly salient so that companies can take action to handle these privacy issues.

In regard to the second approach, academic and practical inquiries explore the type of LBA that elicits deeper privacy concerns (e.g. Bauer and Strauss, 2016; Unni and Harmon, 2007; Xu et al., 2011). Generally, there are two types of LBA, push and pull. With push-LBA, the marketer provides consumers with messages based on their location and preferences without the consumers’ actively asking for them; with pull-LBA, consumers actively request information about preferred products or outlet categories and then receive messages on a one-time basis when the preferred products or outlets are close to their location (Bruner and Kumar, 2007; Shieh et al., 2019; Unni and Harmon, 2007; Xu et al., 2009). It is well documented that consumers have greater privacy concerns about push-than pull-LBA (Bauer and Strauss, 2016; Unni and Harmon, 2007; Xu et al., 2011).

Although privacy concerns have been examined intensively, factors that might affect consumers’ sensitivity to privacy concerns are less understood in the LBA literature. For example, consumers differ in their ability to protect their privacy (i.e. privacy self-efficacy, PSE; Chen and Chen, 2015; Youn, 2009) and not all generations care about privacy issues equally (Sparks and Honey, 2015; Wong, 2021). Thus, consumers with different PSE levels and within different generations may have dissimilar reactions to the same type of LBA. Accordingly, this research investigates how privacy-related factors (i.e. LBA type, PSE and consumer generation) affect consumer value-in-use when using LBA.

Recent discussions of value in the service literature focus on value-in-use, which places emphasis on the process of value creation (Michel et al., 2008; Vargo and Lusch, 2004). Based on the value-in-use literature and technology acceptance model (TAM), this research develops a TAM-based LBA value-in-use framework to investigate the effects of three privacy-related factors (i.e. LBA type, PSE and consumer generation) on value-in-use in terms of perceived usefulness and perceived ease of use as well as the effects of these variables on usage intention. Accordingly, this research addresses the following questions: (1) What are the differences in value-in-use and usage intention between pull- and push-LBA? (2) How is the effect of LBA type on usage intention mediated by value-in-use? (3) How do PSE and consumer generation moderate the above effects of LBA type? Given the significance of
value-in-use in the service literature and the critical concern of privacy with smart and location-based services, research on privacy-related factors and their impact on consumer value-in-use and adoption of LBA is relevant to service research and practice. This study provides an empirical exploration of the concept of value-in-use by unfolding the process of consumer value creation in view of privacy concerns in LBA and contributes to an understanding of the complex relationship between privacy-related factors, value-in-use and LBA adoption. The findings can guide service practitioners in developing LBA strategies that address privacy concerns.

The remainder of this paper is organized as follows. Based on the value-in-use literature and TAM, the theoretical foundations of a TAM-based LBA value-in-use framework and the suggested relationships between the variables are provided in the next section. Then, the design and results of two experiments that test the proposed hypotheses are presented. The paper concludes with a discussion of the academic and practical implications of the findings.

Literature and hypotheses
In this section, we first draw insight from the value-in-use and TAM literature to establish a TAM-based LBA value-in-use framework. Next, we focus on the LBA literature to determine how pull- and push-LBA affect consumers’ privacy concerns and, thus, their intention to use LBA. We then use TAM to explore how LBA type influences value-in-use variables (i.e. perceived ease of use and perceived usefulness) and to explain how LBA type influences usage intention through the mediation of these variables. Finally, we focus on individual differences and how consumers’ PSE and generation affect their sensitivity to privacy concerns regarding LBA and, thus, moderate the effect of LBA type on usage intention through the mediation of value-in-use.

Dimensions, antecedents and consequences of value-in-use
Discussions of value have increasingly acknowledged the importance of value-in-use, which is defined as a consumer’s evaluation of the overall experience of using a service (Sandström et al., 2008) and emphasizes that value is determined by consumers in the process of using a service (Michel et al., 2008; Vargo and Lusch, 2004). One stream of the value literature focuses on identifying the dimensions of service value-in-use. Based on the specific features of different services, scholars have developed value-in-use structures for B2B services (e.g. Macdonald et al., 2011, 2016), personnel-based B2C services (e.g. Medberg and Grönroos, 2020; Plewa et al., 2015) and technology-based B2C services (e.g. Gummerus and Pihlström, 2011; Hartwig and Jacob, 2018) separately. Because LBA is a technology-based service, we focus on the studies in the context of technology-based services. Table 1 provides a summary of these studies.

Although there is no well-recognized structure of value-in-use of technology-based services, the common dimensions that emerge from most studies include the concepts of perceived usefulness and perceived ease of use. For example, technical dimension, decision support of functional dimension, channel functionality of spatial dimension and temporal efficiency/usefulness and speediness of temporal dimension in Heinonen (2009) and Heinonen and Strandvik (2009), performance value in Gummerus and Pihlström (2011), professionalism/need for achievement, productivity and personal self-fulfillment in Bruns and Jacob (2014, 2016), and level of a user’s performance in Hartwig and Jacob (2018) all are related to the extent to which the outcome of a service usage helps users to achieve their goals, improve their daily tasks, pursue their interests, or solve their problems effectively and reliably, which reflect the concept of perceived usefulness. Further, process easiness/functionality of functional dimension, spatial latitude and navigation of spatial dimension and temporal latitude of temporal dimension in Heinonen (2009) and Heinonen and Strandvik (2009), convenience value in Gummerus and Pihlström (2011), convenience and flexibility/independence in Bruns and Jacob (2014), and use process ubiquity, individual effort required
<table>
<thead>
<tr>
<th>Study</th>
<th>Context</th>
<th>Dimensions</th>
<th>Definition and sub-dimensions</th>
<th>TAM variables</th>
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</table>
| Heinonen (2009), Heinonen and Strandvik (2009) | Electronic-service (travel agency’s websites) | Technical dimension | Outcome of the service interaction  
Sub-dimensions: content (the service contains more user-needed information), tangibles (the service indicates directly what it contains and what benefits it offers), and price (the service enables monetary saving or facilitates price comparisons) | Perceived usefulness |
| | | Functional dimension | Process of the service interaction  
Sub-dimensions: process easiness/functionality (the service offers instructions or does not require learning), security (the service is trustworthy), entertainment (the service is entertaining), decision support (the service supports travel planning), and dependability (the service provides a certain feeling of what is to be expected of the holiday or ensures that the reservation details are correct) | Perceived usefulness:  
decision support; perceived ease of use: process easiness/ functionality |
| | | Spatial dimension | Service site characteristics and users' perceptions of the location where the service interaction occurs  
Sub-dimensions: spatial latitude (the service enables users to do transactions at home or other places), visual layout (the service is visually appealing), channel functionality (the service provides different tools for holiday planning), and navigation (the service contains a clear navigation system that enables users to move on the site) | Perceived usefulness:  
channel functionality; perceived ease of use: spatial latitude and navigation |
| | | Temporal dimension | Users' perceptions of the time when the service interaction occurs  
Sub-dimensions: temporal efficiency/usefulness (the service feels like a meaningful way to use the time), speediness (the service helps users plan/book trips rapidly), and temporal latitude (the service enables transactions outside normal office hours) | Perceived usefulness:  
temporal efficiency/ usefulness and speediness; perceived ease of use: temporal latitude |

Table 1. Value-in-use dimensions for technology-based services (continued)
<table>
<thead>
<tr>
<th>Study</th>
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<th>TAM variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gummerus and Pihlström (2011)</td>
<td>Mobile-service (various mobile-services)</td>
<td>Emotional value</td>
<td>Users’ perceptions that the service is used for emotional communication and that the in-use experiences are fun</td>
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<td></td>
<td></td>
<td>Esteem value</td>
<td>Self-esteem generated by service usage, such as self-respect, embarrassment avoidance, and social acceptance</td>
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<td></td>
<td></td>
<td>Monetary value</td>
<td>Users’ perceptions that the use of the service is less expensive than alternatives, and m-payment offers deferred payment</td>
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<tr>
<td></td>
<td></td>
<td>Convenience value</td>
<td>Users’ perceptions that the use of the service is quick and easy, and the service can be used unobtrusively and anonymously</td>
<td>Perceived ease of use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Performance value</td>
<td>Users’ perceptions that the service does its job accurately and reliably</td>
<td>Perceived usefulness</td>
</tr>
<tr>
<td>Bruns and Jacob (2014),</td>
<td>Mobile-service (various mobile apps in Bruns</td>
<td>Hedonic value</td>
<td>Users’ perceptions that the use of the service enables them to have fun and feel good, be entertained, and relax</td>
<td></td>
</tr>
<tr>
<td>Bruns and Jacob (2016)</td>
<td>and Jacob, 2014; an app for weight loss and</td>
<td>Proficiency/need for</td>
<td>Users’ perceptions that the service enables them to enhance their knowledge, know what is happening, learn new things, and be consistently informed/up to date</td>
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<tr>
<td></td>
<td></td>
<td>knowledge/need for</td>
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<td></td>
<td></td>
<td>achievement</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Professionalism/need for</td>
<td>Users’ perceptions that the service enables them to act disciplined and dutifully, strive for achievement and professionalism by meeting their obligations, and compete with others or face challenges</td>
<td>Perceived usefulness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>achievement</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Productivity</td>
<td>Users’ perceptions that the service enables them to better structure and arrange their daily routines and activities, organize personal tasks, keep important data and documentation, and pursue clear goals and plans</td>
<td>Perceived usefulness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Personal self-fulfillment</td>
<td>Users’ perceptions that the service enables them to pursue personal interests, benefits, and hobbies</td>
<td>Perceived usefulness</td>
</tr>
</tbody>
</table>

Dimensions identified in both studies

Table 1. (continued)
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Self-expression</td>
<td>Users' perceptions that the service enables them to be perceived and seen by others and show others their performance and what they are like, satisfying the need to communicate</td>
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<tr>
<td>Social value</td>
<td>Users' perceptions that the service enables them to interact with others and have support from others, emotional attachment to others, and motivation from others</td>
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<tr>
<td>Convenience</td>
<td>Users' perceptions that the use of the service is very easy, involving very little effort</td>
<td></td>
<td>Perceived ease of use</td>
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<tr>
<td>Hartwig and Jacob (2018)</td>
<td>Mobile-service (various mobile apps)</td>
<td>Use process ubiquity</td>
<td>Users' perceptions of the freedom to execute independently from restrictions</td>
<td>Perceived ease of use</td>
</tr>
<tr>
<td>Individual effort required</td>
<td>Users' perceptions that the use process is intuitive/easy to understand</td>
<td></td>
<td>Perceived ease of use</td>
<td></td>
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<tr>
<td>Emotional state</td>
<td>Users' perceptions that the service enables them to feel more relaxed, motivated, and happier</td>
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<tr>
<td>Level of a user’s performance</td>
<td>Users' perceptions that the service usage improves their own performance</td>
<td></td>
<td>Perceived usefulness</td>
<td></td>
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<tr>
<td>Level of source reliability</td>
<td>Users' perceptions that the information provided by the service is reliable</td>
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<tr>
<td>Level of use process adaptability</td>
<td>Users' perceptions that the use processes are individually adaptable</td>
<td></td>
<td>Perceived ease of use</td>
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<tr>
<td>Conformance with others</td>
<td>Users' perceptions of the degree to which others executed usage in the same or similar way</td>
<td></td>
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<tr>
<td>Level of social recognition</td>
<td>Recognition users receive from others for how they undertake the use process</td>
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<tr>
<td>Absence of alternatives</td>
<td>Users' perceptions of the absence of alternatives for the use process about its conducting way and goal achievement</td>
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<tr>
<td>Level of retained process privacy</td>
<td>Users' perceptions of the level they can decide autonomously about how much information is either kept secret or revealed to others</td>
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Source(s): Table created by author

Table 1.
and level of use process adaptability in Hartwig and Jacob (2018) all pertain to the ease, effortlessness and smoothness of using a service and aligns with the idea of perceived ease of use. As such, perceived usefulness and perceived ease of use seem to be the core dimensions of value-in-use for technology-based services.

Moreover, in the value co-creation process, supplier resources, customer resources and the integration of those resources all contribute to value-in-use (Bartelheimer, 2020; Eggert et al., 2018; Vargo and Lusch, 2004). Hence, a more holistic assessment of value-in-use needs to consider the impact of supplier and customer resources and their integration. Specific to technology-based services, supplier resources are typically incorporated into the underlying system or service elements that facilitate the delivery of the service or the equipment or interfaces used to access the service, while customer resources encompass all aspects of the individual user’s attitude toward technology (e.g. user’s demographics, competence and skills of the user, surroundings of the user; Bartelheimer, 2020; Sandström et al., 2008). Therefore, in our framework for assessing LBA value-in-use, we incorporate the features of service elements, user characteristics and their interactions.

As noted, privacy concerns are a critical issue in the LBA literature (Bauer and Strauss, 2016; Unni and Harmon, 2007; Xu et al., 2011); thus, we take into account privacy-related service features and user characteristics in this research to examine their impact on LBA value-in-use. LBA type (pull vs push), an essential feature of LBA, has been shown to influence levels of privacy concerns in regard to LBA (Bauer and Strauss, 2016; Unni and Harmon, 2007; Xu et al., 2011). In addition, users’ PSE appears to affect their ability to protect their privacy (Chen and Chen, 2015; Youn, 2009), and consumer generation can affect sensitivity to privacy issues (sparks and honey, 2015; Wong, 2021). We expect that consumers with different PSE levels and of different generations will have dissimilar reactions to the same type of LBA. Therefore, we include LBA type, consumers’ PSE, generation and their interactions as antecedences of value-in-use of LBA.

We also explore the effect of value-in-use on usage intention. For value-in-use to emerge, service elements should alert customers to use the service (Bartelheimer, 2020; Heinonen and Strandvik, 2009). Therefore, clarifying the relationship between value-in-use and usage intention and the relationship between service elements (e.g. LBA type) and usage intention is critical for a holistic assessment of value-in-use.

Based on the above discussion, we propose a TAM-based LBA value-in-use framework (Figure 1). In what follows, we develop hypotheses about the relationships between the variables in the framework.

**Effect of LBA type on usage intention**

A considerable amount of research related to LBA focuses on privacy issues, especially the effect of privacy concerns on consumer behavior or behavioral intention (Jang and Lee, 2018). Privacy concerns refer to the degree to which individuals are concerned about practices related to the collection and use of their personal information (Hong and Thong, 2013). In general, research has found that consumers have high privacy concerns with LBA, which diminishes their adoption or usage intention (Bauer and Strauss, 2016; Unni and Harmon, 2007; Xu et al., 2011).

LBA providers deliver tailored information through mobile communication and positioning systems in two approaches, push and pull (Bruner and Kumar, 2007; Shieh et al., 2019; Unni and Harmon, 2007). Push-LBA can be further classified into opt-in and opt-out. With opt-in push-LBA, consumers authorize a company to deliver messages to them, and they can opt out at any time; opt-out push-LBA is the practice whereby companies send marketing information to consumers without seeking their permission in advance but provide an option for consumers to opt out (Bruner and Kumar, 2007). Because, compared to
opt-out push-LBA, opt-in push-LBA better complies with data protection regulations and the advice from industry associations, such as Mobile Marketing Association and Direct Marketing Association (Bruner and Kumar, 2007; Li et al., 2019; Lin et al., 2016; Sanchez-Rola et al., 2019), most studies have focused on opt-in push-LBA (e.g. Richard and Meuli, 2013; Unni and Harmon, 2007; Xu et al., 2009). This research also focuses on opt-in push-LBA (hereafter, push-LBA).

Several studies investigate the difference in privacy concerns between pull- and push-LBA (Bauer and Strauss, 2016; Unni and Harmon, 2007; Xu et al., 2011). In push-LBA, because consumers’ personal information is traced all of the time after they agree to use the service for the first time, this leads to higher perceived privacy risks (Unni and Harmon, 2007; Xu et al., 2011). Further, in push-LBA, marketing messages are sent to consumers automatically without asking their permission every time, and, thus, the suddenly appearing messages may be considered a disturbance, which leads to feelings of loss of control (Unni and Harmon, 2007; Xia and Sudharshan, 2002; Xu et al., 2009). Therefore, several studies have found greater privacy concerns evoked by push-than pull-LBA, including risks of information disclosure, interruptions, intrusion and loss of control (Bauer and Strauss, 2016; Unni and Harmon, 2007; Xu et al., 2011).

These privacy concerns deter consumers from using LBA (Gutierrez et al., 2019; Jung and Heo, 2021; Pura, 2005; Xu et al., 2011). As such, due to its greater level of privacy concerns, push-LBA causes lower perceived value, acceptance and behavioral intention than does pull-LBA (Bauer and Strauss, 2016; Unni and Harmon, 2007; Xu et al., 2011). Accordingly, we suggest that, compared to push-LBA, consumers may have greater usage intention with pull-LBA.

H1a. Compared to push-LBA, pull-LBA leads to greater usage intention.

**Relationships between LBA type, perceived usefulness, perceived ease of use and usage intention**

One of the most recognized approaches to studying mobile service adoption is TAM (e.g. Chen, 2013; Chen and Tsai, 2019; Huang and Chueh, 2022; Jang and Lee, 2018). TAM, proposed by
Davis (1985), identifies a number of mediators to explain the effects of external factors on technology adoption. It highlights the critical role of perceived ease of use and perceived usefulness in predicting the acceptance of a technology system. Perceived usefulness describes individuals’ subjective perception that the usage of a certain technology improves their work performance in their daily life, whereas perceived ease of use concerns the perception of effort, which occurs when learning and using a new technology (Davis et al., 1989). Even though TAM has been empirically replicated or extended by many studies, an important feature of TAM is the potential to make incremental contributions and extensions by capturing the impact of external factors in interpreting internal beliefs, attitudes, intentions and behaviors (Davis et al., 1989; Lin and Chang, 2011).

We incorporate privacy-related external factors in TAM to explain the value creation of LBA. Although there are more recent and comprehensive models for assessing technology acceptance, such as the unified theory of acceptance and use of technology (UTAUT; Venkatesh et al., 2003) and UTAUT2 (Venkatesh et al., 2012), these models include variables other than perceived usefulness and perceived ease of use, which do not reflect the core dimensions of value-in-use and might not be affected by our independent and moderating variables (i.e. LBA type, PSE and consumer generation). As such, we adopt TAM, rather than UTAUT or UTAUT2, in our research framework.

As noted, because push-LBA automatically provides consumers with messages, including unwanted ones, it elicits higher interruptions, intrusion and loss of control (Unni and Harmon, 2007; Xu et al., 2009). The interruptions disturb the natural cognitive flow of consumers and may further erode their decision performance and satisfaction (Xia and Sudharshan, 2002). As such, we expect that, compared with pull-LBA, consumers may encounter more difficulty in using push-LBA, resulting in lower perceived ease of use. Further, their decision performance and satisfaction may be influenced by unwanted messages sent by push-LBA, which may give rise to lower perceived usefulness.

Moreover, intrusion from suddenly appearing messages is likely to cause frustration to consumers (Okazaki and Taylor, 2008) and loss of control worsens the situation because consumers cannot easily filter those unwanted messages (Carroll et al., 2007). Consequently, we suggest that the sense of loss of control driven by push-LBA may make consumers perceive the service as not easy to use, and those unwanted messages may be considered useless. Based on the above discussion, we propose:

\[ H1b. \] Compared to push-LBA, pull-LBA leads to greater perceived ease of use.

\[ H1c. \] Compared to push-LBA, pull-LBA leads to greater perceived usefulness.

In TAM, the effect of external variables on intention to use is mediated by several indirect pathways between perceived ease of use, perceived usefulness and attitude (Davis, 1985; Davis et al., 1989). Applying this notion to the LBA context, we suggest that LBA type (one of the external variables) affects consumers’ usage intention through mediations of perceived ease of use and perceived usefulness. Therefore, we propose two causal-effect pathways:

\[ H2a. \] Perceived ease of use mediates the effect of LBA type on usage intention.

\[ H2b. \] Perceived usefulness mediates the effect of LBA type on usage intention.

\textit{Moderation of privacy self-efficacy (PSE)}

PSE refers to individuals’ confidence in their ability to protect their privacy and has been found to influence their attitude toward using technology (Chen and Chen, 2015; Youn, 2009). Individuals’ confidence in their ability could convince them that they can handle certain risks and threats; thus, a high level of self-efficacy makes consumers less focused on privacy concerns (Eddy et al., 1999; LaRose and Rifon, 2007). Further, PSE can prompt users to adopt
certain privacy protection strategies, which, in turn, enhance their self-disclosing behaviors (Chen, 2018; Chen and Chen, 2015). Research shows that, as a result, in the settings of LBA and other technologies, consumers’ PSE is positively related to their usage intention and behaviors (Lee and Hill, 2013; Milne et al., 2009; Rippetoe and Rogers, 1987).

Based on the above literature, we expect that, due to the high intrusion from push-LBA, consumers should generally prefer pull-over push-LBA. Because individuals with high PSE, however, could counteract the negative consequences of privacy invasion, they may not hold as negative a cognition or attitude toward push-LBA as do those with low PSE. Therefore, consumers with low PSE may prefer to use pull-than push-LBA, whereas, for consumers with high PSE, their usage intention for push- and pull-LBA may be one of indifference.

Further, as predicted in H1b and H1c, consumers should generally perceive higher ease of use and usefulness for pull-than push-LBA due to the fact that push-LBA elicits more privacy concerns. The capability of LBA to offer customized services depends, however, on access to personal location and preference information through mobile communication and positioning systems. As such, the greater the willingness of consumers to give out their private information, the greater the value that they can obtain from LBA (Chellappa and Sin, 2005; Xu et al., 2011). Because individuals with high PSE tend to be less focused on privacy concerns (Eddy et al., 1999; LaRose and Rifon, 2007) and more engaged in self-disclosing behaviors (Chen, 2018; Chen and Chen, 2015), users’ PSE is found to have a positive impact on perceived ease of use and perceived usefulness of location-based mobile services (LBMS) (Palos-Sanchez et al., 2017).

Studies show that individuals with high PSE are able to adopt privacy protection strategies (Chen, 2018; Chen and Chen, 2015); thus, they may hold a more positive attitude toward push-LBA than do those with low PSE. We expect that they may be willing to disclose their personal information in exchange for more valuable services not only in pull-LBA but also in push-LBA and may perceive high ease of use and usefulness in both LBA types. Nevertheless, for consumers with low PSE, the highly intrusive nature of push-LBA may impede their willingness to give out their private information; hence, their perceived ease of use and usefulness would be lower for push-than pull-LBA. In summary, we propose:

**H3a, H3b.** PSE moderates the relationship between LBA type and usage intention via perceived ease of use (H3a) and perceived usefulness (H3b). Specifically, the differences in the mediated relationships between pull- and push-LBA are more salient for low than for high PSE consumers.

**Moderation of consumer generation**

A generation refers to a group of people with shared proximities to historical or cultural events, phenomena and developments (Parry and Urwin, 2011). Generational cohorts share common characteristics formed by their experiences through time, and, as such, generations are usually classified based on their birth year; there are different approaches to define the exact division point, but they vary within only a few years (Benckendorff et al., 2010). Currently, there are five generations of adults defined roughly by their birth year: Traditionalists (born before 1945), Baby Boomers (born between 1946 and 1964), Generation X (Gen X, born between 1965 and 1979/80), Generation Y (Gen Y), or Millennials (born between 1980/1 and 1994/6) and Generation Z (Gen Z, born between 1995/7 and 2012; Kasasa.com., 2021; Mohr and Mohr, 2017; Ritter, 2014). Gen Z comprises the largest consumer generation and contributes a significant portion of direct and indirect spending (Fromm, 2018; Peterson, 2014). One of the major differences between Gen Z and other generations is that Gen Z is highly concerned with environmental and ethical issues and social responsibility (sparks and honey, 2015; Turner, 2015). In what follows, we take a closer look at why Gen Z cares more about social issues and privacy concerns.
Gen Z is the only generation that has used the internet their entire lives and, thus, comprises true digital natives (Seemiller and Grace, 2016). Through the internet, they connect to the world by accessing a large amount of global information, including through socializing with friends, businesses and other organizations around the world, making them the most multicultural and global generation (sparks and honey, 2015; Wong, 2021). This generation also grew up with an awareness of data abuse and computer hacking, which makes them more concerned about their online privacy (The Center for Generational Kinetics®, 2016). In addition, due to growing up during a period of two wars, the Iraq War and the Afghanistan War, and in an era of internationalism, gender equality and climate change awareness, Gen Z is aware of global political, environmental and social issues. They are deeply concerned about issues associated with human rights, diversity, freedom, equality and justice (sparks and honey, 2015; Turner, 2015). Overall, the literature indicates that Gen Z is more aware of social issues and online privacy than were the generations that preceded them. As such, we suggest that Gen Z consumers should prefer marketing practices that comply with corporate social responsibility (CSR) to those that do not. A few studies have found that products or brands that adhere to CSR indeed elicit favorable responses among Gen Zers (e.g. Leong and Mariadass, 2019; Wong, 2021). Nevertheless, there is limited research that compares the responses to CSR of Gen Z with those of other generations. Therefore, this research focuses on Gen Zers, particularly how they react to privacy issues related to LBA as compared to how other generations react.

As predicted in H1, due to the high privacy-risky and interruptive features of push-LBA, consumers across generations should generally have lower perceived ease of use, perceived usefulness and usage intention with push-than pull-LBA. We further propose that these disparities in the three dependent variables between push- and pull-LBA would be amplified among Gen Z. As noted, one of the salient features that distinguish Gen Z from other generations is that they care deeply about social issues and online privacy (sparks and honey, 2015; The Center for Generational Kinetics®, 2016) and because push-LBA evokes higher privacy and intrusion concerns than does pull-LBA (Unni and Harmon, 2007; Xia and Sudharshan, 2002; Xu et al., 2009), it would be considered as less adherent to social responsibility. Hence, compared to other generations, Gen Zers may prefer pull-LBA rather than push-LBA, which results in a larger discrepancy in usage intention through the mediations of perceived ease of use and perceived usefulness.

H4a, H4b. Consumer generation moderates the relationship between LBA type and usage intention via perceived ease of use (H4a) and perceived usefulness (H4b). Specifically, the differences in the mediated relationships between pull- and push-LBA are more salient for Gen Z than for other generations.

Method
To test the proposed hypotheses, we conducted two experimental studies in the field. Study 1 focused on the direct effects of LBA type (push vs pull) on value-in-use variables (i.e. perceived ease of use and perceived usefulness) and usage intention (H1), the effect of LBA type on usage intention via the mediation of perceived ease of use and perceived usefulness (H2) and how PSE moderates the effects of LBA type on usage intention via value-in-use variables (H3). Study 2 replicated H1 and H2 to develop the robustness of the research findings and further examined how consumer generation moderates the effects of LBA type on usage intention via value-in-use variables (H4).

To obtain findings that apply to real market situations, we referred to the work of Shieh et al. (2019) to conduct the experiments at a well-known convenience store located in a large mall in Southern Taiwan. The participants were recruited at and near the mall, within a
3-kilometer radius. To collect reactions from consumers of different generations, we included consumers born before 2013 as participants. In addition, to ensure that the participants were familiar with the operation of mobile devices, we required that they have more than two years of experience using mobile phones and to carry a mobile phone currently. The participants were informed about the purpose of the research before participating in the study and were rewarded with a 50 NTD (New Taiwan Dollar; ~1.50 USD) coupon upon completion of the study.

**Study 1**

*Design, participants and procedure*

In Study 1, we tested the effect of LBA type and consumers’ PSE on value-in-use variables and usage intention and verifies the mediation pathways. A one-factor, two-level (LBA type: push vs pull) between-subject experimental design was conducted, using a total of 223 participants (46.6% male; mean age = 30.57; age range = 15–69). A profile of the participants is presented in the appendix. Participants were randomly assigned into either the pull- or push-LBA condition. In each of the pull- and push-LBA scenarios, participants were invited to try out an LBA app, following the steps illustrated in Figure 2. In the push-LBA scenario (Figure 2(a)), when participants entered the 3-kilometer radius of the mall, the app received promotional messages automatically and notified participants of new messages. Participants selected the coupon category they were interested in from a list provided in the app to read the promotional message. In contrast, in the pull-LBA scenario (Figure 2(b)), when participants entered the 3-kilometer radius of the mall, they sent a request through the app for the coupons in the category they were interested in and then received the promotional message in their message box.

*Measurements*

After trying out the LBA app for few minutes, each participant completed a three-section questionnaire. The first section assessed participants’ perceived ease of use, perceived usefulness and usage intention toward the app. The second section included manipulation checks for push- and pull-LBA, with two sets of three items developed by the authors of this research based on the definitions of these two constructs. The last section collected participants’ PSE and demographic characteristics, such as age, gender, education level and occupation.

All items were measured using a 6-point Likert scale, ranging from 1 (highly disagree) to 6 (highly agree) to avoid a central tendency of responses (Chang, 1994). Perceived ease of use and perceived usefulness were measured by four and five items, respectively, adopted from Davis (1989). Usage intention was evaluated by four items, modified from Xu et al. (2009). A three-item scale that measured PSE was modified from Lee and Hill (2013) and Youn (2009; see Table 2 for item details).

A SmartPLS version 4.0 structural equation model was adopted to assess the measurement (Ringle et al., 2022). All of the factor loadings of perceived ease of use, perceived usefulness and usage intention were significant ($p < 0.01$) and greater than 0.5 (Table 2). Table 3 shows that the composite reliability (rho-A, rho-C) and Cronbach’s $\alpha$ were above 0.7 for all constructs, which indicated that the scales had high consistency and good reliability. The average variance extracted (AVE) exceeded the minimum threshold value of 0.5, confirming the convergent validity of the measures (Hair et al., 2018). The results also indicated that the square root of each construct’s AVE was higher than the correlation with any other construct (Fornell and Larcker criterion; Fornell and Larcker, 1981). The heterotrait-monotrait ratio (HTMT) value was smaller than 0.85 (HTMT criterion). The results presented in Table 3 show that the two criteria were satisfied, indicating good discriminant validity.
Manipulation checks
We examined the manipulations of the two LBA types by asking participants to rate the extent to which the LBA message was what they had anticipated through two sets of three-item 6-point scales (Table 2). One-sample t-tests indicated that the means in both conditions were significantly greater than 3.5; thus, the manipulations of pull-LBA ($M_{\text{pull}} = 5.12$, $t(110) = 95.26$, $p < 0.001$) and push-LBA ($M_{\text{push}} = 4.97$, $t(108) = 85.21$, $p < 0.001$) were successful.

Hypothesis testing
To test H1a-H1c and H2a-H2b, we adopted a PROCESS macro in SPSS (Model 4, 10,000 samples, 95% confidence interval; Hayes, 2017) with LBA type (0 = push, 1 = pull) as the
Table 2. Scale items

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>CR</th>
<th>AVE</th>
<th>α</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>HTMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Privacy self-efficacy</td>
<td>4.07</td>
<td>1.35</td>
<td>0.88</td>
<td>0.79</td>
<td>0.87</td>
<td>0.89</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2. Perceived ease of use</td>
<td>4.44</td>
<td>0.86</td>
<td>0.94</td>
<td>0.79</td>
<td>0.91</td>
<td>0.26**</td>
<td>0.89</td>
<td>0.30</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3. Perceived usefulness</td>
<td>4.39</td>
<td>0.88</td>
<td>0.92</td>
<td>0.70</td>
<td>0.89</td>
<td>0.28**</td>
<td>0.56**</td>
<td>0.84</td>
<td>0.32</td>
<td>0.62</td>
</tr>
<tr>
<td>4. Usage intention</td>
<td>4.12</td>
<td>0.93</td>
<td>0.89</td>
<td>0.67</td>
<td>0.83</td>
<td>0.37**</td>
<td>0.55**</td>
<td>0.63**</td>
<td>0.82</td>
<td>0.38</td>
</tr>
</tbody>
</table>

Note(s): The values in diagonal cells are the square root of the AVE for each variable; correlations are reported below the diagonal. CR = composite reliability, AVE = average variance extracted, α = Cronbach’s alpha, HTMT = heterotrait-monotrait ratio; **p < 0.01

Source(s): Table created by author

Table 3. Descriptive statistics, reliability, validity, and correlations of variables in Study 1
independent variable, usage intention as the dependent variable, perceived ease of use and perceived usefulness as two parallel mediators.

The results (Figure 3 and Table 4) showed that, compared to push-LBA, pull-LBA elicited higher usage intention (total effect: $\beta = 0.62$, $SE = 0.12$, $t = 5.14$, $p < 0.001$), perceived ease of use ($\beta = 0.43$, $SE = 0.11$, $t = 3.83$, $p < 0.001$) and perceived usefulness ($\beta = 0.51$, $SE = 0.11$, $t = 4.52$, $p < 0.001$). Thus, $H1a$–$H1c$ were supported.

Then, we further examined the mediation. The results (Table 4) indicate: (1) a positive and significant direct effect of LBA type on usage intention ($effect = 0.28$, $SE = 0.10$, $t = 2.69$, $p < 0.01$); (2) a positive and significant mediation of perceived ease of use on the relationship between LBA type and usage intention ($effect = 0.13; 95\% CI = 0.051$ to $0.234$); and (3) a positive and significant mediation of perceived usefulness on the relationship between LBA type and usage intention ($effect = 0.21; 95\% CI = 0.103$ to $0.344$). Mediated and direct effects exist and point in the same direction; based on Zhao et al. (2010), the pattern is complementary mediation. The two mediated pathways were confirmed, which provides support for $H2a$ and $H2b$.

To test $H3a$ and $H3b$, the interaction of LBA type and PSE on usage intention via perceived ease of use (Path_1) and perceived usefulness (Path_2), we conducted PROCESS Model 7 with PSE (mean-centered) as the moderator. The results revealed two significant indexes of moderated mediation (Path_1: $index = -0.06$, Boot$SE = 0.03$, 95\% CI = $-0.13$ to $0.06$).

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**Figure 3.**
PROCESS model 4 paths in study 1

**Note(s):** *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$*

**Source(s):** Figure created by author

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<table>
<thead>
<tr>
<th>Path</th>
<th>Study 1 Effect</th>
<th>SE</th>
<th>LLCI/BootLLCI</th>
<th>ULCI/BootULCI</th>
<th>Study 2 Effect</th>
<th>SE</th>
<th>LLCI/BootLLCI</th>
<th>ULCI/BootULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Direct effect</td>
<td>0.28</td>
<td>0.10</td>
<td>0.074</td>
<td>0.478</td>
<td>0.41</td>
<td>0.12</td>
<td>0.169</td>
<td>0.652</td>
</tr>
<tr>
<td>2. Indirect effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LBA type $\rightarrow$ perceived ease of use $\rightarrow$ usage intention</td>
<td>0.13</td>
<td>0.05</td>
<td>0.051</td>
<td>0.234</td>
<td>0.12</td>
<td>0.06</td>
<td>0.029</td>
<td>0.245</td>
</tr>
<tr>
<td>LBA type $\rightarrow$ perceived usefulness $\rightarrow$ usage intention</td>
<td>0.21</td>
<td>0.06</td>
<td>0.103</td>
<td>0.344</td>
<td>0.12</td>
<td>0.06</td>
<td>0.022</td>
<td>0.238</td>
</tr>
<tr>
<td>3. Total effect</td>
<td>0.62</td>
<td>0.12</td>
<td>0.381</td>
<td>0.855</td>
<td>0.65</td>
<td>0.13</td>
<td>0.383</td>
<td>0.911</td>
</tr>
</tbody>
</table>

**Table 4.**
Standardized mediation path coefficients

**Source(s):** Table created by author
To decompose these effects, we examined participants with low (−1 SD), medium (mean-centered) and high (+1 SD) PSE separately. The results indicated that, for participants with low PSE, mediations through perceived ease of use (effect = 0.19, BootSE = 0.08, 95% CI = 0.060 to 0.357) and perceived usefulness (effect = 0.29, BootSE = 0.10, 95% CI = 0.123 to 0.504) were significant. For participants with medium PSE, mediations through perceived ease of use (effect = 0.11, BootSE = 0.04, 95% CI = 0.040 to 0.204) and perceived usefulness (effect = 0.18, BootSE = 0.06, 95% CI = 0.079 to 0.315) also were significant. For participants with high PSE, however, mediations through perceived ease of use (effect = 0.02, BootSE = 0.05, 95% CI = −0.090 to 0.112) and perceived usefulness (effect = 0.05, BootSE = 0.08, 95% CI = −0.109 to 0.208) were not significant. The pattern demonstrates that PSE moderates the relationship between LBA type and usage intention through perceived ease of use and perceived usefulness concurrently. The differences in the mediated relationships between push- and pull-LBA are more pronounced among consumers with low PSE than those with high PSE. As a result, both H3a and H3b were confirmed.

Study 2

Design, participants and procedure
In Study 2, we examined how LBA type and consumer generation affect perceived ease of use, perceived usefulness and usage intention and replicated the mediation pathways. Based on the literature (Kasasa.com., 2021; Mohr and Mohr, 2017; Ritter, 2014), we defined participants born before 1996 (currently above 27 years old) as Non-Gen Z and those born between 1997 and 2012 (currently between 11 and 26 years old) as Gen Z.

As a result, a 2 (LBA type: push vs pull) × 2 (consumer generation: Non-Gen Z vs Gen Z) between-subject experiment was conducted, using a total of 151 participants (54.3% male; mean age = 34.56; age range = 16–66). The participant profile is presented in the appendix. The manipulations of pull- and push-LBA were similar to those of Study 1. This study followed a procedure similar to that used in Study 1.

Measurements
The measurement items were the same as in Study 1, except that PSE was not measured in Study 2. Similar to that in Study 1, a SmartPLS version 4.0 structural equation model was adopted to assess the measurement (Ringle et al., 2022). First, all of the factor loadings of perceived ease of use, perceived usefulness and usage intention were significant (p < 0.01) and greater than 0.5 (Table 2). The results presented in Table 5 demonstrate that the composite reliability and Cronbach’s α were above 0.7 for all constructs, which indicates that the scales had high consistency and good reliability. The AVE exceeded the minimum threshold value

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>CR</th>
<th>AVE</th>
<th>α</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>HTMT</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Perceived ease of use</td>
<td>4.46</td>
<td>0.85</td>
<td>0.93</td>
<td>0.77</td>
<td>0.90</td>
<td>0.84</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2. Perceived usefulness</td>
<td>4.61</td>
<td>0.79</td>
<td>0.92</td>
<td>0.70</td>
<td>0.89</td>
<td>0.59**</td>
<td>0.88</td>
<td>0.66</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3. Usage intention</td>
<td>4.18</td>
<td>0.88</td>
<td>0.85</td>
<td>0.66</td>
<td>0.84</td>
<td>0.53**</td>
<td>0.48**</td>
<td>0.81</td>
<td>0.28</td>
<td>0.38</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Note(s): The values in diagonal cells are the square root of the AVE for each variable; correlations are reported below the diagonal. CR = composite reliability, AVE = average variance extracted, α = Cronbach’s alpha, HTMT = heterotrait-monotrait ratio; **p < 0.01

Source(s): Table created by author

Table 5. Descriptive statistics, reliability, validity, and correlations of variables in Study 2
of 0.5, confirming the convergent validity of the measures. The results also indicated that the square root of each construct’s AVE was higher than the correlation with any other construct, and the HTMT ratio value was smaller than 0.85, indicating good discriminant validity.

**Manipulation checks**

The method used to examine the manipulations of LBA type was same as that in Study 1. One-sample t-tests indicated that the means in both conditions were significantly greater than 3.5; thus, the manipulations of pull-LBA ($M_{pull} = 5.15$, $t(75) = 78.49, p < 0.001$) and push-LBA ($M_{push} = 4.73$, $t(74) = 66.89, p < 0.001$) were successful. Further, the result of an independent-sample t-test showed that the ages of participants in the Gen Z group were significantly lower than those in the Non-Gen Z group ($M_{Gen-Z} = 21.00$, $M_{Non-Gen-Z} = 38.41$, $t(149) = 12.88$, $p < 0.001$). Therefore, the manipulations of generations were effective.

**Hypothesis testing**

To strengthen the robustness of the results for H1a-H1c and H2a-H2b, we employed PROCESS Model 4 to test these hypotheses again in Study 2. LBA type (0 = push, 1 = pull) was the independent variable, usage intention was the dependent variable, and perceived ease of use and perceived usefulness were two parallel mediators.

The findings (Figure 4 and Table 4) indicated that, in comparison to push-LBA, pull-LBA elicits significantly higher usage intention (total effect: $\beta = 0.65$, $SE = 0.13$, $t = 4.84$, $p < 0.001$), perceived ease of use ($\beta = 0.37$, $SE = 0.14$, $t = 2.72$, $p < 0.001$), and perceived usefulness ($\beta = 0.42$, $SE = 0.11$, $t = 3.81$, $p < 0.001$). Consequently, H1a–H1c were once again supported.

Then, we further examined the mediation. Similar to the results in Study 1, as seen in Table 4, the direct effect and two indirect pathways were significant, and the 95% CI of each path did not include zero, again supporting H2a and H2b. Mediated and direct effects exist and point in the same direction; according to Zhao et al. (2010), the pattern is complementary mediation.

To test H4a and H4b, the interaction of LBA type and consumer generation on usage intention via perceived ease of use and perceived usefulness, we adopted PROCESS Model 7 with consumer generation as the moderator (0 = Non-Gen Z, 1 = Gen Z). The results revealed that the moderated mediations via perceived ease of use (index = 0.22, Boot $SE = 0.13$, 95% CI = 0.027 to 0.515) and perceived usefulness (index = 0.19, Boot $SE = 0.10$, 95% CI = 0.027 to 0.420) were significant. To decompose these effects, participants with different generations
were examined separately. The results revealed that, for Gen Zers, mediations through perceived ease of use (effect = 0.26, BootSE = 0.12, 95% CI = 0.070 to 0.528) and perceived usefulness (effect = 0.25, BootSE = 0.11, 95% CI = 0.052 to 0.493) were significant. For Non-Gen Zers, however, mediations through perceived ease of use (effect = 0.04, BootSE = 0.06, 95% CI = −0.072 to 0.154) and perceived usefulness (effect = 0.06, BootSE = 0.04, 95% CI = −0.009 to 0.151) were not significant. The pattern showed support for H4a and H4b which propose that the differences in the mediated relationships between pull- and push-LBA are more salient for Gen Z than for other generations.

General discussion
Findings and academic contributions
With advancements in smart service technologies, such as mobile devices, communication technologies, geo-information sensors and systems, and artificial intelligence algorithms, LBA has become a powerful means to learn consumers’ behaviors, preferences and real-time locations and to deliver highly targeted and personalized messages to consumers. These advancements enhance the growth of the LBA market and make it a research field of considerable interest.

Bauer and Strauss (2016) conducted an analysis of the LBA literature and showed that only 1.5% of the studies adopted a social science experimental methodology to examine the acceptance of LBA; thus, they called for more empirical social science experiments on this topic. Gutierrez et al. (2019) also urged researchers who conduct experimental studies to better manipulate the variables that influence consumers’ acceptance of LBA. As one of the few experimental studies in the field that investigates consumers’ acceptance of LBA, this research demonstrates the causal effect of three privacy-related factors (LBA type, PSE and consumer generation) on value-in-use variables (i.e. perceived usefulness and perceived ease of use) and usage intention. This research not only addresses the research gap with respect to methodology but also makes several theoretical contributions.

First, this research bridges the value-in-use and LBA literature by extending TAM to the context of LBA and exploring the effects of privacy-related factors on value-in-use as well as how these variables affect consumers’ intention to use LBA. This study provides an empirical exploration of the concept of value-in-use, thereby contributing to discourse on service research. The underlying idea of value-in-use is that value is determined by individuals’ experiences within a given context, with an emphasis on the process of value creation rather than its outcome (Michel et al., 2008; Sandström et al., 2008; Vargo and Lusch, 2004). Specifically, this study investigates the dynamics involved in the process of how privacy-related factors affect consumers’ evaluation of LBA and incorporates various customer traits, such as PSE and generation, into the analysis of value-in-use. The results indicate that pull- (vs push-) LBA causes higher value-in-use in terms of perceived usefulness and perceived ease of use, leading to greater usage intention. Moreover, the mediated relationships between pull- and push-LBA are more salient among consumers of low PSE (vs high PSE) and Gen Z (vs other generations). The findings reflect the importance of supplier and customer resources as well as their integration in the value co-creation process (Bartelheimer, 2020; Bruns and Jacob, 2016; Eggert et al., 2018; Macdonald et al., 2016); they also advance the LBA literature in clarifying the boundary conditions for the effectiveness of LBA.

Second, although smart service offers significant benefits for service providers and users, certain factors impede its adoption by users (Gonçalves et al., 2020; Lau et al., 2018; Wunderlich et al., 2015). As privacy concerns have been identified as a prominent barrier to the adoption of smart services (Lau et al., 2018; Rauschnabel et al., 2018; Wunderlich et al., 2015), a more fine-grained understanding of how privacy-related factors influence consumers’ adoption of smart service is needed. The current research contributes to this issue by
focusing on a certain kind of smart service, namely LBA, to investigate how privacy-related factors, such as LBA type, consumers’ PSE and consumer generation, affect the adoption of LBA. The results demonstrate that technology features that lower privacy risks (e.g. pull-LBA rather than push-LBA) could prompt the adoption of smart services. Moreover, consumer characteristics that alleviate consumers’ sensitivity to privacy concerns (e.g. having high PSE, being of a generation that precedes Gen Z) could mitigate the negative impact of technology features that engender privacy risks.

Third, although many studies concern the effects of individual differences on consumers’ reactions to LBA and other LBMS, most focus on innovation-related factors, as LBMS is a high-tech tool (e.g. Beldona et al., 2012; Bouwman et al., 2014; Jang and Lee, 2018). This research is one of the first studies of the effects of privacy-related consumer characteristics. In addition, prior studies rarely investigated the privacy-related interactions of LBA type and consumer characteristics; thus, the current study further addresses this gap and contributes to the LBA literature by demonstrating that the consumer value-in-use induced by LBA and, consequently, the adoption of LBA diminishes when using push-LBA for low PSE and Gen Z consumers.

Finally, as noted, Gen Z is becoming the dominant consumer generation and has considerable direct and indirect purchase power (Fromm, 2018), which makes further investigation of Gen Z consumers warranted. Nevertheless, Hayes et al. (2022) found that limited academic attention has been paid to how Gen Zers react to CSR marketing differently from those of other generations and urged further investigation on generational differences in consumers’ responses to CSR marketing. Responding to this call, we investigate how Gen Zers’ response to privacy concerns of LBA differs from that of other generations. This research shows that the disparities in perceived usefulness, perceived ease of use and usage intention between pull- and push-LBA are amplified among Gen Zers, thus adding to the literature on Gen Z and CSR marketing.

Practical implications
Our research findings indicate that consumers, especially those with low PSE and Gen Z, have more negative reactions to push-than pull-LBA. This is probably due to the intrusive and interruptive nature of push-LBA (Unni and Harmon, 2007; Xia and Sudharshan, 2002; Xu et al., 2009), the inability of low PSE consumers to protect themselves (Chen, 2018; Chen and Chen, 2015) and Gen Zers’ deep concerns about social issues and online privacy (sparks and honey, 2015; The Center for Generational Kinetics®, 2016).

Our primary suggestion is that, if possible, it is better to provide pull-instead of push-LBA to lessen consumers’ privacy concerns. If, however, firms still need push-LBA for other reasons, they can improve practices in regard to segmentation and service design. First, they can measure users’ PSE and target consumers with high PSE; they also can target consumers within the generations that precede Gen Z based on their age or birth year. Second, the marketers of push-LBA should act accordingly, when necessary, to improve users’ ability in protecting themselves from privacy intrusion. For example, they can provide clear instructions to low PSE consumers on how to be temporarily untracked, such as switching off the mobile phone’s location-tracking function or using an InPrivate window to surf the internet. Once consumers’ PSE is reinforced, their privacy concerns lessen (Eddy et al., 1999; LaRose and Rifon, 2007), and their usage intention is enhanced (Lee and Hill, 2013). Third, push-LBA providers can give back some control to consumers, as discussed below.

After the implementation of the European Union’s General Data Protection Regulations (GDPR) and other data protection regulations that request that user consent should be given prior to data processing, most firms have adopted opt-in push approaches rather than opt-out push approaches (Lì et al., 2019; Lin et al., 2016; Sanchez-Rola et al., 2019). Further, GDPR requires that firms provide users with the right to withdraw their consent at any time and that
this process should be as easy as giving consent. Therefore, in practice, the implementation of consent withdrawal depends on how a firm gets consent. This could mean providing users with a link or button on websites or apps, providing an online form, providing a phone number, or including information about how to withdraw in a privacy policy or other user-facing documentation (European Data Protection Board, 2020; Information Commissioner’s Office, 2023). As such, it may not always be easy for users to withdraw consent.

Sanchez-Rola et al. (2019) visited 2,000 websites from across the world and found that only 4% of the websites provide a clear withdrawal option. Therefore, consumers still encounter high privacy risks and loss of control over their personal information when using opt-in push websites or apps. Based on our research findings, we believe that this situation may be of greater concern among consumers with low PSE and Gen Zers. Therefore, we suggest that push-LBA providers offer a clear and easy-operating withdrawal option within their apps, websites, or even at the end of every automatically sent message, especially for low PSE and Gen Z consumers. This would allow consumers to have control over the use of their personal information and thereby reduce their privacy concerns toward push-LBA.

Although our research focuses only on LBA, to some extent, the findings could be extended to the practices of other smart services that elicit privacy concerns. First, to increase consumers’ adoption of smart services, it is important to give back control to consumers of when to be tracked. Like using pull-LBA rather than push-LBA, smart service providers can design interfaces that enable consumers to initiate the monitoring functions of smart service or withdraw from being tracked. Second, smart service providers can foster service adoption by targeting consumers with lower privacy sensitivity, such as consumers with high PSE or who are in the generations that precede Gen Z.

Limitations and future research
The limitations of this study suggest opportunities for future research. First, we use privacy concerns to develop hypotheses about the effects of LBA type, PSE and consumer generation on perceived ease of use, perceived usefulness and usage intention. Given that a considerable number of studies have confirmed the correlation between privacy concerns and each variable investigated in this research (e.g. LaRose and Rifon, 2007; Palos-Sanchez et al., 2017; Unni and Harmon, 2007), we did not directly examine the privacy correlations under our hypotheses. For a more comprehensive design, future research can measure the privacy concerns toward push- and pull-LBA among consumers with different PSE levels and within different generations to better understand how privacy concerns change the three dependent variables.

In addition, consumers’ feelings toward some privacy issues, such as interruption and loss of control, may become salient after a period of usage experience. Due to the difficulty of getting participants to take part in a time-consuming experiment, however, in this study, the participants tried the LBA app for only a few minutes and then reported their responses. Future research could implement a different design (e.g. cooperating with well-known app operators to launch pull- and push-LBA to the real market) to gather consumers’ responses after they have accumulated certain usage experiences.

References


### Appendix

#### Table A1.

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**Note(s):** *NTD: new Taiwan dollar; 1 USD ≈ 30 NTD*

**Source(s):** Table created by author

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