

Achievement Gamification Affordances in E-commerce Platforms: An Empirical Study Involving Online Shopping Festival

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ABSTRACT

The implementation of achievement gamification mechanisms in e-commerce platforms has been regarded as a pivotal strategy for enhancing consumer engagement and driving sales during China's online shopping festival. However, empirical research on how achievement gamification affects consumer behavioral with e-commerce platforms remains limited. Drawing from affordance theory, this study investigates how achievement gamification affordance in e-commerce platforms influences consumers' basic psychological needs, subsequently shaping their shopping decisions and continued use intention. A survey was conducted, and the results revealed that achievement affordances (i.e., rewards giving and visibility of achievement) foster consumer purchase intention and continued use intention by satisfying their needs for relatedness, competence, and autonomy. This study sheds light on the pivotal role of achievement gamification in online shopping and provides valuable implications for e-commerce practitioners to effectively employ achievement gamification strategies to accomplish their marketing objectives.

Keywords: Gamification affordance, self-determination theory, online shopping festival, psychological outcomes, purchase intention.

INTRODUCTION

E-commerce gamification has emerged as a crucial tactic during the online shopping festival in China. This innovative strategy aims to enhance consumer engagement and drive sales by incorporating game-like elements into the online shopping experience (Shi, Leung, & Munelli, 2022; Zhang, Shao, Li, & Feng, 2021). One popular gamification element used by e-commerce platforms is the implementation of virtual rewards or badge systems (Zhang et al., 2021). For example, the Taobao platform utilizes achievement-related gamification elements known as "red packets" and "Taobao winner" to actively engage consumers in festival promotions and encourage them to make purchases.

Gamification affordance is context-laden (Shi et al., 2022), referring to "the possibilities for goal-oriented action afforded to specified user groups by implementing multiple game design elements" (Zhang, Shao, Benitez, & Zhang, 2023). The affordance perspective provides a context-specific approach to understanding how consumer behaviors are influenced by the gamification elements on e-commerce platforms. Particularly, Koivisto and Hamari (2019) have identified three categories of gamification affordance that affect user behavioral outcomes: achievement, social, and immersion. Achievement affordance, as the most commonly implemented gameful affordance on e-commerce platforms, plays a crucial role in influencing sales and platform loyalty (Shi et al., 2022; Y. Xu, Chen, Peng, & Anser, 2020). Nonetheless, poorly designed achievement-related gamification mechanisms might fail to yield the anticipated effects and could even have an adverse impact on consumers' attitudes and behaviors (C. Yang, Yang, & Feng, 2022). For instance, implementing a rewards system that is overly complex or requires an extensive understanding of rules can discourage participation. Hence, it is necessary to understand how to properly design achievement-related gamification features to effectively foster consumers' purchasing behavior and loyalty on e-commerce platforms.

However, empirical research into how achievement gamification affordance affects consumer behaviors on e-commerce platforms remains limited, especially in specific shopping contexts, such as online shopping festivals (Shi et al., 2022; Zhang et al., 2021). Indeed, given the diversity of gamification mechanisms, some researchers have pointed out that the impact of specific mechanisms needs to be examined (Huang & Zhou, 2021). Therefore, it is necessary to explore the mechanisms through which achievement affordance can influence consumer behavior in the context of e-commerce platforms.

Furthermore, although existing studies have explored the effects of gamification on consumer attitudes and behavior (Hsu & Chen, 2018; Shi et al., 2022; J. Xu, Du, Shen, & Zhang, 2022), there remains a lack of understanding regarding the effects of achievement-related gamification on consumer behavior and its underlying psychological mechanisms within the e-commerce

context. Gaining insights into these underlying psychological mechanisms can minimize the difficulties designers face when attempting to utilize achievement-related gamification features to increase consumer engagement and product sales. Recent studies have built on the “Affordances-Psychological Outcomes-Behavioural Outcomes” framework to investigate the roles of gamification affordances in individuals’ psychological and behavioral outcomes (J. Xu et al., 2022; Zhou, Lin, & Mou, 2023). Self-determination theory (SDT) indicates that individuals have three fundamental psychological needs: autonomy, competence and relatedness (Deci et al., 2001), and satisfying these three basic psychological needs plays a crucial role in facilitating positive outcomes (Deci & Ryan, 2000; Gilal, Zhang, Paul, & Gilal, 2019). In the gamification context, certain gamification elements and designs have been empirically proven to satisfy individuals’ basic psychological needs (Xi & Hamari, 2019). Therefore, this study empirically investigates the effects of achievement affordance on consumers’ behavioral outcomes in the specific e-commerce shopping festival context, from the perspective of intrinsic need satisfaction.

Overall, based on the “Affordances-Psychological Outcomes-Behavioural Outcomes” framework and SDT, we propose that achievement affordances, namely rewards giving and visibility of achievement, can satisfy consumers’ intrinsic need satisfaction and ultimately stimulate their purchasing behavior as well as loyalty towards e-commerce platforms. In summary, we attempt to explore the following questions in the specific context of e-commerce shopping festivals: *(1) How do achievement gamification affordances, specifically rewards giving and visibility of achievement affect the satisfaction of consumers’ psychological needs for autonomy, competence, and relatedness, respectively? (2) How do psychological outcomes such as the satisfaction of the needs for competence, autonomy, and relatedness affect consumers’ behavioral outcomes including purchase intention and continued use intention?*

This study contributes simultaneously to the literature on gamification and e-commerce. First, it contributes to the e-commerce literature by identifying gamification affordances as antecedents for consumers’ purchase intention and loyalty. Second, it contributes to gamification literature by elucidating the underlying mechanisms through which gamification affordances motivate consumers’ need satisfaction and subsequently influence marketing outcomes. Furthermore, our study findings also provide valuable guidance for e-commerce practitioners on how to effectively utilize achievement gamification strategies to achieve their marketing goals.

The remaining part of the paper is structured as follows: Section 2 presents a literature review of gamification in e-commerce, self-determination theory, and purchase intention and continued use intention. Section 3 proposes the research model and hypotheses. Sections 4 and 5 describe the methodology, data analysis, and results. The last two sections discuss the results, implications, and limitations.

THEORETICAL FOUNDATIONS

Gamification Affordance and Achievement Affordances in E-commerce

Gamification affordance refers to the subjective perception of game elements and mechanics, which is considered as the combination of game design features and individuals’ perceptions (Almeida, Kalinowski, Uchôa, & Feijó, 2023; J. Xu et al., 2022). It consists of three main components articulated into the “Affordances-Psychological Outcomes-Behavioural Outcomes” framework (Hamari, Koivisto, & Sarsa, 2014; Koivisto & Hamari, 2019) as follows: (1) the implemented affordances, such as various elements, features, and mechanisms (e.g., points, badges and leaderboards); (2) the psychological outcomes or game-like experiences (e.g. satisfaction and immersion) stimulated by the gamification affordances; and (3) the resulting behavioral outcomes (e.g., participation and use intention) driven by the individual's psychological state or experience derived from gamified interactions (Hamari et al., 2014). A growing body of studies has investigated how gamification affordances influence individual behaviors and intentions through psychological states in different contexts (Huang & Zhou, 2021; Suh & Wagner, 2017; J. Xu et al., 2022; Zhang et al., 2023; Zhou et al., 2023). For example, Suh, Cheung, Ahuja, and Wagner (2017) adapted this paradigm in a workplace context to examine the influence of gamification affordances on users’ aesthetic and flow experiences, and their continuance intention to use.

Previous studies have examined the impact of different gamification elements and mechanisms in the context of e-commerce (see Table 1). For instance, based on the Taobao and Tmall platforms, Zhang et al. (2021) investigated the influence of gamification mechanisms on impulse buying during the “Double Eleven” shopping festival. Their findings revealed that rewards giving and badges upgrading increase perceived enjoyment and social interaction, thereby promoting impulse buying behavior. Che, Peng, Zhou, Dickey, and Lai (2023) discovered that three types of gamification design features—goals, personalization, and interaction—stimulate consumers’ purchasing behavior through integration benefits. In summary, while scholars generally acknowledge the positive effects of gamification on e-commerce platforms, there remains a dearth of research exploring the underlying mechanisms. To our knowledge, there is still a lack of in-depth understanding regarding the effective gamification implementation mechanism in specific shopping contexts (e.g., online shopping festivals) from the gamification affordance perspective.

Table 1: A review of gamification literature in the e-commerce context

Literature	Research context	Method	Specific gamification elements (s)	Effect of gamification	Key findings
Y. Xu et al. (2020)	Taobao	Survey	Autonomy, rewards, absorption, and competition	Online purchase intention	Game rewards, absorption and autonomy of gamification positively enhance sense of enjoyment, which ultimately affects the online purchase intention of consumers.
Zhang et al. (2021)	e-commerce shopping festival	Survey	Rewards giving and badges upgrading	online impulse buying	Rewards giving and badges upgrading gamification mechanisms are positively associated with perceived enjoyment and social interaction, which in turn strongly influence consumers' impulse buying. The effects upon users' gender and age.
Li, Xu, Ma, and Guo (2022)	Social commerce	experiments	group-formation gamification mechanisms	user participate intention	Strong-tie mechanisms can result in a lower level of user emotional anxiety, and in turn led to higher user intentions to participate in marketing activity.
Che et al. (2023)	e-commerce platforms	Survey	Goals, personalization, and interaction	Purchase intention	Goals and interactions positively impact consumers' integration benefits and thus enhance purchasing behavior.
J. Xu et al. (2022)	e-commerce platforms	Survey	Autonomy support, self-expression, interactivity, and competition	Consumer citizenship behavior	Four perceived gamification affordances are positively associated with psychological ownership and consumer citizenship behavior.
Yu and Huang (2022)	mobile commerce platforms	Survey	Gamification as a whole	Platform purchase intention	Utilitarian value, hedonic value, less time/energy, and social value positively influence users to play games on m-commerce platforms and purchase intention.
Zhang, Wang, Anjum, and Mu (2022)	Mobile payment	Online survey	Point rewarding and point exchanging	User loyalty	Point rewarding enhances users' need satisfaction of core service, whereas point exchanging increases users' perceived value of additional value-added service.
Zhang et al. (2023)	mobile payment	Survey and scenario experiment	rewards, competition, feedback, and cooperation	User retention	Four gamified artifactual affordances enhance user engagement and retention. Narrative affordance moderates the relationships between artifactual affordances and user engagement.
Shi et al. (2022)	online travel agencies	Mixed-methods research	Achievement, identity, competition, and self-expression affordance	Purchase intention	Four key gamification affordances contribute to tourists' diverse value perceptions and their purchase intention

Achievement affordance is the most commonly implemented affordance for gamification design (Koivisto & Hamari, 2019). Existing studies have explored several achievement gamification mechanisms, encompassing both tangible and intangible rewards (Zhang et al., 2021), badges/achievements (Du, Ke, & Wagner, 2020), and levels (Xi & Hamari, 2019; C. Yang et al., 2022). These affordances enable users to obtain a sense of accomplishment or impact their monetary value, which motivates them to change their specific behaviors (Groening & Binnewies, 2019; Shi et al., 2022; Zhang et al., 2023). For example, C.

Yang et al. (2022) discovered that achievement-related gamification features positively affect customers' brand attachment via intrinsic motives in online brand communities. The study conducted by Zhang et al. (2022) demonstrated that the point rewarding mechanism enhances users' needs satisfaction and loyalty in mobile payment applications. Therefore, this study focuses on achievement affordances and their effects on consumers' psychological and behavioral outcomes in e-commerce platforms. We speculate that achievement affordances could increase consumers' intrinsic motivation to participate in marketing campaigns and thus promote their buying behavior and loyalty.

Through a literature review on gamification, our study identifies two main achievement affordances: rewards giving and visibility of achievement. During the online shopping festival, consumers can collect financial rewards or obtain achievements through gamification mechanics, as described in Fig.1. One such example is the "Super Star Show Cat", an interactive game where consumers collect and spend "meow coins" to feed their virtual pet cats daily. By completing tasks, such as upgrading or raising their pets, consumers can earn "red packets" filled with various discounts or promotional codes that can be redeemed during the festival period. Notably, reaching level 45 in the game increases users' chances of receiving more meow coins and winning up to RMB 4,999 worth of red packets. Moreover, consumers can view and showcase their achievements, including information on the badges earned and the leaderboard, on the "Taobao winner" results page.

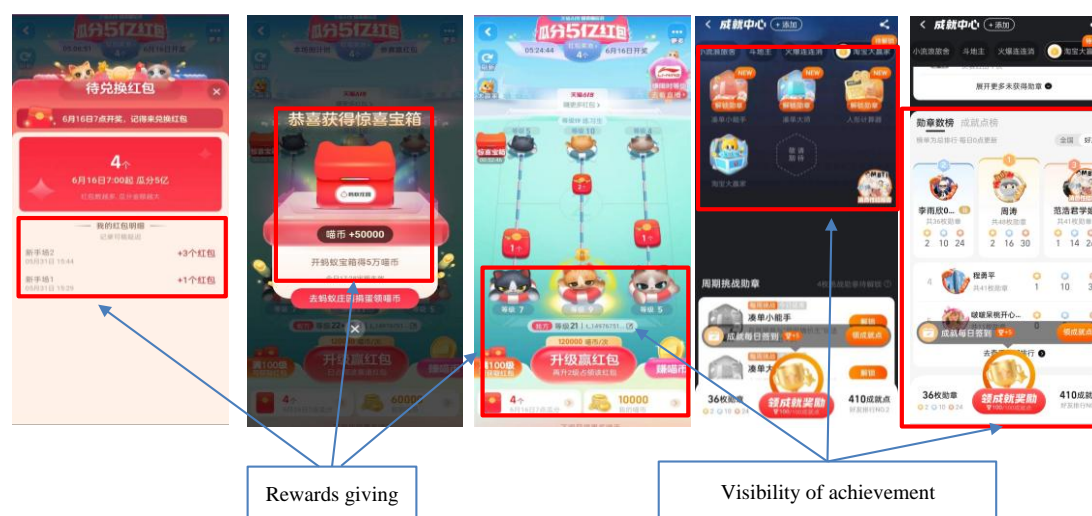


Figure 1: Examples of achievement gamification designs on Taobao during online shopping festival.

Given that rewards giving and visibility of achievement are primarily designed by the e-commerce service provider for marketing activities, rewards giving is an affordance that enables consumers to obtain rewards such as red envelopes and virtual coins as a pay-off when they complete pre-designed tasks (Melancon, Noble, & Noble, 2011; Zhang et al., 2021; Zhou et al., 2023). This tends to affect individuals' monetary value and financial benefits. On the other hand, visibility of achievement is an affordance that enables consumers to visualize their achievements through badges, levels, and leaderboards (Du et al., 2020; Groening & Binnewies, 2019; Suh & Wagner, 2017), aiming to increase individuals' sense of accomplishment.

Self-Determination Theory

The Self-Determination Theory (SDT) is a widely recognized psychological framework that seeks to explain the underlying mechanisms behind gamification affordances and consumer behavior (J. Xu et al., 2022; Zhang et al., 2023). According to SDT, individuals have three fundamental psychological needs: autonomy, competence and relatedness (Deci et al., 2001). Autonomy represents an individual's need for freedom of choice and control over their own actions. Competence refers to an individual's desire to feel capable and effective in performing essential tasks. Relatedness represents an individual's need for social connection and a sense of belongingness. Satisfying these three basic psychological needs plays a crucial role in facilitating positive outcomes. For example, Thomson (2006) suggested that fulfillment of autonomy and relatedness needs bolsters individuals' attachment to celebrities. Therefore, based on SDT, this study attempts to investigate how the achievement affordances of e-commerce platforms satisfy consumers' psychological needs, thereby enhancing their purchase intention and loyalty towards the platform.

Purchase Intention and Continued Use Intention

From a marketing perspective, consumers' behavioral outcomes are reflected in various aspects, including engagement, purchase/repurchase behavior, attitude, and retention (Hofacker, De Ruyter, Lurie, Manchanda, & Donaldson, 2016; Koivisto & Hamari, 2019; Tobon, Ruiz-Alba, & García-Madariaga, 2020). When e-commerce platforms incorporate gamification mechanisms during shopping festivals, their primary goal is to enhance consumers' retention time, stimulate purchase behavior, and foster consumer loyalty (Yu & Huang, 2022). Thus, building upon existing literature, this study aims to explore the impact of achievement affordances on two key marketing outcomes: purchase intention and continued use of e-commerce platforms.

Purchase intention reflects consumers' inclination to make purchases on the e-commerce platform during online shopping festivals (Che et al., 2023). Prior research has established purchase intention as a crucial predictor of actual consumer purchases (Fishbein & Ajzen, 1977; Peña-García, Gil-Saura, Rodríguez-Orejuela, & Siqueira-Junior, 2020). Continued use intention refers to consumers' intention to continue using the e-commerce platform in the future, reflecting their long-term behavior intentions (Hamari & Koivisto, 2015; Suh et al., 2017). The willingness of consumers to maintain continued use emerges as a crucial factor that determines the success of an e-commerce platform (Fathian, Sharifi, & Solat, 2019).

RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

Based on the “affordances-psychological outcomes-behavioral outcomes” paradigm, our study investigates how achievement affordances, specifically rewards giving and visibility of achievement, could affect consumer behavior in terms of purchase intention and continued use intention by satisfying consumers' basic psychological needs. The proposed research model is illustrated in Figure 2. Additionally, gender, age, income, and use frequency are included as control variables.

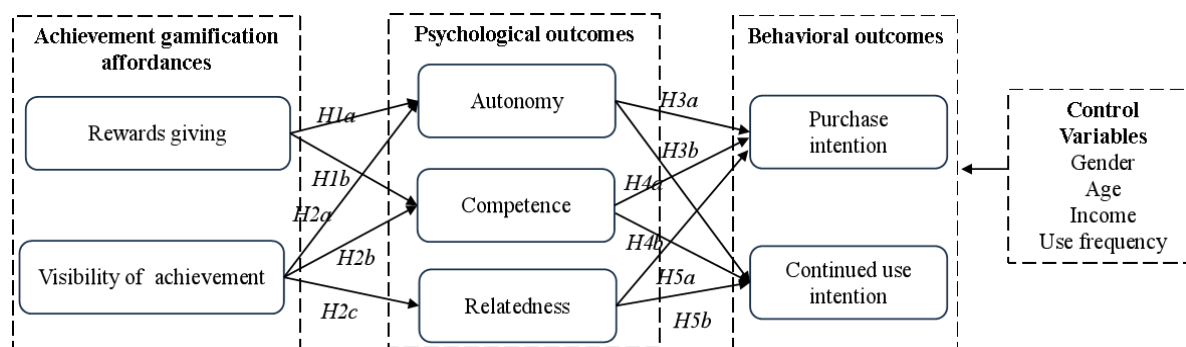


Figure 2: Research model.

Rewards Giving and Psychological Outcomes

Rewards giving is an affordance that enables consumers to obtain rewards, such as red envelopes, upon successful completion of pre-designed tasks (Melancon et al., 2011; Zhang et al., 2021). Within the context of gamified interactions, the attainment of rewards is crucial for satisfying individuals' psychological needs (Bitrián, Buil, & Catalán, 2021; Deci & Ryan, 2000; Suh, Wagner, & Liu, 2018; C. Yang et al., 2022). For example, Hsu (2022) indicated that point-based rewards have a positive impact on people's intrinsic motivations and engagement in resource recycling by influencing needs satisfaction of autonomy, competence, and relatedness.

Consumers voluntarily participate in the games to obtain rewards from the e-commerce platform, which also offers them multiple choices to exchange their earned points for various virtual commodities, discount coupons, or red envelopes (Hsu, 2022). According to the self-determination theory, when individuals have the freedom to pursue an optimal outcome or engage in an activity driven by personal values, their sense of autonomy is high (Peng, Lin, Pfeiffer, & Winn, 2012). Therefore, rewards giving, as an affordance, effectively satisfies consumers' psychological need for autonomy by fostering a sense of freedom and control in their interactions with e-commerce platforms during festival promotions. Therefore, we posit the following hypothesis:

H1a. Rewards giving is positively related to consumers' needs for autonomy.

Additionally, the acquisition of rewards, such as virtual coins and red envelopes, offers immediate feedback, thereby cultivating a sense of self-worth for consumers (Suh et al., 2018). Accordingly, as consumers accumulate an increasing amount of positive feedback, they can continually experience enhanced competence (Przybylski, Rigby, & Ryan, 2010). Previous research has demonstrated that consumers perceive a feeling of competence when they interact with reward-related gamification elements (Bitrián et al., 2021; Xi & Hamari, 2019; C. Yang et al., 2022). For example, Zhang et al. (2022) argued that the implementation of point-based rewards brings users a sense of achievement and increases their satisfaction of competence needs. The more rewards consumers receive through red envelopes when participating in gamified activities on e-commerce platforms, the higher their perceived competence. Therefore, we posit the following hypothesis:

H1b. Rewards giving is positively related to consumers' needs for competence.

Visibility of Achievement and Psychological Outcomes

Visibility of achievement enables consumers to visualize their accomplishments through badges, levels, and leaderboards (Du et al., 2020; Suh & Wagner, 2017), which serve as symbolic representations of consumer achievements (Suh et al., 2017). According to Xi and Hamari (2019), the elements of badges, levels, and leaderboards have been shown to increase users' perception of autonomy. During festival promotions, consumers are free to engage in games that they enjoy to earn their badges on the e-commerce platform. The badges they earn make consumers feel that their efforts in the game are worthwhile, thereby enhancing their sense of autonomy. Furthermore, the e-commerce platform offers flexibility in the choice of badges

and goals when displaying consumers' achievements, which is also linked to feelings of autonomy. Hence, we propose the following hypothesis:

H2a. Visibility of achievement is positively related to consumers' needs for autonomy.

The affordance of displaying achievements motivates consumers to strive to increase their levels, achieve more badges, or improve their rank (Suh & Wagner, 2017). This, in turn, evokes feelings of accomplishment and progress, thereby increasing consumers' need satisfaction for competence (Xi & Hamari, 2019). Moreover, as a specific form of informational feedback, achievements visualization allows consumers to feel progress and achievement, simultaneously showcasing their expertise or outstanding performance in certain domains, which bolsters their self-efficacy (Jung, Schneider, & Valacich, 2010; C. Yang et al., 2022). The more achievement they have (reaching a higher level of perceived success), the more they feel satisfied with the need for competence. Hence, we propose the following hypothesis:

H2b. Visibility of achievement is positively related to consumers' needs for competence.

Moreover, showing off achievements stimulates consumers' social need for achievement (Du et al., 2020). To be more specific, leaderboards and levels are likely to stimulate some degree of competitiveness among consumers (Jung et al., 2010), while badges serve as a significant precursor to social interaction (Zhang et al., 2021). Furthermore, certain gamified activities are designed for group participation, such as allowing friends to assist in level upgrades or involving them in team-based tasks, which can strengthen social bonds with others. Thus, we can deduce that visualizing individuals' achievements can satisfy the need for relatedness by enabling consumers to comprehend the activities of other participants and establish social connections with them. Therefore, we posit the following hypothesis:

H2c. Visibility of achievement is positively related to consumers' needs for relatedness.

The Relationships between Psychological Outcomes and Behavioral Outcomes

Previous research has demonstrated that the satisfaction of individuals' internal needs is related to their purchase intention (Gao, Liu, Liu, & Li, 2018; Gilal et al., 2019; Xi & Hamari, 2019; Yu & Huang, 2022). When an individual's need for autonomy, competence, and relatedness are met, it leads to subsequent purchase intention. For example, Gao et al. (2018) found that autonomy and relatedness positively influence consumers' intention to purchase from the sellers' online platforms. Kosa and Uysal (2021) also indicated that players' basic need satisfaction is positively associated with their purchase intention in Pokémon Go. When consumers participate in gamified activities, it will positively motivate their autonomy, provide them with a sense of achievement, and strengthen their connections with others. As a result, the satisfaction of consumers' psychological needs enhances their emotional appeal and perceived enjoyment (Suh et al., 2018; Y. Xu et al., 2020), which subsequently fosters their purchase intention on e-commerce platforms. Therefore, we posit the following hypotheses:

H3a. Autonomy is positively related to consumers' purchase intention.

H4a. Competence is positively related to consumers' purchase intention.

H5a. Relatedness is positively related to consumers' purchase intention.

The relationship between individuals' need satisfaction and continued use has been demonstrated in various contexts (Gilal et al., 2019; Han, Yoo, Zo, & Ciganeck, 2017; Thomson, 2006). For instance, Han et al. (2017) argued that makerspace users' basic psychological needs influence their intrinsic motivation and continuance intention. In the mobile app context, Bitrián et al. (2021) found that satisfaction with users' needs for autonomy, competence, and relatedness increases their engagement, which leads to higher continuance use intention, positive word-of-mouth, and higher ratings. In our study, the more consumers feel their needs for competence, autonomy, and relatedness are fulfilled while participating in e-commerce gamified activities, the greater their intention to continuously use the e-commerce platform (Kosa & Uysal, 2021). Thus, we posit the following hypotheses:

H3b. Autonomy is positively related to consumers' continued use intention.

H4b. Competence is positively related to consumers' continued use intention.

H5b. Relatedness is positively related to consumers' continued use intention.

MEASUREMENT AND DATA ACQUISITION

The questionnaires were displayed and distributed through Sojump, a professional online survey platform with over 6.2 million registered users and a publication record of 233 million questionnaires. Sojump is widely recognized as the most influential survey platform in China. A concise introduction was presented at the beginning of the questionnaire, introducing the purpose of the survey and providing information about Taobao's gamification design. Specifically, we have chosen Taobao as the representative e-commerce platform due to its increasing utilization of gamification mechanisms. Furthermore, it attracts a significant number of consumers who actively participate in gamified activities during shopping festivals. The 618 shopping festival, held from May 29th to June 18th, has emerged as the latest battleground in China's thriving online commerce market, following the success of the Singles' Day. During this festival, consumers can participate in various mini-games to upgrade the levels of their virtual pet cats and earn red envelopes and badges. We set a pre-screening question to ascertain whether

respondents had experienced gamification on Taobao during the 618 shopping festival. Only those who answered “yes” were permitted to participate in the survey. Then, the qualified respondents answered the questions related to the research constructs. To ensure the validity of the constructs, all items were adapted from previous studies and adjusted to fit the context of Taobao’s gamification design. Appendix A presents the measurement items and their respective sources. All constructs were measured using a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

After conducting a pilot test with 78 college students to ensure content validity, a formal survey was conducted. Following a data collection period of ten days (from June 10th to June 20th, 2023), a total of 322 questionnaires were received. Then, invalid questionnaires (e.g., those containing identical or similar answers for all questions, indicating a lack of full participation in the game, and having too short answer times) were excluded. After removing 38 invalid responses, the final analysis data included 284 valid questionnaires. Table 2 describes the demographics of the sample. As shown in Table 2, 42.3% were male and 57.7% were female. The majority of respondents (88.38%) fell within the age range of 15 to 35 years. Approximately 82.04% of the respondents held a bachelor's degree. Approximately 84.15% of the respondents spent more than 5 minutes per day on gamification activities, and approximately 50% spent over 15 minutes.

Table 2: Demographics of respondents (N=284)

Variables	Category	Frequency	Percentage
Gender	Male	120	42.3%
	Female	164	57.7%
Age	<25	107	37.68%
	26-35	144	50.70%
	>36	33	11.62%
Education level	Below bachelor’s degree	51	17.96%
	bachelor’s degree	196	69.01%
	Master’s degree or above	37	13.03%
Occupation	Student	53	18.66%
	Business staff	181	63.73%
	Government staff	27	9.51%
	Self-employment	10	3.52%
	Other	13	4.58%
Frequency of gamification (Time spent on the game per day)	Less than 5 min	45	15.85%
	5-15 min	94	33.10%
	15-30 min	105	36.97%
	30-60 min	30	10.56%
	More than 60 min	10	3.52%

RESULTS AND ANALYSIS

According to Gefen, Rigdon, and Straub (2011), we employ partial least squares (PLS)-structural equation modeling to analyze both the measurement and the structural models. PLS is known for its ability to achieve a greater degree of statistical power, even with small sample sizes (Hair Jr, Hair Jr, Hult, Ringle, & Sarstedt, 2021). Specifically, we use Smart PLS 4.0 software to analyze the model.

Common Method Bias

Given that the data in this study were obtained through a self-report questionnaire administered within a single environment, we performed two tests to check the presence of common method bias (CMB). First, the result of Harman’s single-factor test indicated that the largest factor explained 42.93% of the total variance, which is below the threshold of 50% (Podsakoff & Organ, 1986). Second, following the study of Liang, Saraf, Hu, and Xue (2007), we modeled all items as indicators loading on a ‘common method factor’. As shown in Appendix B, most loadings related to the method factor were found to be insignificant. The average substantively explained variance of the indicators was 0.675, while the average variance explained by the method construct was 0.007. The ratio of these two values is approximately 97:1. Therefore, the above analysis results suggest that CMB is not a serious issue in this research.

Measurement Reliability and Validity

The measurement model analysis was conducted to assess the reliability, convergent validity, and discriminant validity of the constructs. Table 3 shows that the item loadings of each construct ranged from 0.759 to 0.908, exceeding the acceptable value of 0.70. Additionally, both Cronbach’s alpha and composite reliability (CR) values exceeded 0.70 for each construct. These results demonstrate that the measurement model has good internal consistency and reliability (Chin, Marcolin, & Newsted, 2003). Furthermore, the average variance extracted (AVE) for each construct was between 0.640 and 0.773, higher than the criterion of 0.50, indicating good convergent validity (Chin et al., 2003).

Table 3: Reliability and validity analysis

Constructs	Items	Factor loading	Cronbach's α	C.R.	AVE
Rewards giving (REW)	REW1	0.827	0.879	0.885	0.733
	REW2	0.783			
	REW3	0.819			
	REW4	0.801			
Visibility of achievement (ACH)	ACH1	0.838	0.752	0.753	0.667
	ACH2	0.818			
	ACH3	0.795			
Autonomy (AUT)	AUT1	0.861	0.758	0.765	0.673
	AUT2	0.823			
	AUT3	0.776			
Competence (COM)	COM1	0.836	0.812	0.815	0.640
	COM2	0.799			
	COM3	0.804			
	COM4	0.759			
Relatedness (REL)	REL1	0.856	0.823	0.831	0.652
	REL2	0.847			
	REL3	0.836			
	REL4	0.885			
Continuance use intention (CON)	CON1	0.906	0.844	0.853	0.763
	CON2	0.908			
	CON3	0.803			
Purchase intention (PUI)	PUI1	0.835	0.730	0.730	0.649
	PUI2	0.810			
	PUI3	0.770			

The Fornell-Larcker criteria were employed to assess the discriminant validity (Fornell & Larcker, 1981). As illustrated in Table 4, the square roots of the AVE (highlighted in bold and positioned along the diagonal) exceeded the intercorrelations of the constructs, thereby indicating good discriminant validity. In addition, we evaluated the variance inflation factor (VIF), which revealed values ranging from 1.231 to 2.678, all of which were below the threshold of 3.3. These VIF values suggest that there was no serious multicollinearity concern. Moreover, the standardized root mean square residual (SRMR) value was 0.06, which is below the recommended cutoff value of 0.08, thereby indicating a good model fit (Benitez, Henseler, Castillo, & Schubert, 2020).

Table 4: Fornell-Larcker criteria analysis results

	REW	ACH	AUT	COM	REL	CON	PUI
REW	0.856						
ACH	0.648	0.817					
AUT	0.552	0.490	0.821				
COM	0.509	0.522	0.674	0.800			
REL	0.459	0.541	0.633	0.701	0.808		
CON	0.496	0.504	0.550	0.542	0.531	0.874	
PUI	0.503	0.494	0.593	0.599	0.605	0.709	0.805

Structural Model Analysis

The analysis results are presented in Table 5. As noted in Table 5, regarding the impacts of gamification affordances on consumers' needs satisfaction, rewards giving ($\beta = 0.405$, $p < 0.001$) and visibility of achievement ($\beta = 0.227$, $p < 0.01$) exerted positive impacts on autonomy ($R^2 = 33.5\%$), thereby supporting H1a and H2a. In addition, the model explained 32.2% of the variance in competence, which was significantly predicted by rewards giving ($\beta = 0.294$, $p < 0.01$) and visibility of achievement ($\beta = 0.331$, $p < 0.001$), supporting H1b and H2b. Visibility of achievement ($\beta = 0.541$, $p < 0.001$) exerted positive impacts on relatedness ($R^2 = 29.3\%$), providing support for H2c. Furthermore, the model explained 46.2% of the variance in purchase intention, which was significantly affected by autonomy ($\beta = 0.266$, $p < 0.001$), competence ($\beta = 0.226$, $p < 0.01$), and relatedness ($\beta = 0.274$, $p < 0.001$), providing support for H3a, H4a, and H5a. Moreover, satisfaction of the needs for autonomy ($\beta = 0.275$, $p < 0.001$), competence ($\beta = 0.215$, $p < 0.05$), and relatedness ($\beta = 0.200$, $p < 0.05$) exerted positive impacts on continuance use intention ($R^2 = 38.6\%$), validating H3b, H4b, and H5b. Regarding the control variables, none of them were significant.

Table 5: Structural model evaluation

Hypothesis	β	Z	p	Results
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H1a	0.405***	5.391	0.000	Supported
H1b	0.294**	3.254	0.001	Supported
H2a	0.227**	2.874	0.004	Supported
H2b	0.331***	3.848	0.000	Supported
H2c	0.541***	10.262	0.000	Supported
H3a	0.266***	3.509	0.000	Supported
H3b	0.275***	3.762	0.000	Supported
H4a	0.226**	2.970	0.003	Supported
H4b	0.215*	2.259	0.024	Supported
H5a	0.274***	3.924	0.000	Supported
H5b	0.200*	2.446	0.014	Supported

β = standard regression coefficient

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Furthermore, our study employed the Hayes PROCESS SPSS macro to examine the mediating role of autonomy, competence, and relatedness in the relationship between achievement affordances and consumer behaviors (Hayes, 2017). As shown in Table 6, the confidence interval for all indirect effects does not include zero, confirming the presence of mediating effects. The results suggest that intrinsic need satisfaction partially mediates the relationship between achievement affordances and consumer behavior outcomes.

Table 6: Mediating effect results

Paths	Total effect		Direct effect		Indirect effect			Result
					Bootstrap			
	Effect	t-value	Effect	t-value	Effect	LLCI	ULCI	
REW→AUT→CON	0.412	9.424	0.232	4.976	0.180	0.107	0.264	Partial
REW→AUT→PUI	0.414	9.667	0.216	4.862	0.198	0.128	0.273	Partial
REW→COM→CON	0.412	9.424	0.245	5.243	0.167	0.097	0.246	Partial
REW→COM→PUI	0.414	9.667	0.219	4.977	0.195	0.125	0.266	Partial
ACH→AUT→CON	0.474	9.755	0.283	5.562	0.191	0.109	0.282	Partial
ACH→AUT→PUI	0.454	9.372	0.237	4.821	0.217	0.140	0.301	Partial
ACH→COM→CON	0.474	9.755	0.287	5.452	0.187	0.106	0.287	Partial
ACH→COM→PUI	0.454	9.372	0.225	4.493	0.228	0.146	0.316	Partial
ACH→REL→CON	0.474	9.755	0.298	5.532	0.176	0.094	0.266	Partial
ACH→REL→PUI	0.454	9.372	0.220	4.331	0.234	0.157	0.316	Partial

DISCUSSION AND CONCLUSIONS

Discussion of Results

Guided by the “Affordances-Psychological Outcomes-Behavioural Outcomes” paradigm, this study identified two key achievement affordances on e-commerce platforms during online shopping carnivals and analyzed how they satisfy consumers’ intrinsic needs for autonomy, competence and relatedness, and subsequently drive their purchase intention and continued use intention.

Regarding the impacts of achievement affordances on consumers’ intrinsic need satisfaction, all the hypotheses were supported. The results are consistent with previous research, which suggests that achievement-related mechanisms have a positive impact on the satisfaction of consumers’ intrinsic needs (Sailer, Hense, Mayr, & Mandl, 2017; Xi & Hamari, 2019; C. Yang et al., 2022). Specifically, autonomy need satisfaction was positively associated with rewards giving and visibility of achievement. The results imply that the possibility of achieving certain rewards while playing promotional games amplifies consumers’ degree of autonomy, particularly concerning rewards such as red envelopes and discount coupons. In addition, visibility of achievement had a stronger association with relatedness need satisfaction ($\beta = 0.541$, $p < 0.001$). The visual presentation of achievement enables consumers to compare and connect with others, thereby fostering feelings of relevance and ultimately enhancing their satisfaction of relatedness needs (Sailer et al., 2017; C. Yang et al., 2022).

In terms of the impact of consumers’ psychological needs satisfaction on their behavioral outcomes, our findings confirmed the significant positive effects of psychological needs satisfaction on consumers’ purchase intention. These findings align with previous studies by Gao et al. (2018) and Gilal et al. (2019), who asserted that SDT theory can effectively elucidate consumers’ purchasing intention in online shopping contexts. On the other hand, the results show that all the hypotheses regarding the impacts of psychological needs satisfaction on continued use intention were supported. The fulfillment of consumers’ basic psychological needs enables them to form a positive impression of the platform and stimulates their emotional connection

towards the platform (C. Yang et al., 2022), which subsequently fosters their intention to continue using it. This implies that achievement affordances indeed enhance consumers' intrinsic motivation to continue using the e-commerce platform.

Implications to Research

This study makes several research contributions. First, our study enriches the research on gamification in the context of e-commerce. Almost all major e-commerce platforms in China, including Taobao, JD and Douyin, have released games since 2018 (Che et al., 2023). Moreover, these platforms have also designed games specialized for shopping festivals, which enables consumers to spend more time on the platforms and make more purchases. This study examines the mechanisms by which gamification affordances motivate consumers' need satisfaction and subsequent marketing outcomes (i.e., purchase intention and continued use intention) in the e-commerce context. Furthermore, our study focuses on the specific context of online shopping festivals, which has been overlooked in previous research (Shi et al., 2022). Therefore, this study contributes to the existing literature by investigating the effectiveness and underlying mechanisms of achievement gamification on two key marketing outcomes in e-commerce platforms, especially in the context of online shopping festivals.

Second, this study extends the existing research related to gamification affordances by introducing two representative achievement affordances on e-commerce platforms, namely rewards giving and visibility of achievement, to explore if and how game design affects consumers' behavior during online shopping festivals. Previous empirical studies have mostly focused on a single-point reward mechanism (Hwang & Choi, 2020; Zhang et al., 2022), neglecting a comprehensive understanding of the implementation mechanisms for achievement gamification. Therefore, this study extends the existing literature by providing detailed insights into the achievement gamification mechanisms embedded in e-commerce from the affordance perspective.

Third, this study addresses need satisfaction as the critical outcome of achievement gamification affordances and reveals the relationship between need satisfaction and consumer behavior in gamification-embedded online shopping festival environments. Our study enriches the literature on Self-Determination Theory (SDT) by extending it to the online shopping context. The role of three psychological needs—autonomy, competence, and relatedness—in shaping consumer behaviors has not been fully investigated in previous e-commerce research (Gilal et al., 2019). Our empirical results verify that rewards giving and visibility of achievement enhance consumers' feelings of autonomy, competence and relatedness, ultimately promoting their purchasing behavior and consumer loyalty towards e-commerce platforms.

Implications to Practice

Our study also provides practical implications for e-commerce platform operators and gamification designers. First, platform operators and gamification designers need to recognize that well-designed achievement-related gamification mechanisms can be integrated into e-commerce promotional activities to enhance consumers' shopping enthusiasm and loyalty to the platforms. Specifically, it is recommended that platform designers and operators prioritize the implementation of both rewards giving and visualizing achievements to facilitate consumers in obtaining positive psychological feedback. Platform operators should not only implement reward mechanisms to encourage consumers to earn rewards (e.g., red envelopes) while playing games but also enable consumers to receive informational feedback by making achievements visible to each other (e.g., displaying a list of badges and updating leaderboards), thereby helping consumers fulfill their psychological needs.

Second, the empirical results indicate that two types of achievement affordances foster consumer purchase intention and continued use intention by fulfilling the psychological needs of autonomy, competence and relatedness. Hence, gamification service providers should focus on satisfying the different psychological needs of consumers when designing reward systems. For example, when designing reward systems, platform operators should consider the variations among different populations. Operators can customize the corresponding reward mechanisms to cater to consumers' needs and empower them to set their own goals, thereby fulfilling their needs for autonomy. Similarly, elements such as rewards, badges, and leaderboards should be presented to consumers in a lucid and easy-to-understand way that provides them with a clear picture of their achievements and progress, thereby boosting consumers' self-worth and competence motivation. Furthermore, incorporating multiplayer collaborative missions into games enables consumers to engage in joint tasks and challenges, satisfying their need for social connection.

CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH

Drawing on the "Affordances-Psychological Outcomes-Behavioural Outcomes" framework, this study investigates the effectiveness and mechanisms of implementing achievement gamification on e-commerce platforms in influencing consumers' behavior in the context of online shopping festivals. Our study addresses the current research gap by revealing the influences of two achievement affordances (i.e., rewards giving and visibility of achievement) on consumers' purchase intention and continued use intention from an SDT lens. This study also guides e-commerce platform operators and gamification designers in effectively implementing achievement-related gamification mechanisms, satisfying consumers' psychological needs, and thereby enhancing their purchasing behavior and fostering loyalty.

This study has several limitations, which provide directions for future research. First, our study relied on the gamification design of Taobao or Tmall and used the 618 shopping festival as an example for data collection. Although the 618 festival is currently one of the most popular online shopping festivals in China, future studies could generalize the research findings by

incorporating other online shopping festivals and platforms. Second, the analysis data were all obtained through a self-report questionnaire. To avoid potential common method bias, future studies could consider using longitudinal data as well as gathering data directly from the e-commerce platform. Third, our study only considered achievement affordance and the underlying influencing mechanisms. Future research should consider other gamification affordances, such as social and immersion affordances (Xi & Hamari, 2019). Fourth, the effect of rewards and incentives may diminish over time and potentially undermine intrinsic motivation (Hofacker et al., 2016). Additionally, the number and difficulty level of achievements may have negative effects on consumers' psychological needs and behavior (Groening & Binnewies, 2019). For example, H. Yang and Li (2021) found an inverted-U relationship between achievement level and health management performance in online health communities. Therefore, we encourage future studies to employ other research designs, such as experimental research, to investigate the moderating effects of varying quantities and difficulty levels of achievement gamification.

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APPENDIX A: Measurement Items and Sources

Constructs	Measurement Items	Sources
Rewards giving (REW)	REW1: The Taobao (Tmall) platform offers me the possibility to obtain meow coins, virtual red envelope items, and surprise treasure chests as rewards for my activities. REW2: The Taobao (Tmall) platform offers me the possibility to accumulate virtual red envelope items. REW3: The Taobao (Tmall) platform offers me the possibility to obtain more rewards in the form of discounts and benefits if I make a greater effort to collect virtual red envelope items. REW4: The Taobao (Tmall) platform offers corresponding rewards such as red envelopes and coupons if I try harder to complete activity tasks.	Suh et al. (2017)
Visibility of achievement (ACH)	ACH1: The Taobao (Tmall) platform's activities offer me the possibility to make visible my cat level or achievement rankings. ACH2: The Taobao (Tmall) platform's activities offer me the possibility to make visible my performance during participation, such as the degree of level advancement and the number of badges. ACH3: The Taobao (Tmall) platform's activities offer me the possibility to track the progress of the event, including growth level, red envelope count, cumulative red envelope amount, achievement badge count, and rankings.	Du et al. (2020) and Suh and Wagner (2017)
Autonomy (AUT)	AUT1: I feel that my participation in activities within the Taobao (Tmall) platform is based on my own willingness. AUT2: I feel like I have the autonomy to choose how to participate in activities within the Taobao (Tmall) platform. AUT3: I feel like I engage in activities within the Taobao (Tmall) platform because they attract me for certain reasons, rather than being influenced by external factors.	Bitrián et al. (2021)
Competence (COM)	COM1: I believe I can complete the tasks involved when I participate in activities within the Taobao (Tmall) platform. COM2: I have confidence in my ability to master the relevant operations when I participate in activities within the Taobao (Tmall) platform. COM3: I believe I can effectively utilize the platform to meet my needs. COM4: I am satisfied with my performance when I use the Taobao (Tmall) platform.	Xi and Hamari (2019)
Relatedness (REL)	REL1: When I participate in activities within the Taobao (Tmall) platform, I feel like I am a part of the user community. REL2: When I participate in activities within the Taobao (Tmall) platform, I feel like I can communicate effectively with others, such as merchants, friends, competitors, etc. REL3: When I participate in activities within the Taobao (Tmall) platform, I am willing to engage in discussions related to the topic or	Xi and Hamari (2019)

	relevant modules.	
	REL4: When I participate in activities within the Taobao (Tmall) platform, I feel emotional support and feedback.	
Continuance use intention (CON)	CON1: I intend to continue using the platform rather than discontinue its use.	Bhattacharjee (2001)
	CON2: My intentions are to continue using the platform rather than any alternative platforms.	
	CON3: My usage frequency of the platform is mostly stable currently.	
Purchase intention (PUI)	PUI1: I would like to purchase products on the platform.	Che et al. (2023)
	PUI2: I am willing to purchase the products and services I need on the platform.	
	PUI3: I am more willing to participate in the promotion activities introduced by the platform (such as 618, Double 11, etc.).	

APPENDIX B: Common Method Bias Analysis

Construct	Indicator	Substantive factor loading (R1)	R1 ²	Method factor loading (R2)	R2 ²
REW	REW1	0.867***	0.752	-0.020	0.000
	REW2	0.857***	0.734	-0.007	0.000
	REW3	0.897***	0.805	-0.075	0.006
	REW4	0.808***	0.653	0.096*	0.009
ACH	ACH1	0.899***	0.808	-0.059	0.003
	ACH2	0.899***	0.808	-0.086	0.007
	ACH3	0.649***	0.421	0.152*	0.023
AUT	AUT1	0.866***	0.750	-0.050	0.003
	AUT2	0.733***	0.537	0.065	0.004
	AUT3	0.714***	0.510	-0.036	0.001
	AUT4	0.76***	0.578	0.017	0.000
REL	REL1	0.67***	0.449	0.164*	0.027
	REL2	0.831***	0.691	-0.048	0.002
	REL3	0.779***	0.607	0.042	0.002
	REL4	0.954***	0.910	-0.160*	0.026
PCM	PCM1	0.754***	0.569	0.093	0.009
	PCM2	0.814***	0.663	-0.012	0.000
	PCM3	0.862***	0.743	-0.062	0.004
	PCM4	0.775***	0.601	-0.025	0.001
CON	CON1	0.866***	0.750	0.049	0.002
	CON2	0.902***	0.814	0.004	0.000
	CON3	0.855***	0.731	-0.059	0.003
PUI	PUI1	0.922***	0.850	-0.072	0.005
	PUI2	0.906***	0.821	-0.079	0.006
	PUI3	0.571***	0.326	0.173	0.030
	average	0.816	0.675	-0.019	0.007
	ration		96.637		

*p<0.05; ***P<0.001