

“Beyond the purchase: Examining how flash sale content shapes product return intentions through data fatigue and impulse buying”

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BEYOND THE PURCHASE: EXAMINING HOW FLASH SALE CONTENT SHAPES PRODUCT RETURN INTENTIONS THROUGH DATA FATIGUE AND IMPULSE BUYING

Abstract

Flash sale campaigns have become a dominant promotional strategy in e-commerce has significantly influenced consumer purchasing behavior and post-purchase outcomes. The present study investigates how flash sale content impacts consumers' product return intention by analyzing the mediating role of impulse buying and data fatigue, and the moderating role of perceived irreplaceability. A quantitative research design was followed, with primary data collected from 400 online shoppers from Kerala, India, via a structured questionnaire during December 2025. Partial Least Squares Structural Equation Modelling (PLS-SEM) was used to analyze the data and test the proposed relationships, while descriptive statistics, mediation analysis, and moderation analysis were also applied. The results show that flash-sale content does not directly affect product return intention. Flash sale content significantly influenced data fatigue ($\beta = 0.776$, $p < 0.001$) and impulse buying ($\beta = 0.154$, $p = 0.032$). Data fatigue significantly influenced product return intention ($\beta = 0.228$, $p = 0.006$), while impulse buying positively affected product return intention ($\beta = 0.198$, $p = 0.004$). Data fatigue mediates the relationship between flash sale content and intention to return a product, whilst impulsive buying alone was not a significant mediator. Meanwhile, the serial mediation through data fatigue and impulsive buying has proved to be significant. In addition to that, perceived irreplaceability significantly moderates the correlation between flash sale content and intention to return the product and the relationship between impulsive buying and intention to return a product. This research is an extension to the field of consumer behavior, as it reveals the influence of cognitive and emotional processes on product return intentions during flash sales. The results also offer practical guidance for e-commerce sites in developing effective promotional campaigns that yield fewer impulse purchases, cognitive overload, and product returns.

Keywords

flash sales, consumers, fatigue, impulsivity, returns,
e-commerce

JEL Classification

M31, D91, L81

INTRODUCTION

The trend of e-commerce has grown incredibly in the last ten years globally, and this has changed the retail structure and decision-making by consumers. As per United Nations Conference on Trade and Development (2024), online retail sales exceeded USD 5.8 trillion in the world, and these sales are expected to rise in the future in both emerging and developed markets. Time-constrained campaigns are based on urgency indicators, countdown timers, scarcity indicators, and algorithmic targeting to spur impulse buying. Although these tactics result in peaks in transactions after a short-term period, as it is evidenced by the National Retail Federation (2025) report, by 2025, an estimated 19.3% of online sales will be returned, compared to traditional in-store returns. Post-purchase satisfaction may be undermined

by promotional tactics that aim at speeding up the decision-making process. The cost of operations and reverse logistics is growing, and the number of returns on products is increasing among retailers (Karlsson et al., 2023; Liu & Du, 2023). However, not many studies analyze the influence of flash sale content on product return intention indirectly as a result of a psychological process, which is a critical gap in the management of sustainable platforms.

Current studies outline a range of psychological processes that can be used to explain this tension. They can be supported by Stimulus-Organism-Response theory, which shows that emotional arousal as a result of the promotional stimuli will affect impulsive behavioral decisions (Pereira et al., 2023). Empirical evidence shows that scarcity promotion and time shortages have great promotional effects on impulse buying (Sun et al., 2023; Wu et al., 2021). These effects are magnified in the setting of flash sales due to the limited-time offers and exclusivity (Cengiz & Şenel, 2024; Lamis et al., 2022). Yet, it has been found that impulse purchases are often linked to post-purchase regret and repurchase desire (Kumar & Taneja, 2024).

Similar to emotional stimuli, cognitive overload has emerged as a significant explanatory variable in online trade. Consumers are subjected to continuous promotional cues, which might overburden information-processing capacity. Studies of data overload confirm that the high number of stimuli reduces the quality of decisions (Arnold et al., 2023; Zhang et al., 2023). This mental burden may result in data fatigue, which may undermine post-purchase satisfaction and increase returns (Lv & Liu, 2022; Peng et al., 2021). Though these mechanisms have been discussed separately, their combined effect in a flash sale situation has not been adequately investigated.

Moreover, scarcity-based marketing is based on perceived irreplaceability, which is the belief of the consumer that a product is special. According to meta-analytic findings, scarcity perceptions enhance purchase urgency (Barton et al., 2022; Ladeira et al., 2023). However, little empirical evidence has been conducted on the moderating effect of perceived irreplaceability in enhancing the relationship between impulse purchase and repurchase intention.

Although there is increasing academic interest in the field of impulse buying and flash sale efficacy, three important gaps remain. To start with, existing literature focuses mostly on purchase intention but not on post-purchase effects. Second, cognitive and impulsive behaviors are not studied sequentially, which restricts the overall knowledge on interactions between emotional and cognitive processes. Third, perceived irreplaceability has not been incorporated into the models of return intention through the creation of a fitting boundary condition. These gaps need to be bridged in a bid to balance the short-term success of promotions with long-term consumer welfare.

The study uses PLS SEM to test a combination of direct, mediating, and moderating relationships methodologically. The method is suitable in the context of predictive research where the constructs of latent variables are very complex in the context of consumer behavior.

1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

1.1. Flash sale content

Flash sale content refers to the design and presentation of promotional elements such as countdown timers, scarcity messages, price discounts,

and visual intensity used during limited-time sales events (Zhang et al., 2022). It has become a popular promotional marketing tactic in e-commerce, creating a sense of urgency, scarcity, and time pressure on consumers to make a purchase decision (Dawson & Kim, 2010; Martaleni et al., 2022). Such promotional practices can indeed encourage purchasing behavior, but their consequences after purchasing are a matter of debate. Some research indicates that flash sales

can create the incentive to buy products without planning, leading to potential customer dissatisfaction and returns (Yanti et al., 2025). Kim and Tanford (2021) suggested that promotional discounts would have a significant effect on purchase volumes, but would not necessarily affect post-purchase behavior, while Martaleni et al. (2022) found that flash sales would have an indirect effect on consumer behavior through emotional response. The inconclusive results suggest that the relationship between the content of flash sales and product return intention is not fully understood, especially in new e-commerce markets. Existing research consistently finds that such content acts as a strong external stimulus by increasing perceived urgency and time pressure, thereby accelerating purchase decisions (Yi et al., 2023). Studies grounded in the S-O-R framework argue that vivid and repetitive flash sale cues heighten arousal levels, reducing consumers' ability to engage in deliberate evaluation of product information. The Stimulus-Organism-Response (S-O-R) theory is a useful theory to examine the responses of consumers to flash sale promotions. The Stimulus-Organism-Response (S-O-R) theory posits that external environmental stimuli (S) evoke internal psychological states (O), which subsequently drive behavioral response (R). When it comes to digital commerce, flash sale content such as messages about scarcity and countdown timers, along with limited-time offers, can serve as an external stimulus with cognitive and emotional reactions like excitement, urgency, and impulsivity. Such internal reactions can subsequently shape purchase behaviors and post-purchase experiences, such as product return intentions (Barton et al., 2022; Shi et al., 2020).

However, while some studies emphasize that frequent exposure to flash sale content enhances attention and engagement, others suggest that excessive promotional repetition may lead to diminishing marginal effects over time (Liu & Du, 2023). Critics argue that most studies treat flash sale content as a uniformly positive stimulus, overlooking the possibility that overexposure may overwhelm consumers cognitively. As a result, the literature lacks consensus on whether intensified flash sale content consistently enhances decision quality or merely accelerates impulsive responses.

1.2. Product return intention

Product return intention represents an important post-purchase behavioral outcome that has received relatively limited attention in flash sale literature. While impulse buying has been widely studied, fewer studies examine whether impulsive flash sale purchases translate into higher return rates (Yi et al., 2023). Emerging evidence suggests that purchases made under high-pressure conditions are more likely to result in dissatisfaction and return intentions (Zhang et al., 2024).

Nonetheless, most prior research treats product returns as an operational issue rather than a behavioral consequence of promotional intensity (Ngo et al., 2024). The role of cognitive factors such as data fatigue and emotional factors, including regret, in shaping return intention remains insufficiently explored. This gap is particularly relevant in flash sale contexts, where accelerated decision-making may increase the likelihood of post-purchase dissonance. Cognitive Dissonance Theory explains customers' post-purchase evaluation and return intention. The theory suggests that people feel uncomfortable when their actions don't align with their expectations, beliefs, or preferences (Festinger, 1957). In an online shopping context, when shoppers are pushed for time and feel tempted by the offers at the moment of purchase, this impulsiveness can lead to post-purchase remorse and discontent with the decisions they made. To minimize this psychological discomfort, consumers could be involved in corrective behaviors like product returns. The findings from previous research revealed that post-purchase dissonance is positively related to dissatisfaction and repurchase behavior, especially in high-pressure promotion situations (Jabutay et al., 2025; Lv & Liu, 2022).

1.3. Impulse buying

Impulse buying is one of the most extensively examined outcomes of flash sale environments. Prior research demonstrates that time pressure and scarcity cues embedded in flash sale content significantly increase unplanned purchasing behavior (Chen et al., 2022; Yi et al., 2023). From a behavioral perspective, impulse buying is driven by emotional arousal, anticipated regret and fear of missing out, which collectively weaken self-

control mechanisms. Impulse buying has been consistently linked to spontaneous decision-making and minimal cognitive assessment, which can result in post-purchase regret and product returns (Spears, 2006; Ying-Ping Liang, 2011). Promotional cues also tend to get people to buy things they don't need, which they may have to re-evaluate once they have spent the money. However, Chin and Wu (2022) suggested that positive shopping experiences and perceived value can enhance the satisfaction of purchase and lower consumers' intention to return products. Similarly, Chauhan et al. (2021) reported that sales promotions do not always create impulse buying, and Martaleni et al. (2022) reported that flash sales only indirectly lead to impulse buying via emotional responses. The conflicting results indicate the relationships between the flash sale content, impulse buying and product return intention are still not conclusive.

Nevertheless, empirical findings remain divided regarding the long-term implications of impulse buying triggered by flash sales. While some scholars argue that impulse purchases generate short-term satisfaction, others report higher levels of post-purchase regret and dissatisfaction (Zhang et al., 2024). Moreover, most existing studies focus on impulse buying as an immediate response, with limited attention given to downstream outcomes such as product returns or cognitive strain. This narrow focus restricts a holistic understanding of impulse buying behavior within promotional environments.

1.4. Data fatigue

Data fatigue has emerged as a growing concern in digital commerce literature, particularly in contexts involving continuous exposure to promotional information. Data fatigue refers to consumers' cognitive exhaustion resulting from excessive information processing demands during repeated flash sale events (Arnold et al., 2023). Research has suggested that cognitive overload may hinder consumers' information processing, causing them to make suboptimal purchase decisions, experience poor satisfaction, and be more prone to product returns (Ghose et al., 2014; Q. Zhang & Ahmad, 2024). Likewise, cognitive load theory proposes that cognitive fatigue will lead consumers to use heuristic processing, thus also making unplanned and impulsive buying decisions

(Ngo et al., 2023). On the other hand, some researchers argue that consumers often cope with the overwhelming information by relying on recommender systems, simplification heuristics and streamlined decision supports to mitigate the negative impacts of information overload (Jannach et al., 2010; Meyer-Waarden et al., 2026). Besides, Lovelesh et al. (2024) suggested that too much information can lead to decision paralysis and delay purchases instead of encouraging impulsive buying. Recent studies indicate that repeated exposure to flash sale notifications, product comparisons, and promotional alerts can overwhelm consumers, reducing their capacity for rational decision-making (Lv & Liu, 2022). The LC4MP (Lang, 2000) is a theory that describes the information processing of limited cognitive resources. Consumption theory proposes that consumers have limited mental capacity to encode, store, and recall information. Excessive, repetitive, and/or highly stimulating promotional messages can exhaust cognitive resources, leading to data fatigue and information overload. Cognitive exhaustion may occur in digital retail settings when users receive frequent notifications of flash sales and promotions, which can impair their ability to make choices with high accuracy and depth, leading them to rely more on heuristic processing (Lochab et al., 2025; Xu et al., 2023). Therefore, the meaning of data fatigue might be an important linkage between the flash sale content and the behavioral outcome after a purchase.

Despite its relevance, data fatigue remains underexplored in flash sale research. Existing studies often acknowledge information overload but do not empirically integrate data fatigue into behavioral models explaining impulse buying. Furthermore, most research examines cognitive overload in isolation, without considering how it interacts with emotional stimuli such as urgency and excitement (Sun et al., 2023). This represents a critical gap, as data fatigue may not only influence purchase decisions but also shape post-purchase evaluations and return behavior (Lv & Liu, 2022).

1.5. Perceived irreplaceability

Perceived irreplaceability refers to consumers' belief that a flash sale product is unique or unlikely to be available again under similar conditions (Zhang et al., 2022). It was noted that perceived irreplaceability is a boundary condition that may affect the consum-

er's reaction to promotional stimuli. Agrawal et al. (2026) claimed that fear of missing out (FOMO) creates a psychological burden that enhances the effect it has on consumers' reactions to flash sale promotions by generating a sense of uniqueness of the products. Kim and Tanford (2021), however, proposed that the response of the consumers to promotional offers depends on their individual thinking styles more than on the nature of the promotion. Likewise, Spears (2006) found that impulse purchases were correlated with higher post-purchase regret and returns, whereas Chin and Wu (2022) suggested that higher value perceptions and emotional attachments decreased consumers' return of purchased products. The opposing results suggest that the role of perceived irreplaceability in the influence of flash sale content and impulse buying on product return intention it can have is different. This suggests that scarcity cues embedded in flash sale content significantly enhance perceived irreplaceability, thereby strengthening purchase urgency. When consumers perceive products as irreplaceable, they are more likely to prioritize immediate acquisition over careful evaluation.

However, existing studies predominantly conceptualize perceived irreplaceability as a direct antecedent of impulse buying, without examining its cognitive consequences (Ladeira et al., 2023). Some scholars argue that inflated perceptions of irreplaceability may distort value assessments, leading consumers to overestimate product utility (Chen et al., 2022). Yet, limited research investigates whether such perceptions persist post-purchase or contribute to dissatisfaction and regret, indicating a gap in understanding the broader behavior al implications of perceived irreplaceability (Spiteri Cornish, 2020).

Although existing literature provides valuable insights into flash sale content and impulse buying, it remains fragmented and outcome-focused. Most studies emphasize immediate purchase behavior while neglecting cognitive strain, perceived irreplaceability and post-purchase consequences such as return intention. Additionally, data fatigue is rarely integrated into flash sale models despite its growing relevance in high-frequency digital promotions. Therefore, the purpose of this study is to examine the influence of flash sale content on product return intention through the mediating roles of impulse buying and data fatigue and the moderating role of perceived irreplaceability among online shoppers.

Accordingly, there is a clear need for an integrated framework that simultaneously examines flash sale content, data fatigue, perceived irreplaceability, and impulse buying, extending the analysis to product return intention. Addressing this gap enables a more comprehensive understanding of how flash sale strategies influence both purchase and post-purchase consumer behavior, thereby advancing theoretical and practical insights in digital marketing research.

Therefore, the purpose of this study is to examine the influence of flash sale content on product return intention through the mediating roles of impulse buying and data fatigue and the moderating role of perceived irreplaceability among online shoppers.

1.6. Hypotheses development

From the above literature review and theoretical framework, the following hypothetical relationships were established:

H1: There is a significant positive relationship between flash sale content and product return intention.

Mediating role of impulse buying

H2: Impulse buying mediates the relationship between flash sale content and product return intention.

H2a: Flash sale content impacts impulse buying.

H2b: Impulse buying impacts product return intention.

Data fatigue as a mediator

H3: Data fatigue mediates the relationship between flash sale content and product return intention.

H3a: Data fatigue impacts product return intention.

Serial mediation of data fatigue and impulse buying

H4: Data fatigue and impulse buying serially mediate the relationship between flash sale con-

Source: Developed by the researchers.

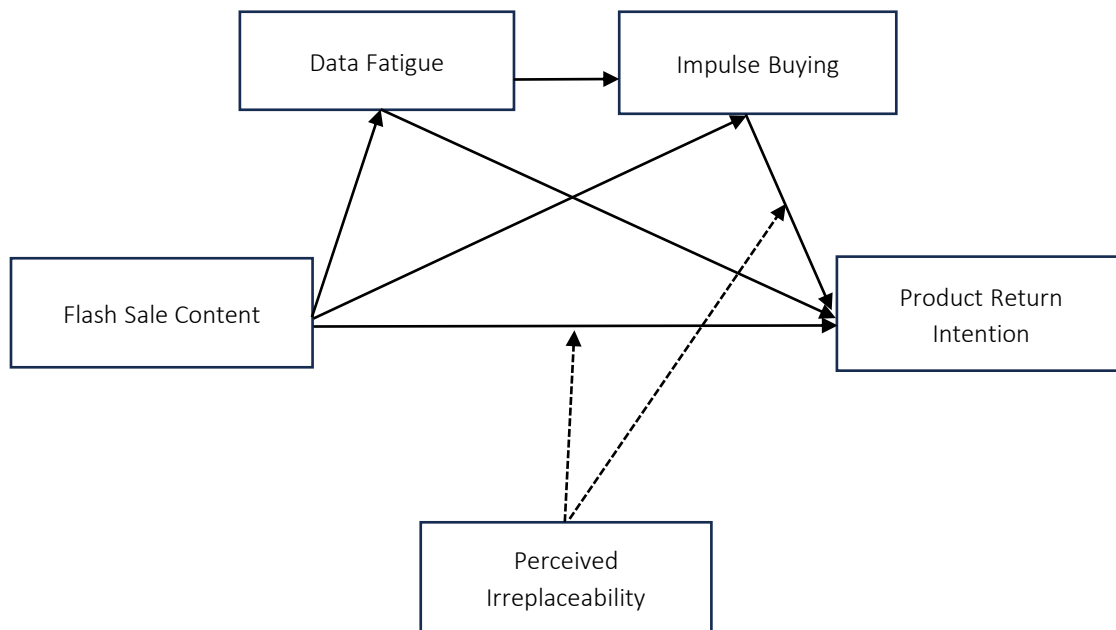


Figure 1. Research conceptual framework

tent and product return intention.

H4a: Flash sale content positively impacts data fatigue.

Moderating role of perceived irreplaceability

H5: Perceived irreplaceability moderates the relationship between flash sale content and product return intention.

Moderating role of perceived irreplaceability on impulse buying

H6: Perceived irreplaceability moderates the relationship between impulse buying and product return intention.

2. DATA AND METHOD

2.1. Research design

This research employs a quantitative, survey-oriented methodology to explore how flash sale content affects impulse buying, data fatigue, and intentions to return products, incorporating perceived irreplaceability as a moderating variable. A cross-sectional approach was utilized, collecting

data from active online shoppers at a single period. This method is suitable for examining mediation and moderation effects within the suggested conceptual model, as it facilitates systematic assessment of consumer reactions to flash sale intensity. Comparable designs have been effectively utilized in previous e-commerce research on scarcity promotions, impulse buying, and post-purchase (Wu et al., 2021; Zhang et al., 2022).

2.2. Research procedure

The study was carried out in five steps systematically. The study first involved a thorough literature review of the constructs, theories, and gaps in the literature regarding flash sale content, data fatigue, impulse buying, perceived irreplaceability, and product return intention. Second, items for the measuring instruments were developed from scales that have already been validated and added to a structured questionnaire appropriate for the context of the flash sale. Third, a pilot review before data collection was carried out to make sure that the items in the questionnaire were clear, relevant, and comprehensible. Fourth, a final questionnaire was sent to eligible online shoppers from Kerala, India, with prior experience participating in flash sale events via electronic means. The responses that were collected were then screened for

completeness, eligibility, and consistency. Finally, the validated data were analysed with the Partial Least Squares Structural Equation Modelling (PLS-SEM) method to test the measurement model, the structural relationships between the constructs, and the hypotheses.

2.3. Sample profile

Table 1 presents the demographic details of the respondents. The sample primarily consists of young consumers, with 72.0% of respondents aged between 18-35 years, indicating active involve-

Table 1. Sample profile

Source: Calculated using SPSS.

Variable	Category	Percentage (%)
Age	Below 18	4.50%
	18-24	72.00%
	25-30	17.00%
	30-35	6.50%
Gender	Male	27.20%
	Female	72.80%
Educational level	SSLC	1.50%
	PUC	9.80%
	Graduate	60.50%
	Postgraduate	26.50%
	Other	1.70%
Occupation	Student	64.00%
	Employed	22.30%
	Self-employed	5.00%
	Unemployed	8.70%
	Other	0.00%
Monthly earnings	Below Rs 10000	73.30%
	Rs.10,001 - Rs.20,000	2.50%
	Rs.20,001 - Rs.30,000	5.50%
	Rs.30,001 - Rs.40,000	8.00%
	Rs.40,001 - Rs.50,000	4.30%
	Rs.50,001 and above	6.40%
Frequency of online shopping	Never	0.30%
	Rarely	27.30%
	Sometimes	53.30%
	Often	16.70%
	Always	2.40%
Source of flash sale awareness	Social media ads	55.50%
	E-commerce app notifications	28.50%
	Friends or family	16.00%
	Other	0.00%
Preferred e-commerce platform	Amazon	20.30%
	Flipkart	34.40%
	Meesho	33.30%
	Myntra	10.80%
	Other	1.20%
Flash sale participation frequency	1 time	49.30%
	2-3 times	40.70%
	4-5 times	8.70%
	More than 5 times	1.30%
Motivators for flash sale participation	Discounts	50.20%
	Limited period offers	38.00%
	Scarcity	7.50%
	Excitement	4.30%
	Other	0.00%

ment in online shopping. The gender distribution shows that the majority of the customers are females (72.8%), showing a higher representation of female consumers.

With respect to educational qualification, 60.5 percent of respondents are graduates, suggesting well-educated and sufficient familiarity with digital platforms. Income levels show that 73.3% earn below Rs. 10,000, reflecting price-sensitive purchasing behavior. Concerning online shopping behavior, 53.3% shop online 'sometimes', demonstrating moderate but regular exposure to digital marketplaces.

These characteristics depict a digitally active consumer segment frequently exposed to flash sale environments, shaping purchasing behavior. Such consumer profiles align with prior flash sale and impulse buying literature (Lamis et al., 2022), which suggests that younger and price-sensitive consumers are more responsive to persuasive promotional cues and more cognitively demanding decision environments. These tendencies provide an appropriate context for examining the psychological and behavioral consequences explored in the present study.

2.4. Data sources and collection

This study used a quantitative cross-sectional survey approach to provide a comprehensive analysis of the behavior of consumers in the flash sale environment. The target population was online consumers (18-35) in Kerala, India, with experience of participating in online flash sale events. The study area was chosen because Kerala has one of the highest literacy rates, high rates of smartphone ownership, internet penetration and fast adoption of e-commerce in urban and rural areas of Kerala in India. The minimum sample size was calculated using Cochran's (1977) formula for an unknown population, as it was not possible to find the exact number of online shoppers who were involved in the flash sale event in Kerala. The minimum sample size was determined to be 384 respondents, based on a 95% confidence level, 5% margin of error and a population proportion (p) of 0.50. The sample size was deemed sufficient for the statistical accuracy to be achieved and for the results to be generalizable to the target population.

The study used a non-probability purposive sampling technique to select respondents who fulfilled the study's eligibility criteria. The online questionnaire was initially sent out to people who had previous experience in online flash sale events via the researchers' professional and social venues and were known to them. Later, a snowball sampling technique was used where these respondents were asked to spread the survey link to others who are eligible to shop online in Kerala and have availed flash sales. This mix of purposive and snowball sampling enabled respondents to have the shopping experience and helped in achieving geographical spread of the survey in various districts of Kerala.

Eligibility criteria were defined before data collection to ensure that the data collected was directly related to the research questions. The participants had to be aged between 18-35, living in Kerala, India, have shopped online at least once during a great flash sale organized by an online retailer, and have enough experience with the flash sale concept to assess their shopping experiences. The criteria ensured that only those respondents who had first-hand and relevant experience in doing online shopping on flash sales were included in the study, as this increased the validity and reliability of the collected data. This instrument was then administered electronically to make it accessible and convenient to the respondents. The data collection began on 04/12/2025. A total of 405 responses were received, of which 400 were valid and suitable for analysis after careful screening for completeness, eligibility and consistency, to achieve a valid response rate of 98.76%. This is beyond the suggested limits for SEM studies as suggested by Hair et al. (2019), which will provide adequate statistical power to estimate the models and to test the hypotheses. This multi-layered sampling approach for sampling regionally, practically and with strict eligibility requirements ensures a representative and methodologically sound data set for the study of the hypothesized relationships between the main constructs.

2.5. Empirical test

The structural equation modelling (PLS-SEM) approach was applied with the help of SmartPLS software, which is a multivariate analysis using

the structural equation approach. The initial phase was confirmation of the model using a structured model with confirmatory factor analysis and path analysis. PLS-SEM was used in this study as it has a unique capability of capturing a holistic picture of the relationship between constructs and of investigating hypothesized paths within the conceptual framework (Lv & Liu, 2022; Ngo et al., 2024; Yi et al., 2023). The reasons for using the SEM approach were as follows:

- It provides a systematic way to validate the relationships between constructs and measures, and test relationships between constructs in an integrated model.
- It is a strong and systematically sound statistical method to tackle complex models involving mediating and moderating processes.

2.6. Questionnaire development

The questionnaire was designed using measurement items adapted from the literature and previously validated. Using established instruments makes it easier to assess content validity and compare with previous studies. Some wording of the items was slightly revised to make them more appropriate to the context of a flash sale. All constructs were measured on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The constructs, measurement items, and their sources are outlined in Table 2.

2.7. Ethical considerations

The study adhered to both institutional and national ethics guidelines to ensure that participants' rights and well-being were protected. Participation was voluntary, informed consent was obtained, and confidentiality and anonymity for the participants were maintained during the entire study. Ethical approval for the research was provided by the Scientific Review Board of the Yenepoya Institute of Arts, Science, Commerce and Management (YIASCM) of Yenepoya (Deemed to be University), Mangalore, India (Ref. No.: YIASCM/ST/SRB/01/MGT/47/2025; dated 16/11/2025). Data collected were kept in a secure manner and used solely for research purposes. The study did not include any questions that could

be considered sensitive or intrusive and ensured no participant was harmed psychologically, physically, or professionally; all principles of research integrity and honesty in reporting were followed.

3. ANALYSIS AND RESULTS

3.1. Measurement model assessment

To identify the adequacy of reliability and validity, the measurement model was evaluated before studying the structural relationships (see Table 2). The measurement model evaluation was conducted according to the recommendations of Hair et al. (2023), which consisted of indicator reliability, internal consistency reliability, convergent validity, discriminant validity, and model fit testing.

The initial model evaluation led to the elimination of the three indicators (IB1, PI1, and FSC5) as they indicated low factor loadings and to enhance convergent validity. For this reason, the three items (IB1, PI1, and FSC5) were removed to improve the measurement model. After cleaning the items, the final version of the measurement model had acceptable factor loadings of above 0.60. Second, Composite Reliability (CR) values were between 0.826 and 0.887, which is higher than the minimum of 0.70. This shows that the constructs have a good level of internal consistency and that the indicators are a good measure of the latent constructs. Third, convergent validity was determined based on the Average Variance Extracted (AVE). The AVE values were 0.545 to 0.665, which are higher than the recommended value of 0.50 (see Table 2). Further, the Heterotrait-Monotrait ratio (HTMT) of correlations was used to assess discriminant validity (see Table 3). All the HTMT values were below the recommended value of 0.90, and this indicates that every construct is empirically different (Henseler et al., 2015). It is an affirmation of the fact that the measurement model has sufficient discriminant validity and that the constructs represent distinct conceptual domains.

The Variance Inflation Factor (VIF) is used to determine the extent of collinearity among the indicators under study. Researchers wanted to determine whether multicollinearity among the indicators exists, considering that high levels of col-

Table 2. Mean, SD, loading of measurement model, reliability and validity results

Source: Calculated using SPSS and SmartPLS.

Construct	Sources	Item Code	Description	Mean	S.D.	Factor Loading	CR	AVE
Flash sale content	Vannisa et al. (2020)	FSC1	I feel interested in flash sales because they offer limited-time discounts.	3.75	.664	0.794	0.887	0.665
		FSC2	Flash sales flood me with lot of product promotions in a short time.	3.67	.585	0.865		
		FSC3	Flash sales create excitement, even if I was not planning to buy anything.	3.52	.617	0.823		
		FSC4	I often feel the urgency to purchase when I see the "only few left" messages.	3.43	.657	0.776		
Data fatigue	Arnold et al. (2023)	DF1	I feel overwhelmed by the number of notifications and messages during the flash sales.	3.54	.624	0.790	0.860	0.558
		DF2	It becomes hard for me to decide on what to buy because of too many choices in flash sales.	3.70	.601	0.761		
		DF3	I often ignore the flash sale promotions because they feel too much to deal with.	3.34	.578	0.722		
		DF4	I feel pressured and confused when I see many flash sale deals in a short time.	3.32	.554	0.791		
		DF5	I lose interest when flash sales show too many options at once.	3.23	.501	0.662		
		IB2	I mostly make unplanned purchases during the flash sales on shopping websites.	3.99	.582	0.633	0.848	0.581
		IB3	When I see something that I like in a flash sale, I buy it right away.	3.97	.684	0.782		
		IB4	I spend more money than I intended because of the flash sale.	3.91	.792	0.827		
		IB5	I tend to make spontaneous purchases when browsing the flash sale offers.	3.47	.613	0.791		
		PI2	Owning the flash sale products makes me feel different from others who missed the flash sales.	3.45	.607	0.797	0.826	0.545
		PI3	I feel that the limited availability during the flash sale makes the products more valuable.	3.44	.580	0.684		
		PI4	I would still choose the flash sale item even if there are many similar options available.	3.18	.485	0.757		
		PI5	I often keep the flash sale items because they feel like a once-in-a-lifetime opportunity.	3.38	.597	0.709		

Table 3. Heterotrait-Monotrait ratio

Source: Calculated using SmartPLS.

Variable	Data fatigue	Flash sale content	Impulse buying	Perceived irreplaceability	Product Return intention
Data fatigue					
Flash sale content	0.880				
Impulse buying	0.747	0.635			
Perceived irreplaceability	0.729	0.686	0.645		
Product return intention	0.557	0.512	0.505	0.542	

linearity can lead to unpredictable estimates. The VIF analysis shows that the values of the variables under consideration range from 1.456 to 2.933, which is below the allowed limit of 5.0 (Kalnins, 2018). Thus, this finding implies that the problem of multicollinearity is not valid, meaning that the indicators are valid for building the measurement system.

Lastly, the model fit indices were tested to determine the overall adequacy of the measurement model. Standardized Root Mean Square Residual (SRMR) indicated a value of 0.057, which is less than the acceptable value of 0.08. Also, CFI (Comparative Fit Index) (0.919) scores were close to the desired value of 0.90, which serves to further confirm that the model is sufficient. All of

these indices prove the fact that the measurement model shows a reasonable fit with observable data.

3.2. Structural model assessment

3.2.1. Direct effect

Structural relationships were assessed using SmartPLS bootstrapping with 5,000 subsamples (see Table 4). The results showed that flash sale content significantly influences impulse buying ($\beta = 0.154$, $t = 2.143$, $p = 0.032$) and data fatigue ($\beta = 0.776$, $t = 27.192$, $p = 0.000$), supporting *H2a* and *H4a*, indicating that intense promotional stimuli directly increase the likelihood of product returns, possibly due to hurried purchase and spontaneous purchasing behavior. However, flash sale content does not influence ($\beta = 0.160$, $t = 1.948$, $p = 0.051$) product return intention, suggesting consumers' return behavior may stem from other psychological and behavioral processes that act as intermediaries between flash sale content and post-purchase return intentions (*H1*). Further, impulse buying ($\beta = 0.198$, $t = 2.880$, $p = 0.004$) and data fatigue ($\beta = 0.228$, $t = 2.318$, $p = 0.020$) significantly affected product return intention, supporting *H2b* and *H3a*, showing that data overload reduces decision quality, increasing dissatisfaction and returns.

3.2.2. Mediation analysis

Further, an attempt was made to assess the mediating role of impulse buying and data fatigue in explaining the relationship between flash sale content and product return intention (*H2–H4*) (see Table

5 and Figure 2). The results indicate that flash sale content does not have a direct effect on product return intention ($\beta = 0.160$, $p = 0.051$), but the total effect with mediation ($\beta = 0.191$) is higher than the direct effect alone. However, impulse buying does not mediate the relationship between flash sale content and product return intention ($\beta = 0.031$, $p = 0.095$) (*H2*). Impulse purchases are driven by immediate feelings rather than post-purchase thoughts as related to flash sale advertising and reasons for product return, meaning when someone makes an impulsive purchase, there is an immediate sense of enjoyment; hence, in most cases, they see no reason to return. As a result, while flash sale advertising may trigger an impulse purchase, it does not directly influence the likelihood of returning an item.

Similarly, in the case of data fatigue as a mediator, the total effect of flash sale content on product return intention through data fatigue ($\beta = 0.337$) exceeds the direct effect, with the significant mediating influence of data fatigue ($\beta = 0.177$, $p = 0.022$) (*H3*), indicating that cognitive strain serves as a psychological mechanism linking promotional intensity and return behavior. Further, the serial mediation of data fatigue and impulse buying strengthens this relation, evidenced by a significant indirect effect ($\beta = 0.080$, $p = 0.009$). This suggests that constant exposure to flash sale promotions can lead to digital fatigue, leading to diminished cognitive control and a greater propensity to make impulse purchases. Therefore, purchases can be made while experiencing fatigue, which will increase the likelihood of later reconsideration with the potential for intention to return those same purchases. As a result, *H4* is supported.

Table 4. Direct effect

Source: Calculated using SmartPLS.

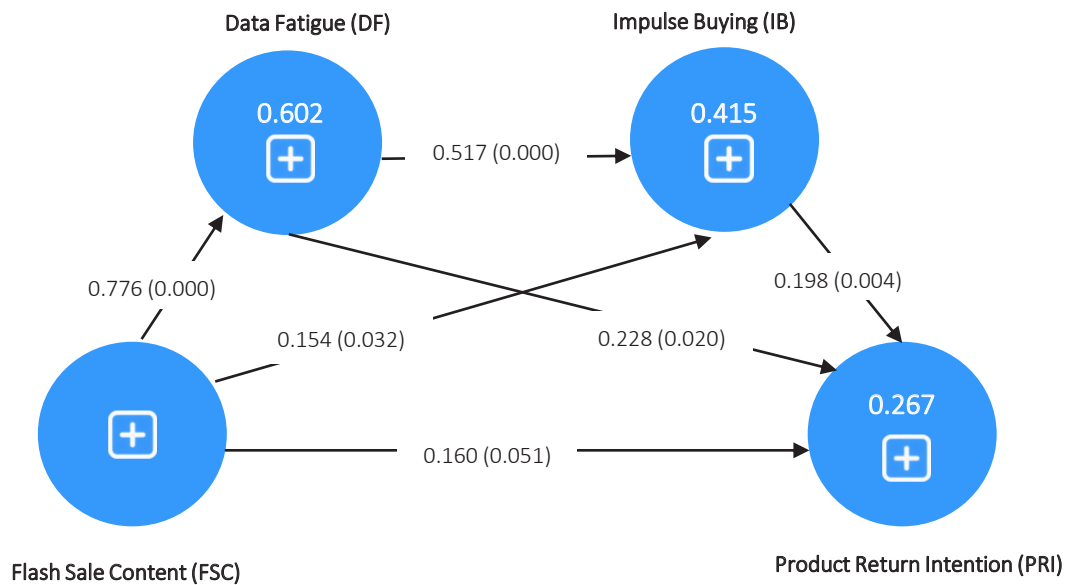
Hypothesis	Direct effect	B	t-statistics	p-values	Decision
<i>H1</i>	FSC→PRI	0.160	1.948	0.051	Not supported
<i>H2a</i>	FSC→IB	0.154	2.143	0.032	Supported
<i>H2b</i>	IB→PRI	0.198	2.880	0.004	Supported
<i>H3a</i>	DF→PRI	0.228	2.318	0.020	Supported
<i>H4a</i>	FSC→DF	0.776	27.192	0.000	Supported

Table 5. Mediating effect

Source: Calculated using SmartPLS.

Hypothesis	Path	DE	TE	p-value	Path	IE	p-value	Decision
<i>H2</i>	FSC → PRI	0.160	0.191	0.051	FSC → IB → PRI	0.031	0.095	Not supported
<i>H3</i>	FSC → PRI	0.160	0.337	0.051	FSC → DF → PRI	0.177	0.022	Supported
<i>H4</i>	FSC → PRI	0.160	0.240	0.051	FSC → DF → IB → PRI	0.080	0.009	Supported

Source: Extracted from SmartPLS.

**Figure 2.** Structural model of mediation effects**3.2.3. Moderation analysis**

To examine the moderating role of perceived irreplaceability, separate linear regression analyses were done in IBM SPSS Statistics to run a comparison between the association at low, mid and high levels of the moderator in the relationship between flash sale content and product return intention (*H5*) and impulse buying and product return intention (*H6*). Firstly, the moderating role of perceived irreplaceability in the relationship between flash sale content and product return intention was examined. The result revealed a positive and

significant effect of flash sale content on product return intention at low ($\beta = 0.244$, $t = 2.563$, $p = 0.004$), moderate ($\beta = 0.271$, $t = 3.434$, $p = 0.001$), and high levels of perceived irreplaceability ($\beta = 0.279$, $t = 3.312$, $p = 0.001$) (see Table 6). The findings indicate that the strength of the relationship between flash sale content and product return intention increases as perceived irreplaceability rises. This suggests that perceived irreplaceability intensifies the effect of flash sale content on product return intention. Hence, the moderating role of perceived irreplaceability is confirmed, leading to the acceptance of *H5*, indicating that when

Table 6. Moderating effect of perceived irreplaceability in the interconnectedness between flash sale content and purchase return intention

Source: Calculated using SPSS.

Perceived irreplaceability		R	R ²	Adjusted R ²	F	sig
Low						
Beta	.244	.244	.061	0.012	8.564	0.004
T	2.563					
P	0.004					
Moderate						
Beta	.271	.271	.073	.067	11.795	0.001
T	3.434					
P	0.001					
High						
Beta	.279	.279	0.078	0.071	10.969	0.001
T	3.312					
P	0.001					
Dependent variable: Product return intention						

Table 7. Moderating effect of perceived irreplaceability in the interconnectedness between impulse buying and purchase return intention

Source: Calculated using SPSS.

Perceived irreplaceability		R	R ²	Adjusted R ²	F	sig
Low						
Beta	.238	.221	.048	0.038	9.490	0.003
T	2.979					
P	0.003					
Moderate						
Beta	.268	.268	.072	.066	11.548	0.001
T	3.398					
P	0.001					
High						
Beta	.388	.388	.150	.144	23.029	0.000
T	4.799					
P	0.000					
Dependent variable: Product return intention						

products are perceived as unique, the influence of promotional stimuli on return behavior becomes stronger.

Secondly, the moderating role of perceived irreplaceability on the relationship between impulse buying and product return intention (*H6*) was examined (see Table 7). The results indicate a positive and significant effect of impulse buying on product return intention at low ($\beta = 0.238$, $t = 2.979$, $p = 0.003$), moderate ($\beta = 0.268$, $t = 3.398$, $p = 0.001$), and high levels of perceived irreplaceability ($\beta = 0.388$, $t = 4.799$, $p = 0.000$). The findings reveal that the effect of impulse buying on product return intention becomes stronger as perceived irreplaceability increases, with the highest impact observed at high levels of perceived irreplaceability ($R^2 = 0.150$). This demonstrates that perceived irreplaceability significantly strengthens the relationship between impulse buying and the intention to return products, thereby supporting *H6*.

4. DISCUSSION AND IMPLICATIONS

The results indicated the rejection of *H1*, stipulating that flash sale content does not have an impact on product return intention. It suggests that, in creating urgency and helping consumers make quick purchasing decisions, flash sale promotions do not affect returns caused by post-purchase reasons such as dissatisfaction, regret, or an expectation

versus performance mismatch. This view aligns with Verhagen and Van Dolen (2011), who found that online retail stimuli influence impulse buying behavior, but it does not necessarily impact post-purchase consequences. Similarly, Wood (1998) states that situational cues trigger impulse buying at the time of purchasing rather than during the analysis of purchasing. This, however, contradicts the research by Kukar-Kinney et al. (2009), who indicate that purchases made under promotional pressure may lead to post-purchase regrets that could increase return-related behavior.

Also, the results suggest that impulse buying does not mediate the relationship between flash sale content and purchase return intention, which means that impulsive buying triggered by promotion cues does not always lead to return behavior. Promotions conducted through flash sales tend to affect consumers during the purchase stage, but return intentions are driven by post-purchase psychological processes. Chen et al. (2023) also supported this finding by demonstrating that impulse buying influences the post-purchase dissonance related to return intention; thus, impulse buying is not enough to explain returns. On the same note, Babu et al. (2026) established that fear of missing out (FOMO) and not post-purchase behavior is a major phenomenon that governs purchase intentions in a flash sale context.

To support *H3*, data fatigue was a major mediator between flash sale content and product return intention. The finding is in line with Ngo et al. (2024),

who noted that data overload decreases the confidence level in a decision and evaluation. Likewise, Yi et al. (2023) emphasized that promotional message exposure reduces the processing capabilities of consumers. The existing findings suggest that promotional intensity can be maintained and override the adaptive mechanisms, causing an increase in dissatisfaction and return behavior.

Besides, the results support *H4*: the content of flash sales brings about data fatigue, causing impulse purchase, and eventually, product return intention. Although some consider impulsive buying as full of emotions and not related to any cognitive load, the current results indicate that cognitive load can undermine self-control and enhance impulsivity (Arnold et al., 2023). Under these circumstances, impulsive buying is more prone to post-purchase regret and post-purchase behavior (Lv & Liu, 2022).

Moreover, moderation analysis confirms *H5*, which shows that perceived irreplaceability enhances the connection between flash sale content and product return intention. This observation indicates that perceived irreplaceability influences the post-purchase behavior of consumers after purchasing via flash sales. The more the products are perceived as irreplaceable, the stronger consumers conduct a post-purchase evaluation that affects their intentions of returning (Chen et al., 2023). This is in line with earlier studies that show that perceived uniqueness and importance enhance psychological ownership and post-purchase evaluation within time-constrained purchase situations, which has an impact on the making of return-related choices (Zhang et al., 2024). The study further supports *H6*, which illustrates that perceived irresponsibility moderates the relationship between impulse buying and product return intention. This is in line with earlier research that identifies perceived uniqueness and psychological ownership to enhance consumer commitment to impulsive purchase, hence influencing their propensity to product returns (Lochab et al., 2025; Singh & Biswas, 2025).

Given the growing dominance of flash sales in digital commerce, the study offers meaningful insights into consumers' post-purchase behavior. While flash sales have been extensively examined for their effectiveness in stimulating purchases, limited attention has been paid to their unintended consequences,

particularly product return intention. By integrating data fatigue and impulse buying as mediating mechanisms, this study extends existing consumer behavior literature, ultimately leading to post-purchase outcomes. Further, by incorporating perceived irreplaceability as a moderating variable, the study advances understanding of how scarcity-based perceptions intensify impulsive decision-making and subsequent return behavior, thereby enriching stimulus-organism-response and impulsive buying frameworks in digital retail contexts. Theoretically, the research contributes by proving how cognitive (data fatigue) and affective (impulse buying) mechanisms mediate the effect of promotional stimuli and post-purchase consequences, and the moderating effect of the perceived irreplaceability enhances the current S-O-R and impulse buying frameworks.

From a practical perspective, the findings offer important implications for online retailers and platform designers. Although flash sale content effectively stimulates impulse buying, excessive promotional content and data overload increase data fatigue and return intention. Retailers are therefore encouraged to design balanced flash sale strategies by limiting excessive notifications, simplifying layouts, and providing clearer product information to reduce consumer overload. Moreover, as perceived irreplaceability strengthens the impact of impulse buying on product return intention, marketers should employ scarcity cues to avoid inflating expectations that may later result in dissatisfaction and higher returns. Platforms must be oriented towards organizing flash sales in a fashion that can provide the consumer with limited time to reflect on the purchase, e.g., limited-time reservation or cart hold functionality, so the user can reconsider their purchases before final checkout. Moreover, retailers can introduce adaptive flash sale exposure whereby the rate of promotional alerts will be lower for users who display excessive browsing or fatigue. Post-purchase cooling-off reminders are also another good tool, whereby consumers can review and make amendments to their orders immediately after purchasing, thus preventing shipments. Lastly, companies can also look to behavior-based flash sale customization, whereby the promotions are made based on the previous behavior of the consumers in terms of returning the products, thus minimizing unnecessary purchases and operational expenses incurred by the companies in returning their products.

CONCLUSION

This study aimed to explore how flash sale content affects product return intention with the involvement of the mediating factors of impulse buying and data fatigue and the moderating variable of perceived irreplaceability of online shoppers. The purpose of the study was to gain deeper insight into the psychological processes that affect the post-purchase behavior of users when confronted with a flash sale promotion.

The results indicated that the content of the flash sale is not found to directly affect the intention to return the product. Data fatigue was still found to be a significant mediator between flash sale content and product return intention, and data fatigue and impulse buying had a significant serial mediating effect. The results also showed that perceived irreplaceability significantly moderates the relationships related to product return intention. This research suggests that the post-purchase assessment of consumers is not only affected by promotional exposure, but also by the cognitive and emotional state that occurs while participating in flash sales.

The study shows that over-promotion can have unintended post-purchase ramifications through cognitive load and promotion-induced impulsive purchase behavior. Retailers therefore need to pay attention to not only the maximum sales in the present but also to the quality of the decisions made by their consumers and to the minimization of some of the factors that lead to a product's return. The results underscore the need to consider not only the effectiveness of the promotion, but also the satisfaction of the customers and the sustainability of the retail operation.

Despite its contributions, the study has certain limitations. First, the data were collected within a single country context, which may limit the generalizability of the findings across different cultural environments. Future studies may replicate the model across diverse geographical settings to validate cross-cultural applicability. Second, the study employed a cross-sectional design and relies on self-reported responses, which may be subject to recall bias, social desirability effects, and common method bias. Longitudinal or experimental designs could provide deeper insights into causal relationships between flash sale exposure and post-purchase behavior. Finally, future research may extend the model by incorporating emotional variables such as regret, satisfaction, or trust to further explain the psychological processes underlying product return intention in flash sale environments.

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