Environment and Social Psychology (2026) Volume 11 Issue 1 ISSN: 2424-8975 (O)
doi: 10.59429/esp.v11i1.4372 2424-7979 (P)

RESEARCH ARTICLE

Psychological Reactance as Mediator: How Perceived Threat to Freedom and Perceived Ease of Use Affect Intention to Use Chatbot Services in Chinese E-commerce

Huanyi Liu[1], Soo-Kyoung Lee [2,*]

[1] *School of Service Management, Korea Aerospace University, Goyang-si 10540, Republic of Korea ; liuhuanyi651@kau.kr*

[2] *School of Service Management, Korea Aerospace University, Goyang-si 10540, Republic of Korea ; sklee@kau.ac.kr*

*** Corresponding author:** Soo-Kyoung Lee, sklee@kau.ac.kr

ABSTRACT

The mandatory implementation of chatbots in Chinese e-commerce has elicited consumer resistance. Existing research primarily focuses on the technical optimization of intelligent customer service, examining how to enhance communication efficiency and effectiveness between chatbots and consumers, while paying insufficient attention to the negative psychological mechanisms triggered by mandatory use. This study integrates Psychological Reactance Theory and the Technology Acceptance Model to examine how perceived threats to freedom and perceived ease of use influence consumers' intention to use chatbots, mediated by psychological reactance under conditions of forced adoption. Based on data collected from 406 survey responses, a structural equation modeling approach was employed to conduct the empirical analysis. The results indicate that: (1) perceived threats to freedom negatively influence intention to use, while perceived ease of use positively influences it. (2) perceived threats to freedom positively predict psychological reactance, whereas perceived ease of use has a negative effect. (3) psychological reactance directly and negatively influences usage intention, serving as a partial mediator between both perceived threats to freedom and perceived ease of use and consumers' intention to use. Drawing on Psychological Reactance Theory, this study reveals the underlying mechanism through which perceived ease of use enhances consumers' intention to use chatbot services by mitigating psychological reactance under mandatory conditions. Furthermore, the study offers practical implications for enterprises seeking to mitigate the negative outcomes associated with the compulsory use of intelligent customer service.

Keywords: Chatbot Service. Forced Use. Psychological Reactance. Perceived Threat to Freedom. Perceived Ease of Use

1. Introduction

With the rapid advancement of AI technology, professional service robots are entering the global market at an unprecedented pace, with chatbots emerging as a particularly prominent application [1]. E-commerce enterprises have increasingly adopted chatbot services, which not only enhance the overall customer service

ARTICLE INFO
Received: 19 November 2025 | Accepted: 4 January 2025 | Available online: 20 January 2026

CITATION
Liu HY, Lee SK. Psychological Reactance as Mediator: How Perceived Threat to Freedom and Perceived Ease of Use Affect Intention to Use Chatbot Services in Chinese E-commerce. *Environment and Social Psychology* 2026; 11(1): 4372 doi:10.59429/esp.v11i1.4372

experience but also significantly reduce response time through 24/7 availability[2]. In online shopping environments, consumers seek product and service information through multiple channels. Over time, shortcomings of traditional customer service models have become increasingly apparent, including high employee turnover, elevated training costs, and restricted service hours. Due to their time- and location-independent nature, chatbot services are gradually replacing human customer service [3].

China's chatbot industry has grown rapidly in recent years [59], capturing an increasing share of the global market. Major platforms like Taobao, JD.com, and Pinduoduo have been especially active in deploying chatbot services [4]. However, in promoting chatbots, enterprises frequently implement compulsory usage strategies (e.g., direct transfers to chatbots), which restrict consumers' freedom of choice [5]. According to IBM's 2024 consumer survey, only about 33% of users expressed satisfaction with their experience using intelligent assistants. Nearly 20% reported significant disappointment and expressed unwillingness to use such services again [6]. Despite technological advancements, consumer resistance remains, with some users even reducing their purchases due to the perceived lack of human touch in such services [7].

The current research on intelligent customer service primarily focuses on technology optimization [8] or examines its positive influencing factors through the Technology Acceptance Model [9], aiming to improve the efficiency and effectiveness of communication between chatbots and consumers. The coercive usage strategies are designs of services that block or cover access to human agents or automatically redirect users to chatbots or use of chatbots as a condition to complete the service. However, existing studies largely overlook the psychological mechanisms of consumers under conditions of forced use—particularly the negative psychological effects stemming from enterprises' mandatory replacement of human customer service, and how such effects influence usage intention from the perspective of consumer cognitive processing. It is worth noting that chatbots are prone to trigger consumers' perceived threats to autonomy due to their monitoring behaviors, preference prediction capabilities, and handling of privacy-related information[10]. These perceptions may in turn induce psychological reactance and reduce consumers' willingness to use such services. Although some scholars have investigated the negative impact of perceived threats to freedom on user behavior [11], research examining the underlying mechanisms in the specific context of mandatory use of intelligent customer service remains relatively limited. In practical application, enterprises often improve operational efficiency by forcibly replacing manual customer service. Such actions may heighten consumers' sense of limited freedom of choice, thereby influencing their attitudes and behavioral responses toward technology. While the perceived usefulness of technology is a critical prerequisite for enterprises to adopt emerging technologies, perceived ease of use exerts a more direct influence on consumer behavior and the realization of business value [12]. In scenarios of mandatory chatbot usage, users face dual pressures of technological complexity and restricted autonomy. However, most existing literature adopts either technology acceptance or psychological reactance as a single lens of analysis [13], which makes it difficult to fully account for the complex theoretical tension between these two dimensions. Therefore, it is necessary to integrate the Technology Acceptance Model and psychological reactance theory to construct a unified analytical framework. This study aims to reveal how consumers'willingness to use chatbots is affected by psychological reactance under the dual influences of perceived threat to freedom and perceived ease of use, thereby enriching the theoretical system of consumer behavior and providing strategic interventions and practical suggestions for enterprise-level technology adoption.

Although much has been researched about the implementation of chatbots and the technology acceptance, little effort has been directed towards consumer psychological resistance when there is a forced use of chatbots. The literature available focuses mainly on voluntary adoption cases, and the effects of

technology adoption on the mental and emotional facets are not well studied. This paper responds to this gap by three core research issues. First, it investigates the direct impact of perceived threat to freedom on consumers' willingness to use chatbot services. Drawing on Psychological Reactance Theory, the forced implementation of chatbots by enterprises is perceived by consumers as a deprivation of their freedom of choice [5]. For example, Ding et al. [14] found that perceived threats to freedom significantly reduced consumers' willingness to participate in loyalty programs. Accordingly, this study examines the potential negative consequences of the mandatory use of chatbots in e-commerce settings. Second, it explores the compensatory effect of consumers' perceived ease of use. While the Technology Acceptance Model establishes the positive influence of ease of use on technology adoption, it remains unclear whether this effect holds under conditions of forced usage. This study seeks to determine whether perceived ease of use can mitigate the negative consequences of mandatory chatbot use by satisfying consumers' need for convenience. Third, the study analyzes the mediating role of psychological reactance. Given the widespread negative attitudes and emotional responses toward chatbot services, this research adopts psychological reactance—based on the original theory—as a mediating variable. It examines how psychological reactance transmits the effects of perceived threat to freedom and perceived ease of use on consumers' intention to use chatbot services, thereby revealing the underlying psychological mechanisms driving consumer responses during human–chatbot interactions.

To solve these problems, we developed a model to test the relationship between perceived threat to freedom, perceived ease of use, psychological reactance and intention to use of chatbot services. 406 Chinese participants participated in the survey, which facilitated the empirical examination of these relationships through structural equation modeling (SEM).

The theoretical contributions of this study are threefold: (1) Grounded in Psychological Reactance Theory, it reveals a reverse mechanism whereby consumers' perceived ease of use enhances their intention to use chatbot services by reducing psychological reactance in mandatory use contexts. (2) Focusing on the unique scenario of the mandatory implementation of intelligent customer service in Chinese e-commerce, it deconstructs the pathway through which perceived threats to freedom affect usage intention, addressing the current gap in literature regarding consumer resistance and psychological conflict in forced-use contexts. (3) By integrating Psychological Reactance Theory and the Technology Acceptance Model, the study constructs a dual mediation framework centered on psychological reactance, offering a unified perspective for understanding technology forced acceptance.

The practical implications are as follows: (1) It provides guidance for enterprises to alleviate psychological reactance and resolve service tensions arising from information asymmetry by optimizing perceived ease of use and managing perceived threats to freedom. (2) It offers strategies to enhance consumers' willingness to adopt intelligent customer service systems and maximize the value derived from technological innovations. (3) It delivers empirical insights to support process optimization and experience balancing, thereby facilitating the intelligent transformation of enterprises and enhancing the realization of service value.

The structure of the paper is organized as follows: Section 2 critically reviews the relevant literature and lays the theoretical foundation. Section 3 details the research methodology. Section 4 presents the empirical findings and analyzes the results. Section 5 provides a critical discussion of the theoretical and practical implications. Finally, the study's limitations are addressed, and suggestions for future research are proposed.

2. Theoretical basis and literature review

2.1. Theoretical basis

2.1.1. psychological reactance theory

The psychological reactance theory was first proposed by Brehm in 1966. The core view is that when individuals perceive that their freedom of behavior is threatened, they will have the motivation to restore freedom[15]. The theory contains four key elements: freedom refers to the individual's subjective perceived behavior or attitude autonomy[16]. Threats come from external coercive forces, such as the forced use of chatbots by enterprises. Resistance is an intertwined reaction of emotion and cognition[17]. It may eventually lead to resistance or avoidance. In the field of technology acceptance, this theory is widely used to explain the user's resistance mechanism to coercive measures. For example, Feng et al. Confirmed in the airport self-service research that forced use would trigger users' psychological reactance [5].

Nonetheless, the application of the psychological reactance theory has been largely limited to the context of persuasive communication and policy enforcement, and the explanatory capacity of this theory in the context of service transactions through AI has not been significantly investigated.

2.1.2. Technology acceptance model

The TAM model proposed by Davis based on rational behavior theory is the core framework to explain technology adoption [17]. The model establishes perceived usefulness (the expectation of improving the efficiency of Technology) and perceived ease of use (the labor-saving degree of technology use) as key variables, which indirectly affect the willingness to use through attitude [18]. Follow up studies continue to expand the model: the TAM2 of Venkatesh et al. [19] includes regulatory variables such as social norms. UTAUT model integrates multiple theories to explain technology acceptance behavior. In the research of chatbot, Ashfaq et al. [20] combined TAM with Expectation Confirmation model and found that perceived ease of use significantly affected users' willingness to continue using.

Although TAM is a useful theory to understand the voluntary adoption of technologies, its assumptions can be disputed in the case of obligatory use when the option of voluntariness is limited.

2.1.3. Theoretical tension between PRT and TAM

TAM and psychological reactance theory suggest conflicting forces of behavior in settings that require the use of chatbots. Although TAM indicates that system usability helps to promote acceptance, the psychological reactance theory anticipates resistance in cases where there is a restriction in autonomy. This conflict introduces a cognitive dissonance where consumers will be both aware of functional advantages and affectively opposing, which presents forced adoption of chatbots as a theoretically distinctive situation.

2.2. Literature review

2.2.1. Research on chatbot services

Chatbots represent an early application in the marketing domain, involving the deployment of digital dialogue agents that interact with customers via voice or text to fulfill various service needs. These systems are gradually replacing human service agents across websites, social media platforms, and information services. By the end of 2024, the market size for chatbots and related technologies is projected to exceed USD 1.34 billion [21]. In the e-commerce sector, JD.com and Taobao have launched their own chatbots—Jimi and Xiaomi, respectively—to handle customer inquiries and provide after-sales support.

Existing research can be categorized into three dimensions. First, regarding technological optimization, scholars have sought to enhance system performance by advancing natural language understanding algorithms [22]and developing multi-level dialog management strategies. Second, in terms of user experience,

Kull et al. [23] found that anthropomorphic design can reduce consumers' perceived psychological distance from brands. Li et al. [24] confirmed that service quality dimensions—such as reliability and responsiveness—significantly affect users' willingness to continue using the service. Third, with respect to usage barriers, field experiments by Luo et al. [7] revealed that disclosing the chatbot's identity reduced purchase rates by 79.7%. Rajaobelina et al. [25] further pointed out that technology-related anxiety can exacerbate users' fears and amplify resistance.

2.2.2. Research on consumer behavior from the perspective of psychological reactance

With the rapid advancement of digital transformation, the perceived threat posed by mandatory technology deployment to consumers' psychological freedom has emerged as a key area of research. Existing evidence identifies three primary mechanisms underlying the generation of psychological reactance. First, when algorithmic decision-making replaces human service, the autonomy threat arising from diminished user-perceived behavioral control serves as a central trigger. Experimental results demonstrate that the compulsory intervention of AI-based customer service in online shopping scenarios reduces the fulfillment of consumers' autonomy needs by 31%, thereby directly eliciting resistance [26]. Second, restrictive technical frameworks (e.g., unskippable verification steps) can activate cognitive evaluations that perceive the decision-making process as oversimplified, thereby intensifying psychological reactance [27]. Third, in luxury consumption contexts, the use of technology-enforced shopping guidance undermines consumers' professional identity, resulting in emotional resistance that is 3.2 times stronger than that observed in ordinary product settings [28].

Research on consumers' acceptance of chatbot services indicates that when these services effectively resolve problems, the level of resistance tends to decrease significantly. Thus, consumer resistance is often attributed not to the technology itself, but to its failure in addressing user needs [29]. Moreover, when consumers attribute the forced use of technology to efficiency-related motives, the negative impact of psychological reactance on purchase intention weakens, suggesting that users' perceptions of a firm's technological deployment motives directly influence resistance levels [30]. During service interactions, guided operations and anthropomorphic interactions can help compensate for reduced autonomy and mitigate the adverse effects of perceived threats to freedom [26].

2.2.3. Mandatory and forced technology use

In addition to voluntary adoption of technology, there is an emergent body of research that has explored consumer reactions in the face of compulsory or coerced technology adoption. Feng et al. [5] proved that mandatory implementation of self-service technologies in airports causes the psychological reactance of users to a significant extent, triggering resistance and avoidance behaviors. Likewise, Cserdi and Kenesei[34] established that the imposition of self-service systems of the public transportation increased negative affective reactions especially among individuals who perceived lower control and technological self-efficacy. Fan and Liu[26] also demonstrated that AI-based services that use algorithmic autonomy can pose a threat to the perceived freedom of consumers and inhibit acceptance intentions. Taken together, these studies indicate that a mandatory usage is a unique situation where psychological resistance processes differ radically as opposed to voluntary technology use conditions.

2.2.4. Summary and research gap

Despite the growing relevance of chatbot services, several key gaps persist in the current literature: (1) There is a lack of targeted research on consumer cognitive resistance arising from the mandatory use of chatbot services. (2) The dynamic evolution of resistance-related emotions in long-term user–technology interactions has been largely overlooked, leading to a decline in consumers' willingness to engage with

chatbot services. (3) The moderating role of technology coercion sensitivity within the Chinese cultural context remains unverified. To address these limitations, the present study focuses on e-commerce chatbot service scenarios and aims to construct an integrated model illustrating the pathway from "technology compulsion characteristics" to "psychological reactance responses" and ultimately to "behavioral adaptation trajectories", thereby contributing to the refinement of theoretical frameworks in this domain.

2.3. Hypothesis presentation

2.3.1. Perceived threat to freedom: effects on willingness to use and psychological reactance

In the context of forced technology use, the perceived threat to freedom serves as a key explanatory factor for consumers' psychological and behavioral responses. According to classical psychological reactance theory, when individuals perceive their right to make autonomous choices is deprived by external forces, they experience a motivational state aimed at restoring that freedom[31]. In chatbot interaction scenarios, corporate decisions to eliminate human customer service channels and mandate the use of chatbot systems have been shown to significantly threaten users' freedom of choice[5]. The strength of this perception aligns with the principle of freedom valuation [16]: users perceive that the more valuable the restricted freedom option (e.g., human support), the stronger their resistance.

Existing studies have identified dual mechanisms through which perceived threat to freedom inhibits acceptance. Forced use of chatbots can trigger perceived restrictions, resulting in decreased satisfaction and increased resistance [22]. Lee et al. [32] found that personalized recommendation services reduce user adoption by threatening choice freedom, while Ding et al. [14] demonstrated that non-member customers who perceived freedom threats from mandatory loyalty program terms exhibited more negative attitudes and lower repurchase intentions. In summary, perceived limitations on consumer freedom significantly inhibit service adoption. Accordingly, the following assumptions are proposed:

H1a: In the context of forced chatbot use, perceived threat to freedom negatively affects consumers' willingness to use.

Wang et al. [33] proposed that compulsive behavior (such as the precise delivery of targeted advertising) will trigger negative emotions such as anxiety and anger through "perceived freedom risk", and eventually lead to advertising avoidance behavior, indicating that compulsive behavior will have negative psychological effects on consumers. Dillard and Shen [11] further demonstrated that such threats evoke both emotional (anger) and cognitive (perceived manipulation) resistance, consistent with consumer reactions in forced chatbot interactions [5]. Fan and Liu [26] confirmed that mandatory use of airport self-service significantly intensified psychological reactance via perceived threat to freedom. Overall, corporate coercion strategies tend to provoke psychological reactance by threatening user freedom. Accordingly, the following assumptions are proposed:

H1b: In the context of forced chatbot use, perceived threat to freedom positively affects consumers' psychological reactance.

2.3.2. Perceived ease of use: effects on willingness to use and psychological reactance

Perceived ease of use, a central construct in the Technology Acceptance Model[17], serves as a key mitigating factor in mandatory usage contexts. Defined as a user's subjective evaluation of the effort required to use a technology, it primarily reflects the reduction in cognitive load. When a system is sufficiently simple to operate, users can focus on task execution rather than on imposed constraints [34].

In chatbot applications, Pillai and Sivathanu [35] found that continued usage intentions increased by 31% with each incremental improvement in ease-of-use ratings for hotel chatbots, highlighting its critical

influence. Ashfaq et al. [20] further emphasized that in scenarios involving multiple interactions, perceived ease of use outweighed perceived usefulness as the primary adoption driver. This positive association has been validated across various contexts, including mobile social apps [36], online banking [37], and intelligent customer service systems [20]. Even under coercive service conditions, high perceived ease of use—such as intuitive interfaces—can enhance satisfaction and indirectly boost willingness to use. Accordingly, the following assumptions are proposed:

H2a: In the context of forced chatbot use, perceived ease of use positively affects consumers' willingness to use.

Regarding its relationship with psychological reactance, Venkatesh et al. [19] noted that ease of use reduces resistance by lowering usage barriers. This logic extends to mandatory chatbot contexts [5]. Cserdi and Kenesei [34] demonstrated that when forced to use airport self-service systems, users with higher perceived ease of use exhibited 43% lower psychological reactance. These findings suggest that designs requiring less cognitive effort weaken perceptions of coercion and reduce resistance. Moreover, in mandatory adoption scenarios, ease of use helps preserve users' sense of control and self-efficacy, thereby buffering psychological reactance [38]. Accordingly, the following assumptions are proposed:

H2b: In the context of forced chatbot use, perceived ease of use negatively affects consumers' psychological reactance.

2.3.3. Aftereffect and mediating role of psychological reactance

Psychological reactance theory posits that when individuals perceive their behavioral freedom is threatened or restricted, they will develop motivational resistance aimed at restoring perceived freedom—typically reflected in emotional (e.g., anger) and cognitive (e.g., perceived manipulation) responses [15]. In service contexts, Dillard and Shen[11] noted that psychological reactance is not merely an emotional response but also involves a complex interplay of negative cognition (e.g., beliefs that problems cannot be effectively resolved), jointly weakening subsequent behavioral intentions. Similarly, Ogbanufe and Gerhart[39] found that psychological reactance in smart wearable users indirectly lowered adoption through elevated risk perception. Hovav et al. [40] reported that employee resistance to mandatory security policies significantly reduced compliance willingness. Collectively, these findings suggest that in coercive settings, psychological reactance negatively influences usage intentions. Accordingly, the following assumptions are proposed:

H3: In the context of forced chatbot use, psychological reactance significantly and negatively affects consumers' willingness to use.

According to Dillard and Shen [11], perceived threat to freedom is the primary antecedent of psychological reactance. When individuals perceive pressure on their freedom, they initially experience negative emotions (e.g., anger), followed by negative cognition, ultimately leading to a compounded psychological reactance state. This state influences behavior through emotional and cognitive interaction. Ghazali et al. [41] empirically validated this mediating chain—perceived threat → psychological reactance → willingness to use—using structural equation modeling. Yi [42] further confirmed that negative cognition and emotion triggered by freedom threats contribute to heightened risk perception, reinforcing the mediating role of psychological reactance. Accordingly, the following assumptions are proposed:

H4a: In the context of forced chatbot use, psychological reactance mediates the relationship between perceived threat to freedom and willingness to use.

While perceived ease of use is generally considered a positive predictor of usage intention (TAM), in chatbot-based services, low ease of use may amplify feelings of being forced to follow complex processes,

thereby increasing psychological reactance. Cserdi and Kenesei [34] showed that enhanced ease of use significantly lowered psychological reactance during self-service ticketing. Similarly, domestic studies on LBS(Location Based System) recommendation systems confirmed a negative correlation between perceived ease of use and psychological reactance [43]. Therefore, in forced chatbot scenarios, perceived ease of use may enhance usage intention by reducing psychological reactance. Accordingly, the following assumptions are proposed:

H4b: In the context of forced chatbot use, psychological reactance mediates the relationship between perceived ease of use and willingness to use.

The conceptual model for this research, built upon the four preceding assumptions, is depicted in Figure 1.

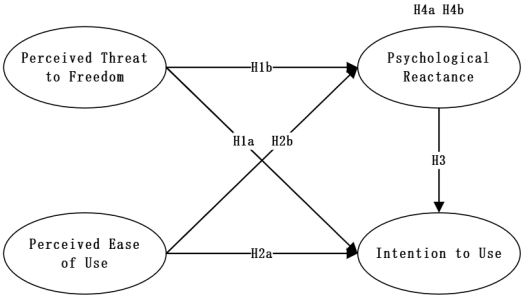

Figure 1. Research model.

3. Research design

3.1. Samples and data

Convenience sampling of the sample through an online survey platform possibly caused self-selection bias. Moreover, the sample is biased in regard to younger and more educated users, which could be a process that restricts representativeness. The majority of the respondents were urban residents, and those working in service-related or professional jobs because that is the prevailing number of users of key Chinese e-commerce websites. To ensure data validity, participants were first asked a control question to confirm prior experience using chatbot services on e-commerce platforms. The survey was conducted online via the Wenjuanxing platform from April to June 2025, collecting 406 valid responses. The research hypotheses were tested using structural equation modeling (SEM). Given the adequate sample size (McDonald & Ho, 2002; Hair, Risher, Sarstedt, & Ringle, 2019), data analysis was conducted using SPSS 27 and Amos 29.

Most participants were male (54%), aged between 20 and 39 (65.5%), and held at least a college degree (79.6%). Regarding chatbot usage on e-commerce platforms, the majority of participants reported having used them for more than six months (70.2%) and at least once per week (71.2%). The most commonly used e-commerce platform for chatbot services was Taobao (including Alibaba and Xiaomi). Table 1 provides detailed demographic information and chatbot usage patterns. Table 2 presents the multiple-response analysis of e-commerce platforms employing chatbot services.

Table 1. Summary of Participant Demographics.

name	**option**	**frequency**	**percentage%**
Gender	Female	223	54.926
	Male	183	45.074
	summary	406	100
Age	20-	92	22.66
	20~29	127	31.281
	30~39	139	34.236
	40~49	31	7.635
	50+	17	4.187
	summary	406	100
Education Level	High school/ Junior college and below	83	20.443
	Specialized	120	29.557
	Undergraduate	135	33.251
	Graduate and above	68	16.749
	summary	406	100
Chatbot Services usage frequency	0-2 times a month	10	2.463
	3-4 times a month	107	26.355
	1-2 times a week	92	22.66
	3-4 times a week	119	29.31
	Used almost every day	78	19.212
	summary	406	100
Chatbot Services usage time	Less than 1 month	17	4.187
	1 month - less than 6 months	104	25.616
	6 months - less than 1 year	94	23.153
	1 year - less than 2 years	118	29.064
	More than 2 years	73	17.98
	summary	406	100
Chatbot Services Usage Intentions	Product Recommendations	163	40.148
	Inquiries and Inventory Inquiries	144	35.468
	Ordering and Delivery Notifications	99	24.384
	Others	0	0
	summary	406	100

Table 2. Response Rate and Prevalence Rate Table.

name	option	response		prevalence rate%
		n	response rate%	
E-commerce platforms that use chatbots	JIMI (Jingdong)	213	23.826	52.463
	Ali Xiaomei (Taobao)	295	32.998	72.660
	Ping Xiaoduo (Pinduoduo)	158	17.673	38.916
	Xiaomei (Meituan)	208	23.266	51.232
	Others	20	2.237	4.926
	summary	894	100.00	220.197

3.2. Variable measurement

All scales employed a five-point Likert scale, with participants rating their agreement with each statement from "strongly disagree" (1) to "strongly agree" (5). To ensure alignment between the research context and the study topic, item wordings were adjusted without altering their original meaning. Additionally, several researchers verified that the semantic integrity of the items was preserved.

Based on existing literature, perceived threat to freedom is defined as an external force deliberately imposed by others or organizations that hinders individuals from exercising their freedom. Under conditions of compulsory use, consumers may perceive a threat when enterprises limit or threaten to eliminate certain choices, thereby infringing on their freedom. Drawing from the studies of Dillard and Shen [11] and Degirmenci [44], this study developed a three-item scale to assess perceived threat to freedom. In reference to Davis's [17] definition in the Technology Acceptance Model, perceived ease of use is defined as the extent to which consumers find it simple and effortless to communicate with intelligent customer service. Following the work of Venkatesh et al. [45] and Malodia et al. [46], a four-item scale was developed to measure perceived ease of use. Psychological reactance theory describes consumers' psychological state when their freedom is perceived to be threatened or restricted. Drawing on Dillard and Shen [11] and Koo [47], this study adapted the intelligent customer service scenario and developed a six-item scale. Consumer intention to use refers to the degree of their subjective intention to adopt intelligent customer service. Referring to the studies by Venkatesh et al. [45] and Wang and Guchait [48], a four-item scale was developed.

3.3. Ethical approval

All methods in this study were conducted in accordance with relevant guidelines and regulations of the Measures for the Ethical Review of Science and Technology (2023) of the People's Republic of China. Informed consent was obtained from all participants and/or their legal guardians prior to the commencement of the study. Data collection involved questionnaire administration only, with no biological samples collected.

4. Empirical analysis

A two-phase design identified and confirmed factors shaping consumers' online purchase intention and persistent chatbot services adoption intent. Phase 1 implemented Confirmatory Factor Analysis (CFA) to validate the measurement model's dimensionality while assessing reliability and validity. Phase 2 examined hypothesized relationships through structural equation procedures.

Total effects analysis evaluated H1a and H2a concerning the impacts of Perceived Threat to Freedom and Perceived Ease of Use on Intention to Use. Direct effects analysis examined H1b and H2b regarding the

antecedent effects of Perceived Threat to Freedom and Perceived Ease of Use on Psychological Reactance, while simultaneously testing H3 pertaining to the influence of Psychological Reactance on Intention to Use. Mediation analysis tested H4a and H4b, investigating whether Psychological Reactance transmits the impacts of Perceived Threat to Freedom and Perceived Ease of Use on Intention to Use.

4.1. Measurement model (First-Order Constructs)

Cronbach's alpha and Composite Reliability (CR) gauged internal consistency. Convergent validity was established through Average Variance Extracted (AVE), while discriminant validity employed the Fornell-Larcker criterion [60]. Table 3 reports item-level statistics (means, standard deviations), factor loadings, AVE values, and reliability metrics.

Table 3. Results of first-order factors.

Variable	Item	Mean	SD	Factor Loading	AVE	CR	α
Perceived Threat to Freedom	PTF1	2.652	1.025	0.775	0.59	0.811	0.809
	PTF2			0.758			
	PTF3			0.751			
Perceived Ease of Use	PEU1	3.264	0.991	0.734	0.591	0.852	0.852
	PEU2			0.757			
	PEU3			0.754			
	PEU4			0.766			
Intention to Use	IU1	3.312	0.946	0.764	0.58	0.847	0.846
	IU2			0.754			
	IU3			0.780			
	IU4			0.710			
Psychological Reactance	PRC1	2.697	0.910	0.785	0.554	0.882	0.882
	PRC2			0.719			
	PRC3			0.758			
	PRC4			0.760			
	PRC5			0.742			
	PRC6			0.780			

Note: *SD: standard deviation, AVE: average variance extracted, CR: composite reliability, α: Cronbach's Alpha.*

All Composite Reliability (CR) metrics surpassed the 0.70 benchmark, exceeding 0.80. Convergent validity was confirmed [49] with Average Variance Extracted (AVE) > 0.5, CR > 0.7, and statistically significant factor loadings. Discriminant validity criteria were satisfied as every construct's AVE square root exceeded its maximum cross-construct correlation magnitude [50] (Table 4). For model fit, all indices— χ^2/df (CMIN/DF), NFI, IFI, TLI, CFI, GFI, AGFI, and RMSEA—achieved recommended thresholds, demonstrating adequate fit[51](Table 5).

Table 4. Distinguishing validity: Correlation and AVE root value.

	PTF	PEU	IU	PRC
PTF	**0.768**			
PEU	-0.568	**0.769**		
IU	-0.624	0.602	**0.762**	
PRC	0.42	-0.525	-0.47	**0.745**

Note: Bolded diagonal entries signify the square roots of Average Variance Extracted (AVE), while off-diagonal elements display correlation coefficients among latent constructs.

Table 5. Model fitting index.

Common index	χ2	df	χ2/df	RMSEA	RMR	CFI	NFI	IFI	TLI	GFI	AGFI
Judging standard	-	-	<3	<0.08	<0.05	>0.9	>0.8	>0.9	>0.8	>0.8	>0.8
Value	135.2	113	1.196	0.022	0.037	0.993	0.96	0.993	0.992	0.961	0.947

4.2. Hypothesis test

Structural equation modeling (SEM) was used to test the proposed hypotheses. The results are summarized in Table 6 and Table 7.

Table 6. Path Index.

Path			Non-standard path coefficient	S.E.	C.R.	P	Standard path coefficient
IU	<--	PTF	-0.327	0.055	-5.904	0.000***	-0.390
IU	<--	PEU	0.277	0.063	4.425	0.000***	0.303
IU	<--	PRC	-0.143	0.056	-2.570	0.010*	-0.147
PRC	<--	PTF	0.154	0.058	2.637	0.008**	0.178
PRC	<--	PEU	-0.398	0.066	-6.025	0.000***	-0.423

**p<0.05 **p<0.01 ***p<0.001*

Results demonstrated significance for all hypothesized pathways (Table 6). Perceived Threat to Freedom (PTF) exhibited substantial negative effects on both Intention to Use (IU: $\beta = -0.390$, C.R. = -5.904, $p \leq 0.05$) and Psychological Reactance (PRC: $\beta = 0.178$, C.R. = 2.637, $p \leq 0.05$), thereby affirming H1a and H1b. Perceived Ease of Use (PEU) showed opposing directional impacts: positive for IU ($\beta = 0.303$, C.R. = 4.425, $p \leq 0.05$; H2a supported) yet negative for PRC ($\beta = -0.423$, C.R. = -6.025, $p \leq 0.05$; validating H2b). Finally, PRC's significant negative influence on IU ($\beta = -0.147$, C.R. = -2.570, $p \leq 0.05$) confirmed H3.

Table 7. Mediation Effect Test.

Parameter	Estimate	Lower	Upper	Standard Estimate	Standard Lower	Standard Upper	Hypothesis
IU<-PRC<-PTF(Indirect Effect)	-0.022	-0.057	-0.005	-0.026	-0.07	-0.005	Partial mediation effect
IU<-PTF(Direct Effect)	-0.327	-0.44	-0.226	-0.39	-0.52	-0.273	Establish
IU<-PRC<-PEU(Indirect Effect)	0.057	0.017	0.11	0.062	0.02	0.118	Partial mediation effect

Parameter	Estimate	Lower	Upper	Standard Estimate	Standard Lower	Standard Upper	Hypothesis
IU<-PEU(Direct Effect)	0.277	0.15	0.41	0.303	0.165	0.434	Establish

Table 7. (*Continued*)

Note: *Lower indicates the lower limit of 95% confidence interval, Upper indicates the upper limit of 95% confidence interval, confidence interval excluding 0 indicates that the effect is significant*

Table 7 demonstrates significant indirect pathways. For the PTF → PRC → IU pathway: β = -0.026 (95% CI excludes zero). With direct effects also significant (CI excludes zero), Psychological Reactance partially mediates PTF's influence on IU, confirming H4a. Specifically, elevated Perceived Threat to Freedom levels trigger stronger Psychological Reactance, ultimately suppressing Intention to Use. For the PEU → PRC → IU pathway: β = 0.062 (indirect and direct effects' CIs exclude zero). This indicates Psychological Reactance partially mediates PEU's relationship with IU, supporting H4b. Higher Perceived Ease of Use reduces Psychological Reactance, thereby enhancing Intention to Use.

4.3. Result discussion

The data show the direct impact of perceived threat to freedom on the willingness to use, and verify the core view of psychological reactance Theory: coercive strategies trigger consumers' alertness to the deprivation of autonomy. It is worth noting that the intensity of this effect is significantly higher than that of the traditional service scenario, suggesting that the "default option" status of manual customer service in Chinese e-commerce's e-commerce environment strengthens the perception of freedom threats. Interestingly, perceived ease of use not only directly promotes the willingness to use, but also indirectly promotes acceptance behavior by negatively affecting psychological reactance. This breaks through the cognitive framework of traditional TAM [19] and reveals the "emotional buffering function" of perceived ease of use in high-pressure situations. When the operation complexity is reduced, users' attention turns from "forced use" to "task solving" [52], providing a new situational perspective for technology acceptance research.

The mediating effect of psychological reactance is particularly critical. Some of its mediators in the path of perceived threat to freedom → intention to use confirmed the chain reaction of "threat → emotional resistance → behavioral resistance" [53], while some of its mediators in the path of perceived ease of use → intention to use showed that ease of use design improved acceptance by reducing emotional conflict (such as frustration) and cognitive conflict (such as "forced obedience") [54]. This discovery innovatively incorporates perceived ease of use into psychological reactance theory, and provides a new way to understand how technology attributes alleviate the negative effects of coercion. Based on this, enterprises need to take both measures to alleviate psychological reactance. The first measure is source management, that is, to weaken the free threat perception of users by clearly communicating the role of technology assistance rather than the purpose of control, and providing users with freedom of choice. The second is to optimize the design. By avoiding the mandatory process and allowing personalized path selection, the technology is perceived as an enabling tool rather than an instruction source.

Traditional TAM believes that perceived ease of use indirectly affects willingness through attitude [12], but this study found that its direct effect is even higher than that of psychological reactance. This implies that in forced situations, technology ease of use may become the "primary compensation factor" for user decision-making, partially offsetting the sense of deprivation of liberty, echoing Ashfaq et al. [20]'s discovery that perceived ease of use plays a leading role in multi round conversation scenarios. Different from the early research on chatrbots focusing on technical performance [22], this paper confirms that the user psychological

mechanism has become a key bottleneck restricting the effectiveness of technology, marking the shift of the research focus in this field from "machine capability" to "man-machine game".

Although the recent AI studies are dedicated to technical soundness and image perception, e.g. transformer-based scene rebuilding and depth estimation, the user psychological reaction to the interaction mediated by AI is rarely addressed, which is why the research on AI service needs to include behavioral theories.

5. conclusion and significance

5.1. Conclusion

First, the perceived threat to freedom shows a significant dual impact in the context of forced use. On the one hand, the perceived threat to freedom directly and negatively affects consumers' willingness to use, which reflects the direct behavior resistance caused by the deprivation of consumers' independent decision-making power by corporate coercive strategies. On the other hand, the perceived threat to freedom is positively strengthening psychological reactance, indicating that external force not only triggers emotional anger, but also accompanied by cognitive conflict, forming a complex motivation state [42]. This conclusion verifies the universality of psychological reactance theory in artificial intelligence service scenarios, and highlights the potential risk of coercive strategies: when consumers perceive that the right to choose is limited, their acceptance of behavior decreases significantly.

Second, perceived ease of use plays a key compensatory role in high-pressure situations. The empirical results show that perceived ease of use not only directly improves the willingness to use, but also indirectly promotes acceptance behavior by significantly reducing the level of psychological reactance. This discovery breaks through the cognitive boundary of the traditional Technology Acceptance Model (TAM) [17] and reveals the "emotional buffering function" of ease of use in a forced environment: when the technology operation is simple enough, the user's attention shifts from "forced use" to "task solving", thus alleviating the negative effects of deprivation of liberty.

Third, psychological reactance, as a core intermediary variable, plays a pivotal role in the coercion mechanism. Psychological reactance has a direct negative impact on willingness to use, which proves that as a complex state of emotion and cognition, it is the key to understand behavioral resistance. More importantly, psychological reactance plays a partial intermediary role between perceived threat to freedom and willingness to use, forming a chain reaction of "threat trigger → emotional resistance → behavioral resistance". At the same time, it also plays a partial intermediary role between perceived ease of use and willingness to use, and constructs a compensation path of "technology optimization → resistance mitigation → willingness improvement". This dual mediation mechanism brings the variables of the technology acceptance model into the psychological reactance framework for the first time, providing an integrated explanation for understanding the efficiency and autonomous game in human-computer interaction.

5.2. Theoretical significance

This research has the following three innovative contributions at the theoretical level:

(1) Broaden the application scope of psychological reactance theory. Previous psychological reactance theories focused on the path of "threat → resistance → avoidance" [11], while the technology acceptance model focuses on the mechanism of "usefulness/ease of use → attitude → Willingness" [19]. This research introduces perceived ease of use into the psychological reactance framework for the first time, and reveals that in the forced use scenario of chatbot services, consumers' perceived ease of use can not only directly improve their willingness to use, but also indirectly promote their acceptance behavior by negatively

affecting psychological reactance, forming a compensation path of "technology optimization → resistance mitigation → willingness improvement". This discovery breaks through the cognitive boundary of traditional TAM and provides a new perspective for understanding how technical attributes play an "emotional buffer function" in high-pressure situations.

(2) The scientificity and contextualization of construct setting. Based on Dillard & Shen [11]'s psychological reactance scale, combined with the revisions of Degirmenci[44] and Koo [47] in different scenarios, this study developed and verified four first-order constructs of perceived threat to freedom, perceived ease of use, psychological reactance and willingness to use, which ensured the semantic fit, reliability and validity of the scale. The CFA and SEM tests of Chinese e-commerce user samples not only enrich the external validity of psychological reactance theory in the emerging intelligent customer service scenario, but also provide a reference for similar research in the future. [55].

(3) This study uses the structural equation model to test the direct effect and the dual mediating effect. On the one hand, it reflects on the feasibility of "reverse inclusion of technology acceptance variables". On the other hand, it reveals the dynamic interaction of the two parallel mechanisms of "threat trigger → emotional resistance → behavior resistance" and "technology ease → resistance mitigation → willingness enhancement" through the dual mediating chain, which provides an integrated perspective for the theory of technology forced acceptance. This methodological exploration combining reflection (reverse mechanism exploration) and formation (chain intermediary construction) helps to promote the transformation of human-computer interaction research from "single theory application" to "multi theory integration".

5.3. Management enlightenment

Based on the above research findings, enterprises should adopt targeted strategies in the following four aspects when enforcing chatbot services:

(1) In order to improve consumers' perception of the ease of use of chatbot services, it is necessary to optimize the interface and process design and improve the ease of use to ease resistance. Simplify the dialogue process, highlight the entry of important functions, and reduce the user's operation load through guidance tips, example conversations, etc., thus significantly reducing the intensity of psychological reactance. It is recommended to use visual dialog tree or shortcut buttons to reduce multiple rounds of input, so as to improve the user experience.

(2) In the context of mandatory use of chatbot services, to alleviate the degree of consumers' perceived threat to freedom, it is necessary to build a "free buffer" mechanism, taking into account efficiency and choice. Before forcibly transferring the chatbot, the option of "return to the original route" or "pre prompt of manual customer service" is reserved for the user. The user's sense of freedom of choice is maintained through the pseudo–option design, and the "legitimacy of forced use" is explained to the user in the interface or opening remarks (such as "this operation can shorten the waiting time by 70%) to reduce the perception of freedom threat.

(3) Implement the strategy of layering and focus, and finely manage user differences. For user groups with different frequency of use and technical literacy, customized robot functions are recommended. For example, the "quick question and answer + manual switching" mode is given priority to the "high resistance" user group, and the "multi round intelligent recommendation" function is mainly displayed for the "high ease of use" user group, so as to balance the technical efficiency and user experience, and maximize the overall willingness to use.

5.4. Limitations and future research

Power distance and uncertainty avoidance are cultural issues that could determine consumer tolerance to compulsory technology use. Psychological reactance can be more intense in cultures in which autonomy is stressed as opposed to collectivist situations in which perceived legitimacy of coercion can lessen the resistance. Although this study based on 406 questionnaires and structural equation model verified the path of perceived threat to freedom and perceived ease of use through psychological reactance, there are still three limitations, which need to be further improved in the follow-up study.

First, it is difficult to reveal the dynamic evolution of the interaction mechanism between factors. This study uses cross-sectional questionnaire data, focusing on the static correlation between variables, and fails to dynamically capture the evolution mechanism of perceived threat to freedom, perceived ease of use and psychological reactance at different stages. In the future, we can use the case study method for reference, through in-depth interviews and follow-up observation, to analyze how the elements interact and evolve over time in specific situations [56]. For example, the forced promotion process of several typical e-commerce platforms can be selected as multiple cases to build an evolution model to enrich the theoretical explanation.

Second, the interaction effect of multi factor allocation is not fully explored. This study mainly focuses on the direct effect and intermediary effect of single variable, and has not yet tested the complex configuration path of multi factor combination (such as high threat – high ease of use, low threat – low ease of use, etc.) to the use intention. In the future, qualitative comparative analysis (QCA) can be used to explore the diversity of consumer behavior results under different conditions [57]. QCA can reveal the "necessary conditions", "sufficient conditions" and their combined effects, and provide a more detailed causal map for forced acceptance research.

Third, the sample is limited to a single cultural background, and the cross-cultural generalizability of the findings remains to be verified. As all samples in this study were drawn from the Chinese e-commerce context, the applicability of the conclusions to other countries or cultural settings is unclear. Future research can combine Hofstede [58] cultural dimension or UTAUT cross-cultural extension framework [45] to conduct comparative empirical research in European, American, Southeast Asian and other multinational samples, test the moderating effect of cultural differences on the relationship between perceived threat to freedom and psychological reactance, and improve cross-cultural adaptation suggestions.

Conflict of interest

The authors declare no conflict of interest

References

1. Shahzad, M. F., Xu, S., An, X. & Javed, I. Assessing the impact of AI-chatbot service quality on user e-brand loyalty through chatbot user trust, experience and electronic word of mouth. J. Retail. Consum. Serv. 79, 103867 (2024).
2. Kumar, V., Ramachandran, D. & Kumar, B. Influence of new-age technologies on marketing: a research agenda. J. Bus. Res. 125, 864–877 (2021).
3. Tamara, C. A. J., Tumbuan, W. J. F. A. & Gunawan, E. M. Chatbots in e-commerce: a study of gen z customer experience and engagement – friend or foe? J. EMBA : J. Ris. Ekon. Manaj. Bisnis Dan Akunt. 11, 161–175 (2023).
4. Wu, C. & Lim, G. G. A study on the effect of chatbot characteristics on customer satisfaction in China's e-commerce platform. J. Inf. Technol. Serv. 22, 37–53 (2023).
5. Feng, W., Tu ,Rungting, Lu ,Tim & and Zhou, Z. Understanding forced adoption of self-service technology: the impacts of users' psychological reactance. Behav. Inf. Technol. 38, 820–832 (2019).
6. IBM Institute for Business Value. Revolutionize Retail with AI Everywhere: Consumers Won't Wai. https://www.ibm.com/thought-leadership/institute-business-value/en-us/report/ai-retail (2024).

7. Luo, X., Tong, S., Fang, Z. & Qu, Z. Frontiers: machines vs. Humans: the impact of artificial intelligence chatbot disclosure on customer purchases. Mark. Sci. mksc.2019.1192 (2019) doi:10.1287/mksc.2019.1192.
8. Nguyen, D. M., Chiu, Y.-T. H. & Le, H. D. Determinants of continuance intention towards banks' chatbot services in Vietnam: a necessity for sustainable development. Sustainability 13, 7625 (2021).
9. Nguyen, G.-D. & Dao, T.-H. T. Factors influencing continuance intention to use mobile banking: an extended expectation-confirmation model with moderating role of trust. Humanit. Soc. Sci. Commun. 11, 1–14 (2024).
10. Kohli, M. & Geis, R. Ethics, artificial intelligence, and radiology. J. Am. Coll. Radiol. 15, 1317–1319 (2018).
11. Dillard, J. P. & Shen, L. On the Nature of Reactance and its Role in Persuasive Health Communication. Communication Monographs 72, 144–168 (2005).
12. Davis, F. D., Bagozzi, R. P. & Warshaw, P. R. User acceptance of computer technology: a comparison of two theoretical models. Manage. Sci. 35, 982–1003 (1989).
13. Pizzi, G., Scarpi, D. & Pantano, E. Artificial intelligence and the new forms of interaction: who has the control when interacting with a chatbot? J. Bus. Res. 129, 878–890 (2021).
14. Ding, A., Legendre, T. S., Han, J. (Rachel) & Chang, H. (Sean). Freedom restriction and non-member customers' response to loyalty programs. Int. J. Hosp. Manag. 94, 102809 (2021).
15. Brehm, J. W., Stires, L. K., Sensenig, J. & Shaban, J. The attractiveness of an eliminated choice alternative. J. Exp. Soc. Psychol. 2, 301–313 (1966).
16. Clee, M. A. & Wicklund, R. A. Consumer behavior and psychological reactance. J. Consum. Res. 6, 389–405 (1980).
17. Davis, F. D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 13, 319 (1989).
18. Venkatesh, V. & Davis, F. D. A theoretical extension of the technology acceptance model: four longitudinal field studies. Manage. Sci. 46, 186–204 (2000).
19. Venkatesh, V., Morris, M. G., Davis, G. B. & Davis, F. D. User acceptance of information technology: toward a unified view. MIS Q. 27, 425–478 (2003).
20. Ashfaq, M., Yun, J., Yu, S. & Loureiro, S. M. C. I, Chatbot: Modeling the determinants of users' satisfaction and continuance intention of AI-powered service agents. Telemat. Inform. 54, 101473 (2020).
21. Wiggers K. Google acquires AI customer service startup onward | VentureBeat. VentureBeat https://venturebeat.com/ai/google-acquires-onward-an-ai-customer-service-startup/ (2018).
22. Liu, J., Pasupat, P., Wang, Y., Cyphers, S. & Glass, J. Query understanding enhanced by hierarchical parsing structures. in 2013 IEEE Workshop on Automatic Speech Recognition and Understanding 72–77 (IEEE, Olomouc, Czech Republic, 2013). doi:10.1109/ASRU.2013.6707708.
23. Kull, A. J., Romero, M. & Monahan, L. How may I help you? Driving brand engagement through the warmth of an initial chatbot message. J. Bus. Res. 135, 840–850 (2021).
24. Li, L., Lee, K. Y., Emokpae, E. & Yang, S.-B. What makes you continuously use chatbot services? Evidence from chinese online travel agencies. Electron. Mark. 31, 575–599 (2021).
25. Rajaobelina, L., Prom Tep, S., Arcand, M. & Ricard, L. Creepiness: its antecedents and impact on loyalty when interacting with a chatbot. Psychol. Mark. 38, 2339–2356 (2021).
26. Fan, Y. & Liu, X. Exploring the role of AI algorithmic agents: the impact of algorithmic decision autonomy on consumer purchase decisions. Front. Psychol. 13, (2022).
27. André, Q. et al. Consumer choice and autonomy in the age of artificial intelligence and big data. Cust. Needs Solut. 5, 28–37 (2018).
28. Xie, Z. Exploration on the concept of personification Marketing：Based on the perspective of psychological reactance theory. (Wuhan University, 2014).
29. Li, C., Pan, R., Xin, H. & Deng, Z. Research on artificial intelligence customer service on consumer attitude and its impact during online shopping. J. Phys. Conf. Ser. 1575, 12192 (2020).
30. Li, H. X. et al. Impulsive and compulsive buying tendencies and consumer resistance to digital innovations: the moderating role of perceived threat of COVID-19. Front. Psychol. 13, (2022).
31. Brehm, J. W. A Theory of Psychological Reactance. x, 135 (Academic Press, Oxford, England, 1966).
32. Lee, G. & Lee, W. J. Psychological reactance to online recommendation services. Inf. Manage. 46, 448–452 (2009).
33. Wang, H. J. et al. Research on the influence mechanism of consumers' perceived risk on the advertising avoidance behavior of online targeted advertising. Front. Psychol. 13, (2022).
34. Cserdi, Z. & Kenesei, Z. Attitudes to forced adoption of new technologies in public transportation services. Res. Transp. Bus. Manag. 41, 100611 (2021).
35. Pillai, R. & Sivathanu, B. Adoption of AI-based chatbots for hospitality and tourism. Int. J. Contemp. Hosp. Manag. 32, 3199–3226 (2020).
36. Akdim, K., Casaló, L. V. & Flavián, C. The role of utilitarian and hedonic aspects in the continuance intention to use social mobile apps. J. Retail. Consum. Serv. 66, 102888 (2022).

37. Alalwan, A. A., Dwivedi, Y. K., Rana, N. P. P. & Williams, M. D. Consumer adoption of mobile banking in Jordan: examining the role of usefulness, ease of use, perceived risk and self-efficacy. J. Enterp. Inf. Manag. 29, 118–139 (2016).
38. Rains, S. A. The nature of psychological reactance revisited: a meta-analytic review. Hum. Commun. Res. 39, 47–73 (2013).
39. Ogbanufe, O. & Gerhart, N. Exploring smart wearables through the lens of reactance theory: linking values, social influence, and status quo. Comput. Hum. Behav. 127, 107044 (2022).
40. Hovav, A. & Putri, F. F. This is my device! Why should I follow your rules? Employees' compliance with BYOD security policy. Pervasive Mob. Comput. 32, 35–49 (2016).
41. Ghazali, A. S., Ham, J., Barakova, E. I. & Markopoulos, P. Effects of robot facial characteristics and gender in persuasive human-robot interaction. Front. Rob. AI 5, (2018).
42. Yi, S. H. Risk perception of biased AI-enabled technologies in healthcare: investigating the role of negative cognition, negative emotion, and reactance. (Nanyang Technological University, 2023). doi:10.32657/10356/174204.
43. Li B., Gao Y. & Guo T. Research on users' psychological resistance to lbs recommendation information based on TAM theory. Modern Management Science 30–32 (2016).
44. Degirmenci, K. Mobile users' information privacy concerns and the role of app permission requests. Int. J. Inf. Manage. 50, 261–272 (2020).
45. Venkatesh, V., Thong, J. Y. L. & Xu, X. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Q. 36, 157–178 (2012).
46. Malodia, S., Islam, N., Kaur, P. & Dhir, A. Why do people use artificial intelligence (AI)-enabled voice assistants? IEEE Trans. Eng. Manag. 71, 491–505 (2024).
47. Koo, J. The influence of AI recommendation on consumer reactance. J. Consum. Stud. 32, 51–67 (2021).
48. Wang, X., Hwang ,YooHee & and Guchait, P. When robot (vs. Human) employees say "sorry" following service failure. Int. J. Hosp. Tour. Adm. 24, 540–562 (2023).
49. Hair, J. F. Multivariate data analysis: an overview. in International Encyclopedia of Statistical Science 904–907 (Springer, Berlin, Heidelberg, 2011). doi:10.1007/978-3-642-04898-2_395.
50. Henseler, J., Ringle, C. M. & Sarstedt, M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. J. Acad. Mark. Sci. 43, 115–135 (2015).
51. Whittaker, T. A. & Schumacker, R. E. A Beginner's Guide to Structural Equation Modeling. (Routledge, New York, 2022). doi:10.4324/9781003044017.
52. Rumetor, M., Sajow, G. T., Niode, D. W. & Simanjuntak, E. R. Contagion-based chatbot usage intention: synthesizing technology adoption and social contagion theory. J. World Sci. 3, 222–237 (2024).
53. Abikari, M., Öhman, P. & Yazdanfar, D. Negative emotions and consumer behavioural intention to adopt emerging e-banking technology. J. Financ. Serv. Mark. 28, 691–704 (2023).
54. Zhao, J., Fang, S. & Jin, P. Modeling and quantifying user acceptance of personalized business modes based on TAM, trust and attitude. Sustainability 10, 356 (2018).
55. Hair, J. F., Risher, J. J., Sarstedt, M. & Ringle, C. M. When to use and how to report the results of PLS-SEM. Eur. Bus. Rev. 31, 2–24 (2019).
56. Eisenhardt, K. M. Building theories from case study research. Acad. Manage. Rev. 14, 532–550 (1989).
57. Fiss, P. C. Building better causal theories: a fuzzy set approach to typologies in organization research. Acad. Manage. J. 54, 393–420 (2011).
58. Hofstede, G. Culture and organizations. Int. Stud. Manag. Organ. (1980).
59. Statista. *Most popular AI chatbots in China as of March 2025* [Internet]. Hamburg: Statista; 2025 [cited 2025 Mar 15]. Available from: https://www.statista.com/statistics/1548754/china-most-popular-ai-chatbots/
60. Fornell, C., & Larcker, D. F. Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39–50 (1981).