INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 15, Issue 7, (2025) E-ISSN: 2222-6990

Exploring the Impact of Hedonic Consumption Tendency, Serendipity, and Cognitive Flexibility on Impulsive Grocery Shopping Behaviour via Retail Apps

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To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v15-i7/25930 DOI:10.6007/IJARBSS/v15-i7/25930

Published Date: 24 July 2025

Abstract

Impulsive shopping, often viewed negatively due to overspending, can yield positive outcomes when approached mindfully. This study investigates the dynamics of impulsive grocery shopping (IGS) via retail apps, focusing on the roles of hedonic consumption tendency (HCT), serendipity, and cognitive flexibility (CF). Guided by Latent State-Trait (LST) theory, the research examines how stable personality traits interact with situational states to shape impulsive behavior. Data were collected from 399 Malaysian consumers and analyzed using Structural Equation Modelling (SEM). Findings reveal that individuals with high HCT are more likely to engage in IGS, as their pleasure-seeking disposition increases sensitivity to shopping stimuli. Serendipity acts as a mediating situational factor, amplifying emotional responses and reinforcing the influence of HCT on impulsive behavior. Meanwhile, CF moderates these relationships by weakening the effects of both HCT and serendipity, indicating that cognitively flexible individuals are better at self-regulating their buying impulses. This study contributes theoretical insights into how traits and states jointly influence IGS and offers practical implications for marketers to balance impulsive triggers with tools for mindful consumption. Future research should incorporate qualitative methods, examine additional contextual factors, and involve diverse samples and approaches to improve understanding and generalizability.

Keyword: Hedonic Consumption Tendency, Serendipity, Cognitive Flexibility, Retail Impulsive Shopping, Latent State-Trait (LST) Theory

Introduction

This study investigates the factors influencing impulsive grocery shopping (IGS) through retail applications among Malaysian consumers, based on the Latent State-Trait (LST) theory. COVID-19 pandemic has expedited the transition to online grocery shopping, significantly increasing dependence on retail applications such as Shopee, Grab, and Aeon2Go (Lim et al., 2022; Sarmad et al., 2024). Technological advancements have facilitated this shift from traditional brick-and-mortar stores to e-commerce and mobile applications, collectively transforming consumer shopping behaviors. Consequently, impulsive shopping has become more prevalent, driven by the convenience of these platforms along with situational states and individuals' stable traits (Xue et al., 2024).

In this digital era, the occurrence of IGS has become increasingly common (Kim, 2021; Lim et al., 2022). While impulsive shopping is often perceived negatively, recent research indicates that it can also lead to consumer satisfaction and enjoyment (Kimiagari, 2021). Lord et al. (2023) identified two distinct segments of impulsive buyers - anxious and innovative shoppers, suggesting that individual differences play a role in impulsive behavior. The present study examines how the interplay between individual traits and situational states influences impulsive grocery shopping (IGS) via retail applications, with cognitive flexibility (CF) proposed as a moderating factor that may weaken impulsive tendencies.

Impulsive shopping is characterized by spontaneous buying decisions that are primarily influenced by emotions, rather than by careful consideration of needs and budgets (Kimiagari, 2021). Liang et al. (2022) argue that impulsive shopping is intricately linked to situational states and individual traits, frequently triggered by store displays or digital prompts. The online shopping environment amplifies this behavior due to the ease of browsing, targeted advertisements, and flash sales (Gulfraz et al., 2022). In Malaysia, IGS is particularly prevalent, with food and snacks being the most frequently purchased items on impulse (The Malaysian Reserve, 2024).

Latent State-Trait (LST) theory, initially introduced by Styer, Schmitt, and Eid (1999), emphasize the importance of distinguishing between traits and states influences on human behavior and measurement outcomes. However, it often overlooks how stable traits might interact with one another or affect situational states themselves (Vaughan & Birney, 2023). Understanding how situational states from retail applications affect consumers' stable traits is crucial for developing a holistic view of impulsive shopping behaviors in today's digital age (Destyanawati & Soepatini, 2023).

Numerous studies have demonstrated that consumers with a hedonic consumption tendency (HCT) are profoundly influenced by sensory and emotional impressions (Schouteten et al., 2018; García-Segovia, Harrington, & Seo, 2018; Seo, 2020). These consumers often prioritize experiential enjoyment over functional or rational motivations, making them particularly receptive to environments that offer unexpected, delightful discoveries, or serendipitous encounters (Wang et al., 2020). Such environments fuel a sense of adventure and novelty, enhancing the appeal of impulsive buying, especially when purchases feel spontaneous and joyful (Tarka & Harnish, 2022). In online shopping, serendipitous moment is characterized by unexpected and enjoyable experiences which can be impactful towards shopping behavior (Makri et al., 2019; Wang & Wang, 2022). For consumers with a strong HCT, these experiences

increase the likelihood of impulsive purchases, as they respond to both the pleasure of discovery and the allure of novelty, which can be conveniently be influential in grocery shopping contexts (Sari & Yasa, 2021; Bao & Yang, 2022).

Serendipity, defined as the unexpected discovery of appealing products, plays a vital role in encouraging impulsive shopping behaviors (Wang & Wang, 2022). When consumers encounter serendipitous moments during online shopping, they are more inclined to make unplanned purchases (Bao & Yang, 2022). This phenomenon is particularly relevant in grocery shopping applications, where unexpected product discoveries or promotions via video shopping ads can trigger spontaneous purchases (Pereira & Coelho, 2024). The excitement generated during online shopping can foster impulsive purchases under such specific conditions namely, serendipitous findings (Naseebullah et al., 2023). As comprehensive evidence shows, impulse purchases made in a serendipitous environment, not only provide consumers with immediate gratification and enhanced mood, but also contribute significantly to retailers' margin (Amos, Holmes, & Keneson, 2014; (Spiteri-Cornish, 2020).
Cognitive flexibility (CF), defined as an individual's ability to adapt their thinking in response to changing environments (Shende & Mudar, 2023), is recognized as an important factor in consumer decision-making. Research has shown that CF is often developed in individuals who pursue long-term goals (Lee et al., 2024), which supports the present study's aim to explore the possibility of either benefits or downside of impulsive grocery purchases in the long run. Unlike more stable personality traits such as hedonic consumption tendency (HCT), CF is context-dependent and can vary across situations. While HCT represents an internal drive that frequently influences impulsive behavior, CF is positioned in this study as a moderating factor that enables individuals to regulate these tendencies by adjusting their thought processes accordingly (Laureiro-Martínez & Brusoni, 2018).

This flexibility may allow consumers to navigate online grocery shopping environments more adaptively, enabling them to respond to situational cues impulsively. Within the framework of this study, CF acts as a moderating factor that helps individuals manage impulsive shopping by regulating their cognitive processing in response to complex stimuli. While unregulated impulsive purchases may occur under conditions of low cognitive load (Kakaria et al., 2023), individuals with high CF are more likely to engage in reflective processing, increasing cognitive engagement and thereby reducing the likelihood of impulse-driven decisions.

In particular, CF may help individuals regulate their responses to unexpected triggers, like surprise discounts or unplanned encounters with products, thereby tempering the influence of HCT on impulsive behavior. While HCT typically encourages impulsivity, high CF individuals are more likely to evaluate such situational states carefully, assessing options like price or product necessity before making a decision. This study propose that CF could limit IGS by enabling a more flexible, reflective approach to serendipitous shopping moments and regulate HCT (Laureiro-Martínez & Brusoni, 2018; Özyörük, 2021).

Although numerous studies highlight the surge in online shopping during the COVID-19 pandemic, there remains a scarcity of research on how IGS behaviors have evolved in the post-pandemic landscape. In the context of grocery shopping, it remains uncertain whether consumers have fully adapted to online shopping or whether there will be a reversion to traditional offline shopping practices often referred to as "revenge shopping" (Liu et al., 2023;

Liu & Cai, 2024). However, as consumers grow increasingly accustomed to online platforms, it is likely that impulsive shopping will continue to rise. Dabija et al. (2024) provide an integrative review of online impulse shopping, noting the antecedents of the IGS post-pandemic phenomenon remain underexplored on grocery-focused.

Despite the prevalence of IGS through retail applications, the literature reveals several important gaps. One major gap lies in our limited knowledge of how serendipitous states may interact with or amplify specific traits, such as impulsivity or novelty-seeking, particularly in online contexts (Akram et al., 2018; Son & Yoon, 2024). Studies indicate that enabling serendipitous encounters online can boost consumer engagement and encourage unplanned purchases (Bao & Yang, 2022, Wang et al., 2024). However, little research has explored how these serendipitous experiences function as situational triggers that activate underlying traits like HCT, potentially shifting the conventional dynamics between states and traits in digital shopping environments.

In conclusion, impulsive grocery shopping (IGS) through retail applications is influenced by both stable individual traits such as hedonic consumption tendency (HCT) and situational states like serendipity. Additionally, cognitive flexibility (CF) is proposed to moderate the effects of these factors on IGS behavior. Therefore, this study aims to investigate the impact of HCT on IGS among Malaysian consumers, while also considering the roles of serendipity and CF. Four research questions are posited to guide this study:

i. How does HCT influence IGS behavior among consumers?
ii. How does the experience of serendipity impact IGS behavior in situational contexts?
iii. Does serendipity mediates relationship between HCT and IGS?
iv. Does CF moderate the relationship between serendipity and IGS, and between HCT and IGS?

Review of Related Literature

Impulsive Online Grocery Shopping

The grocery business has evolved significantly with digitalization. Traditional stores once relied on in-store promotions, but supermarkets and hypermarkets later offered diverse products, driving efficiency and attracting more customers (Kim & Yeo, 2022). The rise of smartphones and online platforms transformed the industry, enabling consumers to shop anytime with home delivery options now available (Anshu et al., 2021). Grocery apps now provide personalized experiences, seamless payments, and subscription-based services which are user-friendly and supports the findings by Khoo et al. (2023) where consumers tend to run groceries online due to convenient gained and time savings, despite the concerns over the perishable items. This shift has introduced online-only stores and on-demand delivery models, meeting modern demands for convenience and speed (Khoo et al., 2023). While impulsive grocery shopping (IGS) thrives in this digital era, studies on its relationship with stable internal traits and situational factors, remain limited (Tyrväinen & Karjaluoto, 2022).

Latent State-Trait (LST) Theory

LST theory, developed by Steyer, Schmitt, and Eid (1999), provides a strong framework for understanding how enduring personality traits and temporary situational factors interact to influence behavior. This study elaborates on Latent State Trait (LST) theory to provide empirical support for the literature on IGS behavior via retail apps, thereby extending the

applicability of LST theory. LST theory posits that an individual's stable traits where enduring characteristics influence individual over time, and situational states which illustrate transient contingency that can vary in any contexts, both significantly impact shopping behavior (Chen et al., 2016). This is supported by Pham et al. (2024) which has found stable traits like buying tendencies and situational states like social media influence concurrently impact shopping behavior. Similarly, a study by Febrilia and Warokka (2021) accentuate how trait-state interplay predict consumers' behavior attest LST perspective derived from both stable trait and situational state. Understanding these constructs allow for a differentiation between stable traits and temporary states in behavioral analysis.

Functional attributes of apps may influence consumer behavior indirectly through mediators such as trust and enjoyment, for instance, a study by Pham et al. (2024) found how celebrity posts generate impulse buying with trust. However, in line with the LST theory, stable traits show more direct and consistent impact, for example, hedonic consumption tendency (HCT). In contrast to the effect of stable traits (i.e., HCT), functional app attributes may trigger situational states, such as serendipity, which influence IGS in the moment, but their impact is typically less consistent due to the need of a mediator like trust (Bao & Yang, 2022). This reflects the dynamic relationship between stable traits and situational states in shaping behavior (García et al., 2021; Bao & Yang, 2022).

Stable traits, particularly emotional responses and cognitive evaluations, significantly influence impulsive buying behavior (García et al., 2021). Positive emotions, such as the excitement generated by promotional offers, serve as powerful motivators for unintended purchases. Research consistently demonstrates that emotions like pleasure and excitement play critical roles in impulsive shopping decisions (Sun et al., 2023; Yi et al., 2023; García et al., 2021).

HCT represents stable traits that predispose individuals towards seeking out pleasurable experiences while shopping and research has shown that HCT is positively linked with impulse purchase behavior in various contexts (De Aquino & Natividade, 2024). This trait interacts with situational stimuli to trigger momentary emotional states. In the context of online grocery shopping, individuals with strong HCT may experience serendipity such as finding an attractive product on sale, which evoke emotional responses that weaken cognitive control, fostering IGS (Naseebullah et al., 2023).

Serendipity refers to unexpected positive events. Busch (2022) refined this concept into three key elements: agency (chance affiliated with opportunity), surprise (unplanned encounters), and value (convenient effect). In consumer contexts, serendipity has been described as 'the discovery of valuable or pleasant things that are not sought for', highlighting its role in elevating consumers' shopping enjoyment and engagement (Liang et al., 2022; Busch, 2022). In online shopping, surprising promotions are common, allowing consumers to encounter unexpected offers. Research has shown that these promotions create an urgency and enjoyment, tempering emotional arousal and decision-making pressure allowing for an impulse purchase in grocery apps (Luo et al., 2021). For example, surprise deals or unanticipated rewards, typically evoke emotions like pleasant surprise or a sense of good fortune, which can positively shape the perception of products or services (Kim et al., 2021). For instance, serendipity can arise from unexpected moments like surprise discounts or free

gifts, prompting consumers to make spontaneous purchases (Kim et al., 2021). This suggests a strong connection between serendipity and IGS.

Research indicates that serendipity influences consumers' intention to buy unplanned products (Liang et al., 2022). Furthermore, serendipitous experiences improve consumer evaluations in e-commerce settings (Kim et al., 2020). According to The Malaysian Reserve (2024), apps such as Aeon2Go and Food Panda are frequently used after consumers experience reliable serendipitous shopping moments. Unexpected encounters can trigger impulsive shopping behaviors especially for first-time app users as they may experience the serendipitous moment more intensely due to limited cognitive routines (Pham et al., 2024).
In the context of LST theory, serendipity acts as a mediator between HCT and IGS. While HCT is a stable trait that reflects a person's predisposition to seek pleasure in consumption, serendipity serves as a situational state that mediates the effect of HCT on IGS (Busch et al., 2022).

When individuals with a high HCT experience serendipitous events, these moments activate emotional responses that increase the likelihood of impulsive shopping behaviors (Luo et al., 2021). Therefore, serendipity mediates the relationship between HCT and IGS, illustrating how a situational state can heighten the effect of an enduring trait on consumer behavior. Consequently, we propose the following hypotheses:

- H1: HCT positively influences serendipity.
- H2: Serendipity mediates the relationship between HCT and IGS behavior.
- H3: HCT positively impact IGS behavior.

Cognitive flexibility (CF), defined as an individual's capacity to alter mental processes and adapt behavior in response to changing encounters (Dajani & Uddin, 2015). Rather than a stable personality trait, CF is recognized as a cognitive skill linked to intelligence and adaptive thinking. For instance, Schmitz and Krämer (2023) deposited CF as a core human thinking skill instead of a static trait as they found CF significantly correlates with individual cognitive capacity and task-switching performance. This cognitive ability encompasses a combination of awareness, confidence, and adaptability, enhancing consumers' information-processing skills, which allows for quick assessment of, for instance, promotional offers and situational triggers. High CF consumers do not always lead to impulsive spending. In fact, it often empowers consumers to carefully consider the consequences of these spending triggers before making a decision. This thoughtful evaluation process reduces the likelihood of impulsive purchases by encouraging a balanced and considered approach to spending (Laureiro-Martínez & Brusoni, 2018; Özyörük, 2021).

While LST theory explains the dynamic trait-state interplay, CF introduces an additional layer of complexity as a moderator. High CF individuals evaluate multiple perspectives and shift their focus from immediate indulgence to long-term goals (Lee et al., 2024). This adaptability helps mitigate the influence of hedonic-driven emotional reactions on impulsive behavior by enabling cognitive reframing, wherein situational situation such as discounts or promotions are assessed more rationally. Empirical support comes from Yu (2022) who found that anxiety and depression on cognitive factors of impulse buying cohesively mediated by CF, suggesting its foundation in controlling emotional triggers.

In grocery shopping contexts, for instance, individuals with high CF are likely to be responsive to impulsive buying cues; however, they tend to tolerate such cues with greater scrutiny, examining options for potential value or need. This adaptability enables high-CF consumers to approach unexpected offers with sensitivity, potentially restrain IGS by aligning purchases with more voluntary act (Ghazali et al., 2018; Oh et al., 2022). Thus, CF serves as a moderating force, guiding consumers to make more deliberate decisions amid serendipitous shopping moments. CF establish rational decision-making in an unexpected moment as Kafadar and Yilmaz (2022) highlight that high CF individuals are less likely to shop impulsively.

Recent studies align with the LST framework's distinction between HCT as a stable trait, which promotes enjoyment-focused consumption, and CF as a cognitive ability that allows individuals to adapt their thinking based on situational states, such as unexpected promotions; thus, allowing CF to moderate emotional reactions like serendipity and in grocery shopping contexts, making it distinct from fixed personality traits (Ionescu et al., 2024; Ghazali et al., 2018). Consequently, CF helps consumers to process promotional cues flexibly, influencing HCT's impact on IGS by enabling responses that vary according to situational factors (Kim et al., 2021; Oh et al., 2022). Thus, we propose the following hypotheses:

- H4a: The positive relationship between HCT and IGS is weaker when CF is high.
- H4b: The positive relationship between serendipity and IGS is weaker when CF is high.

Conceptual Framework

Consumer preferences have gradually shifted from retail to online grocery shopping, highlighting the need for retail apps to be more accessible. Impulsive shopping behavior has been shown to be more prevalent in online situations. A statistics of 40% of consumers shop impulsively in online settings higher than retail stores and a meta-analytic evidence condition this proneness due to digital stimuli like real-time promotions elevating impulsive shopping (Zhao et al., 2021; Jie et al., 2022). Despite substantial research, a gap persists regarding how situational factors interplay with stable traits in impacting impulsive shopping behavior in grocery context. This research aims to fill that gap by examining the dynamics of online IGS. Several stable traits have emerged as significant influences on consumer behavior, such as hedonic consumption tendency (HCT) and cognitive flexibility (CF), while others have shown less consistent effects. For instance, Qureshi et al. (2025) found that agreeableness was not significantly associated with impulsive buying. Similarly, She et al. (2023) reported that future time perspective positively influences financial well-being suggesting that while temporal orientation may shape broader decision-making processes, it does not necessarily predict impulsive shopping behavior.

LST theory, developed by Steyer et al. (1999), is widely applied in psychological research to analyze the components of human behavior. It separates observed scores into latent states (temporary conditions) and measurement errors, further dividing these into latent traits (enduring personality characteristics) and state residuals (situational influences). Chen, Su, and Widjaja (2015) highlight that "human behavior is shaped by environmental cues, individual traits, and their interactions".

Building on these theoretical insights, LST theory offers a valuable framework for understanding how stable traits and situational states influence consumer behaviors like IGS

through retail apps. Accordingly, we propose a conceptual framework (illustrated in Figure 1) that examines how individual traits, such as HCT, interact with situational states like serendipity, while CF is considered here as a moderating cognitive skill, potentially influences the relationship between HCT and IGS through retail apps. This framework allows for a deeper analysis of how the interplay of state-trait influence IGS (Febrilia & Warokka, 2022). Moreover, Bleidorn et al., (2021) note that individual's traits are personal characteristics that remain stable across contexts. Thus, the proposed framework is below:

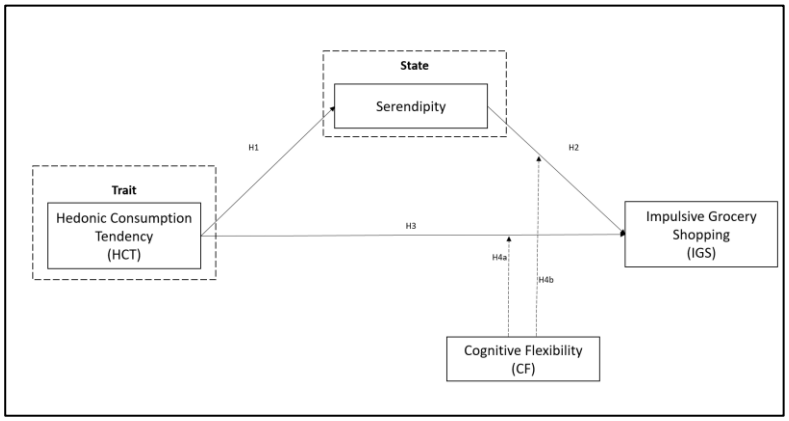

Figure 1: Conceptual Framework

Methodology and Data Collection

Measurement Variables

The questionnaire measured four variables using well-established scales adapted from previous research. Respondents' agreement with the statements was evaluated using 5-point and 7-point Likert scales, with options ranging from 1 (strongly disagree) to 7 (strongly agree). Cognitive flexibility and hedonic consumption tendency, were measured using a 5-point Likert scale while serendipity, and IGS were measured using a 7-point Likert scale. Table 1 (reference in annexure) contain the measurement items.

Pre-testing and pilot test were run. Two experts in social science reviewed the questionnaire, providing feedback on clarity, structure, and wording. Key improvements included enhancing the cover page, checking spelling and grammar, adjusting question relevance to grocery retail apps, and refining instructions. Following the pre-test, a pilot test with 30 experienced grocery app users assessed the reliability of measurement items using Cronbach's Alpha. Nunnally and Bernstein (1994) stated that values above 0.7 indicate reliability. This study found all four constructs above this threshold, confirming reliability for data collection.

Sample and Data Collection

This study used a targeted sampling method, focusing on individuals aged 18 and older who had used grocery apps within the past year. This approach is ideal for uncovering specific trends and gaining valuable insights within this particular group of app users. It was employed because it ensured that only relevant respondents, fitting the study's aim, were included as Etikan (2016) stated it is advantageous when the goal is to understand targeted behaviors rather than generalize findings across a wider population.

Respondents were approached at shopping malls in suburban and urban areas, as these are places where online grocery shopping is prevalent (Zhou et al., 2024). Before approaching

respondents, researchers inquired whether they had used a grocery retail app, even if they were present as in-store shoppers. Participants received grocery shopping vouchers worth MYR10 for their involvement. Self-administered questionnaires maintained uniformity, with the researcher present to clarify ambiguities – a total of 400 questionnaires were distributed, with one excluded due to incorrect responses, resulting in 399 valid responses.

Results

Data Analysis

Data preparation involved coding, editing, and data entry. Responses were reviewed for completeness, and any inconsistencies were addressed using mean and median imputation methods. A multivariate normality test was assess using Mardia's Coefficient. Our findings indicated that Mardia's multivariate skewness ($b = 3065.852$, $z = 203879.1818$, $p < 0.001$) and kurtosis ($b = 5726.499$, $z = 268.9416$, $p < 0.001$) tests indicated significant deviations from multivariate normality. Given this, we used bootstrapping techniques to ensure robust and reliable results despite the non-normality in the data. To check for common method bias, we used Harman's single-factor test, conducting an exploratory factor analysis in SPSS. The first factor explained only 35.71% of the total variance, which is below the typical 50% threshold. This suggests that common method bias is unlikely to be a major concern in our study. However, while widely used, this test has limitations in effectively controlling for common method bias.

Having analyzed the results for CMB, we recognize the potential for bias in our measurement approach that could influence the observed relationships among constructs. To further investigate this issue and assess the extent of variance specifically attributable to the measurement method, we examined Common Method Variance (CMV). By conducting a Variance Inflation Factor (VIF) analysis, we aimed to identify any excessive shared variance among constructs that might indicate the presence of CMV, as outlined by Kock and Lyn (2012). The VIF values (Table 1) obtained in this study were below the 3.33 threshold recommended by Diamantopoulos and Siguaw (2006), thereby confirming that collinearity was not a concern.

Table 1
Lateral Collinearity Results

Variance Inflation Factor (VIF)	
Hedonic Consumption Tendency	1.283
Serendipity	1.210
Cognitive Flexibility	1.191

Measurement Model

To accurately measure all aspects of our study, we developed a reflective model. This involved careful steps to ensure the reliability of our measurements. When evaluating this model, it's crucial to understand the difference between convergent and discriminant validity. Both are essential for proving that our measurements are valid. Convergent validity means that different ways of measuring the same thing should produce similar results. This confirms that the indicators we use to assess a specific concept truly reflect the underlying idea we're trying to measure. In this study, we confirmed convergent validity by evaluating the Average Variance Extracted (AVE), with all values exceeding the recommended threshold of 0.5, as

indicated by Hair et al. (2014). This outcome indicates that the measurement model effectively captures the constructs it intends to measure. Conversely, discriminant validity assesses whether the constructs are truly distinct from one another. It verifies that the measures do not overlap significantly and that each construct provides unique information. Table 2 provides all the convergent analysis metrics, including loadings, Cronbach's alpha, composite reliability, and AVE. In our analysis, we employed the Heterotrait-Monotrait Ratio (HTMT) of correlations, following the recommendations of Henseler et al. (2014). All computed HTMT values in Table 3 adhered to the established thresholds, further reinforcing the notion that our constructs are sufficiently distinct, enhancing the integrity of the measurement model. Analyzing both convergent and discriminant validity is vital as they provide a comprehensive understanding of the measurement model's robustness. By confirming that constructs not only relate to their respective indicators but also remain distinct from one another, we can confidently advance to structural model analysis, knowing that the foundation of our research is reliable.

Table 2
Loadings, Reliability and Validity

Latent Variable	Item	Outer Loading	Cronbach's Alpha	CR	AVE
Cognitive Flexibility	CF1	0.888	0.869	1.007	0.787
	CF2	0.839			
	CF3	0.931			
Hedonic Consumption Tendency	HCT1	0.690	0.869	0.899	0.646
	HCT2	0.701			
	HCT3	0.815			
	HCT4	0.907			
	HCT5	0.881			
Serendipity	Serendipity1	0.960	0.939	0.957	0.847
	Serendipity2	0.944			
	Serendipity3	0.826			
	Serendipity4	0.946			
Impulsive Grocery Shopping	IGS1	0.890	0.928	0.949	0.822
	IGS2	0.919			
	IGS3	0.936			
	IGS4	0.881			

Note(s): CR: Composite reliability; AVE: Average variance extracted

Table 3
Discriminant Validity Results (HTMT Criterion)

	CF	HCT	IGS	Serendipity
CF				
HCT	0.283			
IGS	0.315	0.529		
Serendipity	0.302	0.237	0.465	

Note(s): HCT: Hedonic Consumption Tendency, CF: Cognitive Flexibility, IGS: Impulsive Grocery Shopping

Structural Model

We utilized Partial Least Squares Structural Equation Modeling (PLS-SEM) as it best suits our research objectives, the characteristics of our sample, and the intricate model incorporating Latent State Trait (LST) theory. PLS-SEM prioritizes explaining the variance in the outcomes, making it particularly well-suited for investigating the predictive relationships between constructs such as serendipity, HCT, CF, and IGS (Hair et al., 2021). Unlike Covariance-Based SEM (CB-SEM), which primarily reproduces theoretical covariance matrices, PLS-SEM emphasizes variance explanation, essential for understanding IGS's variance through predictors (Chin, 2009). PLS-SEM's flexibility allows for the inclusion of both reflective and formative indicators, facilitating a more nuanced analysis. We analyzed beta values, standard deviations, t-values, p-values, effect sizes, and moderators to enhance our understanding of these relationships (Henseler et al., 2014). In summary, PLS-SEM's predictive modeling capabilities, flexibility, and robustness with smaller samples support a comprehensive analysis of constructs, enriching our findings on LST theory's application. Below is the structural model (Figure 2) and path coefficients (Table 4) were examined to assess the significance of the hypothesized relationships.

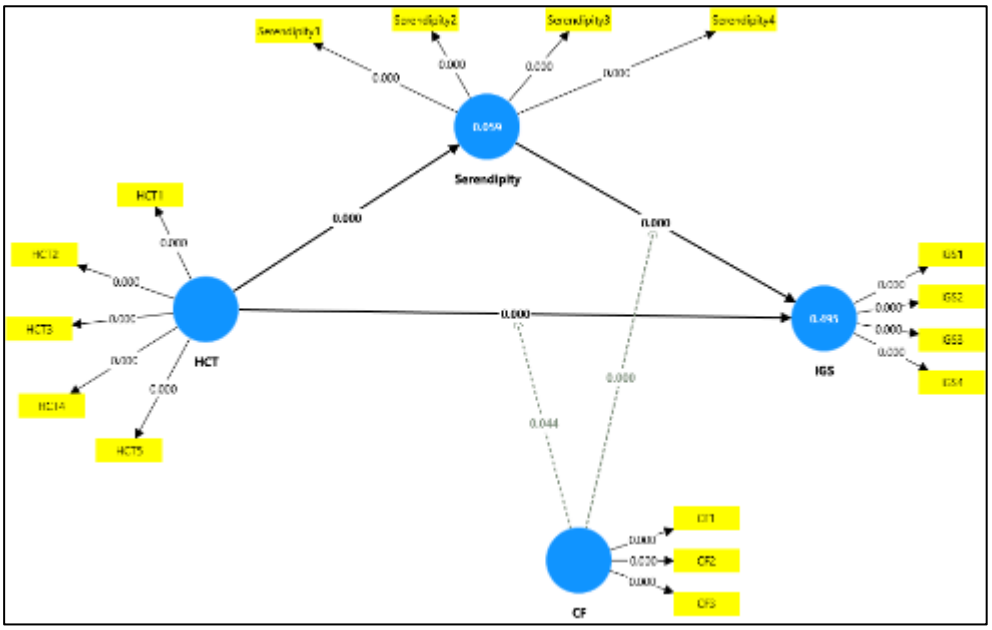

Figure 2: Structural Model

Additionally, we discussed the interaction plot as it provides crucial insights into the moderating role of CF in the relationships between HCT, serendipity, and IGS. Interaction plots are critical for visualizing and interpreting moderation effects, as they help clarify how the relationship between an independent variable and a dependent variable changes at different levels of the moderator (McCabe et al., 2018). Figure 3 demonstrates that the positive relationship between HCT and IGS is significantly weaker when CF is high, indicating that individuals with high CF are better able to regulate impulsive tendencies despite their hedonic urges. Conversely, when CF is low, the relationship strengthens, suggesting that less cognitively flexible individuals are more likely to indulge in impulsive purchases driven by hedonic motives. Similarly, Figure 4 shows that the positive relationship between serendipity and IGS is reduced when CF is high, as individuals with high CF are less influenced by serendipitous stimuli and better equipped to exercise self-control. When CF is low, however,

the relationship is stronger, highlighting that individuals with lower CF are more susceptible to impulsive behavior triggered by unexpected shopping opportunities.

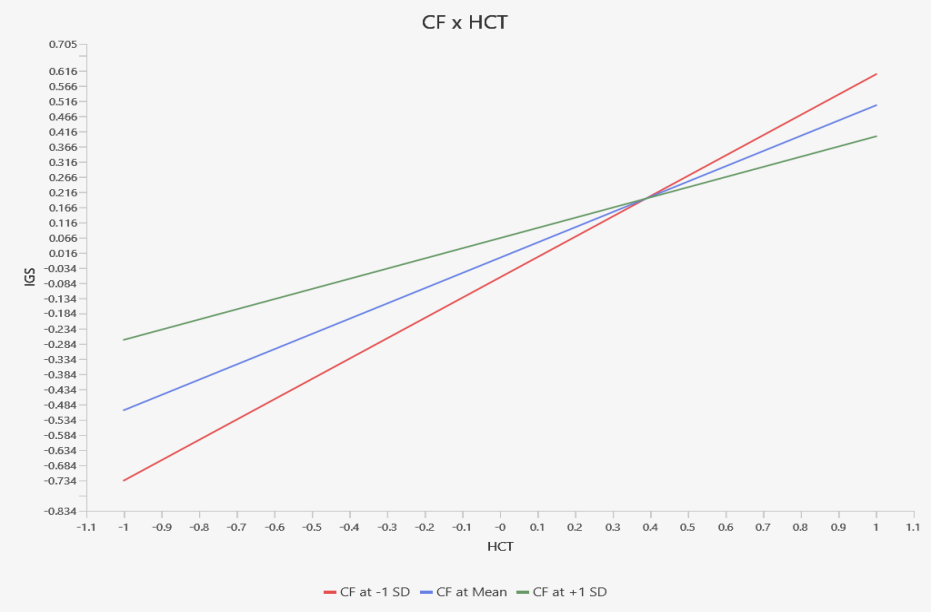

Figure 3: Interaction Plot (HCT x IGS)

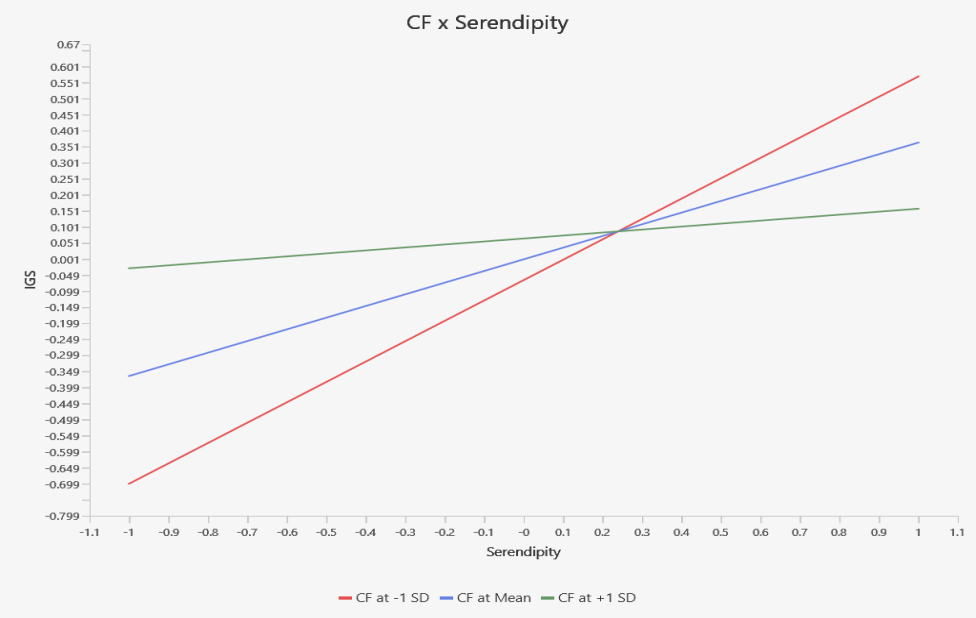

Figure 4: Interaction Plot (Serendipity x IGS)

Table 4
Structural Model Evaluation Path Coefficient Results

Hypothesis	Relationship	β	Std Error	T Statistics	P Values	Decision
H1	HCT - IGS	0.5	0.068	7.309	0.000	S
H2	HCT - S	0.193	0.058	3.323	0.001	S
H3	S - IGS	0.362	0.048	7.57	0.000	S
H4a	CF*HCT - IGS	-0.163	0.082	1.996	0.046	S
H4b	CF*S - IGS	-0.271	0.068	4.116	0.000	S

Note(s): HCT: Hedonic Consumption Tendency, CF: Cognitive Flexibility, IGS: Impulsive Grocery Shopping, S: Supported, NS: Not Supported

The study's results can be interpreted by examining each hypothesis and its corresponding statistical outcomes. Table 4 presents the hypothesized relationships and statistical analysis results for each hypothesis within the proposed framework examining IGS. The findings from the table provide valuable insights into the relationships HCT, serendipity, CF, and IGS. Hypothesis H1 demonstrates a strong and significant positive relationship between HCT and IGS ($\beta = 0.5$, $T = 7.309$, $p < 0.001$), confirming that individuals with higher HCT are more likely to engage in IGS. Similarly, H2 reveals that HCT significantly predicts serendipity ($\beta = 0.193$, $T = 3.323$, $p = 0.001$), indicating that individuals with HCT are more likely to experience unexpected, pleasant moments while shopping. Hypothesis H3 establishes a significant positive effect of serendipity on IGS ($\beta = 0.362$, $T = 7.57$, $p < 0.001$), emphasizing that serendipitous encounters serve as key drivers of impulsive purchases. The moderation hypotheses, H4a and H4b, highlight the role of CF in weakening these relationships. Specifically, H4a demonstrates that CF significantly weakens the relationship between HCT and IGS ($\beta = -0.163$, $T = 1.996$, $p = 0.046$), suggesting that individuals with higher CF are less prone to IGS despite strong HCT. Similarly, H4b shows that CF moderates the relationship between serendipity and IGS ($\beta = -0.271$, $T = 4.116$, $p < 0.001$), further reducing the influence of serendipitous moments on impulsive behaviors. Notably, the moderating effect of CF is stronger for situational factors like serendipity compared to trait-driven factors such as HCT, indicating that CF may be more effective in mitigating impulsive behaviors triggered by external stimuli. Collectively, these findings underscore the importance of considering both individual traits and cognitive abilities in understanding and managing IGS behaviors.

Table 5
Results of R^2

Construct	R^2	Explanatory Power
IGS	0.495	Substantial
Serendipity	0.059	Weak

Note(s): R^2 interpretation is based on Cohen (1988) – substantial: 0.26, moderate: 0.13, weak: 0.02

The explanatory power of the model can be evaluated through the R^2 values for each construct, which indicate how much of the variance in each dependent variable is explained by the independent variables in the model. For IGS, the R^2 value is 0.495, meaning that the model explains 49.5% of the variance in IGS. According to standards for R^2 interpretation, this is considered a substantial level of explanatory power, suggesting that factors like HCT, serendipity, and CF effectively account for almost half of the variability in IGS behaviors. This high R^2 value highlights the strong predictive capacity of the model concerning impulsive buying tendencies in the context of retail apps. In contrast, serendipity has an R^2 value of 0.059, meaning only 5.9% of its variance is explained by HCT within the model, which is classified as a weak level of explanatory power. This indicates that while HCT does have some influence on serendipity, it may not be the primary factor contributing to serendipitous experiences. This model may not fully explain all the factors that influence serendipity, as other situational or environmental factors could play a more important role. While our model effectively predicts how people use in-app games (IGS), further research should consider additional factors to gain a deeper understanding of how serendipity works within the context of retail apps.

Table 6
Table of Effect Size

Constructs	f^2	P values	Effect Size
HCT -> IGS	0.379	0.002	Large (significant)
HCT -> Serendipity	0.063	0.119	Negligible
Serendipity -> IGS	0.220	0.001	Moderate (significant)
CF x HCT -> IGS	0.050	0.288	Negligible
CF x Serendipity -> IGS	0.144	0.042	Small (significant)

The effect sizes results (Table 6) above indicate varying levels of influence among the paths. The relationship between HCT and IGS demonstrates the largest effect size, with an f^2 of 0.379 ($p = 0.002$), indicating a strong influence on IGS. In contrast, the path from Serendipity to IGS exhibits a moderate effect size of 0.220 ($p = 0.001$), suggesting a meaningful contribution to IGS. The path from CF to Serendipity shows a small but statistically significant effect size of 0.144 ($p = 0.007$), reflecting its impact on IGS. Other relationships, such as CF x HCT to IGS ($f^2 = 0.050$, $p = 0.288$), exhibit negligible effect sizes, indicating minimal influence and lack of statistical significance. The interaction effect of CF x Serendipity on IGS reveals a small effect size of 0.144 ($p = 0.042$), which is significant but indicates a weaker influence. Overall, these findings underscore the importance of certain constructs, particularly HCT and Serendipity, in shaping IGS, while highlighting the necessity for further exploration of additional factors that may enhance predictive accuracy in the model.

Discussion

The results of this study reveal several key insights into the dynamics of IGS within online shopping environments. CF, defined as the capacity to adapt one's thinking and behaviors in response to changing circumstances, plays a significant role in influencing impulsive shopping tendencies, especially when decisions need to be made quickly. Consumers with high CF may be more conscious to impulsive purchases in online grocery settings, as they can effectively adjust to unexpected situations, evaluating the needs and wants of their purchases (Kafadar & Yilmaz, 2022). This study's findings show that CF's moderating influence on other variables

is evident, suggesting that while adaptability may impact impulsivity, it does not consistently moderate relationships among other factors.

HCT, which relates to the emotional satisfaction derived from shopping, emerged as a direct positive predictor of impulsive shopping behaviors. Consumers with strong hedonic orientations are likely to actively seek enjoyment and excitement through unplanned purchases, an experience that grocery apps can readily facilitate through visually appealing promotions and strategically place product offers (Chen, Su, & Widjaja, 2015). This aligns with the research indicating that impulsive buying is often driven by emotional triggers and environmental cues that amplify the enjoyment factor (Luo et at., 2021).

In this model, serendipity acts as a mediator in the relationship between CF, HCT, and IGS. Serendipity, defined as the occurrence of pleasant and unexpected discoveries, positively influences the likelihood of spontaneous purchases. This suggests that consumers with adaptable behaviors and a hedonic disposition are more likely to encounter serendipitous moments, which can trigger impulsive buying decisions. The mediating role of serendipity highlights the importance of integrating design elements within grocery apps that encourage surprise discoveries, aligning with findings that suggest environmental factors shape shopping behavior (Liang et al., 2022).

All six hypotheses tested in this study were supported, confirming the theoretical relationships proposed. Hypotheses H1, H2, and H3 demonstrated direct relationships among HCT, serendipity, and IGS, underscoring the roles of hedonic tendencies and situational states in driving impulsive shopping behavior. Additionally, the moderating role of CF (H4a, H4b) was confirmed, indicating that CF significantly influences the strength of these relationships. Specifically, CF attenuates the impact of HCT and serendipity on impulsive behavior, reinforcing its role as a regulatory factor in consumer decision-making. These findings highlight CF's ability to alter the dynamics of trait and state-driven impulsive shopping, suggesting that adaptability and goal-directed behavior are key in mitigating impulsive tendencies. Furthermore, the consistent support for all hypotheses strengthens the integrated framework, paving the way for future research to investigate additional moderators or contextual factors that may further refine the understanding of impulsive grocery shopping behavior or in any different context, both offline and online environment.

Conclusion

This research contributes to the body of knowledge on impulsive grocery shopping (IGS) by applying Latent State-Trait (LST) theory to explain how both stable personality traits and unstable situational states shape shopping behavior. Hedonic consumption tendency (HCT) emerged as a distinct predictor of IGS, confirming that consumers with a stronger desire for thrill-seeking are more prone to impulse purchases. This disposition is further intensified by serendipity; a situational stimulus that evokes arousal and emotional surprise during online shopping, reducing cognitive control and triggering impulsive behavior.

The findings also support serendipity as a mediator that channels the influence of stable characteristics like HCT through emotionally engaging experiences. This aligns with prior literature suggesting that impulsive actions often result from the interaction between internal dispositions and external cues. HCT, as a stable personality trait, inclines individuals

toward emotionally stimulating and hedonic experiences. In consumer settings, this predisposition heightens emotional responses to unexpected stimuli such as chance discoveries, leading to positive feelings, reduced cognitive regulation, and impulsive buying. These results reinforce existing evidence that emotional states can mediate the relationship between personality traits and impulsive behavior.

Serendipity plays a pivotal mediating role, amplifying the influence of HCT through emotional and contextual cues. It introduces a dynamic element into impulsive behavior by enhancing the effect of stable traits through unexpected and pleasurable discoveries. The application of LST theory illustrates how impulsive behaviors arise from the synergistic interaction between enduring traits and transient states, particularly when serendipitous events occur.

Moreover, this study explores cognitive flexibility (CF) as a moderator in regulating consumers' responses to affective stimuli. Individuals with high CF are better at reframing unexpected findings and making deliberate decisions based on their needs, thus mitigating impulsive behavior. However, CF's moderating effect diminishes when the stimuli are highly engaging or emotionally intense, suggesting that even cognitively flexible individuals may succumb to IGS under strong situational pressures.

The interaction between HCT, serendipity, and CF offers a more nuanced understanding of impulsive grocery shopping. The results support LST theory by illustrating how stable traits and situational states interact to produce observable behaviors. The inclusion of CF adds theoretical value by demonstrating the role of self-regulatory mechanisms in moderating these interactions. Additionally, interaction plots enrich the model by visually confirming the moderation effects. For instance, Figure 3 shows that the positive relationship between HCT and IGS weakens under high CF, while Figure 4 indicates that CF also reduces the impact of serendipity on IGS. These visuals underscore CF's buffering role, helping consumers regulate impulsive responses to state-based triggers.

This enhanced understanding contributes to both theory and practice. Developers and marketers can leverage serendipitous experiences such as surprise discounts, personalized recommendations, or gamified features to drive user engagement and impulse purchases. Meanwhile, tools promoting conscious consumption, such as personalized shopping lists or family-bundle offers, can support high-CF consumers in making thoughtful decisions. This balanced approach addresses both commercial goals and consumer well-being, delivering both business and ethical value.

Nonetheless, this study has several limitations. First, the exclusive use of quantitative methods may limit the ability to capture the complex and nuanced nature of impulsive shopping. Qualitative approaches, such as interviews or focus groups, could provide deeper insights into consumers' motivations, emotions, and experiences. Second, the model explains only a moderate portion of the variance in IGS, suggesting that additional variables not examined here such as cultural values, app interface design, or emerging trends like live streaming may also play significant roles. Third, the use of purposive sampling among Malaysian consumers may limit generalizability. Cultural and behavioral differences in shopping habits could condition IGS differently across contexts, underscoring the need for comparative studies involving other populations.

Finally, while efforts were made to mitigate common method bias (CMB) using Harman's single-factor test and the PLS marker variable technique, CMB remains a potential concern due to the self-report survey design. Future studies could adopt mixed-method or time-lagged designs to address this issue.

Future research may also explore additional contextual factors, such as limited-time offers or seasonal cues, that influence serendipity's mediating role in online impulse buying. Examining other moderators — including mood states or broader personality dimensions — may further illuminate how serendipity operates across different consumer profiles. Continued use of interaction plots is encouraged, as they provide clear, interpretable illustrations of complex moderating and mediating effects.

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