



BEYOND GREEN PERSUASION: HOW AI GREEN NUDGES FOSTER CIRCULAR CONSUMPTION THROUGH CONSUMER MORAL ELEVATION UNDER THE BOUNDARY CONDITION OF PSYCHOLOGICAL REACTANCE

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Abstract

Artificial intelligence (AI) is increasingly being used to influence consumers toward sustainable choices, yet limited research explains the psychological mechanisms through which AI-enabled green nudges encourage circular consumption behaviour. Drawing on nudge theory, moral emotion perspectives, and psychological reactance theory, this study examines the effect of AI Green Nudges (AIGN) on Circular Consumption Behaviour (CC), the mediating role of Consumer Moral Elevation (CME), and the moderating role of Psychological Reactance (PR) in the direct AIGN–CC relationship. Data were collected from 400 consumers in Pakistan and analysed using Hayes' PROCESS Model 5. The findings demonstrate that AI Green Nudges significantly enhance Consumer Moral Elevation ($\beta = 0.4014$, $p < .001$), while Consumer Moral Elevation positively influences Circular Consumption Behaviour ($\beta = 0.4496$, $p < .001$). AI Green Nudges also exert a significant positive direct effect on Circular Consumption Behaviour ($\beta = 0.3815$, $p = .0026$). Furthermore, Consumer Moral Elevation significantly mediates the relationship between AI Green Nudges and Circular Consumption Behaviour, with a positive indirect effect ($\beta = 0.1805$, 95% CI [0.1287, 0.2376]). Psychological Reactance significantly moderates the direct relationship between AI Green Nudges and Circular Consumption Behaviour ($\beta = -0.0877$, $p = .0217$), indicating that the positive influence of AI green nudges weakens as psychological reactance increases and becomes nonsignificant at high levels of reactance. The study contributes to sustainability and AI marketing research by identifying a moral-emotional mechanism and psychological boundary condition underlying AI-enabled green nudging. The findings also provide practical guidance for designing AI sustainability interventions that encourage circular consumption while preserving consumer autonomy.

Keywords: AI Green Nudges; Circular Consumption Behaviour; Consumer Moral Elevation; Psychological Reactance; Sustainable Consumption; Artificial Intelligence

1. Introduction

The application of artificial intelligence (AI) to drive consumer decision-making is enabling companies to communicate with consumers through personal, adaptive, and contextually relevant interventions across the entire digital consumption journey (Akbar et al., 2025; Bergram et al., 2022). Artificial intelligence (AI) is no longer a tool in the back office to analyze and understand consumer



Behaviour; it has become a part of everyday choice for consumers, and one of its most rapidly expanding uses is the creation of “nudges” that influence consumers towards more sustainable Behaviours (Khattak & Khattak, 2026; Jain & Kumar, 2024). AI nudges can be more responsive to context, tailor information and timing, and adjust to the specific consumer's shopping, buying, and throwing habits in real time, as opposed to static prompts or generic reminders (Hettler et al., 2025; Zeb et al., 2016). The personalization, connectivity, and dynamism of choice architectures on digital platforms are key aspects of choice architecture, as is the ability to leverage real-time consumer data to adapt the architecture in real time (Ma et al., 2023; Sadeghian & Otarkhani, 2024). According to Berger et al. (2022), digital nudges have the potential to influence consumers' decision-making through various mechanisms, such as defaults, social norms, information, and personalization. Moreover, AI-driven digital nudges on sustainable consumer intentions and actions include personalisation, nudge timing, message framing, perceived usefulness, and environmental concern (Khalufi, 2025). Furthermore, AI nudging has become an emerging Behavioural solution that can influence consumer Behaviour to consume in a more environmentally desirable way, without formally limiting consumer freedom of choice (Mertens et al., 2022).

Climate, waste, and resource scarcity pressures are increasing. As such, this AI-driven component of behavioural design is becoming a growing focus for marketers and policymakers seeking to understand better the gap between intent and action (Manzoor et al., 2024; Fielding & Hornsey, 2026). This transition is particularly significant in the field of circular consumption, where consumers are not only encouraged to purchase “green” products, but to progressively cut, reuse, repair and recycle items over their whole life cycle (Neelam Akbar et al., 2021; Shams et al., 2025). The existing literature focuses on the initial purchase process, with little attention given to the reuse and recycling phases, as well as the re-use and re-entry into the cycle phases (Vidal-Ayuso et al., 2023). Thus, the relevance of sustainability interventions that rely on AI becomes even greater amid the shift from a linear consumption model to a circular economy, in which consumers should be able to keep products and materials in productive use for as long as possible (Akter et al., 2022). Circular consumption refers to actions that reduce resource consumption, including reuse, repair, recycling, upcycling, resale, and other measures that extend the lifespan of products or materials (N Akbar et al., 2021; Vidal-Ayuso et al., 2023). Consumers are therefore not just passive players, but active ones who can make choices that will either keep materials in the circular economy or remove them from it. Despite this, the consumer side of the circular economy is less advanced, particularly regarding the psychological factors that influence consumer behaviour after the initial purchase decision (Shams et al., 2025; Vidal-Ayuso et al., 2023). While the stages before purchase have been extensively studied in the field of circular economy, the post-purchase phases (e.g., product usage, recycling, and upcycling) are still relatively under-researched (Shevchenko et al., 2023). This gap is relevant because circular consumption demands continued behavioural engagement throughout the product lifecycle, rather than just a sustainable consumption decision at the time of purchase. Thus, the study of how current digital tools can facilitate the regular development of circular practices with consumers is an important research priority.

Sustainability research has consistently shown a ubiquitous attitude–intention–behaviour gap: consumers' positive attitudes toward sustainability do not always translate into sustainable behaviour (Akbar, Takreem, et al., 2023; ElHaffar et al., 2020). A pre-registered randomized experiment on sustainable food choice, however, showed that a nudge might paradoxically backfire on compliance due to short-term psychological reactance to the pressure exerted by the nudge (Banerjee et al., 2023). Altogether, these results point to a practical issue in the field of AI-powered sustainability marketing: Since AI systems can tailor nudges with an unprecedented, individualized precision, they can also tailor the very nudges that may cause resistance, and there are questions about the circumstances under which AI green nudges promote or hinder circular consumption (Banerjee et al., 2023; Sadeghian & Otarkhani, 2024). The nudge theory of Thaler et al. (2009) offers a well-established account of how subtle changes to choice architecture can shift Behaviour without restricting options. Moreover, a systematic review lists which nudges are more or less effective, depending on their levers, framings, and delivery methods (Akbar, Mordhah, et al., 2023; Carrel et al., 2023). Additionally, largely separate streams of moral feelings in marketing have been studied as warm, uplifting



emotions that people experience when they witness or are asked to perform moral action, which has been linked to higher levels of prosocial engagement and to relate consumer reactions to actions of brands that communicate a sense of ethical or social virtue (Ahmad et al., 2024; Wannow et al., 2024). Thus, threats to freedom of choice can reduce or reverse the impact of persuasive and nudging messages, such as in sustainability interventions (Banerjee et al., 2023). However, existing research has largely examined these streams independently, leaving their potential interplay insufficiently understood within a unified framework. The literature review on Green Nudges indicates a clear need to enhance understanding of the psychological processes that lead to a lasting effect of a nudge on pro-environmental behaviours, as well as the conditions under which nudges do not work (Carrel et al., 2023).

Empirical studies of AI-driven and digital nudging also highlight that the focus has been on observing the immediate impact of nudging on short-term decisions. In contrast, the affective and dispositional processes that may follow algorithmic nudging and that can be undermined are rarely investigated (Bergram et al., 2022). Despite growing scholarly interest in AI-enabled sustainable consumption, there is a need to integrate these relationships within a single empirical model that examines how AI, particularly in consumer moral elevation and psychological reactance, works together in a circular consumption model. The nudge theory provides limited insights into the consumer's affective journey, from being drawn to valuing the Behaviour to being repeated once the nudge is introduced (Thaler et al., 2009). By conceptualizing moral elevation as the mechanism that transforms an AI green nudge into an internalized motivation to act, this gap can be addressed, as moral-elevation research suggests that exposure to virtuous Behaviour can elicit positive emotions that encourage subsequent prosocial action beyond simple compliance with the choice architect (Chen et al., 2025; Huang & Fang, 2024). Simultaneously, nudge theory does not, on its own, account for the resistance to the nudge from different consumers; integrating psychological reactance as a boundary condition adds to the theory by providing a specification about when the relationship between the nudge and circular consumption should weaken and even turn negative as the perceived pressure on consumers' autonomy increases. Based on this gap, this study aims to explore whether and how AI green nudges affect consumers' circular consumption, whether it is mediated by consumer moral elevation, and whether the direct effect of AI green nudges on circular consumption is constrained by psychological reactance.

To safeguard the totality of the study findings, a moderated mediation model was proposed in this study, in which AI Green Nudges would be the independent variable, circular consumption Behaviour the dependent variable, and the moderating role of psychological reactance. Consumer Moral Elevation is hypothesized to mediate the relationship between the AI green nudge and circular consumption action. In contrast, Psychological Reactance is hypothesized to be a boundary condition between the AI green nudge and circular consumption action. In contrast, the nudge might elevate some consumers; others may be provoked to resist it. Consumer moral elevation refers to a positive moral feeling triggered by observing or experiencing acts that are seen as moral, inspirational, or elevating for the viewer, eliciting positive Behavioural intentions (Diessner & Niemiec, 2023). Wannow et al. (2024) show that moral emotions can serve as powerful tools to mediate consumers' reactions to socially conscious brand actions in consumer research. They found that emotionally engaging brand messages can trigger emotional responses that, in turn, influence consumer responses, as evidenced by their experimental results. Moreover, moral elevation has become a more prominent focus in sustainability research; Chen et al. (2025) examined how green experiences could influence consumers' green consumption. The affective pathway to consumer circular-consumption Behaviour (CCB) via consumer moral elevation is a potential mechanism that the application of AI green nudges can explain.

The Psychological reactance theory, proposed by Brehm (1966), provides an additional perspective by explaining why an intervention may become less effective when individuals perceive it as threatening their freedom or autonomy (Akbar & Ahmad, 2022; Banerjee et al., 2023). Integrating these perspectives, therefore, permits a more nuanced conceptualization in which an AI green nudge may simultaneously function as a positive Behavioural stimulus that elicits moral elevation and as a potential source of resistance when consumers perceive excessive control (Khalufi, 2025). Such an integrated perspective extends the existing



literature by shifting attention from the mere effectiveness of nudges to the emotional mechanisms and psychological boundary conditions that determine when AI-enabled sustainability interventions translate into circular consumption (Carrel et al., 2023). Building on these gaps, the present study develops and tests a moderated mediation framework linking AI Green Nudges (AGN) to Circular Consumption Behaviour (CCB) through Consumer Moral Elevation (CME), while positioning Psychological Reactance (PR) as a boundary condition of the relationship between AI Green Nudges and Circular Consumption Behaviour.

The study is contextualized in Pakistan, an emerging market where research on sustainable consumption is comparatively limited compared to the Western context, while AI-driven digital retail and mobile commerce are growing rapidly. Existing consumer-behaviour studies in Pakistan have also reported that knowledge about eco-labels, environmental attitudes, and green trust influence the adoption of sustainable consumption in areas like domestic energy consumption (Asif et al., 2023), indicating a lack of specific evidence of the mechanisms through which consumers transform their environmental awareness into action in Pakistan. Thus, studying AI green nudges in this context takes the theory developed in high-income, high-digital-penetration markets and applies it to a rapidly digitizing emerging economy, where key assumptions of the theory (circular consumption infrastructure, consumer trust in algorithmic systems, cultural norms around persuasion) might vary meaningfully. The study aims to contribute fourfold. It theoretically combines three literatures: the literature on nudge theory, the moral-emotions literature, and the psychological reactance theory, into one moderated-mediation framework, and addresses calls from the literature on green-nudges and digital-nudges for studies on the psychological mechanisms and boundary conditions of nudge effectiveness. It proposes to test this framework empirically through structural equation modelling in a context where there is not yet much rigorous quantitative evidence compared with conceptual and qualitative evidence — namely, AI-personalized sustainability marketing. In a specific sense, it builds on the literature on circular consumption, which has focused on the purchase stage (Vidal-Ayuso et al., 2023), and on the domain of AI nudging, specifically. The results inform the practical use of the findings, helping marketers and policymakers to tune the intensity and framing of AI nudges to make them more attractive to – rather than turn off – the consumers they aim to engage.

2. Literature Review

2.1 Theoretical Foundation

In digital retail settings, artificial intelligence has shifted from a behind-the-scenes analytics task to a front-facing element of the choice architecture consumers encounter, influencing their purchase choices through recommendations, rankings, and prompts (Wannow et al., 2024). This shift is an extension of the concept of nudging, which began as low-cost, choice-preserving interventions that could guide decisions in a predictable direction without banning any choice or drastically changing economic incentives (Thaler et al., 2009). At the same time, the challenges of resource depletion and environmental degradation have moved circularity, defined as reducing, reusing, repairing and recycling products and materials, to the heart of sustainability policy and marketing research (Geissdoerfer et al., 2017). The shift from a linear to a circular economy cannot be achieved without consumers making decisions about how to handle their products after they are purchased, for example by repairing, reselling, sharing, or disposing of the product at the end of its life (Hobson et al., 2021).

While nudges in the green sector often rely on default settings, social norms, and appeals to self-image through fixed channels like in-store signage or mail inserts (Schubert, 2017). According to von Zahn et al. (2025) AI-powered systems can personalize all three nudges for each shopper in real time. This raises the question of whether algorithmically personalised green nudges are a more efficient form of traditional green nudges, or a qualitatively different persuasive mechanism whose psychological impacts are not yet fully understood or documented, including consumers' emotional and defensive responses. This question is relevant as the process by which a nudge becomes a circular behaviour and the conditions under which this pathway weakens and/or even turns into a counterproductive one remains under-studied when it is generated and personalised by an algorithm instead of being broadcast as a standard and identical message. To fill this gap, the present study uses an integrated moderated-mediation model with AI Green Nudges as the stimulus,



Consumer Moral Elevation as the affective transmission mechanism, Psychological Reactance as the boundary condition and Circular Consumption as the behavioural outcome.

2.2 AI-Green Nudges (AGN)

AI Green Nudges are algorithmically created and personalized nudges placed in the consumption setting to encourage consumers to make an environmentally sustainable choice, while still leaving them the option to choose a non-sustainable option (Thaler et al., 2009). The three constructs that are central to the Green Nudge approach proposed by (Schubert, 2017), namely, self-image appeals (e.g. eco-labels), social-norm comparisons, and smart defaults are all adapted in a dynamic way to the individual based on behavioural and transactional data (Weinmann et al., 2016). Digital nudging scholarship differentiates AI nudges from previous, non-AI nudges by their ability to learn from the behaviour of the user and continuously adapt the message content, timing and framing based on feedback loops from the behaviour of the user, which is associated with concerns over the loss of user autonomy and the lack of awareness of the influence attempt (Calboli, 2025; Richards, 2025). For example, in retailing, recommender systems have been implemented to make lower-carbon product recommendations or more environmentally friendly delivery methods more prominent (Weinmann et al., 2016).

Empirical research on consumers' attitudes towards algorithmically personalised green nudges is in its early stages and does not consider one-size-fits-all green nudges. While personalisation has been found to boost perceived relevance and purchase intention in digital nudging contexts in general (Calboli, 2025), a more individually targeted nudge could create a greater sense of intrusion, potentially leading to a loss of perceived freedom on the part of the consumer (Freudenreich & Penz, 2025). This dual potential to persuade through relevance, as well as to elicit resistance due to perceived content intrusiveness, motivates the inclusion of a positive affective mechanism (moral elevation) and a resistance-based boundary condition (psychological reactance) in the present model.

2.3 Circular Consumption (CC)

Circular consumption refers to consumer behaviours that promote the retention, extension, and recirculation of the value of products and materials, rather than the linear consumption pattern of "use and discard or replace" (Testa et al., 2024). Consumer-behaviour scholarship is increasingly moving away from the premise that circularity is a single act, toward viewing it as a repertoire of interconnected practices that can be broken down into R-strategy typologies, including refuse, reduce, reuse, repair, and recycle (Lopez & Legardeur, 2024). As stated by Fraccascia et al. (2023) the theoretical and practical relevance of circular consumption is mainly related to its ability to lower the demand for virgin resources and the amount of waste produced by consumers when they consume, as well as to the generation of new value propositions for companies in the reuse, repair and resale sectors. Prior research has explored factors that precede circularity-oriented behaviours, such as environmental concern, perceived risk, product quality perceptions, and consumption habits (Corbier et al., 2025; Ungerman & Dědková, 2024). While this is an expanding field of study, the knowledge on what drives the adoption of circular consumption has focused mainly on cognitive and attitudinal antecedents, including knowledge about the environment and perceived behavioural control, and comparatively little on affective/emotional pathways through which the marketing stimulus could engender circular action (Dangelico et al., 2022). Another caveat is that most models of circular consumption have been applied to non-algorithmic marketing environments and remain untested in an algorithmically mediated consumption setting to assess how algorithmically presented stimuli affect this behavioural repertoire (Lopez & Legardeur, 2024; Palwasha Bibi, 2024; Siddiq et al., 2024).

2.4 Relationship Between AGN and CC

The link between behavioural nudge and pro-environmental outcomes is established in the offline green-nudge literature, in which various field experiments demonstrate the power of simple, low-cost nudges like displays or signs in the store to change market shares in favour of pro-environmental product choices (Schubert, 2017). In the (especially) circular consumption domain, the expectation would be that nudges encouraging consumers towards the green option (e.g., digital nudges highlighting the lower environmental impact of a recirculated or repaired product; algorithmic nudges defaulting consumers to the green option of



delivery and packaging) would increase their engagement with circular practices (Weinmann et al., 2016). Since 2022, a growing number of digital-context documents have supported this extension. Default and informational nudges can affect consumer choice toward lower-emission delivery methods, such as pick-up points, and default-based nudges are more effective than informational nudges alone (Nijssen et al., 2023). Likewise, large-scale field trials have found that dynamically coded behavioural nudges applied to web stores deliver a tangible positive impact on product return rates, and thus on resource waste in reverse logistics (Pfrang & Spreer, 2022).

Digital nudge interventions directly integrated into the ordering platform's choice architecture have been shown to influence consumers' ordering choices for food and grocery delivery in favour of more sustainable delivery slots and product selections than pricing alone (Ytreberg et al., 2023). On an individual transaction level, nudges that encourage the use of electronic receipts over paper ones have been seen to drive measurable uptake in field-experimental settings, demonstrating that small changes in the default setting can influence circular waste reduction behaviours, even when not directly related to the purchase of a product (Saulītis et al., 2025). In AI-mediated contexts, recent studies that combined the TAM with nudge theory have shown that AI nudges influence sustainable purchase intentions mainly through perceived usefulness, which is moderated by the individual's prior attitudes toward the environment (Khalufi, 2025). As stated by Duane et al. (2025) in a systematic review and taxonomy of the wider digital-nudging literature also shows that the effectiveness of nudges in digital settings is significantly different depending on the type, platform, and behavioural target, highlighting the need to test them in specific settings rather than generalizing the findings from offline nudges. Meanwhile, the body of evidence supporting this relationship in the context of nudges via AI is less solid than it is in traditional green-nudge studies: nudges do not always work, and their effectiveness can vary significantly depending on the context when other priorities and factors are salient at the moment of choice to the consumer (Schubert, 2017). The divergent results in prior studies, along with the relative lack of studies measuring circular-consumption outcomes (compared to green consumption in a single-act purchase), in the digital nudging literature, encourage a direct test of the relationship in the present model. Drawing on the preceding literature and theoretical arguments, the following hypotheses are proposed:

H1: AI Green Nudges positively influence Circular Consumption.

2.5 Mediator: Consumer Moral Elevation

Moral elevation is an emotion that makes a person feel warm, inspired, and motivated to do something similar to what they just saw and liked, and it is self-transcendent (feeling good about someone else) (Haidt, 2003). Whereas self-focused positive emotions narrow the person's thought-action repertoire and increase long-lasting psychological, social, and behavioural resources, as predicted by the broaden-and-build account of positive emotion (Fredrickson, 2001), elevation and self-transcendent positive emotions extend the person's momentary thought-action repertoire and enhance enduring psychological, social, and behavioural resources over time. Emotion in the "appreciation and self-transcendence" group (gratitude, awe, elevation, compassion) have consistently been more predictive of an individual's own prosocial behaviour than emotions in the "dominance and status assertion" group (e.g., anger, pride) (Feeney & Fitzgerald, 2022). The growing body of empirical research connects moral elevation to prosocial and altruistic behavioural effects such as volunteering, cooperative choice in economic games, and benevolent behaviour toward others (Pohling et al., 2019). However, this behavioural link has also received support in recent empirical work with both children and adults: Experimental research with both children and adults now shows that seeing morally good or highly prosocial actions reliably leads to increases in helping and sharing behaviour, further establishing the link between elevation and prosocial beyond the initial sample of adults in which it was first documented (Gibhardt et al., 2024).

Elevation, an emotional state that results from corporate social responsibility activity, has been found to foster consumers' prosocial behaviours toward the company and to increase their donations to the company, making elevation a distinct emotion for issue advocacy that differs from other condemning emotions like anger (Bao et al., 2023). In addition, elevation is one of the moral emotions identified as positively influencing consumers' reactions to a brand's advocacy in social or environmental causes (Miguel & Miranda, 2025). In



the marketing literature, moral elevation has begun to be researched as a mediator between exposure to marketing content and subsequent consumer actions, rather than as a side effect of the emotional reaction it triggers (Aquino et al., 2011). An AI-personalised nudge that frames sustainable choices in a moral rather than a purely informational way - for example by emphasising the collective environmental good that can be achieved by recycling a product - is well positioned to elicit such a response, as the framing, timing and content of the nudge may be optimised to elicit a moral response from a particular consumer (Weinmann et al., 2016). Moral elevation should be followed by a prosocial, other-oriented state of motivation that extends into action: circular consumption actions like repair, donation and recirculating a product are prosocial and collectively beneficial actions, making the broadened action repertoire associated with (Fredrickson, 2001). Drawing on the preceding literature and theoretical arguments, the following hypotheses are proposed:

H2: AI Green Nudges positively influence Consumer Moral Elevation.

H3: Consumer Moral Elevation positively influences Circular Consumption.

H4: Consumer Moral Elevation mediates the positive relationship between AI Green Nudges and Circular Consumption.

2.6 Moderator: Psychological Reactance

Psychological Reactance Theory posits that an aroused motivational state of reactance will occur whenever a person's freedom to choose is threatened, restricted or taken away, and will motivate them to restore the perceived threat of freedom by resisting or rejecting the message or action that caused them (Brehm, 1966). In a consumer context, reactance has been found to occur in response to a variety of marketing-induced restriction conditions, such as lack of choice in the stimulus environment, limited quantities of products available for purchase, and persuasive pressure in advertising appeals (Mukherjee et al., 2025). Green marketing communications are especially prone to inducing reactance because they often contain a normative quality ('ought to' quality) or assertive pro-environmental messages have been shown to elicit more reactance and attitudes towards the communication than non-assertive messages. However, the underlying environmental goal is one that many consumers support (Fraccascia et al., 2023). According to Freudenreich and Penz (2025) green mobility advertising demonstrated that the reactance-inducing effect of assertive language is not consistent for all consumers: those with a strong bio-spheric value orientation are found to experience significantly less freedom threat due to assertive green messages than people without such a value orientation, indicating that the reactance response to green nudging is itself dependent on the value orientation of the recipient rather than on the assertive tone of the message. AI-personalised nudges are, by their design, more targeted than generic green messages, and, by their nature, more visible in their differences to the individual than generic nudges, which can be perceived as an embedded, opaque attempt to steer behaviours, a process coined by digital-nudging scholars as 'hyper nudging' and explicitly connected to concerns about the loss of user autonomy (Yeung, 2017).

The reactance theory demonstrates that when AI systems override consumer preferences, make default decisions, or nudge consumers in ways that are intrusive or not adequately transparent to the consumer, it is a predictable consequence of the algorithm that reactance will occur, and that this reactance will be more pronounced when the algorithmic logic behind the recommendation is opaque to the consumer (Moon et al., 2025). Additionally, in the context of AI-enabled green nudging, psychological reactance may represent an important mechanism linking AI personalization to consumers' behavioural intentions. Recent evidence indicates that AI-driven personalization can reduce psychological reactance and thereby enhance users' behavioural intentions, with reactance partially mediating the relationship between personalization and usage intention. Importantly, this relationship is conditional on privacy concerns: higher privacy concerns strengthen the negative association between AI personalization and psychological reactance, suggesting that consumers' responses to personalized AI interventions depend not only on the benefits of personalization but also on their sensitivity to privacy-related risks (Duan et al., 2026). Complementing this, experimental research has demonstrated that particular design features ad customisation, ad personalisation, and privacy customisation are capable of actively mitigating consumer reactance to AI-mediated advertising, indicating that reactance



to algorithmic nudging is not an immutable amount, but rather a quantity that can be managed (Snyder et al., 2025).

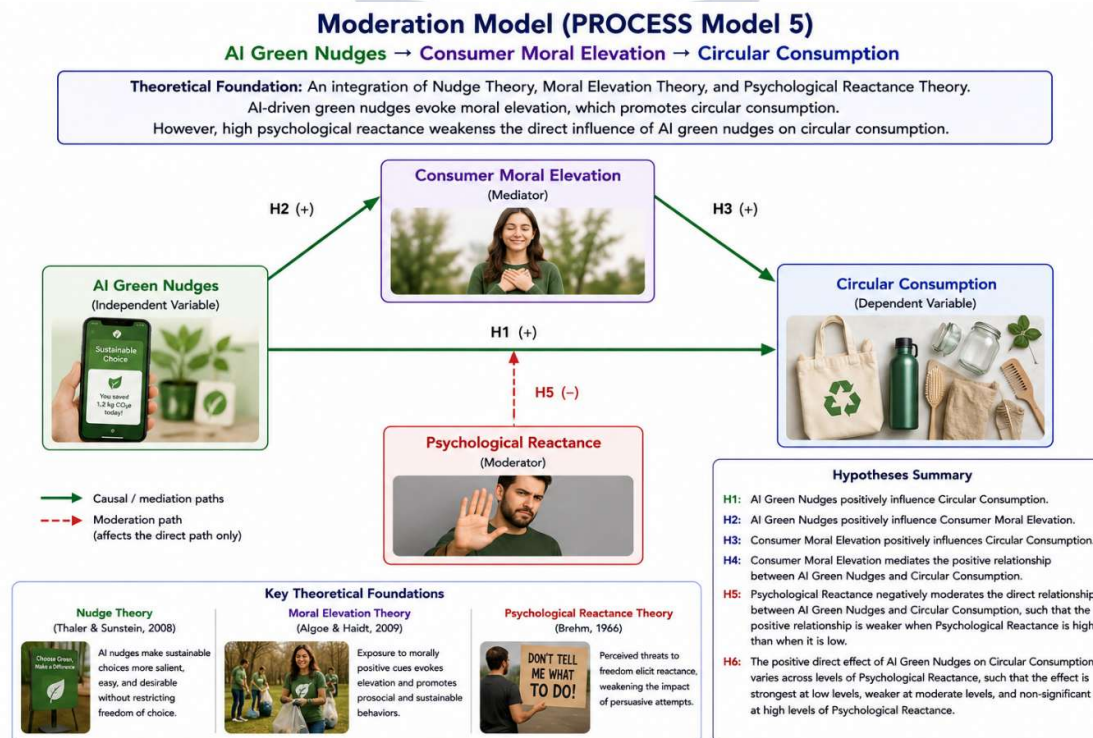
Moreover, a greater personalisation can inspire a defensive psychological response in consumers that can be a counterproductive effect that weakens the desired persuasive outcome, thereby confirming that the very same attribute that makes AI nudges more effective personalisation can make them more likely to provoke consumer resistance (Do et al., 2026). This indicates that psychological reactance should be understood not only as a separate factor that fuels resistance, but also as a boundary condition that influences the success of an AI green nudge in initially generating the affective response of moral elevation. Moral elevation increases the likelihood of successfully influencing the affective response, while psychological reactance increases the likelihood that the affective response is experienced as coercive, independent of the content of the nudge (Freudenreich & Penz, 2025; Yeung, 2017). The first-stage, moderated-mediation model follows previous research on digital nudging, where personalisation used to enhance the relevance and persuasiveness of a nudge can, at the right dose, reduce trust and trigger a counteractive reaction that disables the affective channel for behaviour change (Weinmann et al., 2016; Yeung, 2017). This conditional indirect effect test enables the present study to identify for whom for which group of employees and under what psychological conditions AI Green Nudges are more likely to be effective through moral elevation and less likely to be effective through moral disengagement. Based on the preceding literature, following hypotheses has been developed:

H5: Psychological Reactance negatively moderates the direct relationship between AI Green Nudges and Circular Consumption, such that the positive effect of AI Green Nudges on Circular Consumption Behaviour is weaker when Psychological Reactance is high than when it is low.

H6: The positive direct effect of AI Green Nudges on Circular Consumption varies across levels of Psychological Reactance, such that the effect is strongest at low levels of Psychological Reactance, weaker at moderate levels, and becomes non-significant at high levels of Psychological Reactance.

Figure 1

The Proposed Theoretical Framework





3. Methodology

3.1 Research Philosophy

The study is based on a positivist research philosophy, which holds that one objective social reality exists and can be measured using observable, quantifiable variables, independent of the researcher (Saunders et al., 2012). In line with this philosophy, the study adopts a deductive research approach, deriving specific and testable hypotheses from the theory and previous empirical literature, and testing these hypotheses statistically against the results obtained from data gathered from a specific consumer group, which is then either accepted or rejected based upon the observable evidence (Saunders et al., 2012). The target population is adult consumers who have experienced or regularly interacted with any AI-generated product recommendation, personalised offer, or algorithmically curated content when shopping online or via retail mobile applications. Exposure to, or regular interaction with, AI-generated product recommendations, personalised offers, or algorithmically curated content during online and retail mobile app shopping is a conceptual precondition for answering this survey. Because a complete sampling frame of such consumers was impractical, a non-probability convenience and purposive sampling technique was employed, and respondents were initially screened to confirm they had recently shopped online or via an app before being asked the substantive items. A sample size of 400 valid responses was targeted. This is higher than widely cited rules of thumb for covariance- and variance-based structural equation modelling; it is well above the 10 times rule of thumb relative to the largest number of formative or reflective indicators pointing to a single construct (Hair et al., 2019). It exceeds the minimum sample sizes suggested by the inverse square root (ISR) method and gamma-exponential (GEX) method for a model of this path complexity and expected effect size (Kock & Hadaya, 2018). This aligns with general survey-research sample size recommendations for structural equation modelling in consumer behaviour research (Memon et al., 2020). An a priori power analysis used in G*Power (Faul et al., 2009) assuming a medium effect size ($f^2 = .15$), $\alpha = .05$ and power = .95 for a model with up to 7 predictors at the most saturated structural equation also showed that the required sample was approximately 153, thus offering a generous margin of safety for non-response, incomplete response, and post-screening exclusion.

The questionnaire was distributed online, on consumer panels, university-affiliated consumer networks, and social media sites used by online shoppers, and via intercept distribution at retail and shopping mall sites to provide greater age and income diversity within the target sample. Responses were checked for completion, straight-lining, and missing attention-check items. The questionnaire was structured and self-administered, consisting of two sections: a screening and demographic section (age, gender, level of education, income level, and frequency of online/app-based shopping) and a main section, which included items measuring the four constructs in the model. All substantive items were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The items covering AI-Green Nudges were adapted from Schubert (2017) and (Weinmann et al., 2016). The Consumer Moral Elevation items were extracted from McGuire et al. (2022), the Psychological Reactance items were adapted from Hong and Faedda (1996), and the circular consumption items were adapted from (Colley et al., 2026). The data were analysed using SPSS (v.26/27). Before testing the hypotheses, descriptive statistics (means, standard deviations, skewness, and kurtosis) were calculated for all study variables to assess data normality and sample characteristics and to conduct reliability analysis (Cronbach's alpha) for the constructs. Preliminary relationships between the study variables were explored by examining bivariate correlations for possible multicollinearity. Hypotheses were then tested by using Hayes' PROCESS macro (Model 5), which estimates a simple and unconditional indirect effect of the independent variable on the dependent variable through the mediator and a moderator effect on the direct path ($X \rightarrow Y$) such that the strength of the direct path varies by levels of the moderator. We tested the significance of the indirect effect using bootstrapping (5,000 resamples).

4. Results

4.1 Descriptive statistics

The sample consisted of 400 individuals, as shown in the demographic profile (Table 1). The sample size was approximately equal by gender, with 196 (49.0%) males and 204 (51.0%) females. In terms of age,



the largest group were aged from 26 to 35 years ($n = 114$, 28.5%), followed by those aged from 36 to 45 years ($n = 91$, 22.8%), those aged 56 and above ($n = 77$, 19.3%), 18 to 25 years ($n = 72$, 18.0%) and the smallest group was aged from 46 to 55 years ($n = 46$, 11.5%). Regarding monthly income, the largest segment of respondents reported earnings between 50,000–100,000 PKR ($n = 118$, 29.5%), followed by 100,001–150,000 PKR ($n = 102$, 25.5%), Above 200,000 PKR ($n = 76$, 19.0%), 150,001–200,000 PKR ($n = 64$, 16.0%), and Below 50,000 PKR ($n = 40$, 10.0%). In terms of education, respondents who had a Master's degree were the largest ($n = 99$, 24.8%), followed by Intermediate ($n = 91$, 22.8%) and Bachelor's ($n = 90$, 22.5%) and then MPhil/PhD ($n = 63$, 15.8%) and Below Intermediate ($n = 57$, 14.2%). Overall, the sample is diverse and fairly well distributed by gender, age, income, and educational level.

Table 1*Demographic profile of the Respondents*

Demographic Variable	Category	Frequency	Percent (%)
Gender	Male	196	49.0
	Female	204	51.0
	Total	400	100.0
Age	18–25	72	18.0
	26–35	114	28.5
	36–45	91	22.8
	46–55	46	11.5
	56 and above	77	19.3
	Total	400	100.1
Income	Below 50,000	40	10.0
	50,000–100,000	118	29.5
	100,001–150,000	102	25.5
	150,001–200,000	64	16.0
	Above 200,000	76	19.0
	Total	400	100.0
Education	Below Intermediate	57	14.2
	Intermediate (FA/FSc, 12th grade)	91	22.8
	Bachelor's degree	90	22.5
	Master's degree	99	24.8
	MPhil/PhD	63	15.8
	Total	400	100.1

4.2 Sampling Adequacy and Common Method Bias

The data's sampling adequacy was checked before conducting the common method bias assessment. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .918, which is higher than the suggested value of .60 and suggests that the sample size was sufficient for factor analysis. Further, Bartlett's Test of Sphericity was significant ($\chi^2 = 8817.381$, $df = 465$, $p < .001$), which indicated that the correlation matrix was not an identity matrix and was therefore appropriate for factor analysis. Common method bias was then examined using Harman's single-factor test, in which all 31 items for the study variables were entered into an unrotated principal component analysis. The results indicated five factors with eigenvalues greater than one, explaining 65.44% of the total variance. The first (largest) factor explained 40.43% of the variance, which is less than the recommended 50%. Common method bias is not considered to be a serious threat to the validity of the study's findings because none of these factors explained a large proportion of the variance.

4.3 Correlation Analysis

To explore the relationships between the bivariate data, Pearson correlation analysis was performed, and the results are shown in Table 4. All variables showed a significant, positive correlation at the 0.01 level. AI Green Nudges (AIGN) correlated positively with moderate magnitude with psychological reactance (PR)



($r = .626$, $p < .01$), moderately with consumer moral elevation (CME) ($r = .372$, $p < .01$), and moderately strongly with circular consumption (CC) ($r = .469$, $p < .01$). CME and CC were also strongly correlated ($r = .627$, $p < .01$). At the same time, PR showed a moderate-to-strong correlation with both CME ($r = .444$, $p < .01$) and CC ($r = .577$, $p < .01$). The correlation coefficients were all below the level of concern for multicollinearity ($r > .85$) so that the study variables were still sufficiently distinct.

Table 2

Correlation Analysis

Variable	AIGN	PR	CME	CC
AIGN	1			
PR	.626**	1		
CME	.372**	.444**	1	
CC	.469**	.577**	.627**	1

Note. $N = 400$. AIGN = AI Green Nudges; PR = Psychological Reactance; CME = Consumer Moral Elevation; CC = Circular Consumption.

** Correlation is significant at the 0.01 level (2-tailed).

4.4 Reliability Analysis

The study's internal consistency reliability was assessed using Cronbach's alpha, and the results are presented in Table 5. Constructs showed good reliability, with reliability above the commonly accepted threshold of .70. The highest reliability coefficient (α) was for AI Green Nudges (11 items), followed by Circular Consumption (6 items, $\alpha = .894$), Psychological Reactance (9 items, $\alpha = .890$), and Consumer Moral Elevation (5 items, $\alpha = .881$). The findings of this study indicate that the measurement used has high internal consistency, meaning it is reliable and can serve as a basis for further analysis, including correlation and hypothesis testing in this research.

Table 3

Reliability Analysis (Cronbach's Alpha) of Study Constructs

Construct	Full Name	No. of Items	Cronbach's Alpha (α)
AIGN	AI Green Nudges	11	.940
PR	Psychological Reactance	9	.890
CME	Consumer Moral Elevation	5	.881
CC	Circular Consumption	6	.894

Note. AIGN = AI Green Nudges; PR = Psychological Reactance; CME = Consumer Moral Elevation; CC = Circular Consumption. $\alpha > .70$ indicates acceptable internal consistency reliability.

4.5 Hypotheses Testing

Table 4 presents the results of the moderated mediation analysis, which used Hayes' PROCESS macro (Model 5). Hypotheses 1 and 2 were supported by the results, with AI Green Nudges positively predicting Consumer Moral Elevation (H1: $\beta = 0.4014$, $p < .001$), and Consumer Moral Elevation, in turn, positively predicting Circular Consumption (H2: $\beta = 0.4496$, $p < .001$). AI Green Nudges also had a significant direct effect on Circular Consumption (H3: $\beta = 0.3815$, $p = .0026$), as did Psychological Reactance (H4: $\beta = 0.6032$, $p < .001$). Consumer Moral Elevation was a significant, positive mediator between AI Green Nudges and Circular Consumption (H5: $\beta = 0.1805$, 95% CI [0.1287, 0.2376]). Psychological Reactance significantly moderated the direct effect of AI Green Nudges on Circular Consumption (H6: $\beta = -0.0877$, $p = .0217$), indicating a weakening effect as Psychological Reactance increases. The positive effect of AI Green Nudges on Circular Consumption was significant for the low level of Psychological Reactant (H7: $\beta = 0.1866$, $p = .0012$), the medium level of Psychological Reactant (H8: $\beta = 0.1087$, $p = .0233$), and the high level of Psychological Reactant (H9: $\beta = 0.0405$, $p = .4791$, 95% CI [-0.0719, 0.1529]). As the psychological reactance towards the nudges increases, the positive effect on Circular Consumption caused by the AI approaches zero. Eventually, it becomes negative, consistent with the boundary condition used in this study.

**Table 4**
Hypotheses Testing

Hyp.	Hypothesized Relationship	β / Effect	SE	t	p	95% CI / Bootstrap CI	Decision
H1	AIGN $\rightarrow$ CME	0.4014	0.0502	7.9994	<.001	[0.3028, 0.5001]	Supported
H2	CME $\rightarrow$ CC	0.4496	0.0387	11.6135	<.001	[0.3735, 0.5257]	Supported
H3	AIGN $\rightarrow$ CC	0.3815	0.1259	3.0305	.0026	[0.1340, 0.6290]	Supported
H4	PR $\rightarrow$ CC	0.6032	0.1206	5.0004	<.001	[0.3661, 0.8404]	Supported
H5	CME mediates AIGN $\rightarrow$ CC	0.1805	0.0276	—	—	[0.1287, 0.2376]	Supported
H6	PR moderates AIGN $\rightarrow$ CC	-0.0877	0.0381	-2.3040	.0217	[-0.1625, -0.0129]	Supported
Low	AIGN $\rightarrow$ CC at low PR	0.1866	0.0574	3.2521	.0012	[0.0738, 0.2995]	Supported
Medium	AIGN $\rightarrow$ CC at medium PR	0.1087	0.0477	2.2774	.0233	[0.0149, 0.2025]	Supported
High	AIGN $\rightarrow$ CC at high PR	0.0405	0.0572	0.7085	.4791	[-0.0719, 0.1529]	Not supported

5. Discussions

The current research has explored the mechanism of Consumer Moral Elevation in the relationship between AI Green Nudges and Circular Consumption, including the boundary condition of psychological reactance. The results strongly support the proposed Hayes PROCESS Model 5. AI Green Nudges strongly predicted Consumer Moral Elevation, similar to H1. This aligns with the fact that AI-designed, tailored nudges influence consumers' underlying attitudes towards sustainability and their feelings, as personalisation and timing of digital nudges improve perceived utility and increase sustainable purchase intentions (Khalufi, 2025). Similarly, subtle choice-architecture manipulations like eco-labelling, defaults and personal nudges, which are designed to influence users without taking away their choice, are described as a powerful tool that goes beyond nudging for compliance, with a focus on psychological shifts such as moral elevation (Thaler & Sunstein, 2003), which lends weight to the argument that these nudges can induce a deeper sense of engagement with the message. Consumer Moral Elevation, in turn, significantly affected Circular Consumption (H2) and mediated the relationship between AIGN and CC (H5). This is consistent with basic studies that have found that exposure to or encouragement of behaviour that is good for society elicits feelings of warmth, admiration, and an inclination to behave similarly (Algoe & Haidt, 2009). Further experimental studies have also supported the idea that elevation reliably produces measurable prosocial and behavioural consequences, such as actual donation behaviour, thus establishing elevation as a true behavioural state rather than just a feeling (Thomson & Siegel, 2013).

AI Green Nudges have a significant direct effect on Circular Consumption (H3), which is consistent with digital nudges' direct impacts on shifting sustainable consumption intentions and behaviours, as observed in Khalufi (2025), who found that digital nudges can directly influence eco-friendly behaviour, primarily by personalization and framing effects that affect perceived usefulness. However, field-based nudge interventions in retail environments have also shown that behaviourally informed nudges effectively and substantially influence real-world buying behaviour in favour of more sustainable choices (Bauer et al., 2022). The moderating function of Psychological Reactance (H4, H6) and its attenuating function across conditional



levels (H7–H9) are based on reactance theory, which suggests that threats to freedom of choice elicit resistance to compliance (Brehm, 1966). This is confirmed by the following examples of digital and algorithmic persuasion in the modern world: reactance is a negative psychological reaction that happens when the persuasion attempt is seen as coercive and goes against the direction of the attempt (Bleier & Eisenbeiss, 2015); and, personalized advertising can backfire and result in brand reactance under specific circumstances (De Keyser et al., 2022). In a similar vein, when consumers feel more threatened by the personalization, the impact of the personalization on the downstream outcomes will be mediated by an increase in psychological reactance (Boerman et al., 2021), as was found in the present study, where the more they feel threatened by the personalization, the more they feel it is attacking their autonomy, and, consequently, the less persuasive it is at high levels of reactance.

5.1 Theoretical Contributions

This study has several theoretical contributions. First, it expands moral elevation theory to sustainability communication with AI, suggesting that algorithmic nudges can trigger authentic moral-emotional reactions in consumers, rather than mere cognitive or functional compliance. Second, it introduces psychological reactance theory as a boundary condition in an AI green nudging framework, providing a more dynamic and contextual description of when and for whom AI green nudges work—rather than treating persuasive impact as a one-size-fits-all outcome. Third, the study provides a non-overlapping theoretical framework for understanding the AIGN–CC relationship, modelling the resistance-based mechanism, namely, Psychological Reactance, in parallel with the affective mechanism, namely, Consumer Moral Elevation, which directly affects the relationship. Fourth, the study extends the literature on circular consumption by providing empirical evidence on the relationship between an emerging technological antecedent (AI nudging) and circular consumption behavioural outcomes, a relationship not as extensively researched as more traditional ones (subjective norms or environmental attitudes). Finally, the study situates the research in the regional preferences of the Swat/KP population, examining the cross-cultural generalizability of moral elevation and reactance theory, validated primarily in Western cultures, and its applicability to populations with high digital literacy.

5.2 Practical Contributions

The results provide marketers and platform designers with some actionable steps. Green nudging interventions should aim to generate moral elevation rather than compliance: use stories people can relate to raise awareness and promote positive environmental behaviours, for example, rather than instructions or guilt. At high levels of reactance, it is important to avoid giving too many nudges, too many in the same way, and too manipulative a nudge; if the person feels manipulated, nudge effectiveness is undermined. Where possible, based on behavioural or proxy measurements of baseline reactance, or based on survey measures of reactance, firms might be able to adjust the level of nudges, with more intense nudges being administered to those with low reactance and less intense nudges, or nudges that do not prevent consumers from choosing, being administered to those with high reactance. For companies situated in areas like Swat/KP, where circular practices like reuse and repair are already part of the informal economy, AI-based nudges may work best when they build on and formalize informal economic practices already present in the region, namely using resources sparingly and creatively.

6. Conclusion

The purpose of this study was to investigate the effect of AI Green Nudges on Circular Consumption, the mediating effect of Consumer Moral Elevation, and the moderating effect of Psychological Reactance between the direct AIGN–CC relationship. The results of this study, based on survey data from 400 consumers and moderated mediation analysis (PROCESS Model 5), supported the direct and indirect positive effects of AI Green Nudges on Circular Consumption via Consumer Moral Elevation, which also weakened significantly with rising levels of psychological reactance (to the point of being not significant at high levels of reactance). The results emphasize the fact that the effectiveness of sustainability marketing with AI is not an absolute, but rather depends on the emotional and psychological condition of the recipient of the message. The study fits into the broader understanding of how new AI-enabled persuasive technologies affect



fundamental human psychological issues related to sustainable consumption outcomes, such as morality and autonomy preservation.

7. Future Research Recommendations

The model could be further elaborated by adding parallel mediators, such as perceived AI trustworthiness or environmental self-efficacy, to account for other pathways through which AI Green Nudges might affect Circular Consumption in future studies. More conclusive causal claims could be made with a longitudinal or experimental design that allows a closer look at whether repeated exposure to AI nudges increases reactance over time (habituation to persuasion attempts) or builds trust and lowers resistance to persuasion attempts. Replication across different regional or national settings would enable the generalizability of the Swat/KP findings, especially the comparison of “high” and “low” digital-literacy populations. Future research could also include other possible moderators, including consumer AI-literacy, perceived algorithmic transparency, and environmental identity strength, as well as other or more boundary conditions on the b-path (CME → CC) instead of just the direct path to create a more comprehensive understanding of where and how resistance to AI sustainability messaging is likely to occur.

8. Limitations

This study has several limitations. First, the cross-sectional design does not allow for strong causal inferences about the relationships between AI Green Nudges, Consumer Moral Elevation, Psychological Reactance and Circular Consumption; longitudinal or experimental designs are required to support causality. Second, attitudinal constructs and behavioural outcomes (Circular Consumption) were both measured using self-reported instruments, which may lead to common method bias, but does not seem to be a serious concern according to Harman's single-factor test. Thirdly, the sampling was specific, that is, from the Swat/KP territory, which may hinder the transferability of results to other cultural, urban, or higher digital literacy settings. Fourth, the study did not capture the type or channel of an AI Green Nudge (e.g., app-based, e-commerce platform-based, or voice-assistant-based), which could show varying degrees of moral elevation or reactance across media. Last but not least, we modelled Psychological Reactance as a single moderating construct. Still, reactance is a multidimensional phenomenon that could be broken down into cognitive and affective components for future research to investigate which of these aspects reduces the effectiveness of the AI Green Nudge.

Contribution of Authors

All the authors participated in the ideation, development, and final approval of the manuscript, making significant contributions to the work reported.

Conflict of Interest Statement

The authors declare no conflict of interest.

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Informed consent was obtained from all participants.

Data Availability

This study relies exclusively on publicly available secondary sources, including corporate disclosures, industry reports, and peer-reviewed literature, all of which are cited in the References section.

References

- Ahmad, A., Ali, D., Siddiq, A., Akbar, D., Bibi, D., & Rahman, D. (2024). Impact of talent management on job performance of teachers of government colleges: mediating role of psychological empowerment. *Migration Letters*, 21(3), 1119-1127.
- Akbar, N., & Ahmad, S. (2022). The Moderating Effect of Price Sensitivity on the Relationship between Consumers Environmental Knowledge and Green Purchase Intentions. *Journal of Managerial Sciences*, 16(3), 110-125.



- Akbar, N., Ghutai, G., & Yousafzai, M. T. (2025). ARTIFICIAL INTELLIGENCE TRANSFORMATIONS IN MARKETING: THE NEXUS BETWEEN CHATBOTS' PERCEIVED USEFULNESS, PERCEIVED CREDIBILITY, AND BRAND LOYALTY IN E-COMMERCE. *Policy Journal of Social Sciences Review*, 3(8), 455-467.
- Akbar, N., Mordhah, D. N., Takreem, D. K., & Dr, I. R. (2023). "Connecting the Dots: Unravelling the relationship between Brand Attitude, Loyalty, and Purchase Intentions in the Textile and Fashion Industry". *Journal of Positive school Psychology*, 7(4), 523-536.
- Akbar, N., Mordhah, N., & Rafiq, I. (2021). Examining The Moderating Role Of Gender And Also Investigating The Influence Of Marketing Strategies On Online Consumer Buying Behavior. *Webology*, 18(1), 895-912.
- Akbar, N., Rafiq, I., Uddin, Z., & Bilal, M. (2021). Observing the role of online marketing strategies with consumer buying behaviour in the presence of Attitude as a mediator. *ILMA Journal of Social Sciences and Economics*, 2, 124-139.
- Akbar, N., Takreem, D. K., & Akbar, S. (2023). Examining the Connection between Glass Ceiling Beliefs and Job Performance of Female Employees in Directorates of Education, Khyber Pakhtunkhwa, Pakistan. *Global Economic Review*, 8(II), 172-185.
- Akter, U. H., Pranto, T. H., & Haque, A. (2022). Machine learning and artificial intelligence in circular economy: a bibliometric analysis and systematic literature review. *arXiv preprint arXiv:2205.01042*.
- Algoe, S. B., & Haidt, J. (2009). Witnessing excellence in action: the 'other-praising' emotions of elevation, gratitude, and admiration. *J Posit Psychol*, 4(2), 105-127. <https://doi.org/10.1080/17439760802650519>
- Aquino, K., McFerran, B., & Laven, M. (2011). Moral identity and the experience of moral elevation in response to acts of uncommon goodness. *Journal of personality and social psychology*, 100(4), 703.
- Asif, M. H., Zhongfu, T., Irfan, M., Ahmad, B., & Ali, M. (2023). Assessing eco-label knowledge and sustainable consumption behavior in energy sector of Pakistan: an environmental sustainability paradigm. *Environmental Science and Pollution Research*, 30(14), 41319-41332.
- Banerjee, S., Galizzi, M. M., John, P., & Mourato, S. (2023). Immediate backfire? Nudging sustainable food choices and psychological reactance. *Food Quality and Preference*, 109, 104923.
- Bao, C., Hu, X., Zhang, D., Lv, Z., & Chen, J. (2023). Predicting moral elevation conveyed in Danmaku comments using EEGs. *Cyborg and Bionic Systems*, 4, 0028.
- Bauer, J. M., Aarestrup, S. C., Hansen, P. G., & Reisch, L. A. (2022). Nudging more sustainable grocery purchases: Behavioural innovations in a supermarket setting. *Technological Forecasting and Social Change*, 179, 121605. <https://doi.org/https://doi.org/10.1016/j.techfore.2022.121605>
- Berger, M., Lange, T., & Stahl, B. (2022). A digital push with real impact – Mapping effective digital nudging elements to contexts to promote environmentally sustainable behavior. *Journal of Cleaner Production*, 380, 134716. <https://doi.org/https://doi.org/10.1016/j.jclepro.2022.134716>
- Bergram, K., Djokovic, M., Bezençon, V., & Holzer, A. (2022). The digital landscape of nudging: A systematic literature review of empirical research on digital nudges. Proceedings of the 2022 CHI conference on human factors in computing systems,
- Bleier, A., & Eisenbeiss, M. (2015). Personalized online advertising effectiveness: The interplay of what, when, and where. *Marketing Science*, 34(5), 669-688.



- Boerman, S. C., Kruikemeier, S., & Bol, N. (2021). When is personalized advertising crossing personal boundaries? How type of information, data sharing, and personalized pricing influence consumer perceptions of personalized advertising. *Computers in Human Behavior Reports*, 4, 100144. <https://doi.org/https://doi.org/10.1016/j.chbr.2021.100144>
- Brehm, J. W. (1966). A theory of psychological reactance.
- Calboli, S. (2025). Autonomy and AI Nudges: Distinguishing Concepts and Highlighting AI's Advantages: S. Calboli. *Philosophy & Technology*, 38(3), 116.
- Carrel, C., Gavard-Perret, M.-L., & Caldara, C. (2023). Factors of effectiveness of green nudges for more eco-responsible behaviour – Systematic review and research directions. *Recherche et Applications en Marketing (English Edition)*, 38(3), 32-76. <https://doi.org/10.1177/20515707231177814>
- Chen, F., Zhang, T., Hou, J., Chen, H., Long, R., & Zhang, T. (2025). How do children encourage their parents to adopt green consumption behaviour?-An analysis of the perspective of moral elevation. *Sustainable Production and Consumption*, 55, 257-267.
- Colley, K., Sánchez, G. M., Chen, J., Somervail, P., Hague, A., Wooldridge, T.,...Craig, T. (2026). Development and validation of the Circular Behaviours Scale: A measure of householder behaviours for a circular economy. *Journal of Environmental Psychology*, 103058.
- Corbier, D., Pettifor, H., Agnew, M., & Nagashima, M. (2025). Shaping sustainable consumption practices: Changing consumers' habits through lifestyle changes and Extended Producer Responsibility schemes. *Resources, Conservation and Recycling*, 217, 108214.
- Dangelico, R. M., Alvino, L., & Fraccascia, L. (2022). Investigating the antecedents of consumer behavioral intention for sustainable fashion products: Evidence from a large survey of Italian consumers. *Technological Forecasting and Social Change*, 185, 122010.
- De Keyser, F., Dens, N., & De Pelsmacker, P. (2022). How and When Personalized Advertising Leads to Brand Attitude, Click, and WOM Intention. *Journal of Advertising*, 51(1), 39-56. <https://doi.org/10.1080/00913367.2021.1888339>
- Diessner, R., & Niemiec, R. M. (2023). Can beauty save the world? Appreciation of beauty predicts proenvironmental behavior and moral elevation better than 23 other character strengths. *Ecopsychology*, 15(2), 93-109.
- Do, N. B., Bui, M.-D., Hoang, D., & Martinez, L. F. (2026). AI Personalization and Psychological Response: Examining the Role of Obsession and Reactance. *Services Marketing Quarterly*, 1-18.
- Duan, H., Dawod, A. Y., & Wan, G. (2026). The personalization paradox in AI-driven tourism e-commerce: Psychological reactance, threat-substitution, and the moderating role of privacy concerns. *Journal of Theoretical and Applied Electronic Commerce Research*, 21(4), 127.
- Duane, J.-N., Ericson, J., & McHugh, P. (2025). Digital nudges: a systematic narrative review and taxonomy. *Behaviour & Information Technology*, 44(13), 3250-3270.
- ElHaffar, G., Durif, F., & Dubé, L. (2020). Towards closing the attitude-intention-behavior gap in green consumption: A narrative review of the literature and an overview of future research directions. *Journal of Cleaner Production*, 275, 122556.
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior research methods*, 41(4), 1149-1160.
- Feeney, J. A., & Fitzgerald, J. (2022). Autonomy–connection tensions, stress, and attachment: The case of COVID-19. *Current Opinion in Psychology*, 43, 18-23.



- Fielding, K. S., & Hornsey, M. J. (2026). Understanding and reducing the intention–behaviour gap in climate action. *Nature Climate Change*, 1-10.
- Fraccascia, L., Ceccarelli, G., & Dangelico, R. M. (2023). Green products from industrial symbiosis: Are consumers ready for them? *Technological Forecasting and Social Change*, 189, 122395.
- Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American psychologist*, 56(3), 218.
- Freudenreich, T., & Penz, E. (2025). Psychological reactance in assertive green advertising: addressing the role of individual values. *Journal of Consumer Marketing*, 42(1), 24-37.
- Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy–A new sustainability paradigm? *Journal of Cleaner Production*, 143, 757-768.
- Gibhardt, S., Hepach, R., & Henderson, A. M. (2024). Observing prosociality and talent: the emotional characteristics and behavioral outcomes of elevation and admiration in 6.5-to 8.5-year-old children. *Frontiers in Psychology*, 15, 1392331.
- Haidt, J. (2003). Elevation and the positive psychology of morality.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24.
- Hettler, F. M., Schumacher, J.-P., Anton, E., Eybey, B., & Teuteberg, F. (2025). Understanding the user perception of digital nudging in platform interface design. *Electronic Commerce Research*, 25(3), 2097-2134.
- Hobson, K., Holmes, H., Welch, D., Wheeler, K., & Wieser, H. (2021). Consumption Work in the circular economy: A research agenda. *Journal of Cleaner Production*, 321, 128969.
- Hong, S.-M., & Faedda, S. (1996). Refinement of the Hong psychological reactance scale. *Educational and psychological measurement*, 56(1), 173-182.
- Huang, M., & Fang, S. (2024). Mechanisms of self-control in the influence of moral elevation on pro-social behavior: A study based on an experimental paradigm. *Psychology Research and Behavior Management*, 537-552.
- Jain, R., & Kumar, A. (2024). Artificial intelligence in marketing: Two decades review. *NMIMS Management Review*, 32(2), 75-83.
- Khalufi, N. A. M. (2025). Digital Nudges and Environmental Concern in Shaping Sustainable Consumer Behavior Aligned with SDGs 12 and 13. *Sustainability*, 17(24), 11292.
- Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal*, 28(1), 227-261.
- Khattak, A., & Khattak, S. R. (2026). Spiritual leadership and employee voice behavior in higher education institutions: A moderated mediation model. *Acta Psychologica*, 266, 106831.
- Lopez, N. S. R., & Legardeur, J. (2024). Consumer behaviour in the context of circular economy: a systematic literature review. *Proceedings of the Design Society*, 4, 1417-1426.
- Ma, X., Khattak, A., Ghani, B., & Huo, M. (2023). Perceived overqualification in higher education institutions: Enhancing employee innovative behavior via creative self-confidence and harmonious workplace climate. *Current Psychology*, 1-12.
- Manzoor, S. R., Ullah, R., Khattak, A., Ullah, M., & Han, H. (2024). Exploring tourist perceptions of artificial intelligence devices in the hotel industry: impact of industry 4.0. *Journal of Travel & Tourism Marketing*, 41(2), 272-291.



- McGuire, A. P., Hayden, C. L., Tomoum, R., & Kurz, A. S. (2022). Development and validation of the state moral elevation scale: Assessing state-level elevation across nonclinical and clinical samples. *Journal of Happiness Studies*, 23(6), 2923-2946.
- Memon, M. A., Ting, H., Cheah, J.-H., Thurasamy, R., Chuah, F., & Cham, T. H. (2020). Sample size for survey research: Review and recommendations. *Journal of applied structural equation modeling*, 4(2), i-xx.
- Mertens, S., Herberz, M., Hahnel, U. J., & Brosch, T. (2022). The effectiveness of nudging: A meta-analysis of choice architecture interventions across behavioral domains. *Proceedings of the National Academy of Sciences*, 119(1), e2107346118.
- Miguel, A., & Miranda, S. (2025). Brands Driving Social Change: The Impact of Social Brand Activism on Consumers Pro-Social and Pro-Environmental Attitudes. *International Journal of Strategic Communication*, 19(5), 651-670. <https://doi.org/10.1080/1553118X.2025.2504466>
- Moon, S., Chung, S.-j., & Oh, J. (2025). Effect of Nudge Interventions in Real-World Kiosks on Consumer Beverage Choices to Promote Non-Sugar-Sweetened Beverage Consumption. *Nutrients*, 17(15), 2524.
- Mukherjee, A., Lee, S. Y., & Gershoff, A. (2025). Consumer flexibility and the effectiveness of limited time offers: the role of psychological reactance. *Journal of Business Research*, 200, 115645.
- Nijssen, S. R., Pijs, M., van Ewijk, A., & Müller, B. C. (2023). Towards more sustainable online consumption: The impact of default and informational nudging on consumers' choice of delivery mode. *Cleaner and Responsible Consumption*, 11, 100135.
- Palwasha Bibi, H. R., Muhammad Anees ul Husnain Shah, Nazim Ali, Neelam Akbar, Ashfaq Ahmad. (2024). The Relationship between Talent Management and Work Engagement: Role of Psychological Capital as Mediator. *Migration Letters*, 21(S2), 1161-1169.
- Pfrang, T., & Spreer, P. (2022). Behavioral Return Interventions-How Behavioral Science Helps Prevent Returns in E-Commerce. *Marketing Review St. Gallen*, 39(4), 24-33.
- Pohling, R., Diessner, R., Stacy, S., Woodward, D., & Strobel, A. (2019). Moral elevation and economic games: The moderating role of personality. *Frontiers in Psychology*, 10, 1381.
- Richards, I. (2025). 'Hypernudging': a threat to moral autonomy? *AI and Ethics*, 5(2), 1121-1131. <https://doi.org/10.1007/s43681-024-00449-y>
- Sadeghian, A. H., & Otarkhani, A. (2024). Data-driven digital nudging: a systematic literature review and future agenda. *Behaviour & Information Technology*, 43(15), 3834-3862.
- Saulītis, A., Silkāne, V., & Ozola, A. K. (2025). Enhancing sustainable consumer behaviour through Nudging: Insights from a field experiment on adoption of electronic receipts. *Electronic Commerce Research and Applications*, 101548.
- Saunders, M., Lewis, P., Thornhill, A., & Lewis, P. (2012). Research methods for business students.
- Schubert, C. (2017). Green nudges: Do they work? Are they ethical? *Ecological economics*, 132, 329-342.
- Shams, H., Ab Rahman, M. N., Hishamuddin, H., & Rafique, M. Z. (2025). A circular consumption behavior model for addressing and reducing product demand and disposal. *Resources*, 14(9), 148.
- Shevchenko, T., Saidani, M., Ranjbari, M., Kronenberg, J., Danko, Y., & Laitala, K. (2023). Consumer behavior in the circular economy: Developing a product-centric framework. *Journal of Cleaner Production*, 384, 135568.
- Siddiq, A., Bibi, P., Akbar, N., ud Din, R., Ahmad, A., & Rahman, H. (2024). Moderating Role Of Organizational Citizenship Behavior In The Relationship Between Job Satisfaction And Associated



- Factors: A Perspective From University Teachers In Peshawar, Pakistan. *Migration Letters*, 21(S4), 412-425.
- Snyder, E. C., Sundar, S. S., & Lee, J.-G. (2025). Reducing reactance to ads by voice assistants: The role of ad customization, ad personalization, and privacy customization. *Journal of interactive marketing*, 60(2), 161-179.
- Testa, F., Marullo, C., Gusmerotti, N. M., & di Iorio, V. (2024). Exploring circular consumption: Circular attitudes and their influence on consumer behavior across the product lifecycle. *Business Strategy and the Environment*, 33(7), 6961-6983. <https://doi.org/https://doi.org/10.1002/bse.3849>
- Thaler, R. H., & Sunstein, C. R. (2003). Libertarian Paternalism. *American Economic Review*, 93(2), 175–179. <https://doi.org/10.1257/00028280321947001>
- Thaler, R. H., Sunstein, C. R., & Milligan, S. (2009). *Nudge: Improving decisions about health, wealth, and happiness* (Vol. 47). HeinOnline.
- Thomson, A. L., & Siegel, J. T. (2013). A moral act, elevation, and prosocial behavior: Moderators of morality. *The Journal of Positive Psychology*, 8(1), 50-64. <https://doi.org/10.1080/17439760.2012.754926>
- Ungerman, O., & Dědková, J. (2024). Consumer behavior in the model of the circular economy in the field of handling discarded items. *Plos one*, 19(3), e0300707.
- Vidal-Ayuso, F., Akhmedova, A., & Jaca, C. (2023). The circular economy and consumer behaviour: Literature review and research directions. *Journal of Cleaner Production*, 418, 137824.
- von Zahn, M., Bauer, K., Mihale-Wilson, C., Jagow, J., Speicher, M., & Hinz, O. (2025). Smart green nudging: Reducing product returns through digital footprints and causal machine learning. *Marketing Science*, 44(4), 954-969.
- Wannow, S., Haupt, M., & Ohlwein, M. (2024). Is brand activism an emotional affair? The role of moral emotions in consumer responses to brand activism: S. Wannow et al. *Journal of brand Management*, 31(2), 168-192.
- Weinmann, M., Schneider, C., & Brocke, J. v. (2016). Digital Nudging. *Business & Information Systems Engineering*, 58(6), 433-436. <https://doi.org/10.1007/s12599-016-0453-1>
- Yeung, K. (2017). ‘Hypernudge’: Big Data as a mode of regulation by design. *Information, Communication & Society*, 20(1), 118-136.
- Ytreberg, N. S., Alfnes, F., & Van Oort, B. (2023). Mapping of the digital climate nudges in Nordic online grocery stores. *Sustainable Production and Consumption*, 37, 202-212.
- Zeb, A., Akbar, N., & Ahmad, S. (2016). ANALYZING THE ROLE OF CULTURAL DETERMINANTS ON VISITORS SATISFACTION IN HOSPITALITY AND TOURISM INDUSTRY OF PAKISTAN. *Journal of Rural Development and Administration*, 47(2), 19-30.