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From scarcity to impulse: how quantity and time constraints drive impulsive buying in blind box consumption in Thailand

Adi Prasetyo Tedjakusuma[a,b], Waiphot Kulachai[c] and Andri Dayarana K. Silalahi[d]

[a]Faculty of Business and Economics, University of Surabaya, Surabaya, Indonesia; [b]Department of Business Administration, Chaoyang University of Technology, Taichung, Taiwan; [c]College of Politics and Government, Suan Sunandha Rajabhat University, Bangkok, Thailand; [d]Department of Marketing and Logistics Management, College of Management, Chaoyang University of Technology, Taichung, Taiwan

ABSTRACT

This study investigates the psychological mechanisms driving impulsive buying behaviour in blind box consumption among Thai consumers, using the Stimulus-Organism-Response (SOR) framework as its theoretical foundation. Survey data were collected from 500 blind box consumers in Thailand and analysed using PLS-SEM. Six of eight hypotheses were supported. Time scarcity emerged as the strongest FOMO trigger, while PHE was nearly twice as powerful as FOMO in driving anticipatory arousal. Anticipatory arousal exhibited a strong positive relationship with impulsive buying, whereas the interaction between self-control and anticipatory arousal was nonsignificant, indicating that the moderating role of self-control may be context dependent in hedonic and gamified consumption. The findings refine the application of the SOR framework by distinguishing quantity and time scarcity at the stimulus layer and specifying a sequential organism process through which FOMO and perceived hedonic excitement are associated with anticipatory arousal and impulsive buying.

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SUBJECTS
Business, Management and Accounting; ICT; Information Technology

1. Introduction

Over the past decade, blind boxes have evolved from a niche collectible format in Japan and China into a major global retail trend. The global market was valued at approximately USD 16.96 billion in 2024 and is expected to reach USD 38.4 billion by 2032 (Verified Market Research, 2025). This rapid growth indicates that blind box consumption is not only a matter of product popularity, but also reflects distinctive psychological mechanisms that shape consumer engagement and purchase behaviour. In Southeast Asia, Pop Mart's revenue reportedly increased by 400% year on year in 2024, further demonstrating the commercial significance of this retail format (Cruz et al., 2025). In Thailand, blind boxes have moved beyond novelty status, with brands such as Pop Mart, Miniso, and Sonny Angel entering mainstream retail channels and becoming increasingly embedded in youth consumer culture.

The psychological appeal of blind boxes can be understood by examining their core product design. Consumers know the product series, but they do not know which specific item they will receive. This gap between known category and unknown outcome creates anticipatory uncertainty, transforming what would otherwise be a routine purchase into a game-like consumption experience. When this uncertainty is combined with limited releases, rare secret variants, and the social media visibility of other collectors' unboxing experiences, blind box consumption becomes a setting in which scarcity, social comparison, hedonic excitement, and emotional arousal operate simultaneously before purchase decisions are made. These conditions are strongly associated with impulsive purchase behaviour in consumer research (Aragoncillo & Orús, 2018; Beatty & Ferrell, 1998; Rook, 1987).

CONTACT Waiphot Kulachai waiphot.ku@ssru.ac.th College of Politics and Government, Suan Sunandha Rajabhat University, 1 U-Thong Nok, Dusit, Bangkok 10300, Thailand.

Academic interest in blind box consumer behaviour has increased alongside the market's commercial expansion. Prior research has examined how product uncertainty shapes purchase intention (Zhang & Zhang, 2022), how curiosity transmits the influence of environmental cues to impulse buying (Gong et al., 2024), how scarcity type affects purchase intention through perceived control (Tang et al., 2025), and how hedonic and functional benefits encourage repeat purchasing (Cruz et al., 2025). These studies establish uncertainty, scarcity, and hedonic value as important features of blind box consumption. However, three issues remain insufficiently resolved. First, scarcity is often represented as a general environmental cue, although quantity scarcity and time scarcity may activate different psychological processes. Second, the organism layer is commonly modelled through a single affective or cognitive state, providing limited explanation of how socially driven FOMO and intrinsically driven hedonic excitement develop into the more immediate anticipatory activation preceding purchase. Third, self-control is generally expected to restrain impulse buying, but its moderating role may depend on whether consumers perceive a purchase as a serious conflict with longer-term goals or as socially accepted, low-stakes entertainment (Hoch & Loewenstein, 1991; Iyer et al., 2020).

This study examines impulsive blind-box purchasing through an integrated SOR model in which quantity scarcity and time scarcity constitute distinct stimuli; FOMO and perceived hedonic excitement represent parallel upstream organism states; anticipatory arousal functions as the more proximal pre-purchase state; and impulsive buying constitutes the behavioural response. The study refines the application of SOR by specifying the organism layer as a sequential process and examining self-control as a potential boundary condition of the arousal–response relationship. The empirical findings indicate that self-control did not significantly weaken the relationship between anticipatory arousal and impulsive buying, suggesting that its regulatory role may be context-dependent in hedonic and gamified consumption. Accordingly, the study provides a focused application of SOR for explaining how differentiated scarcity cues are associated with distinct psychological pathways in blind-box purchasing.

The study addresses the following research questions:

RQ1. How are quantity scarcity and time scarcity differently associated with FOMO and perceived hedonic excitement among blind-box consumers?

RQ2. How are FOMO and perceived hedonic excitement associated with anticipatory arousal in the blind-box purchasing context?

RQ3. How is anticipatory arousal associated with impulsive buying behaviour among blind-box consumers in Thailand?

RQ4. Does self-control moderate the relationship between anticipatory arousal and impulsive buying in blind-box consumption?

2. Literature review

2.1. Theoretical framework: the stimulus-organism-response

The present study is based on the Stimulus-Organism-Response (SOR) approach which supplies a theoretically coherent and empirically well-supported foundation for studying the determination of the impact of environmental cues on internal psychological states and their subsequent effect on consumer behaviour. Originally proposed by Mehrabian and Russell (1974), the SOR model states that environmental stimuli affect one's cognitive and emotional states, which either affect behavioural response. Critically, the SOR model is a significant advance on conventional stimulus-response paradigms as it explicitly considers the mediating role of internal psychological processes within the overall performance model whereby the organism is the key mechanism for the conversion of external stimuli towards behavioural outcomes. Jacoby (2002) formalised this reconceptualisation for consumer research, arguing that it is the internal processing of the organism - including the interpretation of sensation(s), the experience of affective states and the cognitive evaluation of environmental cues - that results in the emotional and motivational conditions that determine the final decisions of consumers.

Since the formalisation by Jacoby (2002), the SOR framework has been gradually applied to many diverse fields of offline and online consumer behaviour. Zhang et al. (2022) applied the model specifically to investigate scarcity cues as an environmental stimulus, which activates psychological mechanisms (such as emotional arousal and FOMO) that transfer to immediate and unplanned purchasing behaviour. Huo et al. (2023) expanded on this further by showing that situational variables, such as time and resource availability, are a moderating factor in the formation of affective states into behavioural responses at the organism level, demonstrating that individual circumstances can significantly influence the stimulus-to-response pathway. This theoretical progression aligns directly to the model, postulated in the current research, where quantity scarcity and time scarcity form the environmental stimuli (S); FOMO, perceived hedonic excitement, and anticipatory arousal represent the successive state of the organism internally (O); and the impulsive buying being the behavioural response (R). Self-control is modelled as a potential moderator of the relationship between anticipatory arousal and impulsive buying, reflecting the possibility that individual regulatory capacity conditions the organism-to-response pathway. Collectively, the SOR framework provides a theoretically based and contextually appropriate lens in which the psychological mechanisms underlying blind box impulsive buying behavior can be systematically studied.

2.2. Hypothesis development

Before developing the hypotheses, it is important to clarify the conceptual structure of the organism layer in this study. FOMO and perceived hedonic excitement are treated as parallel upstream organism states because they capture different psychological reactions to scarcity cues. FOMO reflects a socially driven apprehension about missing a desirable blind box opportunity, whereas perceived hedonic excitement reflects the intrinsic pleasure, thrill, and enjoyment expected from the blind box experience itself. Anticipatory arousal is conceptually distinct from both constructs because it does not represent a cumulative affective score or a general positive emotion. Rather, it captures the forward-looking emotional activation that emerges immediately before purchase or unboxing, when the uncertain reward has not yet been realised. Thus, the model positions FOMO and perceived hedonic excitement as parallel antecedent states that can independently energise anticipatory arousal, which then functions as the more proximal organism state leading to impulsive buying.

2.2.1. Scarcity on FOMO and perceived hedonic excitement

Recent evidence supports the relevance of scarcity-induced FOMO while also showing that the effects of different scarcity formats are context dependent. Cengiz and Şenel (2024) found that perceived scarcity increased impulse-buying tendencies and that FOMO partially transmitted this relationship. However, the estimated relationships did not differ significantly between limited-quantity and limited-time scarcity conditions. More directly relevant to collectible consumption, Phan and Hoai (2025) found among Pop Mart Labubu collectors that scarcity cues increased FOMO, which subsequently strengthened willingness to pay. These findings provide contemporary support for treating FOMO as a psychological response to scarce and socially visible collectibles, while avoiding the assumption that quantity and time scarcity necessarily produce identical or universally different effects.

Quantity scarcity signals restricted supply and competition for a finite number of products. In blind-box consumption, limited production runs, hidden variants, and visible stock constraints make permanent non-acquisition more salient because other collectors may obtain the remaining items first. Tang et al. (2025) found that blind-box product scarcity increased impulse-purchase intentions and that supply-based scarcity was particularly influential when the product was hedonic. Although their study did not examine FOMO directly, it establishes that supply restrictions are psychologically and behaviourally consequential in the hedonic blind-box setting. Combined with collectible-market evidence connecting scarcity cues with FOMO, this supports the expectation that limited quantity can heighten concern about missing a desirable acquisition opportunity.

H1a: Quantity scarcity is positively associated with FOMO among blind-box consumers.

Time scarcity communicates a different constraint by indicating that access will expire after a specified period. Countdown timers and short release windows transform postponement into the possibility of irreversible exclusion. Cengiz and Şenel (2024) showed that scarcity-induced FOMO operated under both limited-time and limited-quantity conditions, although the strengths of the estimated relationships did not differ significantly across the two groups. Sun et al. (2024) further found that countdown pressure increased consumers' urge to buy impulsively in online group buying. These findings suggest that temporal restrictions heighten the immediacy of lost access, while leaving their relative strength compared with quantity scarcity as an empirical question.

H1b: Time scarcity is positively associated with FOMO among blind-box consumers.

Quantity scarcity may also intensify perceived hedonic excitement by making acquisition feel exclusive and achievement-oriented rather than routine. This expectation follows from the combination of scarcity theory and the inherently hedonic structure of blind boxes, including mystery, uncertain rewards, and rare variants. Tang et al. (2025) did not measure hedonic excitement directly, but their finding that supply-based scarcity produced stronger impulse-purchase intentions for hedonic products establishes the particular relevance of restricted supply in an enjoyment-oriented blind-box setting. The proposed effect on hedonic excitement is therefore theory driven and contextually supported rather than presented as a previously established direct relationship.

H1c: Quantity scarcity is positively associated with perceived hedonic excitement among blind-box consumers.

Time scarcity may make a purchase episode more emotionally intense by concentrating decision-making within a narrowing opportunity window. Nevertheless, the available evidence more clearly connects countdown pressure with urgency and purchase urge than with intrinsic enjoyment. Sun et al. (2024), for example, found that countdown pressure increased the urge to buy impulsively but did not test perceived hedonic excitement. A deadline may therefore be experienced as pleasurable stimulation or primarily as pressure and anxiety. The proposed relationship is consequently plausible but empirically contestable.

H1d: Time scarcity is positively associated with perceived hedonic excitement among blind-box consumers.

2.2.2. FOMO on anticipatory arousal

FOMO refers to apprehension that other people may be obtaining desirable opportunities, experiences, or possessions from which the individual is absent (Przybylski et al., 2013). Recent research demonstrates that this psychological state also operates in scarcity-oriented consumption. Cengiz and Şenel (2024) found that FOMO partially mediated the relationship between perceived scarcity and impulse-buying tendencies. In the more closely related collectible market, Phan and Hoai (2025) found that scarcity cues increased FOMO among Pop Mart Labubu collectors and that FOMO subsequently increased willingness to pay. These studies update the foundational literature by demonstrating that FOMO is relevant to limited-access products and socially visible collecting experiences.

Within the proposed SOR process, FOMO is expected to increase anticipatory arousal because concern about losing access raises the perceived importance and immediacy of the purchase opportunity. Nevertheless, the two constructs remain conceptually distinct. FOMO captures apprehension regarding exclusion or missed access, whereas anticipatory arousal captures the forward-looking emotional activation experienced before purchasing or unboxing an uncertain reward. The proposed relationship therefore examines whether socially driven concern is converted into a more proximal state of pre-purchase activation.

H2a: FOMO is positively associated with anticipatory arousal in blind-box consumption.

2.2.3. Perceived hedonic excitement on anticipatory arousal

Perceived Hedonic Excitement captures the degree of pleasure, sensory stimulation, and emotional delight a consumer expects an experience to bring (Hirschman & Holbrook, 1982), and in blind boxes

this perception is built into the product format itself – the mystery, the reveal, and the possibility of a rare figure are not incidental features but the core appeal. Drawing on appraisal theory (Lazarus, 1991), consumers who find this hedonic excitement personally meaningful are more likely to evaluate the upcoming purchase as emotionally significant, giving rise to anticipatory arousal. This dynamic mirrors flow theory (Novak et al., 2000), wherein high arousal combined with focused attention produces a deeply engaged psychological state. Empirically, Huang (2016) identified hedonic perceptions as among the strongest predictors of anticipatory arousal under outcome uncertainty – conditions that define blind box purchasing by design – while Overby and Lee (2006) confirmed that novelty and unpredictability amplify the arousal-elevating effect of hedonic value. Kim and Eastin (2011) found parallel results in gaming contexts, and Mvondo et al. (2023), in a blind box-specific study, identified hedonic benefits as the primary driver of consumer emotional activation, directly linking perceived hedonic value to pre-purchase affective states. Accordingly,

H2b: Perceived Hedonic Excitement has a significant positive effect on Anticipatory Arousal in the context of blind box consumption.

2.2.4. Anticipatory arousal on impulsive buying behaviour

Anticipatory arousal is expected to be positively associated with impulsive buying because heightened affective activation can direct attention towards immediate rewards and reduce deliberative processing. The arousal–approach perspective proposes that emotionally activating stimuli increase approach-oriented behavioural tendencies (Donovan & Rossiter, 2002; Mehrabian & Russell, 1974). In blind-box consumption, uncertainty regarding the product outcome, together with the anticipated possibility of obtaining a desirable or rare variant, may increase emotional activation immediately before the purchase decision.

Two mechanisms support this relationship. First, heightened arousal may reduce the cognitive resources available for self-regulation, thereby limiting consumers' capacity to pause and reconsider an unplanned purchase (Baumeister, 2002). Second, arousal may increase the perceived attractiveness of the anticipated reward and encourage consumers to assign greater weight to immediate consumption benefits than to subsequent financial or practical consequences (Loewenstein et al., 2003). Prior research has similarly associated emotional arousal with impulsive buying in retail and live-streaming commerce settings (Wongkitrungrueng et al., 2020; Youn & Faber, 2000). These arguments support the expectation that anticipatory arousal represents a proximal psychological state associated with impulsive purchasing.

H3: Anticipatory Arousal has a significant positive effect on Impulsive Buying Behavior in the context of blind box consumption.

2.2.5. The moderating role of self-control (H4)

Self-control is commonly expected to restrain the conversion of emotional activation into impulsive purchasing, but the empirical evidence indicates that its moderating role depends on the emotional and consumption context. Sun et al. (2024) found that self-control weakened the relationships between positive emotion and impulse-oriented responses and between countdown pressure and the urge to buy impulsively in online group buying. This supports the argument that regulatory capacity can reduce the behavioural influence of positive affect and temporal pressure.

However, such moderation is not consistently observed. Chen et al. (2022) found that self-control did not significantly moderate the relationship between enjoyment and impulse buying among Chinese college students using social media, although it significantly weakened the relationship between depression and impulse buying. This pattern suggests that self-control may be more readily activated when impulsive consumption is associated with negative affect than when purchasing is embedded in pleasurable engagement. Although social-media enjoyment is not identical to blind-box anticipatory arousal, the finding provides relevant analogous evidence that self-control does not uniformly weaken positively valenced affect-purchase relationships.

This distinction is particularly relevant to blind-box consumption, which is commonly framed as play, collecting, surprise, and affordable entertainment. Consumers may not perceive an immediate blind-box purchase as a sufficiently serious conflict with longer-term objectives to activate strong restraint.

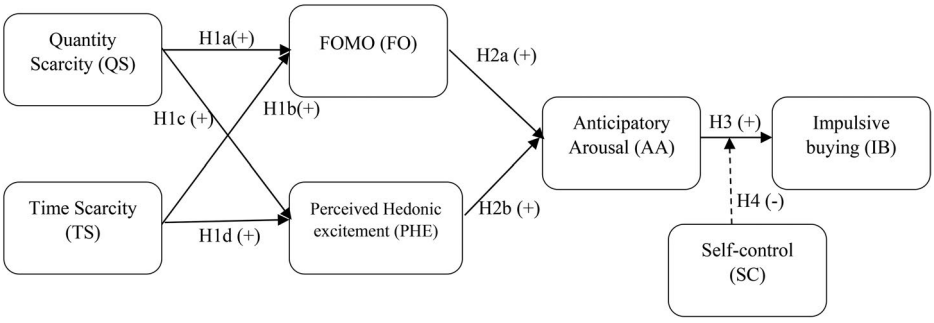

Figure 1. Research framework.

Accordingly, self-control may reduce general impulsive tendencies without necessarily changing the strength of the specific anticipatory-arousal pathway. Its moderating role is therefore theoretically justified but empirically contestable.

H4: Self-control negatively moderates the relationship between anticipatory arousal and impulsive buying, such that the positive relationship is weaker among consumers with higher self-control.

All proposed hypotheses are exhibited as Research Framework in Figure 1.

3. Methodology

3.1. Operationalization and measurement items

The study operationalizes the research variables through clear conceptual definitions, appropriate measurement indicators, and procedures to ensure the internal consistency of each construct. The constructs examined in this research comprise time scarcity, quantity scarcity, fear of missing out, perceived hedonic excitement, anticipatory arousal, self-control, and impulsive buying behavior. Each construct is measured using multiple indicators assessed on a seven-point Likert scale, where responses range from 1 ('strongly disagree') to 7 ('strongly agree'). The detailed operational definitions and corresponding measurement items for all constructs are summarized in Table 1.

3.2. Sampling technique and data collection

Given the absence of a comprehensive sampling frame for blind box consumers and the requirement for participants with recent purchasing experience, this study adopted a purposive, criterion-based non-probability sampling strategy. This approach is appropriate for experiential consumption research, where evaluations must be grounded in direct behavioural experience rather than generalised attitudes – a condition particularly important in blind box research, where perceptions of uncertainty and hedonic excitement are formed through actual product encounters.

Eligibility criteria were defined prior to data collection. Participants were required to be aged 18 or older, possess at least a high-school level of education, and have purchased a blind box within the previous six months. These criteria were enforced through screening questions at the beginning of the questionnaire, with only qualifying respondents permitted to proceed. To anchor responses in a concrete consumption episode and reduce recall bias, participants were also asked to identify their most recently purchased blind box series and indicate approximately when the purchase occurred.

The questionnaire was developed in Google Forms and distributed across multiple social media platforms, including WhatsApp, Facebook, Line, Instagram, X, and Threads. Online dissemination was appropriate because blind box consumption spans both online communities and offline purchase channels, making digital recruitment suitable for reaching active consumers. Data collection ran from August to December 2025 to obtain a sufficiently large sample of eligible respondents. However, this five-month window may have exposed participants to different product launches, promotional campaigns, or availability conditions, which could have influenced perceptions of quantity scarcity, time scarcity, and FOMO.

Table 1. Summary of operationalization and measurement items.

Variable	Operationalization	Measurement items	Source
Quantity Scarcity (QS)	The consumer's perception that a blind box product or series is available only in limited numbers or editions, making it difficult to obtain due to supply constraints.	1. The blind box series I am interested in is available in very limited quantities. 2. This blind box is a limited-edition release that is hard to find. 3. The limited availability of this blind box makes it feel rare and exclusive. 4. I believe this blind box will sell out quickly due to limited stock.	Aggarwal et al. (2011), Ku et al. (2012)
Time Scarcity (TS)	The consumer's perception that a blind box product is available for purchase only within a restricted time window, creating urgency through deadline or countdown mechanisms.	1. The blind box I am considering is only available for a limited time period. 2. There is a countdown timer or deadline associated with purchasing this blind box. 3. I feel time pressure when deciding whether to purchase this blind box. 4. Missing the purchase deadline for this blind box would mean I cannot buy it later.	Aggarwal et al. (2011), Mosteller et al. (2014)
Fear of Missing Out (FO)	A pervasive apprehension that other collectors are obtaining desirable blind box variants that one is missing, accompanied by a desire to remain continuously informed about what others are acquiring.	1. I worry that other blind box collectors are getting rare variants that I am missing out on. 2. When I see other collectors unboxing limited editions online, I feel I am missing something important. 3. I feel anxious when I think about the possibility of missing a limited blind box release. 4. Seeing others share their new blind box purchases on social media makes me feel I am missing out.	Przybylski et al. (2013), Alt (2015)
Perceived Hedonic Excitement (PHE)	It captures the anticipated pleasure, stimulation, and thrill associated with the blind box purchasing experience, particularly the excitement of not knowing which variant will be revealed upon unboxing.	1. Purchasing a blind box gives me a thrill because I do not know which figure I will get. 2. The surprise element of opening a blind box is very exciting to me. 3. The possibility of getting a rare or secret variant makes blind box purchasing very exciting. 4. Buying blind boxes feels like an adventure because of the element of chance.	Arnold and Reynolds (2003)
Anticipatory Arousal (AA)	A heightened state of positive affective activation directed toward the anticipated reward of purchasing and unboxing a blind box, reflecting the emotional intensity experienced in the moments before a purchase decision is made.	1. When I think about purchasing a blind box, I feel a strong sense of anticipation and excitement. 2. The thought of buying a blind box right now makes me feel emotionally charged and eager. 3. Thinking about unboxing a new blind box generates a strong feeling of enthusiasm in me. 4. Right now, my desire to purchase this blind box feels very strong and urgent.	Gard et al. (2006), Loewenstein (1987)
Self-Control (SC)	The individual's capacity to override impulsive urges and regulate purchasing behavior in accordance with long-term goals and financial intentions, particularly when confronted with arousal-inducing scarcity cues.	1. I am good at resisting temptations to buy blind boxes impulsively. 2. I can stop myself from purchasing blind boxes when I know I should not. 3. I have a hard time breaking my impulse to buy blind boxes when I see a limited release. 4. When I feel a strong urge to buy a blind box, I am usually able to think it through first.	Tangney et al. (2004)
Impulsive Buying (IB)	Unplanned, spontaneous purchase behavior driven by a sudden and powerful urge to buy, without deliberate evaluation of consequences, triggered by scarcity and emotional arousal cues.	1. I often buy blind boxes without planning to do so beforehand. 2. When I see a limited blind box, I frequently buy it on the spot without thinking. 3. I sometimes feel a powerful compulsion to buy a blind box immediately when I encounter one. 4. I have purchased blind boxes impulsively even when I did not intend to buy any. 5. I find it difficult to resist purchasing a blind box when I encounter a limited or new release.	Rook and Fisher (1995), Verhagen and Van Dolen (2011), Beatty and Ferrell (1998)

Therefore, the findings should be interpreted as cross-sectional associations observed during the August–December 2025 period, rather than as evidence of stable market conditions or causal relationships.

Although this recruitment strategy was appropriate for accessing active blind box consumers, it may have introduced self-selection bias. Respondents recruited through social media are likely to be more digitally engaged, socially connected, and exposed to peer unboxing content than consumers who purchase mainly through offline channels. As a result, the sample may overrepresent consumers for whom social visibility, FOMO, and online scarcity cues are especially salient. This limitation was considered when interpreting the findings, particularly those related to FOMO and social-media-driven scarcity perceptions.

Sample adequacy was verified against PLS-SEM guidelines. Applying the 10-times rule of thumb (Hair et al., 2017), the maximum number of structural paths directed at any single construct in the model is three, requiring a minimum of 30 responses – a threshold the present sample of 500 substantially exceeds. This sample also provides sufficient statistical power to detect medium effect sizes at conventional significance levels (Cohen, 1988). Post-collection data quality checks removed responses with missing data, logical inconsistencies, or patterned answering, confirming the integrity of the final dataset.

The study involved an anonymous, minimal-risk online questionnaire administered to non-vulnerable adults. No institutional research ethics committee review or formal exemption determination was obtained before data collection. Nevertheless, the research procedures were designed with reference to the ethical principles set out in the Ethical Guidelines for Research on Human Subjects in Thailand (Forum for Ethical Review Committees in Thailand [FERCIT], 2007), including voluntary participation, informed consent, confidentiality, minimisation of participant risk, and the right to discontinue participation before submitting the questionnaire.

Electronic informed consent was obtained before participation. The opening page of the questionnaire explained the study purpose, the voluntary nature of participation, confidentiality safeguards, the intended use of the data, and participants' right to discontinue without penalty before submission. Only respondents who confirmed that they were at least 18 years old and agreed to participate were permitted to proceed. No directly identifying personal information was collected or retained in the analytical dataset.

3.3. Analysis technique

Partial least squares structural equation modelling (PLS-SEM) was used to test the hypothesised relationships using SmartPLS 4. PLS-SEM was selected because the study is prediction-oriented, involves multiple latent constructs measured reflectively, and includes a moderation effect. Compared with covariance-based SEM, PLS-SEM is particularly suitable for behavioural and consumer research that prioritises theory development and variance explanation, especially when the model includes non-normal data and relatively complex structural relationships (Hair et al., 2017; 2019).

3.3.1. Measurement model assessment

The assessment process began with evaluation of the measurement model to ensure the reliability and validity of the constructs. Indicator reliability was examined through standardised outer loadings, with higher loadings indicating that observed indicators adequately represent their respective latent constructs. The internal consistency reliability was measured using Cronbach Alpha (CA) and Composite Reliability (CR), since CR gives a closer estimation in the scenarios of PLS-SEM. A convergent validity was tested using the average variance extracted (AVE) where it was confirmed whether each construct corresponds to an adequate percentage of strength of its indicators (Hair et al., 2017). Discriminant validity was primarily assessed using the heterotrait–monotrait ratio (HTMT), which is widely regarded as a stringent criterion for detecting construct overlap. HTMT values below recommended thresholds indicate adequate conceptual distinctiveness among constructs (Henseler et al., 2015). Conventional cross-loading inspections were also reviewed as supporting evidence.

3.3.2. Structural model evaluation

After confirming measurement adequacy, the structural model was assessed. Potential multicollinearity among predictor constructs was first examined using inner variance inflation factor (VIF) values to ensure that path estimates were not distorted by excessive collinearity. Hypothesised relationships were then tested through a bootstrapping procedure with 10,000 resamples and two-tailed significance testing, allowing robust estimation of standard errors and confidence intervals. Model explanatory power was evaluated using coefficients of determination (R^2) for endogenous constructs, while effect sizes (f^2) were calculated to determine the relative contribution of each exogenous construct. In addition, overall model approximation was inspected using the standardized root mean square residual (SRMR), which provides an indication of the discrepancy between observed and model-implied correlations (Hair et al., 2019).

3.3.3. Additional model assessment

For descriptive completeness, a global Goodness-of-Fit (GoF) index was also calculated using the geometric mean of average AVE and average R^2 values (Tenenhaus et al., 2005). Although GoF is not used as a strict decision criterion in PLS-SEM, reporting this index provides an additional summary indication of overall model performance. All analytical procedures and reporting standards followed established guidelines to ensure methodological transparency and robustness in PLS-SEM applications (Hair et al., 2019).

3.4. Common method bias controls and assessment

To mitigate the common method bias potential in single-source self-reported information, both procedural as well as statistical controls were applied following Podsakoff et al. (2003). Procedurally, full anonymity was guaranteed, participation was voluntary with the right to withdraw at any time and a specific statement made that there were no right or wrong answers, all efforts to minimize assessment apprehension and the socially desirable response. The questionnaire was ordered in a planned manner, and the first items to be completed have been screening and demographic followed by the substantive constructs and all the measurement items had been expressed in a clear and behaviour-based manner so as to reduce the ambiguity and mitigate the tendency towards mechanical response patterns.

Statistically, Harman's single-factor test was conducted by submitting all the indicator variables to exploratory factor analysis and analyzing the unrotated solution. No single variable contributed to most variance in the data, which gave preliminary evidence that common method bias was not a big problem in regard to the validity of the findings (Podsakoff et al., 2003). All these measures enhance confidence in the dataset integrity.

4. Results

4.1. Common method bias

Common method bias was evaluated by applying the full collinearity variance inflation factor (VIF) procedure. The VIF statistics obtained varied between 1.000 and 2.404, remaining well under the recommended cutoff value of 3.3. These results suggest that common method variance does not pose a substantial threat to the validity of the findings, following the criterion proposed by Kock (2015).

4.2. Sample demographics

The final sample comprised 500 valid responses from Thai consumers who had purchased blind box products within the previous six months. As shown in Table 2, the sample was predominantly female (62.40%) and young, with respondents aged 21–30 years forming the largest group (40.80%), followed by those aged 18–20 years (31.20%). Most respondents were single (68.60%), and the two largest education groups were high school or equivalent (53.40%) and bachelor's degree holders (30.80%).

Occupationally, the sample was dominated by high school students (51.20%) and university students (24.60%), reflecting the relevance of youth and student consumer segments in blind box consumption. In terms of purchasing frequency, most respondents reported buying blind boxes one to two times within the past six months (65.60%), followed by three to five times (24.60%). Overall, the sample profile indicates that blind box consumption in this study is concentrated among young, digitally reachable consumers with occasional but recurring purchase engagement.

This sample profile should be considered when interpreting the findings. Because respondents were concentrated among young consumers and students, the results may reflect a segment that is particularly responsive to novelty, peer visibility, social media trends, and emotionally driven purchasing cues. These characteristics may strengthen the observed roles of FOMO, anticipatory arousal, and impulsive buying; therefore, generalisation to older, less digitally engaged, or more financially independent blind box consumers should be made cautiously.

Table 2. Sample demographics.

Measure	Items	Frequency	Percentage
Gender	Male	188	37.60%
	Female	312	62.40%
Age	18-20	156	31.20%
	21–30 Years	204	40.80%
	31–40 Years	89	17.80%
	41–50 Years	43	8.60%
	>50 Years	8	1.60%
Marital Status	Married	157	31.40%
	Single	343	68.60%
Education level	High School or Equivalent	267	53.40%
	Bachelor's Degree	154	30.80%
	Master's Degree	56	11.20%
	Doctoral's Degree	23	4.60%
Occupation	Student (High School or Equivalent)	256	51.20%
	University Student	123	24.60%
	Private sector worker	69	13.80%
	Civil servant	40	8.00%
	Others	12	2.40%
How many time(s) in buying blind box (s) in the past 6 months	1-2 times	328	65.60%
	3-5 times	123	24.60%
	6-9 times	47	9.40%
	>=10 times	2	0.40%

Table 3. Convergent validity and reliability.

Constructs	Items	FL	CA	CR	AVE
Quantity Scarcity (QS)	QS1	0.740			
	QS2	0.727	0.716	0.821	0.534
	QS3	0.719			
	QS4	0.736			
Time Scarcity (TS)	TS1	0.817			
	TS2	0.747	0.795	0.866	0.619
	TS3	0.798			
FOMO (FO)	TS4	0.782			
	FO1	0.789	0.723	0.708	0.613
	FO2	0.738			
	FO3	0.825			
	PHE1	0.715			
	PHE2	0.873	0.825	0.884	0.658
Perceived Hedonic Excitement (PHE)	PHE3	0.860			
	PHE4	0.787			
	AA1	0.806	0.773	0.852	0.591
Anticipatory Arousal (AA)	AA2	0.719			
	AA3	0.707			
	AA4	0.835			
Self-Control (SC)	SC2	0.884	0.766	0.819	0.694
	SC4	0.778			
	IB1	0.746			
Impulsive Buying (IB)	IB3	0.887	0.745	0.854	0.662
	IB4	0.803			

Note: 1. FL: Factor Loading ≥ 0.7; CA: Cronbach Alpha ≥ 0.7; CR: Composite Reliability ≥ 0.7; AVE: Average Variance Extracted ≥0.5.
2. Table 3 reports the retained indicators after measurement purification. FO4, SC1, SC3, IB2, and IB5 were removed because they did not meet the recommended indicator reliability criterion of 0.70 or weakened the measurement quality of their respective constructs. Item deletion was based on both empirical criteria and theoretical coverage, not solely on model fit improvement.

4.3. Validity and reliability assessment

Structural equation modelling was conducted using SmartPLS 4.1.1.2 to assess the measurement model and test the proposed relationships. Indicator reliability was first examined using standardised outer loadings. As shown in Table 3, all retained indicators exceeded the recommended threshold of 0.70, indicating that the items adequately represented their respective latent constructs (Hair et al., 2017).

During the measurement-model assessment, several indicators were removed because they did not meet the recommended indicator-reliability criterion of 0.70 or weakened the measurement quality of their respective constructs. Specifically, FO4, SC1, SC3, IB2, and IB5 were deleted. This purification decision was not made solely to improve model fit; it followed established PLS-SEM assessment procedures

Table 4. Fornell-Larcker Criterion.

	AA	FO	IB	PHE	QS	SC	TS
Anticipatory Arousal	**0.769**						
FOMO	0.571	**0.783**					
Impulsive Buying	0.734	0.602	**0.814**				
Perceived Hedonic Excitement	0.700	0.551	0.617	**0.811**			
Quantity Scarcity	0.620	0.595	0.610	0.533	**0.731**		
Self-Control	0.653	0.611	0.669	0.540	0.612	**0.833**	
Time Scarcity	0.565	0.688	0.558	0.458	0.785	0.583	**0.786**

Note. Bold diagonal values represent the square root of the AVE. Discriminant validity is supported when each diagonal value exceeds its corresponding inter-construct correlations (Fornell & Larcker, 1981).

Table 5. Heterotrait-Monotrait Ratio.

	AA	FO	IB	PHE	QS	SC	TS
Anticipatory Arousal	-						
FOMO	0.727	-					
Impulsive Buying	0.732	0.808	-				
Perceived Hedonic Excitement	0.654	0.712	0.765	-			
Quantity Scarcity	0.798	0.768	0.804	0.671	-		
Self-Control	0.731	0.717	0.701	0.759	0.704	-	
Time Scarcity	0.688	0.768	0.698	0.551	0.702	0.730	-

by considering outer-loading quality, internal consistency, convergent validity, discriminant validity, and theoretical coverage. The retained indicators continued to represent the core meanings of the constructs: FOMO as apprehension about missing desirable blind-box opportunities, self-control as the capacity to regulate blind-box purchasing urges, and impulsive buying as unplanned and urge-driven purchasing behaviour.

Convergent validity was assessed using average variance extracted (AVE). All constructs recorded AVE values above 0.50, confirming that each latent construct explained a sufficient proportion of variance in its indicators (Hair et al., 2017). Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability, both of which exceeded the accepted threshold of 0.70. These results indicate satisfactory reliability and convergent validity.

Discriminant validity was assessed using the Fornell–Larcker criterion, indicator cross-loadings, and the heterotrait–monotrait ratio of correlations (HTMT). As reported in Table 4, the Fornell–Larcker criterion was satisfied for most construct pairs. One exception was identified between quantity scarcity and time scarcity: their correlation of 0.785 exceeded the square root of AVE for quantity scarcity (0.731), although it remained marginally below the corresponding value for time scarcity (0.786). The Fornell–Larcker criterion was therefore not fully satisfied for this construct pair, warranting further evaluation using HTMT and indicator cross-loadings.

As shown in Table 5, the HTMT value between quantity scarcity and time scarcity was 0.702, remaining below the conservative threshold of 0.85 (Henseler et al., 2015). The cross-loading results in Table 6 also showed that every quantity-scarcity and time-scarcity indicator loaded most strongly on its intended construct. Their relatively high correlation is theoretically understandable because both constructs represent perceptions of restricted product availability. Nevertheless, they capture distinct forms of restriction: quantity scarcity concerns limited supply, rarity, and competition for available units, whereas time scarcity concerns a narrowing purchase window and deadline pressure. Taken together, the HTMT, cross-loading, and conceptual evidence support the empirical distinctiveness of the two constructs, although the Fornell–Larcker exception is acknowledged.

Given the conceptual proximity between FOMO and scarcity cues, the corresponding discriminant-validity evidence was also examined carefully. Some association between FOMO and the scarcity constructs is theoretically expected because quantity scarcity and time scarcity are modelled as environmental cues that activate FOMO. Nevertheless, the FOMO indicators loaded most strongly on their intended construct, and the HTMT values between FOMO and both quantity scarcity and time scarcity remained below 0.85. FOMO is therefore empirically distinguishable from the scarcity constructs because it represents an internal apprehension about missing a desirable opportunity, whereas quantity and time scarcity represent external perceptions of restricted availability.

Table 6. Cross-loadings matrix.

Indicators	AA	FO	IB	PHE	QS	SC	TS
AA1	**0.806**	0.581	0.630	0.651	0.527	0.613	0.511
AA2	**0.719**	0.281	0.457	0.455	0.387	0.419	0.312
AA3	**0.707**	0.233	0.464	0.422	0.410	0.323	0.318
AA4	**0.835**	0.556	0.659	0.578	0.548	0.584	0.533
FO1	0.424	**0.783**	0.474	0.380	0.593	0.519	0.737
FO2	0.392	**0.738**	0.431	0.406	0.327	0.385	0.339
FO3	0.521	**0.825**	0.502	0.516	0.419	0.505	0.452
IB1	0.505	0.359	**0.746**	0.459	0.426	0.482	0.345
IB3	0.711	0.623	**0.887**	0.602	0.596	0.652	0.574
IB4	0.551	0.451	**0.803**	0.424	0.445	0.475	0.411
PHE1	0.462	0.239	0.338	**0.715**	0.344	0.258	0.212
PHE2	0.619	0.540	0.579	**0.873**	0.486	0.496	0.441
PHE3	0.577	0.508	0.540	**0.860**	0.498	0.480	0.439
PHE4	0.599	0.454	0.511	**0.787**	0.382	0.480	0.359
QS1	0.446	0.386	0.426	0.408	**0.740**	0.379	0.558
QS2	0.529	0.588	0.522	0.436	**0.727**	0.590	0.658
QS3	0.384	0.360	0.413	0.290	**0.719**	0.357	0.509
QS4	0.414	0.336	0.389	0.392	**0.736**	0.400	0.530
SC2	0.638	0.638	0.629	0.523	0.595	**0.884**	0.598
SC4	0.428	0.345	0.469	0.358	0.404	**0.778**	0.343
TS1	0.517	0.594	0.576	0.415	0.647	0.574	**0.817**
TS2	0.364	0.491	0.352	0.338	0.594	0.372	**0.747**
TS3	0.483	0.559	0.433	0.348	0.612	0.469	**0.798**
TS4	0.398	0.510	0.370	0.333	0.617	0.397	**0.782**

Note. Bold diagonal values represent the square root of the AVE. Discriminant validity is supported when each diagonal value exceeds its corresponding inter-construct correlations (Fornell & Larcker, 1981).

4.4. Model robustness testing

Model robustness was evaluated through multiple assessment criteria, including explanatory power (R^2), effect size estimates (f^2), and approximate model fit indicators such as SRMR and supplementary discrepancy indices. The coefficients of determination show that the proposed model accounts for a considerable share of variance across the endogenous constructs. Specifically, AA has an R^2 of 0.540, FO has 0.481, IB has 0.602, and PHE has 0.488, indicating adequate explanatory power for the modelled outcomes.

The relative contribution of individual predictors was examined using f^2 effect sizes, with Cohen's Cohen (1988) benchmarks of small ($f^2 \geq 0.02$), medium ($f^2 \geq 0.15$), and large ($f^2 \geq 0.35$). At the impulsive buying stage, AA has a large effect on IB ($f^2 = 0.381$), confirming its central role as the proximal driver of unplanned purchasing behaviour in the blind box context. The interaction term SC × AA yields a negligible effect on IB ($f^2 = 0.002$), consistent with the non-significant moderation result for H4.

When AA is treated as the dependent construct, PHE demonstrates a large effect ($f^2 = 0.464$), identifying perceived hedonic excitement as the dominant psychological antecedent of anticipatory arousal. FOMO contributes a small-to-medium effect ($f^2 = 0.107$), indicating a meaningful but weaker influence on arousal relative to PHE.

At the FOMO stage, TS has a medium effect ($f^2 = 0.245$), reinforcing its role as the stronger scarcity-based stimulus driving FOMO, while QS produces a negligible effect ($f^2 = 0.015$). At the PHE stage, QS produces a small effect ($f^2 = 0.109$), whereas TS has a negligible effect ($f^2 = 0.006$), consistent with the non-significant H1d result. The direct effect of SC on IB registers a medium effect size ($f^2 = 0.157$), indicating that self-control has some baseline suppressive influence on impulsive buying, although its interaction with arousal does not meaningfully contribute additional explanatory power.

Global model fit was inspected using SRMR and supplementary discrepancy indices. The SRMR value was 0.079, which is below the commonly accepted threshold of 0.08 and suggests an acceptable level of approximate model fit. However, the NFI value was 0.684, which is relatively low compared with conventional covariance-based SEM expectations. In PLS-SEM, NFI should be interpreted cautiously because PLS-SEM is primarily prediction-oriented and variance-based, rather than designed to optimise global covariance fit. Therefore, the low NFI indicates that the model has modest global covariance fit and should not be interpreted as evidence of strong overall model fit.

Table 7. Summary of hypothesis testing.

Hypothesis	β	T-value	Bootstrapping 95% Confidence Interval 2.5%	97.5%	Decision
H1a Quantity Scarcity → FOMO (+)	0.143**	2.835	0.047	0.245	Supported
H1b Time Scarcity → FOMO (+)	0.576***	12.079	0.480	0.667	Supported
H1c Quantity Scarcity → Perceived Hedonic Excitement (+)	0.450***	7.661	0.333	0.562	Supported
H1d Time Scarcity → Perceived Hedonic Excitement (+)	0.105	1.657	−0.019	0.230	Not Supported
H2a FOMO → Anticipatory Arousal (+)	0.266***	7.465	0.197	0.337	Supported
H2b Perceived Hedonic Excitement → Anticipatory Arousal (+)	0.554***	14.098	0.475	0.628	Supported
H3 Anticipatory Arousal → Impulsive Buying (+)	0.527***	11.812	0.440	0.612	Supported
H4 Self-control x Anticipatory Arousal → Impulsive Buying (-)	0.023	0.922	−0.023	0.076	Not Supported

Notes: Significance level with ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

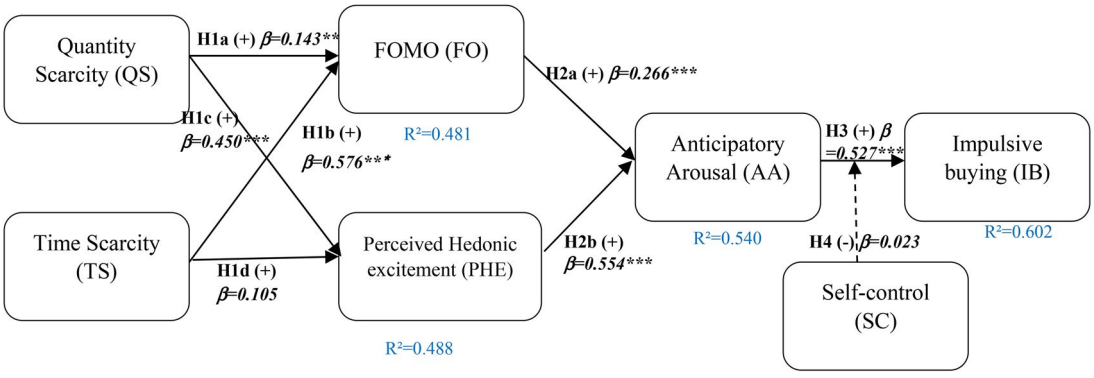

Figure 2. Structural model results.

Accordingly, the adequacy of the model was evaluated primarily through measurement reliability and validity, explanatory power, effect sizes, multicollinearity diagnostics, and the significance of the hypothesised paths. For descriptive completeness, the GoF index was also calculated using the formula GoF = √(average AVE × average R^2). With an average AVE of 0.624 and an average R^2 of 0.528, the GoF value was 0.417. However, consistent with contemporary PLS-SEM reporting practice, this value is treated only as a supplementary descriptive index rather than as a strict model acceptance criterion.

4.5. Hypothesis results

H1a shows that quantity scarcity has a significant positive relationship with FOMO (β = 0.143, t = 2.835, 95% CI [0.047, 0.245]), supporting H1a. H1b is also supported, as time scarcity has a significant positive relationship with FOMO (β = 0.576, t = 12.079, 95% CI [0.480, 0.667]) and represents the strongest scarcity-related relationship in the model. H1c confirms that quantity scarcity is positively associated with perceived hedonic excitement (β = 0.450, t = 7.661, 95% CI [0.333, 0.562]), supporting H1c. However, H1d is not supported because the relationship between time scarcity and perceived hedonic excitement is nonsignificant (β = 0.105, t = 1.657, 95% CI [−0.019, 0.230]), with the confidence interval including zero.

Turning to the organism-level psychological processes, H2a confirms that FOMO has a significant positive effect on anticipatory arousal (β = 0.266, T-value = 7.465). H2b further shows that perceived hedonic excitement is the strongest predictor of anticipatory arousal (β = 0.554, T-value = 14.098). H3 confirms that anticipatory arousal significantly and positively predicts impulsive buying behaviour (β = 0.527, T-value = 11.812). Finally, H4 is not supported, as the interaction effect between self-control and anticipatory arousal on impulsive buying is non-significant and marginally positive (β = 0.023, T-value = 0.922, $p > 0.05$, CI: −0.023 to 0.076). Hypothesis testing results are presented in Table 7 and Figure 2.

5. Discussion

This study examined how scarcity cues in the blind-box market are associated with a sequence of psychological states culminating in impulsive purchasing, with self-control proposed as a moderator of the anticipatory-arousal–impulsive-buying relationship. Grounded in the SOR framework (Mehrabian & Russell, 1974), six of the eight hypotheses were supported. The two unsupported relationships – time scarcity with perceived hedonic excitement and the moderating effect of self-control – are also theoretically informative.

H1a was supported, indicating that quantity scarcity is positively associated with FOMO. When consumers perceive that only a limited number of blind boxes or variants remain available, the possibility that other collectors may acquire them first makes non-acquisition more salient. This interpretation is consistent with commodity theory, which proposes that restricted availability enhances perceived value and motivates approach behaviour (Brock, 1968). It also aligns with recent evidence that scarcity cues can heighten FOMO in limited-access and collectible consumption settings (Cengiz & Şenel, 2024; Phan & Hoai, 2025). Nevertheless, the quantity-scarcity relationship with FOMO was descriptively weaker than the corresponding time-scarcity relationship. Because the coefficients were not formally compared, this pattern should be interpreted as relative variation rather than evidence that temporal scarcity is universally more influential.

H1b was supported and produced the strongest stimulus-level coefficient in the model. Time scarcity was positively associated with FOMO, suggesting that a narrowing purchase window makes the possibility of missed access more immediate. Countdown timers, limited-duration releases, and closing sales periods convert postponement into a potentially irreversible loss, particularly when other collectors' acquisitions are visible through online communities and unboxing content. This interpretation is consistent with research showing that time-scarcity promotions heighten urgency and that countdown pressure strengthens impulse-oriented responses (Hmurovic et al., 2023; Sun et al., 2024). In blind-box consumption, temporal restrictions may therefore activate FOMO primarily by making the cost of delay explicit rather than by increasing the intrinsic enjoyment of the product.

H1c was also supported, showing that quantity scarcity is positively associated with perceived hedonic excitement. Limited production runs, rare variants, and restricted stock can transform acquisition from an ordinary purchase into a challenge or achievement, thereby increasing the anticipated pleasure of obtaining the product. This interpretation is consistent with the hedonic-consumption perspective, in which rarity and uncertainty enhance experiential value (Hirschman & Holbrook, 1982). It is also supported contextually by evidence that supply-based scarcity is particularly influential for hedonic blind-box products, although prior research has not directly tested perceived hedonic excitement as the outcome (Tang et al., 2025). The present finding therefore suggests that supply restrictions contribute not only to concern about missing out but also to the pleasurable and achievement-oriented character of blind-box purchasing.

H1d was not supported, as time scarcity was not significantly associated with perceived hedonic excitement. This finding indicates that temporal pressure may function more strongly as an urgency- and loss-oriented cue than as a source of intrinsic pleasure. Existing research links limited decision time with heightened arousal, urgency, and impulse-oriented behaviour, but does not consistently show that it increases enjoyment of the consumption experience (Hmurovic et al., 2023; Liu et al., 2022; Sun et al., 2024). In the blind-box context, hedonic excitement may depend more directly on product-related characteristics – such as mystery, uncertain outcomes, rare variants, and the pleasure of unboxing – than on the duration of the purchase opportunity. Accordingly, countdown-based tactics may increase FOMO and encourage prompt action without necessarily strengthening the playful excitement that underlies longer-term engagement with blind-box consumption.

H2a was supported, indicating that FOMO is positively associated with anticipatory arousal. This relationship suggests that apprehension about losing access to a desirable blind-box opportunity increases the emotional salience and immediacy of the prospective purchase. The visibility of other collectors' acquisitions through social media and unboxing content may further reinforce this process by maintaining awareness of potential exclusion. FOMO therefore appears to represent a socially oriented pathway through which scarcity-related concern is associated with pre-purchase emotional activation.

H2b was also supported, with perceived hedonic excitement showing a descriptively stronger relationship with anticipatory arousal than FOMO. This pattern suggests that anticipated enjoyment, uncertainty, and the possibility of obtaining a rare variant may be particularly relevant to the emotional activation preceding blind-box purchases. The result is consistent with flow-based reasoning, according to which intrinsic engagement with an enjoyable activity can generate sustained attention and affective involvement (Novak et al., 2000). Because the two coefficients were not formally compared, however, their difference should be interpreted descriptively rather than as conclusive evidence that hedonic motives are universally stronger than socially oriented motives.

H3 was supported, and anticipatory arousal exhibited a large effect on impulsive buying. This finding is consistent with the arousal–approach perspective, which proposes that heightened affective activation increases approach tendencies and reduces attention to delayed consequences (Mehrabian & Russell, 1974). Anticipatory arousal may therefore represent the proximal organism state through which earlier scarcity-related and hedonic reactions are associated with impulsive purchasing. Nevertheless, the cross-sectional design supports an interpretation of statistical association rather than temporal or causal ordering.

The non-support of H4 provides an important boundary-condition insight into the role of self-control in blind box impulsive buying. Although self-control is widely recognised as a restraint mechanism in impulse buying, prior research suggests that its effectiveness depends on contextual conditions such as the strength of affective arousal, the salience of regulatory goals, and the availability of self-regulatory resources. Vohs and Faber (2007), for example, showed that weakened regulatory capacity increases impulsive spending, while Iyer et al. (2020) identified self-control as an important but context-dependent moderator in impulse buying. In the present study, the arousal generated by perceived hedonic excitement and FOMO may have been strong enough to reduce the practical influence of trait-based self-control on the arousal-to-impulse pathway. Moreover, blind box purchasing is often framed as entertainment, collecting, and low-stakes hobby consumption, which may reduce the salience of restraint compared with more financially consequential purchase contexts. This interpretation is consistent with the view that self-regulation is most effective when consumers recognise a clear conflict between immediate desire and longer-term goals (Hoch & Loewenstein, 1991; Hofmann et al., 2012). Therefore, the non-significant moderation result does not imply that self-control is irrelevant to impulsive buying generally; rather, it suggests that in hedonic, gamified, and socially normalised consumption settings, trait self-control may be insufficient to weaken the effect of anticipatory arousal on impulsive buying.

Although the evidence is specific to blind-box consumption, the underlying psychological sequence may also be relevant to other uncertainty-based or gamified consumption formats, such as mystery packs, gacha-style purchases, randomised digital rewards, and limited-time collectible drops. In these settings, restricted availability and uncertain outcomes may similarly heighten FOMO, hedonic excitement, and anticipatory arousal; however, transferability should be treated as provisional because these formats differ in monetary stakes, repeat-purchase intensity, product tangibility, and regulatory context.

6. Implications

6.1. Theoretical implications

This study refines the application of the SOR framework to blind-box consumption by distinguishing quantity and time scarcity as separate environmental stimuli and by specifying the organism layer as a sequential process. FOMO and perceived hedonic excitement are modelled as parallel upstream states associated with anticipatory arousal, which in turn is associated with impulsive buying. This specification provides a more differentiated account of the psychological processes linking scarcity perceptions with behavioural responses in an uncertainty-based consumption setting.

The first contribution concerns the stimulus layer. Most SOR-based research has treated scarcity as a single, uniform environmental cue (Zhang et al., 2022), but the data here tell a more nuanced story. Quantity scarcity and time scarcity do not produce the same psychological effects – both elevate FOMO to varying degrees, but only quantity scarcity reliably activates perceived hedonic excitement. Time scarcity, despite being the stronger FOMO trigger, leaves hedonic excitement largely untouched. This

asymmetry suggests that future SOR models applied to scarcity contexts should disaggregate scarcity type rather than treating all forms of limited availability as interchangeable, since collapsing them into a single stimulus construct conceals which psychological pathways are actually being engaged.

Second, the study enriches the organism layer by introducing anticipatory arousal as a theoretically distinct and empirically central construct sitting between hedonic-social psychological states and impulsive behaviour. Existing SOR-based impulse buying research has tended to treat emotional arousal as a broad, undifferentiated state (Huo et al., 2023), but operationalising it specifically as anticipatory arousal – forward-directed emotional activation building before an uncertain pleasurable outcome (Loewenstein, 1987) – positions the organism layer as a sequentially structured process rather than a single mediating step. The finding that PHE exerts a substantially stronger effect on anticipatory arousal than FOMO further establishes that intrinsic hedonic engagement is a more powerful arousal-generating mechanism than social anxiety, adding theoretical precision to how the organism stage should be modelled in hedonic consumption contexts.

Third, the dominant role of PHE throughout the model extends hedonic consumption theory (Hirschman & Holbrook, 1982) by showing that in uncertainty-based product formats, intrinsic hedonic value is not merely a purchase motivator but the primary engine of the entire affective chain leading to impulse buying. This positions blind box consumption as fundamentally product-driven rather than socially driven at the psychological level – a distinction that refines theoretical accounts of motivation in collectible and gamified retail contexts and extends flow theory (Novak et al., 2000) into a new empirical domain.

Finally, the nonsignificant moderation result provides qualified evidence regarding the potential boundary conditions of self-control. Self-control did not significantly alter the relationship between anticipatory arousal and impulsive buying in the present sample. This finding does not indicate that self-regulation is generally ineffective; rather, it suggests that its moderating role may depend on the salience of goal conflict, the intensity of affective activation, and whether the purchase is perceived as consequential spending or low-stakes entertainment (Hoch & Loewenstein, 1991; Hofmann et al., 2012). Future studies should examine alternative regulatory constructs, including state self-control, purchase guilt, financial constraints, and hedonic self-regulation.

6.2. Practical implications

The findings offer two sets of practical implications for blind box retailers, brand managers, and platform operators: business-oriented implications for engagement and conversion, and responsible-marketing implications for consumer protection. This separation is important because the same psychological mechanisms that make blind box consumption commercially effective may also increase the risk of excessive or poorly controlled purchasing among vulnerable consumers.

6.2.1. Business and engagement implications

The asymmetry between scarcity types provides an important strategic insight. Time scarcity is the stronger FOMO trigger, but it appears to generate urgency and anxiety rather than hedonic pleasure. Quantity scarcity, by contrast, activates both urgency and genuine excitement. Retailers that rely too heavily on countdown timers may therefore trade long-term collector engagement for short-term conversion. A more sustainable approach is to lead with rarity framing, such as production run sizes, variant ratios, limited-edition status, or never-to-be-rereleased designs, while using time pressure only as a secondary nudge. Product pages and launch announcements that foreground 'only 500 units produced globally' or 'secret variant ratio: 1 in 72' before deadline language are likely to create a warmer and more enjoyable pre-purchase state.

Since perceived hedonic excitement is a stronger driver of anticipatory arousal than FOMO, pre-purchase marketing should focus on building experiential anticipation rather than relying only on scarcity pressure. Series teaser campaigns, partial design reveals, live-streamed community unboxing previews, and 'variant hunt' narratives can strengthen the excitement of discovery and increase consumer engagement with the blind box experience. At the checkout stage, retailers can support conversion through convenience-oriented features such as frictionless payment, clear stock information, and

series-completion prompts. These tools should be designed to support enjoyable and informed purchasing rather than to pressure consumers into immediate action.

6.2.2. Responsible-marketing implications

At the same time, the non-significant moderating role of self-control suggests that consumers may have limited natural protection once anticipatory arousal becomes strong. This creates an ethical responsibility for retailers, especially because blind box consumers often include younger buyers, students, and consumers who may be sensitive to scarcity pressure or social visibility. Rather than waiting for regulatory intervention, responsible retailers should build optional safeguards directly into the platform experience. These may include transparent disclosure of variant pull rates, user-controlled monthly spending limits, cooling-off reminders, and periodic summaries of cumulative blind box spending.

Overall, the findings suggest that blind box marketing should balance commercial effectiveness with consumer welfare. Retailers can build excitement through rarity, storytelling, and community engagement, but these strategies should be accompanied by transparency and self-regulation tools to avoid exploiting arousal-driven impulsivity.

7. Conclusions

Under the SOR framework, this study traced how scarcity-based environmental stimuli activate a sequential chain of psychological states culminating in impulsive blind box purchasing. H1a, H1b, and H1c were supported, confirming that quantity scarcity elevates both FOMO and perceived hedonic excitement, and that time scarcity is a significant FOMO driver producing the model's strongest stimulus-level path coefficient. H1d was not supported, revealing that time scarcity fails to activate perceived hedonic excitement. H2a and H2b were both supported, confirming that FOMO and PHE elevate anticipatory arousal, with PHE exerting a substantially larger effect. H3 was supported with the largest effect size in the model, firmly establishing anticipatory arousal as the proximal and most powerful driver of impulsive buying. H4 was not supported, as self-control did not significantly moderate the relationship between anticipatory arousal and impulsive buying. This result suggests that the regulatory role of trait-based self-control may be context dependent in hedonic and play-framed consumption, but it should not be interpreted as evidence that self-control is generally irrelevant or ineffective.

7.1. Limitations and future research

This study has six limitations. First, the sample was drawn only from Thai consumers and was strongly concentrated among younger respondents and students. This profile may limit the generalisability of the findings because younger consumers may be more responsive to novelty, peer influence, social media visibility, and trend-driven purchasing cues, which could strengthen FOMO, anticipatory arousal, and impulsive buying tendencies. Future research should replicate the model across broader age groups, occupational segments, and cultural contexts, including other Southeast Asian markets such as Indonesia and Malaysia, as well as originating markets such as China and Japan.

Second, the model does not account for individual difference variables such as collector identity, hedonic self-regulation, or purchase guilt. These constructs may function as more context-sensitive moderators in gamified retail environments and represent productive directions for future inquiry.

Third, this study measured self-control as a trait-based, purchase-contextualised capacity rather than as momentary state self-control during a specific buying episode. Although this approach is appropriate for examining individual regulatory differences in a cross-sectional survey, it may not fully capture temporary depletion or situational fluctuations in control during aroused blind box purchasing moments. Future studies could use experimental, diary-based, or real-time purchase-tracking designs to examine how state self-control operates during actual blind box buying episodes.

Fourth, the use of purposive and social-media-based snowball sampling may have introduced self-selection bias. Respondents active in online communities are likely to be more digitally engaged,

socially connected, and exposed to peer unboxing content than average blind box consumers, potentially strengthening the observed role of FOMO and social visibility. Future research should combine online recruitment with offline store-based sampling, mall-intercept surveys, or broader quota-based approaches to capture less digitally active blind box consumers.

Fifth, data were collected over a five-month period from August to December 2025. Although this window was necessary to obtain a sufficient number of qualified blind box consumers, market conditions may have changed during the collection period due to new releases, promotional campaigns, or shifts in product availability. These temporal effects may have influenced respondents' perceptions of scarcity, FOMO, and purchase urgency. In addition, the cross-sectional design does not permit causal inference. Future research could use longitudinal, experimental, or time-lagged designs to examine how changes in scarcity cues influence blind box purchasing behaviour over time.

Sixth, impulsive buying was measured using self-reported survey items. Although self-report measures are widely used in consumer behaviour research, they may be affected by recall bias, social desirability bias, or respondents' subjective interpretation of their own purchasing behaviour. Future studies could strengthen behavioural validity by combining survey responses with transaction records, platform purchase histories, diary data, or experimental purchase simulations to capture actual impulsive buying behaviour more directly.

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None.

Author contributions

CRediT: **Adi Prasetyo Tedjakusuma**: Conceptualization, Investigation, Methodology, Project administration, Writing – original draft; **Waiphot Kulachai**: Data curation, Resources, Software, Validation, Writing – original draft, Writing – review & editing; **Andri Dayarana K. Silalahi**: Conceptualization, Methodology, Project administration, Supervision, Validation, Writing – review & editing.

Disclosure statement

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About the authors

Adi Prasetyo Tedjakusuma is an academician at the Faculty of Business and Economics, University of Surabaya, Indonesia, and is currently a Ph.D. candidate in the Department of Business Administration at the College of Management, Chaoyang University of Technology, Taiwan. His research focuses on the role of AI in tourism and its impact on consumer behavior.

Pol. Lt. Col. Waiphot Kulachai, Ph.D., is an Assistant Professor at the Graduate School, Suan Sunandha Rajabhat University (SSRU), Thailand. His research focuses on criminology, public administration, policing, and public policy. He earned Ph.D. degrees in Criminology and Public Administration, an M.Sc. in Transport from Imperial College London, and a Master of Public Policy from the National Graduate Institute for Policy Studies (GRIPS), Japan.

Andri Dayarana K. Silalahi is an Assistant Professor in the Department of Marketing and Logistics Management at Chaoyang University of Technology. His research interests include consumer behavior on social media, AI in education and business, and sustainability.

ORCID

Adi Prasetyo Tedjakusuma http://orcid.org/0000-0003-0794-2124
Waiphot Kulachai http://orcid.org/0000-0002-3476-9462
Andri Dayarana K. Silalahi http://orcid.org/0000-0002-5399-3742

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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