REDUCING RE-DELIVERY FAILURES IN E-COMMERCE: AN EMPIRICAL STUDY ON SMART LOCKER ADOPTION

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Abstract

Research purpose: The rapid expansion of e-commerce has transformed consumer purchasing behaviors and introduced substantial challenges for last-mile logistics, particularly concerning failed delivery attempts due to recipient unavailability. These unsuccessful deliveries often result in costly and inefficient re-delivery processes. In response, distribution service providers have implemented smart locker systems to streamline parcel collection and improve delivery efficiency. Thus, this study aims to investigate the key determinants influencing the adoption of smart lockers and examine the interrelationships among these factors, grounded in an established research framework and a comprehensive literature review.

Design/Methodology/Approach: This study employes a combination of purposive and snowball sampling methods to select research participants, focusing on consumers with prior experience using smart lockers to examine their usage intentions. Further, building upon the insights garnered from the literature review, the research framework of this study has been meticulously structured. The foundational theoretical underpinning for this research architecture is rooted in the Decomposed Theory of Planned Behavior (DTPB) to examine the determinants of consumers' intentions to adopt smart lockers.

Findings: Based on survey data from 316 respondents, the analysis identifies perceived usefulness, ease of use, and compatibility as significant predictors of positive attitudes toward smart lockers. Social influences, including peer and supervisor opinions, shape subjective norms, while self-efficacy and facilitating conditions contribute to perceived behavioral control. In turn, these three dimensions, attitude, subjective norm, and perceived behavioral control, significantly affect behavioral intention.

Originality/Value: The study contributes to the broader literature on technology adoption by highlighting the critical role of decomposed belief structures and social-cognitive variables in shaping consumer behavior. Managerial implications and actionable recommendations are offered for logistics providers and e-commerce platforms to enhance smart locker adoption and mitigate the inefficiencies associated with re-delivery.

Keywords: smart locker, re-delivery, decomposed theory of planned behavior

1. Introduction

The accelerating pace of urbanization has generated a rising demand for urban services and amenities. At the same time, economic growth, demographic transitions, and shifting social norms have resulted in a greater proportion of household members engaging in employment or educational activities during daytime hours. This shift has created new challenges in managing in-home services, particularly parcel retrieval. Simultaneously, technological advancements and societal transformations have fueled the rapid expansion of e-commerce. Global retail e-commerce sales reached approximately 5.2 trillion U.S. dollars in 2021 and are projected to grow by more than fifty percent by 2026 (Chevalier, 2022). As consumers increasingly rely on online retail for daily necessities, the delivery sector faces mounting logistical difficulties, most notably repeated delivery failures caused by recipient unavailability.

To address these challenges, distribution service providers have introduced value-added solutions such as delivery notifications and alternative collection points. Despite these innovations, unresolved issues persist, including limited-service hours, difficulty accessing depots, and low consumer familiarity with smart locker systems. Consequently, re-deliveries remain common. In dual-income households, where daytime availability is restricted, nearly one-fifth of parcels require multiple delivery attempts, leading to higher operational costs, wasted resources, additional warehousing needs, and increased risk of cargo damage. These inefficiencies also diminish customer satisfaction due to unsuccessful first deliveries. Contributing factors include inaccurate delivery addresses, misaligned delivery schedules, absence of concierge services, and challenges in handling temperature-sensitive goods.

Although smart lockers have emerged as a promising alternative, prior research has predominantly examined their deployment from the perspective of distribution operators, focusing on operational concerns such as location optimization and cost reduction (Yin et al., 2023). In contrast, studies exploring consumer perspectives remain limited, particularly regarding factors influencing their willingness to adopt smart lockers. Addressing this gap is critical for increasing utilization and alleviating the inefficiencies associated with re-deliveries.

Accordingly, the present study pursues two objectives: (1) to apply the Decomposed Theory of Planned Behavior (DTPB) to examine the determinants shaping consumer willingness to use smart lockers and clarify the interrelationships among these factors, and (2) to generate insights into consumer perceptions of the benefits and challenges of adopting smart lockers.

The remainder of this paper is organized as follows. Section 2 reviews relevant literature on smart lockers and the DTPB framework. Section 3 presents the research design, including framework development, hypotheses, variables, and data collection. Section 4 analyzes the empirical results and evaluates the proposed hypotheses. Finally, Section 5 concludes the study and offers recommendations for both practice and future research.

2. Literature review

2.1 Decomposed Theory of Planned Behavior (DTPB)

The Decomposed Theory of Planned Behavior (DTPB), developed by Taylor and Todd (1995a, 1995b), extends the Theory of Planned Behavior (TPB) (Fishbein & Ajzen, 1975; Ajzen, 1985) by integrating elements of the Technology Acceptance Model (Davis, 1989) and Innovation Diffusion Theory (Rogers, 1983). Unlike TPB's one-dimensional belief structure, DTPB decomposes behavioral intention into attitudes, subjective norms, and perceived behavioral control, and further disaggregates these into factors such as perceived usefulness, compatibility, self-efficacy, and facilitating conditions. This decomposition offers a more detailed framework for explaining technology adoption.

DTPB has been widely applied to innovation studies, including sustainability practices (Garay et al., 2018), mobile banking (Jouda et al., 2020), and digital literacy integration (Sadaf & Gezer, 2020). However, its application to smart locker adoption remains limited. Existing research on smart lockers (Cai et al., 2021; Tang et al., 2021; Chen et al., 2023) has largely focused on operational efficiency or location strategy rather than consumer decision-making. Given that attitudes (e.g., convenience, security), subjective norms (e.g., peer influence), and perceived behavioral control (e.g., accessibility, ease of use) are central to consumer acceptance, this study employs DTPB as the theoretical foundation to investigate users' willingness to adopt smart lockers.

2.2 Contemporary development of smart lockers

Smart lockers are automated storage and retrieval systems that integrate electronic locks, sensors, centralized management platforms, and mobile applications to enable secure, contactless delivery and retrieval (Tang et al., 2021). By streamlining last-mile logistics, they reduce delivery times, enhance operational efficiency, and improve customer convenience, making them a critical solution to challenges such as re-deliveries and resource waste.

Recent studies highlight both operational and consumer perspectives. Optimization models have been developed for locker placement and design (Faugère & Montreuil, 2020), while IoT and blockchain applications have been examined to enhance efficiency and security. From the demand side, smart lockers have been shown to reduce home delivery trips (Refaningati et al., 2020) and significantly improve customer satisfaction in e-commerce (Quân et al., 2022). Their widespread adoption underscores their adaptability to technological advances and demographic shifts, offering a scalable solution to the evolving demands of contemporary logistics.

3. Research methodology

3.1 Research framework

The primary objective of this study is to investigate the determinants influencing consumers' intention to adopt smart lockers. Based on the insights derived from the literature review and the discussions presented in Section 2, a research framework was systematically developed. This framework is grounded in the Decomposed Theory of Planned Behavior (DTPB), which extends the Theory of Reasoned Action (Fishbein & Ajzen, 1975), Innovation Diffusion Theory (Rogers, 1983), and the Theory of Planned Behavior (Ajzen, 1985), as further elaborated by Taylor and Todd (1995a, 1995b). By integrating these theoretical foundations, the framework provides a structured lens for examining attitudes, subjective norms, and perceived behavioral control in the context of smart locker adoption. The schematic representation of this framework is illustrated in Figure 1.

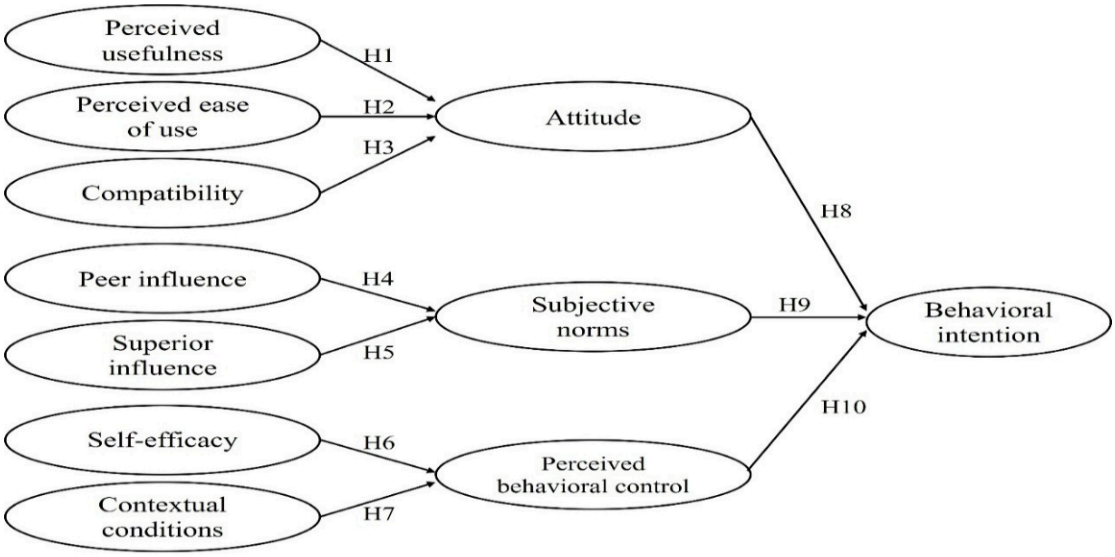

Figure 1 Research framework

To empirically test the proposed framework, this study employed an online questionnaire survey. Online surveys offer several advantages over traditional paper-based methods, particularly in overcoming geographical constraints and facilitating broader respondent accessibility. Compared to on-site data collection, online questionnaires provide participants with greater flexibility in responding at their convenience, while also benefiting from the anonymity afforded by digital platforms (Deutskens et al., 2006). Such anonymity can encourage participation from individuals who may be reluctant to disclose personal information in face-to-face contexts (Iacobucci & Churchill, 2018). Consequently, this approach expands the potential sampling pool beyond the researcher's immediate environment, thereby enhancing both the diversity and representativeness of the collected data.

In alignment with the established research framework, this study adopts the Decomposed Theory of Planned Behavior (DTPB) as its theoretical foundation for examining the factors influencing consumers' intention to adopt smart lockers. The operationalization of constructs is detailed in Table 1, which presents the dimensions, measurement items, and supporting literature for each factor.

The questionnaire was carefully designed based on prior studies to ensure content validity. All items were measured using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). This format enables respondents to express varying degrees of agreement, thereby capturing their perceptions of smart lockers and their willingness to adopt potential enhancements.

Data analysis was conducted using SPSS 21 and AMOS 22. The analytical procedures included descriptive statistics, reliability testing, validity assessment, and structural equation modeling (SEM). Descriptive analysis was first employed to summarize respondents' demographic characteristics and provide an overview of their familiarity with smart locker services. Reliability was assessed through Cronbach's alpha, with coefficients above 0.7 indicating acceptable internal consistency (Iacobucci & Churchill, 2018). Validity tests were performed to ensure construct measurement accuracy, followed by SEM to evaluate the hypothesized relationships among constructs within the DTPB framework.

Table 1 Dimensions and items for evaluating consumer behavior intentions

Dimension	Code	Items	Literature
Perceived usefulness (PCU)	PCU1	I find using smart lockers convenient for retrieving my packages.	Smarkola (2008); Lin et al. (2022); Xia et al. (2024)
	PCU2	I find using smart lockers can improve the quality of my experience when retrieving my packages.	
	PCU3	I find using smart lockers meet my requirement when retrieving my packages.	
	PCU4	Overall, I believe using smart lockers is useful.	
Perceived ease of use (PCE)	PCE1	I find it is easy to learn how to operate a smart locker.	Smarkola (2008); Lin et al. (2022); Xia et al. (2024)
	PCE 2	I find the operating instructions for smart lockers clear and easy to understand.	
	PCE 3	I find the functions of smart lockers simple and convenient.	
	PEU4	Overall, I find smart lockers easy to use.	
Compatibility (CMP)	CMP1	I find using smart lockers meets my retrieving habits.	Rogers (1983); Taylor and Todd (1995a, b); Smarkola (2008)
	CMP 2	I find using smart lockers meet my retrieving requirement.	
	CMP 3	I find smart lockers are suitable for retrieving my personal packages.	
	CMP 4	I believe using smart lockers for retrieving my package offers the same functionality as having a delivery operator handle it at home.	
Peer influence (PEI)	PEI1	My family, friends, and colleagues highly recommend that I use smart lockers for retrieving my packages.	Taylor and Todd (1995a, b); Bhattacherjee (2000)
	PEI2	Suggestions from my family, friends, and colleagues influence my willingness to use smart lockers.	
	PEI3	For me, the opinions of my family, friends, and colleagues play a significant role in my decision to use smart lockers.	
Superior influence (SPI)	SPI1	E-commerce operators encourage me to use smart lockers for retrieving my packages.	Taylor and Todd (1995a, b); Bhattacherjee (2000);
	SPI2	I believe the measures taken by e-commerce operators will influence my willingness to use smart lockers for retrieving my packages.	

	SPI3	Overall, I think e-commerce operators will encourage customers to use smart lockers for retrieving their packages.	Garay et al. (2018)
Self-efficacy (SLE)	SLE1	I can easily operate smart lockers for sending/picking up my package by myself.	Bandura, 1977;Taylor and Todd (1995a, b); Garay et al. (2018); Bhattacherjee (2000)
	SLE 2	I am capable of using smart lockers independently.	
	SLE3	I can easily navigate the various functions on the smart lockers interface.	
	SLE 4	I am confident in my ability to operate smart lockers independently, even without instructional demonstrations or guidance.	
Contextual conditions (CTC)	CTC1	I believe using smart lockers for retrieving up my package can help me save time.	Bandura, 1977; Taylor and Todd (1995a, b); Garay et al. (2018); Bhattacherjee (2000)
	CTC2	I think utilizing smart lockers can reduce delivery costs.	
	CTC3	I feel I can easily access the locations where smart lockers are set up.	
	CTC4	I believe smart lockers have adequate storage compartments of the right size for my needs.	
Attitude (ATT)	ATT1	I believe using smart lockers for retrieving my package is a good idea.	Taylor and Todd (1995 a, b); Garay et al. (2018); Sadaf and Gezer (2020); Jouda et al. (2020)
	ATT2	I find using smart lockers for retrieving my packages to be a pleasant experience.	
	ATT3	Overall, I have a positive perception of using smart lockers.	
Subjective norms (SBN)	SBN1	I am likely to use smart lockers due to the expectations of individuals who influence my decisions.	Taylor and Todd (1995); Garay et al. (2018); Sadaf and Gezer (2020); Jouda et al. (2020)
	SBN2	Those who influence my opinions will encourage me to use smart lockers for retrieving my packages.	
Perceived behavioral control (PBC)	PBC1	I believe I can use smart lockers independently.	Taylor and Todd (1995 a, b); Garay et al. (2018); Sadaf and Gezer (2020); Jouda et al. (2020)
	PBC2	I feel confident in my ability to use smart lockers for sending and retrieving my packages.	
	PBC3	I think I possess the necessary skills to use smart lockers.	
	PBC4	I believe I have the knowledge required to use smart lockers.	
Behavioral intention (BHI)	BHI1	I am willing to use smart lockers for retrieving my packages in the future.	Taylor and Todd (1995a, b); Smarkola (2008); Garay et al. (2018); Sadaf and Gezer (2020)
	BHI2	I will continue to use smart lockers for retrieving up my packages in the future.	
	BHI3	If I need to retrieve my packages in the future, I will use smart lockers more frequently.	
	BHI4	I highly recommend others use smart lockers for retrieving their packages.	

Validity analysis was performed using confirmatory factor analysis (CFA), with model fit evaluated through established indices to ensure consistency with the theoretical framework (Hair et al., 2019). Composite reliability (CR) and average variance extracted (AVE) were computed, with factor loadings above 0.5 and AVE square roots exceeding inter-construct correlations confirming convergent and discriminant validity. Building on this, structural equation modeling (SEM) was applied to assess the research framework, evaluating model fit and estimating path coefficients to identify the causal relationships influencing consumers' intention to adopt smart lockers.

3.2 Research hypothesis

This study investigates the determinants influencing consumers' intention to adopt smart lockers, drawing on the Decomposed Theory of Planned Behavior (DTPB) and prior empirical research. DTPB has been widely validated across contexts, including online shopping (Lin, 2007), industrial buying behavior (Celuch et al., 2007), technology adoption by teachers (Shiue, 2007), and educators' computer usage (Smarkola, 2008). These studies consistently demonstrate that perceived usefulness, ease of use, and compatibility strongly influence attitudes toward adoption. Research has also highlighted the influence of social factors. For example, Gangwal and Bansal (2016) applied DTPB to mobile commerce, while Aziz et al. (2017) extended the framework with moderating variables. Garay et al. (2018) further demonstrated that attitudes, social norms, and perceived behavioral control shape innovation adoption in sustainability-related contexts. Self-efficacy and contextual conditions also play a central role in shaping perceived behavioral control. Bandura (1977) emphasized self-efficacy as a determinant of behavioral outcomes, while Sadaf and Gezer (2020) confirmed its importance in digital literacy integration. Similarly, resource availability has been shown to strengthen perceived behavioral control and adoption intentions. Finally, DTPB posits that attitudes, subjective norms, and perceived behavioral control directly influence behavioral intention. Empirical evidence supports this linkage: Sadaf and Gezer (2020) identified attitude, usefulness, and self-efficacy as strong predictors, while Jouda et al. (2020) validated these effects in mobile banking adoption. Based on these findings, the final hypotheses are listed in Table 2:

Table 2. Research Hypotheses

Construct	Hypothesis	Expected Relationship
Perceived Usefulness → Attitude	H1	Perceived usefulness positively influences Attitude.
Perceived Ease of Use → Attitude	H2	Perceived ease of use positively influences Attitude.
Compatibility → Attitude	H3	Compatibility positively influences Attitude.
Peer Influence → Subjective Norms	H4	Peer influence positively influences Subjective norms.
Superior Influence → Subjective Norms	H5	Superior influence positively influences Subjective norms.
Self-Efficacy → Perceived Behavioral Control	H6	Self-efficacy positively influences Perceived behavioral control.
Contextual Conditions → Perceived Behavioral Control	H7	Contextual conditions positively influence Perceived behavioral control.
Attitude → Behavioral Intention	H8	Attitude positively influences Behavioral intention.
Subjective Norms → Behavioral Intention	H9	Subjective norms positively influence Behavioral intention.
Perceived Behavioral Control → Behavioral Intention	H10	Perceived behavioral control positively influences Behavioral intention.

4. Analysis results

4.1 Characteristics of respondents

This study employed a combination of purposive and snowball sampling to recruit participants, focusing specifically on consumers with prior experience using smart lockers. Data were collected via an online questionnaire administered between January 28, 2024, and March 31, 2024. A total of 367 responses were received, of which 51 were excluded due to participants' lack of smart locker experience. The remaining 316 valid responses yielded an effective response rate of 86.1%.

Descriptive statistical analysis was conducted to summarize participant characteristics (Table 2). Of the valid respondents, 183 (57.9%) were male and 133 (42.1%) were female. In terms of age distribution, 23 respondents (7.3%) were under 18 years old, 191 (60.4%) were between 19 and 28, 85 (26.9%) were between 29 and 38, 9 (2.9%) were between 39 and 48, and 8 (2.5%) were aged 49 or above. The majority of respondents were young adults between 19 and 28 years old. Educational background indicated that 35 participants (11.1%) held a high school diploma or below, 221 (69.9%) had completed a college or university degree, and 60 (19.0%) held a graduate-level degree or above, suggesting that most respondents possessed higher education qualifications. Occupational distribution revealed that 3 respondents (1.0%) were employed in agriculture, forestry, fishery, or animal husbandry; 56 (17.7%) in manufacturing; and 136 (43.0%) in the service sector. In addition, 30 respondents (9.5%) were employed in the military or public education, 55 (17.4%) were students, 23 (7.3%) identified as housekeepers, and 13 (4.2%) selected “other”.

Non-response bias was assessed using an independent samples t-test, following Armstrong and Overton (1977). Comparing early (n=210) and late (n=106) respondents, no significant differences were found at the 95% confidence level, indicating minimal risk of non-response bias and confirming the sample’s suitability for further analysis.

4.2 Confirmatory Factor Analysis and Validity

Reliability analysis was conducted using SPSS 21, with Cronbach’s alpha values for all constructs exceeding 0.7, indicating satisfactory internal consistency. Confirmatory factor analysis (CFA) was then performed in AMOS 22 to evaluate model fit (Fornell & Larcker, 1981). Key indices, including GFI, AGFI, NFI, TLI, RMR, and RMSEA, were assessed against recommended thresholds (Hair et al., 2019), all of which met acceptable standards, as summarized in Table 3.

Table 3 Goodness fit of confirmatory factor analysis

	Indicator	Criteria	Results	References
Parsimonious fitness	χ^2/df	＜2	1.92	Hair et al. (2019); Lin and Chang (2021); Kanwal et al. (2022); Chang et al. (2024); Xia et al. (2024)
Absolute fitness index	GFI	＞0.90	0.93	
	AGFI	＞0.90	0.96	
	RMR	＜0.05	0.03	
	RMSEA	＜0.08	0.06	
Incremental fitness index	NFI	＞0.90	0.95	
	TLI	＞0.90	0.93	

Note: GFI: goodness of fit index; AGFI: adjusted goodness-of-fit index; RMR: root mean square residual; RMSEA: root mean square error of approximation; NFI: normed fit index; TLI: Tucker-Lewis index.

To assess the validity of the measurement model, both convergent and discriminant validity were examined. Construct reliability (CR) and average variance extracted (AVE) were calculated from standardized factor loadings, with values above 0.5 deemed acceptable and those above 0.7 preferred as stronger evidence of convergent validity.

The results indicate strong construct validity, with factor loadings ranging from 0.70 to 0.89 across all constructs, confirming satisfactory internal consistency. Additionally, the square root of each construct’s AVE exceeded its inter-construct correlations, thereby establishing discriminant validity and demonstrating that the constructs are both reliable and conceptually distinct.

4.3 Structural Equation Modeling (SEM)

Structural Equation Modeling (SEM) using AMOS 22 was employed to examine the causal relationships among latent variables in this research. Following confirmatory factor analysis, which confirmed acceptable measurement model fit, the structural model was tested and path analysis

conducted. Using a significance threshold of $p < 0.10$, all hypothesized paths were found to be positive and statistically significant (Table 4), confirming the robustness of the model and its explanatory power in capturing the determinants of consumers' intention to adopt smart lockers.

Table 4 Estimated results of SEM coefficients

Path	Path coefficient		S.E.	C.R.	P
	Standardization	Non-standardization			
PU→AT[a]	0.39	0.43	0.38	2.76	*
PE→AT	0.33	0.39	0.36	2.28	*
CO→AT	0.48	0.38	0.61	3.23	**
PI→SN	0.73	0.69	0.89	7.81	**
SI→SN	0.75	0.63	0.75	6.89	**
SE→PB	0.66	0.71	0.97	7.25	**
CC→PB	0.39	0.43	0.42	4.23	**
AT→BI	0.49	0.51	0.94	5.42	**
SN→BI	0.28	0.29	0.51	3.34	**
PB→BI	0.46	0.58	0.89	6.41	**

Note: [a]PU: Perceived usefulness; PE: Perceived ease of use; CO: Compatibility; AT: Attitude; PI: Peer influence; SI: Superior influence; SN: Subjective norms; SE: Self-efficacy; CC: Contextual conditions; PB: Perceived behavioral control; BI: Behavioral intention.

*p<0.1; **p<0.05

Figure 2 presents the structural equation model with standardized path coefficients, illustrating the hypothesized relationships among constructs. Statistically significant paths are depicted with solid lines, confirming validated associations within the model. The standardized coefficients (β) indicate both the strength and direction of these effects, providing insights into the relative influence of each predictor on its corresponding outcome. Furthermore, the coefficients of determination (R^2) for the dependent variables reflect the proportion of variance explained by their predictors, thereby demonstrating the model's explanatory power.

The results confirm that perceived ease of use, usefulness, and compatibility significantly enhance attitude (H1–H3 supported). Peer and superior influence positively affect subjective norms (H4–H5), while self-efficacy and contextual conditions significantly strengthen perceived behavioral control (H6–H7). Finally, attitude, subjective norms, and perceived behavioral control each exert a significant positive effect on behavioral intention, supporting H8–H10.

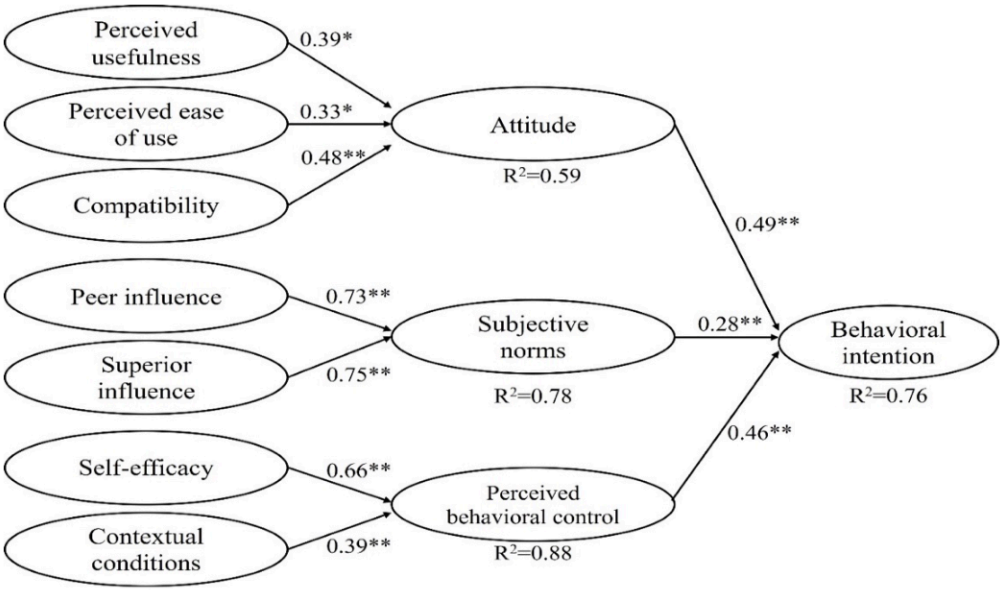

Figure 2 Result of SEM

5. Conclusion and discussion

In the evolving e-commerce landscape, smart lockers have emerged as a promising solution to last-mile delivery challenges, offering consumers greater flexibility and efficiency. Yet, issues such as limited operating hours, restricted access, and unfamiliarity with the systems continue to hinder their effectiveness, leading many consumers to rely on re-delivery services.

Grounded in the Decomposed Theory of Planned Behavior (DTPB), this study examined the determinants shaping consumer intentions to adopt smart lockers. The findings demonstrate that perceived usefulness, ease of use, and compatibility positively influence attitudes, while peer and supervisor influences strengthen subjective norms. Self-efficacy and contextual conditions significantly enhance perceived behavioral control, with user confidence identified as a key driver of adoption. Attitudes, norms, and control collectively shape behavioral intention, underscoring the importance of both system usability and consumer empowerment. These insights highlight the need for distribution providers and e-commerce platforms to improve locker visibility, usability, and consumer confidence. Strengthening these aspects may accelerate adoption, reduce re-deliveries, and enhance the efficiency of last-mile logistics.

The findings of this study provide important insights into consumers' behavioral intentions to adopt smart lockers, positioning them as a viable strategy for mitigating re-delivery challenges in last-mile logistics. By applying the DTPB, this research contributes to the literature by demonstrating that perceived usefulness, ease of use, and compatibility are critical determinants of consumer attitudes. Adoption intentions are strengthened when smart locker functionalities align with consumers' prior experiences and current needs, reinforcing positive perceptions of their value. Social influences also play a significant role. Peer recommendations strongly shape subjective norms, highlighting the importance of social endorsement in motivating adoption. Similarly, supervisor influence reflects the relevance of workplace encouragement and operational convenience, suggesting that institutional support may further accelerate smart locker usage. In addition, self-efficacy and contextual conditions significantly affect perceived behavioral control, with self-efficacy identified as the most influential factor. Consumers who feel confident in their ability to use smart lockers are more likely to integrate them into their daily routines. The analysis further reveals that perceived behavioral control is the strongest predictor of behavioral intention, underscoring the central role of confidence and convenience in shaping adoption.

Overall, these results suggest that enhancing user confidence and improving the accessibility and ease of smart locker systems can substantially increase consumer adoption. For logistics providers, this highlights the strategic importance of designing user-friendly systems and fostering consumer trust to reduce re-deliveries and strengthen last-mile efficiency.

This study contributes to the literature by applying the DTPB to the emerging context of smart locker adoption, shifting the focus from operational efficiency to consumer behavior. By examining perceived usefulness, ease of use, compatibility, social influence, self-efficacy, and contextual conditions, it extends the application of DTPB and highlights the central roles of attitudes, subjective norms, and perceived behavioral control in shaping adoption intentions. The findings provide practical implications for e-commerce platforms and logistics providers, suggesting that enhancing usability, visibility, and consumer confidence—alongside leveraging social influence—can foster wider adoption and reduce re-deliveries.

Future research should broaden sample diversity, refine measures of industry influence, and engage with multiple distribution providers to strengthen generalizability. Incorporating qualitative approaches, such as interviews, could also yield deeper insights into consumer perceptions and barriers, enriching understanding of technology adoption in last-mile logistics.

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