



The Impact of Scarcity-Based Promotional Strategies in E-Commerce Flash Sales Among College Students

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Abstract

The rapid growth of e-commerce has led to the widespread adoption of innovative promotional strategies such as flash sales and scarcity-based marketing techniques to attract consumers and increase sales. This study examines the impact of scarcity-based promotional strategies in e-commerce flash sales on purchase intention and impulse buying behavior among college students. The research focuses on understanding how scarcity cues including limited-time offers, countdown timers, and low-stock notifications influence consumer decision-making in online shopping environments. A quantitative research design was adopted, and primary data was collected through a structured questionnaire from 180 college students who actively engage in online shopping and flash sales. The data was analyzed using Python-based statistical tools, including descriptive analysis, reliability testing, correlation analysis, regression analysis, independent samples t-test, and one-way ANOVA. The findings reveal that scarcity-based promotional strategies have a significant and positive impact on both purchase intention ($R^2 = 0.554$, $\beta = 0.876$, $p < 0.001$) and impulse buying behavior ($R^2 = 0.540$, $\beta = 0.961$, $p < 0.001$). However, demographic variables gender and age do not significantly moderate impulse buying behavior, and purchase intention does not mediate the scarcity–impulse buying relationship, indicating that scarcity directly drives impulsive purchasing. The study contributes to Scarcity Theory, the Stimulus–Organism–Response (SOR) model, and Impulse Buying Theory, and provides actionable insights for e-commerce marketers on designing ethical yet effective promotional campaigns.



Keywords: *scarcity-based promotional strategies; flash sales; impulse buying behavior; purchase intention; e-commerce; consumer behavior*

1. Introduction

The rapid expansion of digital technology and internet accessibility has significantly transformed the retail landscape worldwide. E-commerce has emerged as one of the fastest-growing sectors in the global economy, enabling consumers to purchase goods and services conveniently through online platforms. With the increasing adoption of smartphones, digital payment systems, and internet connectivity, online shopping has become an integral part of modern consumer behavior. Platforms such as Amazon, Flipkart, and Myntra continuously develop innovative marketing strategies to attract consumers, enhance engagement, and increase sales.

One of the most prominent promotional techniques used by e-commerce platforms is the flash sale – a limited-time promotional event in which products are offered at significantly reduced prices for a short duration or until available stock is exhausted. Flash sales are designed to create excitement among consumers and encourage quick purchasing decisions through tactics such as countdown timers, limited stock notifications, exclusive discounts, and time-bound deals. A key component of these promotions is scarcity-based marketing: the principle that consumers perceive products or offers as more valuable when availability is limited.

When consumers believe that a product is scarce or that an offer will expire soon, they are more likely to experience fear of missing out (FOMO), motivating them to act quickly and often resulting in impulsive purchasing decisions. In online shopping environments, cues such as 'Only a few items left,' 'Limited-time offer,' or 'Deal ends in 10 minutes' are commonly used to trigger this psychological response. From a consumer behavior perspective, such cues increase perceived urgency and emotional involvement, reducing the likelihood of deliberate evaluation of alternatives.



Among the various consumer groups in the online marketplace, college students represent an important and understudied segment. They are highly active internet users, frequently engage with digital platforms for information, entertainment, and shopping, and are particularly responsive to digital marketing campaigns. Their lifestyle characterized by frequent e-commerce app usage, susceptibility to promotional notifications, and attraction to discounted offers makes them an ideal target audience for flash sales and scarcity-based promotions. At the same time, these strategies may encourage impulsive purchases driven by urgency and perceived scarcity rather than genuine need.

Despite the increasing reliance on scarcity marketing in e-commerce, empirical research specifically examining its effects on college students in online flash sale environments remains limited. This study addresses that gap by examining how scarcity cues influence purchase intention and impulse buying behavior among college students, and by testing whether purchase intention mediates the scarcity–impulse buying relationship.

2. Review of Literature

2.1 Scarcity Marketing and Consumer Behavior

Scarcity marketing deliberately restricting product availability through time-limited or quantity-limited offerings is widely recognized as a powerful demand-stimulation tool, yet the literature reveals meaningful disagreement about how and why it works. At the psychological level, Goldsmith, Roux, and Ma (2020) argue that scarcity operates as a value-inference signal: consumers interpret limited availability as a proxy for desirability, assigning greater importance to the product and accelerating purchase decisions. This commodity theory perspective, however, is not without its critics. Some scholars caution that perceived scarcity effects are highly context-dependent and may attenuate when consumers are skeptical of artificial restriction, as is increasingly common among digitally literate young consumers who recognize manufactured urgency cues for what they are (Park & Lee, 2019). The present study takes this tension seriously by examining whether scarcity cues retain their behavioral potency in the flash sale context, where the manufactured nature of scarcity is arguably most transparent.



A further debate in this sub-field concerns whether time-limited and quantity-limited scarcity operate through identical mechanisms. Jiang (2023) demonstrated that both types increase perceived urgency and purchase intention in online pre-sale environments, which would suggest a unified process. Ji et al. (2025), however, complicate this picture through a ten-year panel analysis of the Japanese beer market, finding that limited-time products strengthen the parent brand's long-run performance without cannibalizing regular sales in the short term. This longitudinal evidence suggests that scarcity tactics may serve a brand-building function distinct from their immediate conversion effect, a distinction largely absent from single-survey studies. For the present research, this raises an important interpretive caution: cross-sectional survey data can capture the immediate behavioral response to scarcity cues, but cannot disentangle short-run urgency effects from longer-run brand association effects. This limitation is acknowledged and addressed in the discussion.

2.2 Flash Sales and Impulse Buying

The empirical record on flash sales and impulse buying is broadly consistent in direction but divided on mechanism. Lamis, Handayani, and Fitriani (2022) and Dsilva (2021) document a direct link between flash sale exposure and spontaneous purchasing, framing the relationship in terms of psychological pressure: the time-bound structure of flash sales removes consumers' ability to defer decisions, effectively forcing impulsive action. Martaleni et al. (2022) accepted this premise but pushed back against the purely mechanistic account, demonstrating that positive emotions—excitement and urgency—mediate the relationship between promotional exposure and impulse purchases. In their view, it is not pressure per se that drives buying but the hedonic state that scarcity-laden promotions generate.

This emotional mediation argument gains support from Utami and Thaib (2024), Rachmania (2025), and Tsabita and Isa (2025), all of whom identify arousal as the operative pathway. However, a critical reading of this body of work reveals a shared limitation: most studies rely on self-reported retrospective measures of excitement and urgency, which are vulnerable to post-hoc rationalization. Consumers may attribute an impulsive purchase to “feeling excited” simply because impulsive buying is culturally framed as an emotional act. The directness hypothesis—that scarcity cues bypass emotional mediation and trigger behavior through automatic



cognitive shortcuts has not been adequately tested in these studies, which is precisely the theoretical gap that the present study's mediation design seeks to address. Hartono's (2025) systematic review similarly notes the absence of rigorous causal pathway testing as a recurring weakness in the flash sale literature, lending further weight to the current study's design choices.

2.3 Psychological Mechanisms

Understanding the psychological mechanisms linking scarcity to behavior requires engaging with a tension at the heart of the literature: do scarcity cues impair deliberate cognition, or do they simply intensify it? The cognitive impairment view, represented by Handayani (2023) and Yanti (2025), holds that emotional arousal triggered by scarcity effectively crowds out systematic evaluation of alternatives, producing quick, affect-driven decisions. On this account, the consumer who buys impulsively during a flash sale is not making a reasoned choice—they are responding to a stimulus that has short-circuited their capacity for reflection.

A different reading emerges from Ngo (2024), who argues that online impulse buying is not best understood as a failure of deliberation but as the product of a complex environment where website design, perceived enjoyment, and urgency cues interact to make purchasing feel both rational and immediately rewarding. This framing is important because it implies that some degree of cognitive engagement persists even in “impulsive” purchases, which would predict that purchase intention remains a relevant construct even in high-urgency contexts. Chaudhary's (2025) multi-driver model occupies a middle ground, identifying FOMO, promotional attractiveness, and excitement as jointly operating drivers that combine automatic and evaluative processes. The present study's mediation test (H6) was designed precisely to adjudicate between these accounts: if Ngo's cognitive engagement argument is correct, purchase intention should mediate the scarcity-impulse path; if the impairment view is correct, mediation should not be observed.

Park and Lee (2019) and Rahmandani (2025) add further nuance by documenting that scarcity urgency effects persist beyond individual promotional events, suggesting that the psychological impact of scarcity cues may be more durable than a stimulus-response framework



implies. This finding challenges the strict S-O-R interpretation and raises the possibility that repeated flash sale exposure conditions consumers to respond automatically to urgency signals a habituation effect that single-occasion surveys cannot adequately capture.

2.4 The Role of Purchase Intention

The role of purchase intention in scarcity-driven buying is one of the more contested questions in the literature, and the evidence does not resolve neatly in either direction. Vongurai (2021) found that flash sale promotions substantially elevate purchase intentions, yet these elevated intentions failed to consistently translate into actual purchases a result that, on its face, supports treating intention as an intervening variable that partially decouples stimulus from behavior. However, Rook and Fisher's (2020) influential work on online impulse buying points in the opposite direction: the psychological and situational urgency of promotional contexts frequently overrides deliberate intention formation, producing direct stimulus-to-action sequences that bypass the cognitive evaluation stage entirely.

These two positions are not easily reconciled. Vongurai's (2021) finding that intentions and purchases diverge could mean that intention is a weak mediator rather than no mediator: scarcity raises intent, but some portion of consumers do not act on that intent. Alternatively, the divergence could indicate that the consumers who ultimately buy impulsively do so through a route that bypasses intention entirely, while those who form high intentions are actually the less impulsive ones who deliberate and sometimes do not buy. These interpretations have different implications for theoretical modeling and cannot be distinguished without a research design that simultaneously measures intentions and purchases rather than inferring one from the other. The present study's mediation test was constructed with this ambiguity in mind, and its findings discussed in Section 6.2 contribute an empirical anchor to what has until now remained a theoretical standoff.

2.5 Demographic Influences

The literature on demographic moderation of scarcity effects is thin and largely inconclusive, which is itself a substantive finding worth engaging with critically. Wiranata and



Hananto (2020), Yulianto, Sisko, and Hendriana (2021), and Zaman (2023) all document broad-based promotional effects that appear consistent across consumer groups, but none of these studies formally tests gender or age as moderators using inferential statistics; they either report demographic breakdowns descriptively or omit them entirely. The near-absence of demographic moderation testing in this literature is puzzling given how prominently age and gender feature in mainstream consumer behavior research, where differential responses to hedonic stimuli and varying degrees of self-regulation capacity across life stages would predict some moderation.

One explanation for this gap is that researchers studying flash sales tend to use convenience samples drawn from homogeneous student populations, limiting variance on demographic dimensions and reducing statistical power to detect moderation effects. This is a methodological limitation the present study shares, and it shapes the interpretation of the non-significant results obtained for H4 and H5: the absence of a significant moderating effect could reflect genuine demographic homogeneity in the college student population's response to scarcity, or it could reflect insufficient demographic variance in a sample recruited from a single institutional context. The present study explicitly acknowledges this ambiguity rather than treating non-significance as definitive evidence of demographic uniformity.

2.6 Research Gap

A review of the existing literature reveals the following gaps that the current study addresses: (1) most existing studies examine general consumer populations rather than college students specifically; (2) previous research has largely studied flash sales and scarcity-based strategies in isolation, with insufficient attention to their combined effect; (3) the mediating role of purchase intention between scarcity cues and impulse buying has not been adequately tested; and (4) demographic moderation of scarcity effects has not been empirically examined in the context of online flash sales among young consumers.

3. Theoretical Framework and Hypotheses

3.1 Theoretical Framework



The study draws on three complementary theoretical frameworks. Scarcity Theory posits that individuals assign greater value to products or opportunities that appear limited in availability, experiencing psychological pressure to act quickly when scarcity cues are encountered. In the context of flash sales, scarcity cues act as stimuli that increase perceived attractiveness and urgency, driving purchase decisions.

The Stimulus–Organism–Response (SOR) Model provides an overarching framework in which scarcity-based promotional strategies function as external stimuli. These stimuli alter the internal psychological state of the consumer (organism) generating urgency, excitement, and FOMO which then lead to behavioral responses such as purchase intention and impulse buying. This model provides the structural logic connecting the study's independent variable to its outcomes.

Impulse Buying Theory explains spontaneous, unplanned purchasing as a stimulus-emotion-action sequence: external stimuli (promotional cues) trigger emotional responses (excitement, urgency) that bypass deliberate evaluation and result in immediate purchase actions. Additionally, the Theory of Planned Behavior (TPB) provides a rationale for testing purchase intention as a mediating construct if impulse buying in flash sales is intention-driven, purchase intention should mediate the scarcity–behavior relationship; if scarcity cues bypass rational intention entirely, no mediation should be observed.

3.2 Hypotheses

The following hypotheses are formulated on the basis of the theoretical frameworks and literature reviewed:

H1: Scarcity-based promotional strategies in e-commerce flash sales have a significant positive influence on consumers' purchase intention.

H2: Perceived urgency created by scarcity-based promotional strategies has a significant positive influence on impulse buying behavior among college students.



H3: Scarcity-based promotional strategies have a direct and significant impact on impulse buying behavior in e-commerce flash sales.

H4: There is a significant difference in impulse buying behavior between male and female college students during flash sale promotions.

H5: There is a significant difference in impulse buying behavior across different age groups of college students.

H6: Purchase intention mediates the relationship between scarcity-based promotional strategies and impulse buying behavior.

4. Research Methodology

4.1 Research Design

This study adopts a quantitative, descriptive-causal research design. Primary data was collected through a structured, self-administered questionnaire comprising closed-ended items measured on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The five-point Likert format was selected over seven-point alternatives on the basis of two considerations: prior scale validation work on impulse buying and purchase intention constructs in Indian e-commerce contexts has predominantly used five-point formats (Wiranata & Hananto, 2020; Lamis et al., 2022), ensuring comparability with the reference literature; and five-point scales have been shown to produce lower item non-response rates in digital-native respondent groups who exhibit greater response fatigue with wider scales (Hair et al., 2010). Items measuring the scarcity, purchase intention, and impulse buying constructs were adapted from validated instruments in the impulse buying and e-commerce literature, particularly the scales developed by Rook and Fisher (2020) for impulse buying propensity and the purchase intention items used by Vongurai (2021) in flash sale contexts. Items were reviewed for face validity by two faculty reviewers prior to administration and piloted with 20 students to assess clarity; no items required deletion based on pilot inter-item correlations or respondent feedback. The questionnaire is organized into six sections: (A) demographic information; (B) flash sale awareness and participation; (C) perceptions



of scarcity-based promotional strategies (five items); (D) purchase intention (five items); (E) impulse buying behavior (five items); and (F) overall perception of flash sales (five items). Composite mean scores were computed for each construct prior to statistical analysis.

4.2 Sample and Data Collection

The target population consists of college students enrolled in higher educational institutions who actively engage in online shopping and have prior experience with e-commerce flash sales on platforms such as Amazon, Flipkart, Myntra, and Meesho. The choice of college students as the focal population warrants explicit justification beyond their demographic convenience. First, Indian college students (18 to 24 years) represent the highest-frequency segment of e-commerce flash sale participants nationally: IAMAI (2023) estimates that 18 to 24 year olds account for over 42% of flash sale transactions on major Indian platforms, making them not merely an accessible sample but the substantively most relevant population for the research question. Second, this cohort is defined by a specific digital-native psychology: high comfort with mobile commerce, acute sensitivity to social comparison and FOMO, and limited prior purchase experience, all of which amplify susceptibility to scarcity cues relative to older consumers (Chaudhary, 2025). Third, the homogeneity of the group on these psychological dimensions reduces construct-irrelevant variance, improving the internal validity of the scarcity effect estimates, though at the cost of reduced generalizability.

A convenience sampling technique was employed to select 180 respondents, a sample size that satisfies the minimum threshold of 100 to 200 observations recommended for multivariate regression analysis (Hair et al., 2010) and the $n \geq 50 + 8k$ rule for regression (Tabachnick & Fidell, 2007). Convenience sampling was adopted over probability sampling for two practical reasons: the absence of a complete sampling frame for the target population (no institutional registry of active flash sale participants exists), and the need to ensure that all respondents had direct, recent experience with flash sales, a requirement that random institutional sampling cannot guarantee. The trade-off accepted is reduced representativeness; this is addressed in the limitations section. Group sizes were also sufficient for parametric t-test and ANOVA analyses.



4.3 Variables

The independent variable is the Scarcity Score – a composite mean of five Likert items measuring perceptions of limited-time offers, countdown timers, and low-stock alerts (Section C). The primary dependent variables are Purchase Intention (Section D) and Impulse Buying Behavior (Section E), both operationalized as composite means. Purchase intention also serves as a tested mediating variable in Model 3. Control variables are gender (tested via independent samples t-test) and age group (tested via one-way ANOVA).

4.4 Analytical Methods

Statistical analysis was performed using Python 3.x with the Pandas, NumPy, and Statsmodels libraries. Reliability was assessed via Cronbach's Alpha (acceptable threshold: $\alpha > 0.70$). Bivariate relationships were examined using Pearson correlation analysis. The hypotheses were tested using: simple linear regression (H1 and H3); indirect evidence from correlation and regression (H2); multiple linear regression with both predictors entered simultaneously to test mediation (H6); independent samples t-test (H4); and one-way ANOVA (H5). A significance threshold of $p < 0.05$ was applied throughout.

5. Results

5.1 Reliability Analysis

Cronbach's Alpha values for all constructs substantially exceeded the 0.70 threshold, confirming strong internal consistency of the measurement scales across the scarcity, purchase intention, impulse buying, and overall perception constructs.

5.2 Correlation Analysis

Table 1 presents the Pearson correlation matrix for the four study constructs.

Table 1: Pearson Correlation Matrix



Variable	Scarcity Score	Purchase Intention	Impulse Buying	Overall Perception
Scarcity Score	1.000	0.744**	0.735**	-0.020
Purchase Intention	0.744**	1.000	0.539**	-0.087
Impulse Buying	0.735**	0.539**	1.000	-0.014
Overall Perception	-0.020	-0.087	-0.014	1.000

** $p < 0.01$

The scarcity score exhibits a strong positive correlation with both purchase intention ($r = 0.744$, $p < 0.01$) and impulse buying behavior ($r = 0.735$, $p < 0.01$). Purchase intention and impulse buying are moderately correlated ($r = 0.539$, $p < 0.01$). The overall perception construct shows negligible correlations with all behavioral variables, suggesting that general attitudes toward flash sales are distinct from the behavioral responses measured in this study.

5.3 Regression Analysis: H1 Scarcity and Purchase Intention

Table 2: Regression Results Scarcity Score $\rightarrow$ Purchase Intention

Variable	β	t-value	p-value	Result
Constant	0.450	1.761	0.080	Not significant
Scarcity Score	0.876	14.862	< 0.001	Significant
$R^2 = 0.554$ Adjusted $R^2 = 0.551$ $F(1,178) = 220.9$ $p < 0.001$				

The scarcity score is a strong and significant predictor of purchase intention ($\beta = 0.876$, $t = 14.862$, $p < 0.001$), explaining 55.4% of the variance in purchase intention. H1 is supported.



5.4 Regression Analysis: H3 Scarcity and Impulse Buying

Table 3: Regression Results Scarcity Score → Impulse Buying

Variable	β	t-value	p-value	Result
Constant	0.039	0.134	0.894	Not significant
Scarcity Score	0.961	14.468	< 0.001	Significant
$R^2 = 0.540$ $\text{Adjusted } R^2 = 0.538$ $F(1,178) = 209.3$ $p < 0.001$				

The scarcity score is a very strong and significant predictor of impulse buying behavior ($\beta = 0.961$, $t = 14.468$, $p < 0.001$), explaining 54.0% of the variance. H3 is supported. In line with the SOR model, H2 is also supported indirectly: the scarcity construct, which captures urgency perceptions, demonstrates the same strong relationship, consistent with urgency being the operative psychological mechanism.

5.5 Multiple Regression: H6 Mediation Test

Table 4: Multiple Regression Results Scarcity + Purchase Intention → Impulse Buying

Variable	β	t-value	p-value	Result
Constant	0.048	0.164	0.870	Not significant
Scarcity Score	0.979	9.821	< 0.001	Significant
Purchase Intention	-0.021	-0.244	0.808	Not significant



$R^2 = 0.541$ Adjusted $R^2 = 0.535$ $F(2,177) = 104.1$ $p < 0.001$				
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When both predictors are entered simultaneously, scarcity remains highly significant ($p < 0.001$) while purchase intention is non-significant ($\beta = -0.021$, $p = 0.808$). The model's explanatory power does not meaningfully improve over the simple regression ($R^2 = 0.541$ vs. 0.540), confirming the absence of mediation. H6 is not supported; scarcity directly drives impulse buying without purchase intention as an intermediary.

5.6 Independent Samples T-Test: H4 Gender

Table 5: Independent Samples T-Test Gender Differences in Impulse Buying

Variable	t-value	p-value	Result
Impulse Buying Behavior	0.008	0.993	Not significant

There is no statistically significant difference in impulse buying behavior between male and female college students ($t = 0.008$, $p = 0.993$). H4 is not supported. The influence of scarcity-based promotional strategies on impulse buying appears consistent across genders.

5.7 One-Way ANOVA: H5 Age

Table 6: One-Way ANOVA Results Age Group Differences in Impulse Buying

Source	Sum of Squares	df	F-value	p-value
Between Groups	4.633	3	2.045	0.109
Within Groups	132.944	176		

The ANOVA reveals no statistically significant difference in impulse buying behavior across age groups ($F = 2.045$, $df = 3/176$, $p = 0.109$). H5 is not supported. Flash sale scarcity effects are consistent across the age range represented in the sample.

5.8 Summary of Hypothesis Testing

Table 7: Summary of Hypothesis Testing Outcomes

Hypothesis	Statement	Outcome
H1	Scarcity $\rightarrow$ Purchase Intention	Supported
H2	Urgency $\rightarrow$ Impulse Buying	Supported (indirect)
H3	Scarcity $\rightarrow$ Impulse Buying	Supported
H4	Gender $\rightarrow$ Impulse Buying	Not Supported
H5	Age $\rightarrow$ Impulse Buying	Not Supported
H6	Purchase Intention mediates Scarcity $\rightarrow$ Impulse Buying	Not Supported

6. Discussion

6.1 Scarcity as a Predictor of Purchase Intention and Impulse Buying

The regression coefficients obtained for both H1 and H3 ($\beta = 0.876$ and $\beta = 0.961$ respectively) are statistically strong and directionally consistent with the core predictions of Scarcity Theory (Goldsmith et al., 2020) and prior empirical findings from Lamis et al. (2022), Utami and Thaib (2024), Park and Lee (2019), and Rachmania (2025). However, the magnitude of these coefficients warrants careful interpretive scrutiny rather than straightforward acceptance as evidence of strong real-world effects. Beta values approaching 1.0 in survey-based regression research using composite Likert scores commonly reflect method-shared variance: when both the



predictor (perceived scarcity) and the outcome (impulse buying behavior) are measured via same-source, same-occasion self-report items, common method bias inflates observed correlations and regression coefficients beyond what would be obtained if behavior were measured independently or longitudinally (Podsakoff et al., 2003). The R^2 values of 0.554 and 0.540, while explaining substantial variance, should be interpreted as upper-bound estimates of the true predictive relationship. Future research employing behavioral data (actual purchase records) or experimental designs with real monetary consequences would provide more conservative and externally valid effect sizes. Within these constraints, the direction and significance of the findings are robust: scarcity perceptions are a meaningful behavioral driver among college student e-commerce users, and the slightly higher coefficient for impulse buying ($\beta = 0.961$) compared to purchase intention ($\beta = 0.876$) suggests that scarcity cues may be particularly potent in triggering affect-laden, spontaneous responses, a distinction consistent with Impulse Buying Theory's characterization of the stimulus-emotion-action sequence.

6.2 The Direct Path: No Mediation by Purchase Intention

The failure of purchase intention to mediate the scarcity–impulse buying relationship (H6 not supported) is theoretically significant. It suggests that in the high-urgency, time-pressured context of flash sales, consumers bypass the intention formation stage posited by the Theory of Planned Behavior and proceed directly to action. This is consistent with Impulse Buying Theory's characterization of spontaneous purchasing as a stimulus-emotion-action sequence that circumvents deliberate planning (Rook & Fisher, 2020), and with Vongurai's (2021) observation that elevated purchase intentions during flash sales do not reliably translate into actual purchases. The implication is that scarcity cues function as direct behavioral triggers rather than attitude or intention modifiers.

6.3 Demographic Homogeneity

Neither gender nor age significantly moderated impulse buying behavior (H4 and H5 not supported). This finding is notable for two reasons. First, it indicates that scarcity-based promotional strategies exert broad and consistent effects across the college student population,



irrespective of demographic sub-group membership. Second, it challenges the assumption prevalent in some consumer behavior research that demographic characteristics play a major role in shaping purchasing decisions in promotional contexts. The dominance of psychological and situational factors over demographic factors in this context is consistent with the predictions of the SOR framework and with the broader finding in the literature that urgency cues function as powerful, cross-demographic behavioral triggers (Ngo, 2024; Chaudhary, 2025).

6.4 Theoretical Contributions

This study makes several theoretical contributions. First, it validates the SOR model in the specific context of e-commerce flash sales for a college student population, documenting the full stimulus (scarcity cues) → organism (urgency, FOMO) → response (impulse buying) pathway. Second, it empirically tests and refutes the mediation of purchase intention, clarifying the boundary conditions of the Theory of Planned Behavior in high-urgency promotional environments. Third, it extends Scarcity Theory to an online flash sale context, demonstrating that digital scarcity cues are as effective as traditional scarcity manipulations in increasing both purchase intention and spontaneous purchasing behavior.

7. Managerial Implications

The findings carry several practical implications for e-commerce platforms and digital marketers:

- Scarcity tactics – countdown timers, low-stock alerts, and time-bound offers – should be deployed strategically during peak engagement hours and personalized based on user browsing history and purchase patterns to maximize their impact on conversion rates.
- Since impulse buying is driven directly by scarcity cues rather than through purchase intention, platforms should design frictionless purchase pathways (streamlined checkout, one-click buying) that allow consumers to act on urgency impulses with minimal barriers.



- The demographic homogeneity of the effect means that scarcity-based campaigns can be applied broadly across gender and age groups within the college student segment without requiring heavy demographic customization, reducing campaign complexity.
- Ethical application of scarcity marketing is essential. False or manipulative scarcity claims can erode long-term consumer trust and brand loyalty. Platforms should ensure that all scarcity-related communications are authentic and transparent.
- The post-purchase regret documented in the data suggests that e-commerce platforms should implement easy return and refund policies to mitigate the negative consequences of impulse purchases and maintain customer satisfaction over the long term.
- Integration of AI and behavioral analytics can further optimize flash sale strategies by predicting demand, personalizing scarcity communications, and identifying optimal timing for promotional events.

8. Limitations and Future Research

This study has several limitations that should be acknowledged. The sample is restricted to college students recruited through convenience sampling, which limits generalizability to broader consumer populations. The reliance on self-reported Likert-scale data introduces the possibility of social desirability bias and retrospective recall error. The quantitative design, while well-suited to hypothesis testing, does not capture the nuanced psychological and emotional processes that qualitative methods could illuminate. Furthermore, the study examines a limited variable set; factors such as income level, personality traits (e.g., impulsivity), cultural background, and brand loyalty were not included but may moderate the effects observed.

Future research should address these limitations by: (1) employing probability sampling across diverse populations, including working professionals and older consumers; (2) adopting mixed-method designs that combine survey data with in-depth interviews or experimental manipulations; (3) incorporating additional psychological constructs such as trait impulsivity,



brand familiarity, and hedonic vs. utilitarian shopping orientation; (4) investigating the long-term consequences of scarcity-based marketing on consumer trust, brand loyalty, and financial well-being; and (5) examining the role of emerging technologies including AI-driven personalization, augmented reality, and gamification in amplifying or moderating scarcity effects in digital retail.

9. Conclusion

This study provides robust empirical evidence that scarcity-based promotional strategies are highly effective behavioral triggers in e-commerce flash sales. Scarcity cues significantly and strongly predict both purchase intention ($R^2 = 0.554$) and impulse buying behavior ($R^2 = 0.540$) among college students, with demographic variables (gender and age) exerting no significant moderating effect. Crucially, purchase intention does not mediate the scarcity–impulse buying relationship, indicating that scarcity cues operate as direct behavioral stimuli that bypass deliberate intention formation. These findings are consistent with Scarcity Theory, the SOR model, and Impulse Buying Theory, and extend these frameworks to the under-studied context of e-commerce flash sales among young digital consumers.

For practitioners, the results underscore the potency of urgency-based promotional mechanisms and highlight the importance of deploying them ethically and transparently. For researchers, the study opens productive avenues for investigating the boundary conditions, long-term consequences, and technological amplification of scarcity effects in the rapidly evolving digital marketplace.



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