Article

From Impulse to Intention: Examining Sustainable Online Purchases in the Age of Programmatic Advertising

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Abstract

The rapid advancement of digital technology has transformed marketing, providing businesses with opportunities to leverage data-driven insights for effective consumer targeting. 'Programmatic Advertising' (PA), known for its automated ad placements powered by big data, has become a cornerstone of digital advertising by delivering personalised content to consumers in real time. While effective in driving engagement, PA also raises environmental concerns due to its high energy consumption and potential to encourage impulsive buying behaviour (IBB). This conceptual study, based entirely on secondary sources and theoretical analysis, explores the relationship between PA and Sustainable Online Purchase Decisions (SUPD) in the emerging Indian market, focusing on how PA-induced impulsive buying can be influenced by environmental knowledge (EK). Drawing on the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), and the Stimulus-Organism-Response (S-O-R) framework, this study proposes a model wherein PA attributes act as stimuli triggering impulsive buying, with EK functioning as a moderating variable that redirects these tendencies toward sustainable consumer choices. Theoretical insights from this framework suggest

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how EK may foster a positive consumer attitude toward sustainable shopping, ultimately contributing to more conscious purchase decisions. This study aims to guide future empirical work, inform policymakers and businesses on incorporating environmental awareness into digital advertising strategies, while also addressing gaps in understanding PA's cognitive and behavioural impact within emerging markets.

Keywords

Sustainability, programmatic advertising, online shopping, impulsive buying behaviour, environmental knowledge, sustainable online purchase decisions

Introduction

Technology has revolutionised marketing in the digital age, with the internet transforming e-commerce into the new marketplace (Hollensen, 2004). The widespread use of mobile devices has made online shopping more accessible (Joines et al., 2003), prompting marketers to adopt diverse digital strategies to engage increasingly online consumers (Kiran & Arumugam, 2020). Among these, the use of big data has propelled programmatic advertising (PA)—a method enabling highly targeted, automated ad placements that enhance consumer engagement (Bush, 2014). The Interactive Advertising Bureau (IAB, 2014) defines PA as 'a digital advertising method that involves automated buying and selling using algorithms, data, and software'. PA enables organisations to bid for personalised ads shown to specific audiences at the optimal time and place, streamlining campaigns and optimising budgets (Samuel et al., 2021). In the US, PA spending accounted for 65% of total digital ad expenditure in 2018, with expectations of reaching 84% by 2022 (Malthouse et al., 2019), highlighting its growing importance for businesses seeking to connect with consumers on the go.

Existing research has examined how PA can trigger impulsive buying behaviours (IBB) by targeting consumers in real time with persuasive content (Boerman et al., 2017; Dhandra, 2019; Turel et al., 2011). However, there remains a significant research gap regarding the intersection of PA and sustainable consumption behaviours, particularly in emerging economies such as India, where digital adoption is accelerating but sustainability considerations are still evolving. While the link between advertising and impulsivity has been explored, the role of psychological and cognitive factors—such as environmental knowledge (EK)—in moderating this relationship has received limited scholarly attention (Turel, 2019). Furthermore, the ethical and social dimensions of PA, including its potential to either reinforce hyper-consumption or encourage sustainable purchasing decisions (SUPD), are often overlooked in the literature (Deuze, 2016; Hu et al., 2019; Kadic-Maglajlic et al., 2019).

Most studies on sustainable consumption have focused on environmentally friendly behaviours related to specific products or packaging (Ha & Janda, 2017; Prakash & Pathak, 2017) but have not sufficiently examined the influence of digital

marketing tactics like PA on broader sustainable consumption choices, especially through cognitive-behavioural models. In particular, the moderating role of EK—which shapes individuals' attitudes, cognitive processes, and decision-making towards sustainable consumption—remains underexplored in the context of PA (Joshi & Rahman, 2019; Schmuck et al., 2018; Yadav & Pathak, 2016).

In response to these gaps, this study investigates how PA influences consumers' attitudes towards online shopping and sustainable purchases, with a specific focus on impulse buying as moderated by EK. By doing so, it seeks to reveal the psychological mechanisms underpinning SUPD, a dimension largely absent from current discussions.

This study presents several distinctive contributions to the literature:

1. It examines the impact of PA on online consumer behaviour within a developing country context (India)—where digital marketing is on the rise but its association with sustainable purchase decisions remains insufficiently explored (Majeed et al., 2022).
2. It introduces EK as a novel moderator in the relationship between PA and impulsive buying, an area rarely investigated in previous studies (Ashfaq et al., 2022; Yuen et al., 2022; Zha et al., 2022).
3. It offers practical insights for policymakers and businesses, demonstrating how digital advertising can potentially encourage sustainable purchasing behaviours rather than merely driving consumption.

The study is grounded in the Theory of Reasoned Action (TRA), which posits that individuals deliberate before acting (Ajzen & Fishbein, 1980), and the Theory of Planned Behaviour (TPB), which extends this by considering perceived behavioural control (PBC). Additionally, the Stimulus-Organism-Response (S-O-R) framework offers a valuable lens for understanding how external stimuli such as PA can shape internal psychological responses, ultimately influencing behaviour (Eroglu et al., 2001; Vonkeman et al., 2017; Zafar et al., 2020).

By applying these theories to the context of sustainable online purchasing, this research not only broadens the theoretical understanding of consumer behaviour in the digital era but also highlights actionable strategies for promoting eco-friendly consumption through digital marketing tools like PA.

Theoretical Background, Research Model and Hypotheses Development

Sustainable Online Shopping Decisions

Ongoing environmental degradation poses serious threats to sustainability, making sustainable purchasing behaviour a vital approach to addressing these challenges. As Cacho et al. (2020) explain, when consumers use sustainability as a guiding criterion to evaluate and select products online, they engage in what is known as a SUPD. This process involves conscious consideration of environmental impacts in online

shopping, leading to choices that align with green purchase intentions (Dhandra, 2019). Green purchase intention captures a consumer's inclination to choose eco-friendly products (Yadav & Pathak, 2016), while socially conscious purchasing reflects preferences for products that uphold labour rights and benefit society (Pepper et al., 2009). Prior research (Pagiaslis & Krontalis, 2014) has shown that positive environmental attitudes are linked to increased green buying behaviour.

Sustainable consumption is shaped by multiple psychological and social factors such as social norms, environmental concern, self-identity, consumer values, and social marketing (Dhandra, 2019; Grebitus et al., 2017; Kadic-Maglajlic et al., 2019; Yadav & Pathak, 2016). These factors foster green purchase intentions and conscientious consumer choices, which together define SUPD. However, while these drivers of sustainability have been studied, there is limited understanding of how contemporary digital marketing tools, particularly PA, interact with these behaviours—especially in emerging markets where online shopping is rapidly expanding but sustainability awareness and infrastructure are still developing.

This study focuses on the role of PA—a data-driven, automated advertising approach—in influencing consumer decisions, particularly by triggering IBB. Impulse buying refers to the sudden, spontaneous urge to purchase a product without prior planning (Beatty & Ferrell, 1998). Techniques such as personalised ads, parasocial interactions, celebrity endorsements, time-limited offers, and social proof create an environment that can heighten impulsivity (Chen et al., 2016; Zafar et al., 2020; Zhang et al., 2018). IBB, driven by emotional triggers, may conflict with the deliberation required for sustainable consumption decisions (Song et al., 2015).

While existing literature has explored sustainable consumption and impulse buying separately, there is a notable gap in understanding how PA shapes the intersection between these behaviours—a gap that is particularly pronounced in emerging markets, where digital transformation and sustainability adoption coexist but are unevenly integrated. This study adopts a novel perspective by examining how PA influences SUPD in such contexts, considering cognitive and emotional factors that may either support or undermine sustainable choices.

Overview of PA

PA is strategically designed to deliver personalised product and service information to users on social media by tailoring content according to their demographics and preferences (Dehghani & Tumer, 2015; Thompkins, 2019). This targeted approach seeks to address user needs with high precision, aiming to reduce information overload by focusing on relevancy (Chen & Hsieh, 2012; Deuze, 2016; Liang et al., 2006; Thompkins, 2019). The PA system integrates interactions among key stakeholders: adopters of PA, platform developers, and end consumers (White & Samuel, 2019). This coordination enables real-time ad delivery that aligns with consumers' interests at moments when they are most likely to engage with or purchase a product, effectively facilitating retailers' connection to potential customers at critical points in their purchasing journey (Palos-Sanchez et al., 2019; Yang et al., 2017).

As a data-driven marketing approach, PA emphasises a personalised experience, leveraging users' online behaviours and interests to present targeted ads that resonate more profoundly with them (McGuigan, 2019). This strategy is commonly employed by companies seeking to shape user behaviour on social media platforms like Facebook, Instagram, and YouTube, where interactive features help boost brand image, foster loyalty, and build brand equity (Dehghani & Tumer, 2015; Dehghani et al., 2018; Dix et al., 2012). Through the integration of interactivity and user attachment, PA becomes a catalyst for purchase behaviour of the consumer (Hollebeek et al., 2014). Significant levels of customisation and relevance in advertisements allow marketers to present product information that aligns closely with consumers' unique shopping needs, promoting an engaging and effective advertising experience (Komiak & Benbasat, 2006). Sundar et al. (2017) proposed that PA acts as an environmental trigger, prompting cognitive shortcuts regarding the content viewed, which in turn affects consumers' purchasing choices (Kim et al., 2014). This study applies the Stimulus-Organism-Response (S-O-R) model, positioning PA as a stimulus that has the potential to impact an organism, that is, IBB. Conceptualising IBB as the organism, this article posits that exposure to PA may systematically stimulate individuals' impulsive buying tendencies in the following hypothesised manner:

Thus, we hypothesise that:

H_1: PA significantly and positively influences IBB.

Attributes of PA

Personalisation

Ad personalisation customises marketing based on consumer data, making ads more relevant and appealing (Montgomery & Smith, 2009; Tran, 2017). Advances in technology allow precise tracking, enhancing the impact of personalised ads, especially in mobile contexts (Kim et al., 2014). Research suggests that once a consumer encounters ad personalisation, it positively stimulates consumers' attitudes toward online ads, making them buy more products impulsively without considering the effect on the environment. Therefore, when consumers perceive programmatic ads as personalised, it can increase their tendency for impulse purchases, as they feel the product or service is directly aligned with their preferences and current needs (Rana et al., 2022).

Thus, we hypothesise that:

H_{1a}: Ad personalisation significantly and positively influences IBB.

Relevance

Relevance in advertising refers to how closely content aligns with an individual's interests and needs, making it significant and engaging (Blom, 2000; Merriam-Webster, 2018). In PA, relevance is enhanced through personalisation, which uses

user data, like preferences, browsing history, and behaviour, to tailor ads for each viewer (Zhang et al., 2014). This customisation increases the likelihood of consumer engagement, as personalised ads feel more applicable and meaningful, creating a sense of self-relevance (Kreuter & Wray, 2003; Petty et al., 2009). When consumers perceive ads as personally relevant, they engage more deeply with the content, which can stimulate impulse buying by appealing directly to their current desires and needs (Celsi & Olson, 1988; Xia & Bechwati, 2008). Studies confirm that perceived ad relevance significantly influences consumer responses and increases the effectiveness of personalised advertising (Hayes et al., 2020; Kim & Huh, 2017; Liu-Thompkins, 2019; Tam & Ho, 2005). Therefore, relevance not only enhances user engagement but also plays a critical role in triggering unplanned purchasing behaviour.

Thus, we hypothesise that:

H_{1b}: Ad Relevance significantly and positively influences IBB.

Novelty

To break through traditional advertising clutter, online retailers increasingly use innovative strategies like location-based, personalised, and mobile social media advertising to capture consumer attention in dynamic and engaging ways (Ketelaar et al., 2017; Unni & Harmon, 2007; Wu, 2016; Xu et al., 2009). Central to these strategies is the perception of novelty and relevance in personalised ads, which enhances consumer engagement by making messages feel fresh and tailored, even if the product or brand is familiar (Carpenter et al., 1994; Kalyanaraman & Sundar, 2006). Novelty in personalisation identifies consumer needs in advance and presents relevant options, stimulating impulsive purchases by offering something new and unexpected (Sharma et al., 2010). As Hausman (2000) noted, novelty fuels hedonic desire, which in turn drives impulse buying. Thus, the combination of personalisation and novelty creates a powerful trigger for unplanned purchases by fulfilling latent desires through surprising and relevant content.

Thus, we hypothesise that:

H_{1c}: Ad Novelty significantly and positively influences IBB.

Impulsive Buying Behaviour

IBB is widely recognised as a spontaneous, pleasure-driven reaction to online stimuli, often triggered without prior planning or conscious intent (Beatty & Ferrell, 1998; Rook, 1987; Zhang et al., 2018). Rather than being a stable personality trait, IBB is shaped by situational and contextual cues such as personalised advertisements, social influences, and digital media exposure (Chen et al., 2016; Xiang et al., 2016; Zafar et al., 2019, 2020), making it a crucial factor in understanding online shopping behaviour.

This study conceptualises IBB within the S-O-R framework, where PA serves as the stimulus, IBB functions as the organism, representing the consumer's internal

cognitive and emotional state, and SUPDs constitute the response. Impulsive purchases are typically associated with affective, spontaneous reactions that bypass deliberate cognitive evaluation, which can conflict with rational, reflective processes such as environmental decision-making (Leong et al., 2017; Verplanken & Sato, 2011).

In this context, EK is not treated as an outcome of IBB—which would contradict established findings that impulsive behaviours often diminish reflective thinking (Baumeister, 2002; Dittmar et al., 1995)—but rather as a moderating variable that influences the relationship between impulse-driven reactions and SUPD. Consumers with higher levels of EK are more likely to regulate impulsive tendencies and make environmentally responsible choices, even when exposed to persuasive PA. Conversely, low EK may amplify the likelihood of impulsive, less sustainable consumption. Thus, EK plays a crucial role in shaping whether spontaneous online buying can be steered towards more sustainable outcomes (Eysenck, 1983; Leong et al., 2017; Sherman et al., 1997).

Thus, we hypothesise that:

H_2: IBB negatively influences attitude towards Adoption of Sustainable Online Shopping.

The Moderating Role of EK

EK plays a pivotal role in shaping individuals' environmental attitudes and behaviours, particularly in areas such as climate change, recycling, and sustainability (Scott & Ellis, 2014; Shahzad et al., 2019). Defined as individuals' awareness of environmental issues, their impacts, and the shared responsibilities for sustainable development (Fryxell & Lo, 2003), EK enables informed decision-making across diverse ecological concerns (Kaplan, 1991). Research has consistently shown that EK fosters eco-friendly behaviours, with Wang et al. (2014) confirming its significance in promoting sustainable actions. Climate-related knowledge, particularly among young graduates, has been linked to increased environmental responsibility (Whitmarsh & O'Neill, 2010). Furthermore, EK is a key determinant of consumer attitudes toward green products and purchasing decisions (Lu & Sinha, 2019; Matthes et al., 2014), as well as a driver of green consumption behaviour (Joshi & Rahman, 2019; Peattie & Belz, 2010). Ultimately, EK serves as a foundational factor influencing consumers' intentions and readiness to engage in eco-friendly purchasing practices (Yadav & Pathak, 2016).

Thus, we hypothesise that:

H_3: EK significantly affects attitude towards Adoption of Sustainable Online Shopping.

Individuals tend to avoid actions when they feel inadequately informed, and varying levels of ENVK can significantly shape sustainable consumption decisions (Haron et al., 2005; Joshi & Rahman, 2019; Kearney & Young, 1995; Matthes et al., 2014).

Limited ENVK often results in hesitation or inconsistency in eco-friendly behaviours like recycling (Schmuck et al., 2018). This study suggests that differing degrees of ENVK influence individuals' engagement with sustainable actions. While programmatic ads on shopping apps may trigger IBB, consumers with higher environmental awareness are more likely to consider the ecological impact before making a purchase. Thus, ENVK is proposed as a moderating factor that shapes the link between IBB induced by personalised advertising and attitudes toward adopting Sustainable Online Shopping.

Thus, we hypothesise that:

H_4: EK moderates the relationship between IBB and attitude towards the Adoption of Sustainable Online Shopping [Negative (positive) effect of IBB is weaker (stronger) for individuals with high (less) EK].

Consumer's Attitude Towards the Adoption of Sustainable Online Shopping

Consumer attitudes toward sustainable shopping are increasingly shaped by online forums and communities that share information on environmental impact, product reviews, and price comparisons (Ghouri et al., 2021; Nuseir, 2020). These platforms help consumers make informed decisions, especially in the absence of physical product interaction (Nam et al., 2020). Forums focused on environmental issues offer valuable insights into product use and eco-benefits, promoting quicker and more informed purchases (Lee et al., 2022). Online Environmental Platform Services (OEPS) further support sustainable buying by providing resources and guidance, raising awareness, and regulating impulsive buying triggered by programmatic ads, ultimately fostering more conscious and eco-friendly shopping behaviour (Gunawardena & Dhanapala, 2023).

Thus, we hypothesise that:

H_5: Consumers' attitude towards the Adoption of Sustainable Online Shopping significantly and positively affects Sustainable Online Shopping Purchase Decisions.

Theory of Reasoned Action

Past research has utilised either the TRA (Fishbein & Ajzen, 1975) or the TPB (Ajzen, 1991) to develop conceptual models for analysing consumers' green and sustainable behaviour (Garay et al., 2019; Han, 2020). Both theories have been widely used to explain various behavioural domains.

According to the TRA, attitude combined with social influences contributes to forming a behavioural intention, the immediate precursor of actual behaviour (Ajzen & Kruglanski, 2019; Fishbein & Ajzen, 2010; Meng et al., 2020). In this

theory, attitude is defined as a mix of beliefs about the behaviour, its possible consequences, and evaluations of those outcomes, judging them as either favourable or unfavourable. Meanwhile, subjective norms refer to perceived social support or opposition to a particular behaviour, shaped by normative beliefs (expectations of others) and the individual's motivation to comply (Moon, 2021). Initially, the TRA was applied in contexts such as health, social behaviour and consumer intentions. Over time, it evolved into the TPB with the addition of PBC, which addresses instances where external factors may hinder or enable the behaviour (Ajzen, 1991).

Theory of Planned Behaviour

Introduced by Icek Ajzen in 1985, the TPB enhances the understanding of how actual behaviours emerge from intentions, especially in situations where individuals may feel they lack complete control over outcomes. Central to TPB is the intention to act, influenced by three components: attitude, subjective norms, and PBC (Ajzen, 1991). This addition has positioned TPB as one of the most impactful frameworks for explaining and predicting human behaviour across various areas, including health, organisational behaviour, and consumer decision-making (Fishbein & Ajzen, 1975). PBC specifically addresses an individual's sense of capability in performing a behaviour, based on perceived control over internal or external factors. PBC recognises that people may intend to act but might feel constrained by certain barriers or limitations. Since its inception, TPB has been widely applied across fields to study behaviours related to environmental protection, exercise commitment, and purchasing decisions, proving its adaptability and effectiveness across cultural settings (Ajzen, 1991).

Stimulus-Organism-Response

The research is primarily structured around the S-O-R framework (Mehrabian & Russell, 1974). The stimuli include external environmental factors, such as advertising, social interactions, and peer recommendations (Xiang et al., 2016; Zhang et al., 2018). These stimuli evoke cognitive and affective reactions within the organism, representing the 'mental processes that take place in an individual's mind upon interacting with the stimulus' (Eroglu et al., 2001). These reactions can be perceptual, emotional, impulsive, goal-oriented, or utilitarian (Vonkeman et al., 2017; Zafar et al., 2020). The response refers to the individual's final action or choice, influenced by internal cognitive and emotional processes (Sherman et al., 1997).

Within the S-O-R model, EK functions as an internal aspect of the organism (O). Consumers with higher EK are better equipped to interpret the stimuli presented through PA (Tanner & Kast, 2003). They can identify genuinely sustainable products and understand the broader environmental impact of their purchases. This knowledge shapes their attitudes toward sustainable shopping and aids them

in managing impulsive buying more effectively. For example, when presented with a persuasive advertisement, environmentally knowledgeable consumers may critically assess the ad's claims, enabling them to make more informed purchasing choices that align with their sustainability values (Paul & Rana, 2012).

Our research model integrates the TPB, the TRA and the S-O-R framework developed by Mehrabian and Russell (1974). The framework proposed that PA attributes, IBB and EK influence attitude and perceived behaviour control. The attributes of PA, IBB and EK can influence attitudes and can play a significant role in controlling the behaviours of customers by offering them knowledge about the environment, availability, persuasion, information about the process, and so forth. Knowledge and persuasion are essential sources of shaping consumers' attitudes (Zeynalova & Namazova, 2022). According to Choi and Lee (2020) and Zeynalova and Namazova (2022), green strategies can be utilised to protect the physical environment, including air, water, and soil. By instilling green attitudes and behaviours among energy consumers, the environment can be further nurtured.

Within this model, external stimuli like PA and EK serve as triggers that influence consumers' cognitive and emotional responses—the 'organism' phase of the S-O-R model. Here, PAD functions as a stimulus that encourages impulsive buying tendencies, which are further moderated by EK, influencing the consumer's internal cognitive and emotional processing. These internal responses then shape the ultimate 'response', where individuals make SUPD based on their attitudes and perceived control over behaviour (Sherman et al., 1997). Green strategies, as indicated by previous research, can effectively protect critical environmental resources such as air, water, and soil (Choi & Lee, 2020; Zeynalova & Namazova, 2022), suggesting that fostering green attitudes and behaviours among consumers contributes to broader environmental preservation efforts. This study thus formulates hypotheses grounded in existing literature to explore these relationships and their impact on sustainable consumer choices.

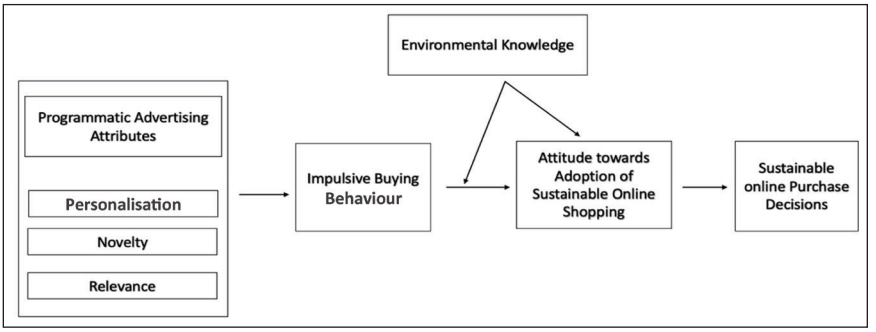
Conceptual Framework

This study presents a conceptual framework based on an extensive literature review of factors influencing SUPDs. A research model is developed to examine how attributes of programmatic advertising (PAD) drive impulsive buying, moderated by different levels of EK, which ultimately fosters an attitude towards Sustainable Online Shopping and leads to SUPDs.

Using the TRA, the TPB, and Mehrabian and Russell's (1974) S-O-R framework, the model illustrates how external stimuli, like PAD, engage with consumers' cognitive and emotional states (the 'organism' phase) to influence their eventual behavioural responses. PA serves as a stimulus that triggers IBB, while EK acts as a moderating factor, channelling these impulses into a more sustainable mindset.

This approach links PA (independent variable), IBB, attitude towards Sustainable Online Shopping, and SUPDs (dependent variables), with EK as a moderating variable.

Proposed Conceptual Model



Source: Proposed by the researchers.

Proposed Hypotheses

The above model led to the formulation of the following hypotheses:

H_1: PA significantly and positively influences IBB.
H_{1a}: Ad personalisation significantly and positively influences IBB.
H_{1b}: Ad Relevance significantly and positively influences IBB.
H_{1c}: Ad Novelty significantly and positively influences IBB.
H_2: IBB negatively influences attitude towards Adoption of Sustainable Online Shopping.
H_3: EK significantly affects attitude toward Adoption of Sustainable Online Shopping.
H_4: EK moderates the relationship between IBB and attitude towards Adoption of Sustainable Online Shopping.
H_5: Consumers' attitude towards the Adoption of Sustainable Online Shopping significantly and positively affects Sustainable Online Shopping Purchase Decisions.

Research Methodology

This study adopts a blend of exploratory and descriptive research designs, incorporating an extensive literature review and secondary data collection from diverse sources, including online platforms, academic articles, and prior research studies. The secondary data, specifically focused on SUPDs, was gathered from theses, research papers, and institutional articles published over the past several years. The primary objective is to develop a theoretical conceptual framework that explains how PA influences consumer behaviour, particularly by triggering impulsive buying tendencies, and how EK moderates this relationship.

The exploratory aspect of the research is used to investigate and expand upon existing theories and concepts surrounding sustainable consumer behaviour, particularly in the context of digital advertising. It allows the study to explore emerging constructs,

such as the role of personalisation, novelty, and relevance in advertising, and their psychological impact on consumers. Meanwhile, the descriptive component provides a structured examination of the collected data, summarising insights from the literature to support the conceptual model. This structured synthesis supports the formulation of the proposed conceptual model, clarifying the pathways through which impulsive buying can either hinder or support sustainable online purchasing, depending on the level of consumer environmental awareness. By integrating insights from multiple theoretical perspectives—such as the S-O-R framework, the TPB, and literature on impulse buying and sustainability—the study offers a comprehensive understanding of how advertising-driven impulses can be redirected towards eco-friendly consumption, provided there is adequate EK.

This dual approach enriches the theoretical foundation of sustainable online purchasing by integrating insights from multiple theoretical frameworks, ultimately aiming to capture the complex interactions that shape consumers' sustainable purchasing behaviour in online settings.

Expected Findings and Discussions

The dynamic interplay between IBB and SUPD is especially complex in the context of personalised and real-time PA. On one hand, PA stimulates impulsive purchases by appealing to consumers' immediate desires; on the other hand, it risks undermining long-term sustainability goals. The inclusion of EK as a moderating factor adds depth to this analysis by introducing a cognitive filter that influences how consumers interpret and act upon programmatic stimuli. Consumers with higher levels of EK are more capable of critically assessing the sustainability implications of their purchases—even in the presence of persuasive, impulse-inducing ads. This heightened cognitive awareness acts as a protective mechanism, guiding consumers toward more responsible consumption. As previous studies suggest (Dhandra, 2019; Yadav & Pathak, 2016), sustainable purchase intentions are shaped by a combination of emotional triggers and cognitive reasoning, underscoring the need for informed decision-making in the digital marketplace. Incorporating EK into PA design could help marketers strike a balance between engagement and ethical responsibility. This study draws on three foundational theories to deepen its conceptual insights: the TRA, the TPB, and the S-O-R model. TRA emphasises the influence of consumer attitudes and subjective norms on behavioural intentions, making it relevant for understanding how PA shapes attitudes toward sustainable consumption. TPB expands on this by introducing PBC, which reflects consumers' confidence in their ability to make sustainable choices—especially when informed by EK. The S-O-R framework frames PA as the external stimulus, the consumer as the organism, and their behaviour—whether impulsive or sustainable—as the response. Here, EK serves as a key moderating factor, influencing how consumers cognitively process advertising stimuli. When environmental awareness is high, cognitive evaluations align more with green purchase intentions, thereby reducing the likelihood of impulsive consumption. By integrating these theoretical perspectives, the article finds that PA can either reinforce or undermine sustainability goals

based on its design and perceived message. When crafted thoughtfully, PA can include cues that encourage mindful consumption—such as emphasising eco-friendly product features or tapping into social norms that favour green behaviours (TRA). Moreover, it can enhance PBC (TPB) by offering transparent, accessible information about sustainable alternatives. This approach not only aligns consumer behaviour with sustainability objectives but also supports more ethical digital marketing practices.

Implications

Implications for Stakeholders

First, the framework developed here shows that PA serves as a stimulus that can lead to IBB, while EK modulates how consumers process and react to these influences. These internal cognitive and emotional responses significantly determine whether individuals adopt sustainable purchasing behaviours or not. Several studies have sought to identify sustainable consumption behaviours, such as using energy-efficient products (Ha & Janda, 2017) and environmentally friendly packaging (Prakash & Pathak, 2017). The influence of psychological factors on sustainable online purchasing decisions is still not well understood, nor is the effect of PA on sustainable consumption (Turel, 2019). This study is distinguishable from them in terms of the identification of PA's attributes significantly influencing consumer attitudes and behaviours, creating IBB, particularly in an environment marked by rapid digital growth and evolving consumer expectations. It not only drives impulsive buying but also shapes attitudes toward sustainability when moderated by EK. This moderating role of EK proves crucial, as it informs consumers' cognitive processing and fosters more environmentally responsible decision-making. This insight emphasises the importance of educational and informational efforts that enhance consumer awareness.

Second, this framework demonstrated actionable strategies for companies to adopt by integrating environmental messaging into PA, guiding them on how to influence consumer behaviour toward more sustainable choices. By embedding eco-conscious cues in targeted advertisements, companies can subtly but effectively encourage consumers to prioritise environmentally responsible products. This strategy not only capitalises on consumers' growing awareness and preference for sustainable products but also positions the brand as a proactive player in environmental stewardship. Moreover, the framework suggests that companies go beyond advertising by actively investing in the development and promotion of green products that satisfy both consumer demands and ecological considerations. This dual focus ensures that products not only meet consumer expectations for quality and utility but also align with environmental values, fostering a deeper and loyal customer base that appreciates the company's dedication to sustainability. This shift not only supports broader environmental conservation efforts but also aligns with national sustainability objectives, contributing to pollution reduction and progress toward a more sustainable economy.

Third, this framework provides insights into how EK can generate benefits across consumer, societal, and corporate levels—an emerging area of interest in business research. This study is among the first to explore how EK can mediate the relationship between IBB and consumer attitudes toward Sustainable Online Shopping. By promoting sustainable product choices, EK fosters consumer benefits; it contributes to environmental conservation as a social benefit and encourages the adoption of eco-friendly advertising strategies as a corporate benefit. Overall, this study underscores the dual capacity of PA to drive impulsive consumption while also serving as a catalyst for sustainable decision-making when aligned with informative, environmentally oriented strategies. These insights offer a strategic pathway for leveraging digital marketing in ways that encourage sustainable consumer behaviour, carrying substantial implications for marketing tactics and environmental policy development.

Implications for Research

This research offers a significant theoretical contribution by validating and expanding the TPB, TRA, and S-O-R frameworks in the context of environmental behaviour and digital marketing. By integrating TPB, TRA, and the S-O-R framework, the study offers a holistic perspective on how external stimuli—such as programmatic advertising—impact consumer cognition and emotions, ultimately leading to SUPD. These insights address a critical gap in the literature by demonstrating the relevance of TPB, TRA, and S-O-R frameworks in analysing sustainable consumption behaviours influenced by PA. Furthermore, the findings support existing research, underscoring that environmentally oriented strategies play an essential role in protecting crucial resources like air, water, and soil (Choi & Lee, 2020; Zeynalova & Namazova, 2022). This reinforces the importance of encouraging eco-friendly attitudes and behaviours as a pathway to fostering consumer choices that benefit environmental sustainability.

Limitations and Future Research Directions

This research is conceptual in nature and does not include empirical validation through primary data collection, which may limit the generalizability of the findings. Future studies could strengthen the conclusions by employing quantitative or qualitative research methods to test the proposed relationships. Cross-cultural comparisons and platform-specific analyses (e.g., social media vs. e-commerce) can offer insights into contextual influences on PA's impact. Additionally,

Second, the study focuses primarily on psychological and emotional factors influencing sustainable consumption but does not fully account for contextual variables such as cultural differences, economic constraints, and regulatory frameworks that often shape consumer behaviour in emerging markets. Moreover, integrating psychological constructs such as digital fatigue, privacy concerns, and eco-guilt may deepen understanding of consumer responses. Future work can investigate green AI and ethical ad technologies to align PA strategies with environmental sustainability goals.

Lastly, the rapid evolution of digital advertising technologies, including PA, means that consumer responses may change over time. The findings and theoretical implications presented here should be revisited periodically to ensure continued relevance in the face of technological advancements and shifting consumer values.

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References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. Prentice-Hall.

Ajzen, I., & Kruglanski, A. W. (2019). Reasoned action in the service of goal pursuit. *Psychological Review, 126*(5), 774–786. https://doi.org/10.1037/rev0000155

Ashfaq, M., Tandon, A., Zhang, Q., Jabeen, F., & Dhir, A. (2022). Doing good for society! How purchasing green technology stimulates consumers toward green behaviour: A structural equation modelling–artificial neural network approach. *Business Strategy and the Environment*, *32*(4), 1274–1291. https://doi.org/10.1002/bse.3188

Baumeister, R. F. (2002). Yielding to temptation: Self-control failure, impulsive purchasing, and consumer behavior. *Journal of Consumer Research, 28*(4), 670–676.

Beatty, S. E., & Ferrell, M. E. (1998). Impulse buying: Modeling its precursors. *Journal of Retailing*, *74*(2), 169–191. https://doi.org/10.1016/s0022-4359(99)80092-x

Blom, J. (2000). Personalization: A taxonomy. Paper presented at CHI'00 Extended Abstracts on Human Factors in Computing Systems, Seattle. https://dl.acm.org/doi/abs/10.1145/633292.633483

Boerman, S., Kruikemeier, S., & Borgesius, F. (2017). Online behavioral advertising: A literature review and research agenda. *Journal of Advertising*, *46*(3), 363–376. https://doi.org/10.1080/00913367.2017.1339368

Bush, O. (2014). *Programmatic advertising: The successful transformation to automated, data-driven marketing in real-time* (Business & Management). Springer.

Cacho, O. J., Moss, J., Thornton, P. K., Herrero, M., Henderson, B., Bodirsky, B. L., Humpenöder, F., Popp, A., & Lipper, L. (2020). The value of climate-resilient seeds for smallholder adaptation in sub-Saharan Africa. *Climatic Change*, *162*, 1213–1229.

Carpenter, G. S., Glazer, R., & Nakamoto, K. (1994). Meaningful brands from meaningless differentiation: The dependence on irrelevant attributes. *Journal of Marketing Research*, *31*(3), 339–350.

Celsi, R. L., & Olson, J. C. (1988). The role of involvement in attention and comprehension processes. *Journal of Consumer Research*, *15*(2), 210–224.

Chen, J. V., Su, B. C., & Widjaja, A. E. (2016). Facebook C2C social commerce: A study of online impulse buying. *Decision Support Systems*, *83*, 57–69.

Chen, P. T., & Hsieh, H. P. (2012). Personalized mobile advertising: Its key attributes, trends, and social impact. *Technological Forecasting and Social Change*, *79*, 543–557. https://doi.org/10.1016/j.techfore.2011.08.011

Choi, S., & Lee, S. (2020). Eco-packaging and its market performance: UPC-level sales, brand spillover effects, and curvilinearity. *Sustainability*, *12*(21), 9061–9065.

Dehghani, M., Niaki, M. K., Ramezani, I., & Sali, R. (2018). Evaluating the influence of YouTube advertising for attraction of young customers. *Computers in Human Behavior, 59*, 165–172. https://doi.org/10.1016/j.chb.2016.01.037

Dehghani, M., & Tumer, M. (2015). Research on the effectiveness of Facebook advertising in enhancing the purchase intention of consumers. *Computers in Human Behavior*, *49*, 597–600. https://doi.org/10.1016/j.chb.2015.03.051

Deuze, M. (2016). Living in media and the future of advertising. *Journal of Advertising*, *45*, 326–333. https://doi.org/10.1080/00913367.2016.1185983

Dhandra, T. K. (2019). Achieving triple dividend through mindfulness: More sustainable consumption, less unsustainable consumption and more life satisfaction. *Ecological Economics*, *161*, 83–90.

Eroglu, S. A., Machleit, K. A., & Davis, L. M. (2001). Atmospheric qualities of online retailing: A conceptual model and implications. *Journal of Business Research*, *54*, 177–184. https://doi.org/10.1016/S0148-2963(99)00087-9

Fryxell, G., & Lo, C. (2003). The influence of environmental knowledge and values on managerial behaviours on behalf of the environment: An empirical examination of managers in China. *Journal of Business Ethics*, *46*. https://doi.org/10.1023/A:1024773012398

Grebitus, C., Printezis, I., & Printezis, A. (2017). Relationship between consumer behavior and success of urban agriculture. *Ecological Economics*, *136*, 189–200. https://doi.org/10.1016/j.ecolecon.2017.02.010

Ha, H. Y., & Janda, S. (2017). Predicting consumer intentions to purchase energy-efficient products. In C. L. Campbell (Ed.), *The Customer is NOT Always Right? Marketing Orientations in a Dynamic Business World* (Developments in Marketing Science). Springer, Cham. https://doi.org/10.1108/07363761211274974

Hausman, A. J. (2000). A multi-method investigation of consumer motivations in impulse buying behavior. *Journal of Consumer Marketing*, *17*(5), 403–426.

Hayes, J. L., Golan, G., Britt, B., & Applequist, J. (2020). How advertising relevance and consumer–brand relationship strength limit disclosure effects of native ads on Twitter. *International Journal of Advertising*, *39*(1), 131–165. https://doi.org/10.1080/02650487.2019.1596446

Hollensen, S. (2004). *Global marketing: A decision-oriented approach*. Prentice Hall.

Joines, J. L., Scherer, C. W., & Scheufele, D. A. (2003). Exploring motivations for consumer Web use and their implications for e-commerce. *Journal of Consumer Marketing*, *20*(2), 90–108. https://doi.org/10.1108/07363760310464578

Joshi, Y., & Rahman, Z. (2019). Consumers' sustainable purchase behaviour: Modeling the impact of psychological factors. *Ecological Economics*, *159*, 235–243.

Kadic-Maglajlic, S., Arslanagic-Kalajdzic, M., Micevski, M., Dlacic, J., & Zabkar, V. (2019). Being engaged is a good thing: Understanding sustainable consumption behavior among young adults. *Journal of Business Research*, *104*, 644–654. https://doi.org/10.1016/j.jbusres.2019.02.040

Kalyanaraman, S., & Sundar, S. S. (2006). The psychological appeal of personalized content in web portals: Does customization affect attitudes and behavior? *Journal of Communication*, *56*(1), 110–132.

Ketelaar, P. E., Bernritter, S. F., van't Riet, J., Hühn, A. E., van Woudenberg, T. J., Müller, B. C., & Janssen, L. J. (2017). Disentangling location-based advertising: The effects of location congruency and medium type on consumers' ad attention and brand choice. *International Journal of Advertising*, *36*(2), 356–367.

Kim, H., & Huh, J. (2017). Perceived relevance and privacy concern regarding online behavioral advertising (OBA) and their role in consumer responses. *Journal of Current Issues and Research in Advertising*, *38*(1), 92–105. https://doi.org/10.1080/10641734.2016.1233157

Kim, J., Yoo, J., & Han. (2014). Why smartphone advertising attracts customers: A model of Web advertising, flow, and personalization. *Computers in Human Behavior*, *33*, 256–269.

Kiran, K. U., & Arumugam, T. (2020, December). Role of programmatic advertising on effective digital promotion strategy: A conceptual framework. *Journal of Physics: Conference Series*, *1716*(1), 012032. IOP Publishing.

Kreuter, M. W., & Wray, R. J. (2003). Tailored and targeted health communication: Strategies for enhancing information relevance. *Journal of Health Behavior*, *27*(1), 227–232.

Lee, P. T. Y., Feiyu, E., & Chau, M. (2022). Defining online to offline (O2O): A systematic approach to defining an emerging business model. *Internet Research, 32*(5), 1453–1495. https://doi.org/10.1108/INTR-10-2020-0563

Liu-Thompkins, Y. (2019). A decade of online advertising research: What we learned and what we need to know. *Journal of Advertising*, *48*(1), 1–13. https://doi.org/10.1080/00913367.2018.1556138

Majeed, M. U., Aslam, S., Murtaza, S. A., Attila, S., & Molnár, E. (2022). Green marketing approaches and their impact on green purchase intentions: Mediating role of green brand image and consumer beliefs towards the environment. *Sustainability*, *14*(18), 11703. https://doi.org/10.3390/su141811703

Malthouse, E. C., Hessary, Y. K., Vakeel, K. A., Burke, R., & Fudurić, M. (2019). An algorithm for allocating sponsored recommendations and content: Unifying programmatic advertising and recommender systems. *Journal of Advertising*, *48*(4), 366–379, https://doi.org/10.1080/00913367

McGuigan, L. (2019). Automating the audience commodity: The unacknowledged ancestry of programmatic advertising. *New Media & Society*, *21*(11/12), 2366–2385. https://doi.org/10.1177/1461444819846449

Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*. MIT Press.

Merriam-Webster. (2018). Definition of relevance. Retrieved, 17 September 2019, from https://www.merriam-webster.com/dictionary/relevance

Montgomery, A. L., & Smith, M. D. (2009). Prospects for personalization on the Internet. *Journal of Interactive Marketing*, *23*(2), 130–137.

Pagiaslis, A., & Krontalis, A. K. (2014). Green consumption behavior antecedents: Environmental concern, knowledge, and beliefs. *Psychology & Marketing*, *31*, 335–348. https://doi.org/10.1002/mar.20698

Palos-Sánchez, P., Saura, J. R., & Martín-Velicia, F. (2019). A study of the effects of programmatic advertising on users' concerns about privacy over time. *Journal of Business Research*, *96*, 61–72. https://doi.org/10.1016/j.jbusres.2018.10.059

Petty, R. E., Barden, J., & Wheeler, S. C. (2009). The elaboration likelihood model of persuasion: Developing health promotions for sustained behavioral change. *Emerging Theories in Health Promotion Practice and Research, 2*, 185–214.

Rana, A., Bhat, A. K., & Rani, L. (2022). E-marketing mix variables to create online brand equity in the Indian context. *International Journal of E-Business Research (IJEBR)*, *18*(1), 1–25.

Samuel, A., White, G. R., Thomas, R., & Jones, P. (2021). Programmatic advertising: An exegesis of consumer concerns. *Computers in Human Behavior*, *116*, 106657. https://doi.org/10.1016/j.chb.2020. 106657

Schmuck, D., Matthes, J., & Naderer, B. (2018). Misleading consumers with green advertising? An affect–reason–involvement account of greenwashing effects in environmental advertising. *Journal of Advertising*, *47*, 127–145. https://doi.org/10.1080/00913367.2018.1452652

Scott, L., & Ellis, D. (2014). Consumer understanding, perceptions and behaviours with regard to environmentally friendly packaging in a developing nation. *International Journal of Consumer Studies*, *38*. https://doi.org/10.1111/ijcs.12136

Sharma, P., Sivakumaran, B., & Marshall, R. J. (2010). Impulse buying and variety seeking: A trait-correlates perspective. *Journal of Business Research*, *63*(3), 276–283.

Sherman, E., Mathur, A., & Smith, R. B. (1997). Store environment and consumer purchase behavior: Mediating role of consumer emotions. *Psychology & Marketing*, *14*, 361–378. https://doi.org/10.1002/(SICI)1520-6793(199707)14:4<361::AID-MAR4>3.0.CO;2-7

Song, H. G., Chung, N., & Koo, C. (2015). Impulsive buying behavior of restaurant products in social commerce: The role of serendipity and scarcity message.

Tam, K. Y., & Ho, S. Y. (2005). Web personalization as a persuasion strategy: An elaboration likelihood model perspective. *Information Systems Research*, *16*(3), 271–291.

Tran, T. P. (2017). Personalized ads on Facebook: An effective marketing tool for online marketers. *Journal of Retailing and Consumer Services*, *39*, 230–242.

Turel, O. (2019). Potential "dark sides" of leisure technology use in youth. *Communications of the ACM*, *62*, 24–27. https://doi.org/10.1145/3306615

Turel, O., Serenko, A., & Giles, P. (2011). Integrating technology addiction and use: An empirical investigation of online auction users. *MIS Quarterly*, *35*, 1043–1061. https://doi.org/10.17705/1atrr.00002

Unni, R., & Harmon, R. (2007). Perceived effectiveness of push vs. pull mobile location based advertising. *Journal of Interactive Advertising*, *7*(2), 28–40.

Vonkeman, C., Verhagen, T., & van Dolen, W. (2017). Role of local presence in online impulse buying. *Information & Management*, *54*, 1038–1048.

Wang, Z., Zhang, D., & Lei, L. (2014). Gender differences in problematic internet use and psychological well-being among Chinese adolescents. *Computers in Human Behavior, 29*(5), 1870–1876. https://doi.org/10.1016/j.chb.2013.05.017

Whitmarsh, L., & O'Neill, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology*, *30*(3), 305–314. https://doi.org/10.1016/j.jenvp.2010.01.003

Wu, L. (2016). Understanding the impact of media engagement on the perceived value and acceptance of advertising within mobile social networks. *Journal of Interactive Advertising*, *16*(1), 59–73.

Xia, L., & Bechwati, N. N. (2008). Word of mouth: The role of cognitive personalization in online consumer reviews. *Journal of Interactive Advertising*, *9*(1), 3–13.

Xiang, L., Zheng, X., Lee, M., & Zhao, D. (2016). Exploring consumers' impulse buying behavior on social commerce platforms: The role of parasocial interaction. *International Journal of Information Management*, *36*, 333–347.

Xu, H., Oh, L.-B., & Teo, H.-H. (2009). Perceived effectiveness of text vs. multimedia location-based advertising messaging. *International Journal of Mobile Communications*, *7*(2), 154–177.

Yadav, R., & Pathak, G. S. (2016). Young consumers' intention towards buying green products in a developing nation: Extending the theory of planned behavior. *Journal of Cleaner Production*, *135*, 732–739. https://doi.org/10.1016/j.jclepro.2016.06.120

Yuen, K. F., Ng, W. H., & Wang, X. (2022). Switching intention in the online crowdsourced delivery environment: The influence of a platform's technological characteristics and relational bonding strategies. *Technology in Society*, *72*, 102167. https://doi.org/10.1016/j.techsoc.2022.102167

Zafar, A. U., Qiu, J., & Shahzad, M. (2020). Do digital celebrities' relationships and social climate matter? Impulse buying in f-commerce. *Internet Research*, *30*, 1066–2243.

Zafar, A.U., Qiu, J., Li, Y., Wang, J., & Shahzad, M. (2019). The impact of social media celebrities' posts and contextual interactions on impulse buying in social commerce. *Computers in Human Behavior*, 115, 106178.

Zeynalova, Z., & Namazova, N. (2022). Revealing consumer behavior toward green consumption. *Sustainability*, *14*(10), 5806. https://doi.org/10. 3390/su14105806

Zha, Y., Li, Q., Huang, T., & Yu, Y. (2022). Strategic information sharing of online platforms as resellers or marketplaces. *Marketing Science*, *42*(4), 659–678. https://doi.org/10.1287/mksc.2022.1397

Zhang, K. Z. K., Xu, H., Zhao, S., & Yu, Y. (2018). Online reviews and impulse buying behaviour: The role of browsing and impulsiveness. *Internet Research*, *28*, 522–543.

Zhang, W., Yuan, S., & Wang, J. (2014). *Optimal real-time bidding for display advertising* [paper presentation]. The 20th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, New York, NY.