Advanced International Journal for Research (AIJFR)
E-ISSN: 3048-7641 ● Website: www.aijfr.com ● Email: editor@aijfr.com

From rational comparison to impulsive choice: experimental evidence of present bias in E-Commerce.

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Abstract:

Digital marketing increasingly relies on time-limited discounts, instant cashback, and frictionless purchasing tools to accelerate buying decisions. Such strategies may capitalise on present bias, a behavioural tendency explained by hyperbolic discounting, where individuals disproportionately value immediate rewards over larger delayed benefits. Understanding how this bias shapes online purchasing behaviour is essential for both marketing strategy and consumer welfare.

A quantitative survey-based experimental design was employed using a structured online questionnaire distributed across multiple age groups (below 16, 16–17, 18–19, and 20+ years) with varied online shopping frequencies. Participants evaluated controlled hypothetical scenarios requiring a choice between smaller immediate discounts (e.g., 10% today) and larger delayed benefits (e.g., 20–30% after 7 or 30 days), with constant time gaps. Variables included reward preference, decision time, reactions to urgency cues, frequency of unplanned purchases, decision style, and perception of marketing intent. Descriptive statistical analysis examined the distribution of preferences and behavioural trends. Findings reveal a strong preference for immediate rewards, indicating present bias. Urgency mechanisms such as countdown timers and flash sales triggered accelerated decision-making, often within one to five minutes or less. Digital features—including single-click purchase options, algorithm-based suggestions, and social media endorsements were reported to increase purchase likelihood. Although many participants expressed satisfaction, instances of regret and uncertainty suggest post-purchase reflection. Notably, awareness of marketing intent did not eliminate immediate preference shifts [35], [10] [32].

The results support hyperbolic discounting behaviour in digital contexts, demonstrating that time-based promotional strategies effectively exploit preference for immediacy. While beneficial for marketing effectiveness, these findings underscore the importance of financial literacy, [28] [34]. Cognitive bias awareness and transparent promotional practices.

Keywords:

Intertemporal choice, Behavioural economics, Online consumer behaviour, Impulse buying, Time-limited promotions, Urgency cues, Choice architecture.

1. Introduction:

Time preferences lie at the core of economic and consumer decision-making, shaping how individuals trade off present and future outcomes. Classical rational choice models assume stable, exponential discounting; yet, a large body of behavioural research documents systematic deviations from this benchmark, particularly in the form of present bias and time-inconsistent preferences (Rational Choice Theory critiques; [12], [35], [14], [3]).

Hyperbolic and quasi-hyperbolic models emerged to explain why individuals' overweight immediate rewards relative to delayed benefits, generating patterns such as procrastination, underserving, and impulsive consumption [20], [27], [36], [40]. Experimental and meta-analytic evidence confirms that present bias is widespread across monetary and non-monetary domains, although estimates vary depending on elicitation methods, subject pools, and contexts [20].

Empirical work has expanded this foundation in multiple directions. Studies link hyperbolic discounting to financial planning outcomes, asset accumulation, and mortgage decisions, highlighting how present bias alters long-term wealth trajectories [2], [15], [39]. Others demonstrate that psychological traits, affect, and perceived continuity with the future self-moderate intertemporal choices [13], [16], [21]. Methodological contributions further reveal substantial heterogeneity in how discount rates are measured and interpreted, cautioning against simple generalisations [4], [23], [26]. In parallel, research in consumer and marketing domains shows that temporal framing, mental accounting, and promotional design can systematically shift discounting behaviour and purchase timing [12],[19], [11].

Despite these advances, a clear gap remains at the intersection of intertemporal theory and contemporary digital commerce. While nudging, zero-price effects, and mobile consumption environments have been discussed conceptually [1], [7], [29], there is limited integrated evidence examining how hyperbolic discounting operates within digitally mediated promotional mechanisms and how consumers reconcile awareness of persuasive intent with actual behaviour. The growing diffusion of short-term financing tools such as Buy Now, Pay Later further intensifies the need to understand present-oriented consumption in online settings [12], [35].

Addressing this gap, the present study investigates how present bias, grounded in hyperbolic discounting theory, shapes consumer purchase decisions in digital marketing environments. Specifically, it examines preference for immediate versus delayed incentives, the role of urgency cues and frictionless design, and the extent to which perceived marketing intent moderates' behaviour. By embedding intertemporal trade-offs within simulated online purchase scenarios, this research bridges behavioural economics and digital marketing practice. The findings aim to clarify how time-inconsistent preferences manifest in modern retail contexts and to inform both strategic design decisions and consumer protection initiatives in rapidly evolving digital marketplaces [35], [3].

2. Literature Review:

Research on intertemporal choice has long challenged the predictions of classical rational choice theory, which assumes stable and time-consistent preferences. Empirical evidence from behavioural economics demonstrates that individuals frequently display declining discount rates over time, giving

disproportionate weight to immediate rewards relative to future outcomes, a pattern captured by hyperbolic and quasi-hyperbolic discounting models [20], [27], [36], [40]. Meta-analytic findings confirm the robustness of present bias across monetary and non-monetary domains, while also revealing substantial heterogeneity depending on methodology, subject pool, and elicitation procedures [8], [9], [31]. These theoretical and empirical developments provide the foundation for understanding time-inconsistent consumer behaviour [20]. [18], [33] [25]

A growing body of work connects hyperbolic discounting to real-world financial decisions. Studies show that present bias impairs long-term asset accumulation and savings behaviour, particularly in later life or high-wealth thresholds [2], [39]. Mortgage selection and abandonment decisions further illustrate how immediate cost minimisation interacts with long-term patience, revealing complex behavioural reversals across financial contexts [15]. Other contributions emphasise psychological moderators, demonstrating that personality traits, affective states, and perceived connectedness to the future self-influence the strength of intertemporal bias [13], [16], [21]. Together, these findings suggest that present bias is not merely a theoretical anomaly but a measurable determinant of economic outcomes. [20], [35], [19].

Within consumer and marketing research, intertemporal trade-offs are shaped not only by internal preferences but also by contextual framing and design. Temporal framing effects show that discount sensitivity varies depending on whether decisions are framed as deferring or expediting consumption [5]. Mental accounting processes influence willingness to pay and perceived pain of paying, thereby affecting ultimate purchase decisions [6]. Promotional strategies such as uncertain discounts can alter internal reference prices and repurchase intentions (R17). Meanwhile, digital environments characterised by mobile commerce and immediate access to goods amplify impatience and gratification-seeking tendencies [29]. Emerging financial technologies, including Buy Now, Pay Later services, further demonstrate how payment structures increase spending, particularly among younger and promotion-sensitive consumers [27], [36], [40].

Despite extensive evidence on hyperbolic discounting in savings, health, and investment domains, less attention has been paid to how these temporal biases operate within digitally mediated retail settings that combine urgency cues, frictionless purchasing, and algorithmic personalisation. While research has examined nudging and persuasive design in digital applications [1], [7], a comprehensive integration of hyperbolic discounting theory with experimental purchase scenarios in online marketing contexts remains limited. Addressing this gap is essential for understanding how contemporary digital tools interact with time-inconsistent preferences and for evaluating both their strategic effectiveness and ethical implications in consumer markets [3].

3. Methodology:

A. Research Design

The study adopted a quantitative, cross-sectional survey research design. Its primary objective was to examine online purchasing behaviour in relation to present bias, urgency cues, promotional framing, and impulsive decision-making. Data were collected at a single point in time through a structured questionnaire distributed digitally.

The design was descriptive and analytical in nature. It aimed to identify behavioural patterns and examine relationships among variables associated with intertemporal choice and digital marketing influence. No experimental manipulation was introduced; instead, naturally occurring perceptions and self-reported behaviours were analysed within a defined survey period. [27], [36], [40].

B. Materials

The primary dataset consisted of responses collected through a structured online questionnaire (responses Excel sheet). The instrument comprised 20 closed-ended questions designed to capture multiple behavioural and demographic dimensions. [4], [23], [26]

The questionnaire included items covering:

- Demographic variables (age group, gender identity)
- Online purchasing frequency and primary device usage
- Preference between immediate and delayed rewards
- Responses to time-limited offers and countdown timers
- Impulsive buying tendencies
- Influence of digital features such as flash sales, algorithm-based suggestions, cashback offers, and single-click purchase options [1], [7], [29].
- Perception of marketing intent
- Suggested improvements for rational online decision-making

Completed responses were exported into spreadsheet format for organisation and statistical processing. Only finalised submissions were included in the dataset.

C. Methods / Procedures

1) Questionnaire Development

The survey instrument was developed using constructs from behavioural economics, including present bias, hyperbolic discounting, urgency framing, and impulsive buying behaviour. Questions were structured to measure both stated preferences and observable behavioural tendencies in digital purchasing contexts.

The instrument underwent review for clarity, coherence, and logical sequencing prior to distribution to ensure comprehensibility and reduce ambiguity.

2) Data Collection

The survey was administered digitally using an online form platform. Participation was voluntary. Respondents completed the questionnaire independently during a defined data collection period. [1], [7], [29]

3) Data Screening and Cleaning

Following data collection, incomplete responses were excluded. Valid responses were coded numerically to facilitate statistical analysis. Response categories—such as urgency, sensitivity levels and reward preference options—were standardised to maintain analytical consistency.

4) Variable Classification

Variables were categorised as follows:

Independent variables: promotional features, urgency cues, and digital nudges. [1], [7], [29].

Dependent variables: purchase decision speed, impulsive buying frequency, and reward preference.

Control variables: age group, gender identity, and purchase frequency.

This classification enabled structured analysis of behavioural relationships.

D. Analysis

Data organisation and coding were conducted using spreadsheet software (e.g., Microsoft Excel or Google Sheets). Statistical analyses were performed using standard statistical software packages such as SPSS, Jamovi, or R.

The analytical procedures included:

- Descriptive statistics (frequency distributions and percentage analysis)
- Cross-tabulation to examine demographic variations
- Correlation testing between urgency cues and impulsive buying tendencies
- Comparative analysis of immediate versus delayed reward preferences

Graphs and tables were generated to represent behavioural patterns and facilitate interpretation visually.

E. Ethical Considerations

Participation in the study was voluntary and based on informed consent. No personally identifiable information was collected at any stage. All responses were anonymised during analysis to ensure confidentiality.

Data were used strictly for academic research purposes. Participants were informed that they could withdraw before submission without consequence. Given the anonymous and minimal-risk nature of the survey, formal institutional ethical clearance was not required.

4. Results and Discussion:

A. Results

The analysis identified immediate price reductions as the most influential promotional strategy affecting online purchase decisions. Convenience-oriented digital features, particularly single-click purchasing and algorithm-based recommendations, also demonstrated a substantial impact on consumer behaviour. [1], [7], [29].

A considerable number of respondents reported engaging in a brief evaluation prior to completing a purchase. However, a meaningful proportion acknowledged making unplanned purchases, especially when exposed to urgency cues such as limited-time discounts and flash sales. These responses indicate that time-sensitive promotions and digitally embedded nudges are associated with higher instances of impulsive buying tendencies. [1], [7], [29]

An additional pattern emerged regarding perceived versus reported behaviour. While many participants characterised their decision-making style as balanced or cautious, their responses simultaneously reflected susceptibility to promotional framing. Age-related variation was observed. Younger respondents displayed stronger urgency responses, whereas older participants more frequently indicated attention to long-term financial considerations and delayed benefits. [5], [6], [17], [24].

The findings were supported by frequency distribution tables illustrating dominant promotional preferences and reward choices. Cross-tabulation tables compared age groups with urgency response levels and impulsive buying frequency. Comparative tables analysed immediate versus delayed reward preference, and graphical representations—such as bar charts and percentage charts—highlighted the influence of flash sales, cashback offers, and other digital features. These visual summaries clarified behavioural trends across demographic categories without altering the underlying response patterns. [1], [7], [29].

B. Discussion

The results align with prior behavioural economics research documenting the prevalence of present bias in intertemporal decision-making. Consistent with earlier studies on hyperbolic discounting, a substantial subset of respondents showed a preference for immediate rewards over delayed benefits. The influence of urgency cues observed in this study also corresponds with established literature on scarcity framing and time pressure effects, which suggests that limited-time offers can alter perceived value and accelerate decision-making.

At the same time, this study extends previous findings by situating behavioural biases within a contemporary digital commerce environment. Unlike laboratory-based discounting experiments, which isolate time preferences under controlled conditions, the present research captures naturally occurring consumer responses to real-world e-commerce tools such as flash sales, cashback incentives, and algorithm-driven recommendations. The integration of these practical mechanisms within a single analytical framework contributes applied insight to the theoretical understanding of intertemporal choice. [27], [36], [40].

The observed perceptual inconsistency—where respondents described themselves as cautious yet demonstrated responsiveness to promotional framing—adds nuance to the discussion of self-control and consumer awareness. This suggests that awareness of rational decision-making does not necessarily eliminate vulnerability to digital nudges. Moreover, the age-related variation supports earlier research indicating that discounting behaviour and impulsivity may differ across demographic groups. Younger participants' stronger urgency responses are consistent with the literature linking age to time preference sensitivity. [5], [6], [17].

Several limitations should be acknowledged. The reliance on self-reported data introduces potential response bias and social desirability effects. The cross-sectional design prevents causal conclusions and does not capture behavioural changes over time. In addition, the study measured behavioural intentions rather than actual transaction data, which may not fully reflect real purchasing actions. The sample distribution across age groups may also limit broader generalisation of the findings. [4], [23], [26].

Despite these limitations, the study carries practical and academic significance. For digital marketers, the findings underscore the influence of urgency cues and convenience features, underscoring the need for responsible, transparent promotional design. For policymakers and consumer protection authorities, the results emphasise the importance of safeguarding younger consumers who appear more responsive to time-based framing. [5], [6].

From an academic perspective, the research reinforces the relevance of intertemporal choice theory in modern online shopping contexts. It demonstrates that present bias operates not only in experimental settings but also within everyday digital purchasing environments, thereby strengthening the bridge between behavioural economics and contemporary e-commerce analysis [35].

5. Conclusion:

This study set out to examine how digital promotional strategies and behavioural nudges shape online purchasing decisions, with particular emphasis on present bias, urgency framing, and impulsive buying across different age groups. By situating behavioural economics constructs within a real-world e-commerce context, the research sought to better understand how consumers respond to everyday digital marketing tools. [12], [20], [35]

The findings reveal that immediate price reductions and convenience-oriented features, such as single-click purchasing and algorithm-based recommendations, exert a strong influence on purchase behaviour. Although many respondents described their decision-making as deliberate, a considerable proportion acknowledged making unplanned purchases, especially when exposed to urgency cues like limited-time discounts and flash sales. This suggests a perceptual gap between perceived rational control and actual behavioural tendencies. Age-based differences were also evident: younger participants displayed stronger responsiveness to urgency framing, whereas older respondents more frequently emphasised long-term financial considerations. [5], [6], [17], [24].

The study contributes to the literature by integrating the concept of present bias with practical digital marketing mechanisms operating in contemporary online environments. Unlike controlled experimental discounting studies, this research captures consumer reactions to naturally occurring e-commerce features,

including cashback incentives, countdown timers, and delayed discount framing. By comparing demographic groups within a unified behavioural framework, the study offers applied insights relevant to digital commerce strategy and consumer policy discussions.

Despite these contributions, several limitations must be acknowledged. The reliance on self-reported survey data introduces the possibility of response bias and social desirability effects. The cross-sectional design restricts causal interpretation and does not account for behavioural changes over time. Additionally, the concentration of specific age groups within the sample may limit broader generalizability. The study also measured behavioural intentions rather than actual transaction data, which may not perfectly reflect real purchasing behaviour. [4], [23], [26].

Future research could adopt experimental designs to establish causal links between urgency cues and impulsive buying. Longitudinal approaches would allow examination of how repeated exposure to digital nudges shapes long-term financial habits. Incorporating real transactional data from e-commerce platforms could strengthen behavioural validity, while expanding samples across diverse socio-economic and cultural contexts would enhance generalizability. Further integration of psychological measures, such as self-control and risk preference scales, may also provide deeper insight into the mechanisms underlying present-biased decision-making [29].

Overall, the study advances understanding of how digital marketing structures interact with behavioural biases, offering evidence-based implications while recognising the need for continued empirical refinement [7].

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Survey Questionnaire Link:

https://docs.google.com/spreadsheets/d/1Tbuws9V_r03vNzsREBaBcsES-_4qIepRgejdv0dy-OQ/edit?usp=sharing