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AI-Driven Purchase Intention in Pakistan's E-Commerce: The Roles of Personalization, Anthropomorphism, Usefulness, Transparency, Trust, and AI Anxiety

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Artificial intelligence is getting involved more and more with e-commerce, changing the way customers search for products, receive recommendations, interact with digital platforms, and make purchasing calls. Although the adoption of AI-enabled tools like focused recommendations, chatbots, automated facilitation, and transparent digital communication has been growing rapidly, there is a lack of understanding about consumer purchase intention in AI-mediated shopping conditions, especially in emerging markets such as Pakistan. The current study investigates how sales intention is influenced in the context of Pakistan's e-commerce sector by perceived personalization, perceived anthropomorphism, perceived usefulness, and perceived transparency. It also explores the mediating influence of trust and the moderating role of AI anxiety in these relationships. The study depends on the S-O-R framework and follows a quantitative research design with a deductive approach and positivist philosophy. The data for the AI-enabled e-commerce element in Pakistan is then gathered from customers with experience of online buying. Using SmartPLS 4, the proposed model is tested with Partial Least Squares Structural Equation Modeling (PLS-SEM), The findings also demonstrate how perceived personalization, perceived technology usage and humanization have a strong positive impact on consumers' purchase intention; however, it has no significant effect from anthropomorphism Found results further state that trust significantly mediates between perceived personalization and consumer purchase intention whilst failing to do so between perceived transparency and purchase intentions. In addition, AI anxiety significantly weakens the positive effect of proposed personalization and perceived usefulness on purchase intention and has no moderating effect between perceived anthropomorphism and perception of transparency. In an emerging-market context, this study adds to the literature by introducing an integrated AI-commerce framework that discusses consumer purchase intention using cognitive as well as psychological routes. For e-commerce companies, it provides actionable steps to design the kind of AI that consumers will find not only useful and personalized, but also transparent, trustworthy, and psychologically acceptable. So, in summary, the study finds that AI adds value to digital commerce not because it is sophisticated but rather because it is relevant and reliable, and consumer-centric.

1. Introduction

Artificial intelligence (AI) is fundamentally changing what it means to engage with a digital interface, how shoppers assess products and make buying decisions. AI is not limited to back-end analytics in modern e-commerce; it increasingly manifests itself through personalized recommendations, chatbots, algorithmic communication and automated decision-support tools. The critical academic and managerial question is whether these AI-enabled interactions lead to purchase intention. Previous studies highlight that personalization through AI can enhance various responses from consumers, such as trust and perceived usefulness (Teepapal et al., 2025; Oesterreich et al., 2025), while trust has proven to be one of the most critical predictors for behavioral outcomes in e-commerce. Concurrently, AI-related features, including anthropomorphism and transparency, also play a role in influencing trust and purchase intention, but their effects are still complex and context-dependent (Wang et al., 2024a; Wang et al., 2024b). This indicates that the existing understanding of AI-enabled features impacting purchase intention is yet limited.

In developing economies like Pakistan, where the consumer is often influenced by uncertainty, perceived risk, and lack of confidence in online systems, more advanced techniques to reach the potential clients. Previous research in Pakistan suggests trust-based and performance-related views have a stronger influence than convenience on online practice comforts. Hanif et al. (2022) show that young Pakistani consumers' mobile shopping behavioral intentions are shaped by enabling and disabling beliefs; whereas, Rehman et al. Trust has been shown by (2019) to be a key factor in facilitating the relationship between intention and actual online purchase behavior. The results suggest that consumer purchasing intention in Pakistan is delicate and significantly reliant on trust regarding the digital environment (Hanif et al., 2022; Rehman et al., 2019).

This problem is especially important in Pakistan’s e-commerce sector, where companies increasingly use AI-powered recommendation systems, chatbots, and algorithmic communication to affect consumer choice. While these tools are designed to improve the shopping experience and relevance, they can also create hesitation if consumers see them as too human-like, ambiguous, or invasive. Past studies indicate that transparency helps increase purchase intention, and anthropomorphic AI communication leads to trust formation, which impacts behavioral responses, while in the online retail setting, trust-oriented AI systems are crucial (Wang et al., 2024b; Wang et al., 2024a; Chakraborty et al., 2024). So, the real issue is not only whether companies integrate AI, but rather whether these AI-supported functions create sufficient trust and perceived value to enhance purchase intention on a digital marketplace with emerging trust.

While research on how AI can influence consumer behavioural responses in digital purchase contexts is plentiful, the literature is fragmented across variables, contexts, and mechanisms of explanation. Within the digital advertising ecosystem of Vietnam, An et al. (2023) revealed that perceived personalization strengthens consumers' purchase intention via trust and perceived usefulness, which implies that the effects of personalization on purchasing behavior are more likely to be realized through evaluative mechanisms rather than direct influence. Similarly, Wang et al. (2025) discovered an anthropomorphism direct effect

on purchase intention — as well as an indirect effect on purchase intention, mediated by trust and social presence — while transparency can mitigate some of these effects if it is made explicit that the content has been generated by AI. In yet another retail-centric AI study, Malhotra et al. (2023) found that perceptual anthropomorphism affects purchase intention through perceived animacy and intelligence, while AI trust moderates the mechanism of anthropomorphism. While these studies together confirm the relevance of the selected variables, they also reveal that such evidence is spread out across different models and largely excludes Pakistani contexts, be it for digital ads, generative AI communication, or AI-supported retail, instead of in an integrated model focusing on purchase intention.

Money laundering and embezzlement are among the 15 common digital purchase withdrawal mechanisms, which can be explained as a more stable and theoretically representative index than other common mechanisms in the past several studies, which have also not been explicit. In Vietnam, An et al. (2025) addressed trust as a mediating variable between AI-driven personalization-related perceptions and purchase intention. Wang et al. (2023) found in generative AI marketing communication (2025) that trust was recognized as a mediator between anthropomorphism and purchase intention once again. At a higher level, Dang et al. (2025), upon reviewing 562 empirical studies, argued that trust continues to be a central but inconsistently modeled construct in AI research as its antecedents and consequences often vary widely between domains. Thus, trust seems a likely candidate for mediation in this study. Nonetheless, existing literature has yet to comprehensively analyze trust toward purchase intention regarding perceived personalization, perceived anthropomorphism, perceived usefulness, and perceived transparency in a single consumer-behavior framework.

Another key deficit is about AI anxiety. Despite the recent surge of AI anxiety as a significant psychological burden or boundary condition that is relevant to consumer behaviour, not much work has been done on its association with purchase intention through an integrated consumer framework in Pakistan's e-commerce domain. Mohamed et al. (2025) show that anxiety moderates behavioral intention to their use of generative AI tools, indicating that it can weaken or transmute the process of forming intention. In another consumer context, Schultz et al. (2025) also revealed that technology anxiety adversely influences perceptions and behavioral intention toward digital voice assistants for online grocery shopping. Jia et al. (2026), using Chinese e-commerce consumers, found that AI-induced anxiety mediates the effect of AI transparency on consumer satisfaction. Though these studies provide evidence that anxiety influences AI-related response, it has not been sufficiently evaluated for moderating the relation between AI-induced perceptions and purchase intention in the context of Pakistan's e-commerce setting.

Thus, the main research gap is obvious. While previous research has addressed some of the components, no comprehensive consumer model that focuses on AI has previously explored how perceived personalization, perceived anthropomorphism, perceived usefulness, and perceived transparency affect purchase intention directly and indirectly through trust, nor has it tested whether AI anxiety moderates these relationships, particularly in an underserved context such as Pakistan's e-commerce industry. Closing this gap is both theoretically

important and contextually urgent. This study is therefore significant at multiple levels. Theoretically, it extends AI-enabled consumer-behavior research by integrating four important AI-related antecedents within a single framework. Existing studies have often examined these constructs separately or in limited combinations, which has contributed to fragmentation. By bringing them together, the present study offers a more comprehensive explanation of how consumers evaluate AI-driven shopping environments. It also contributes conceptually by positioning trust as a mediating mechanism between AI-related perceptions and purchase intention, thereby clarifying not only whether AI features matter, but also how and why they matter. In addition, the inclusion of AI anxiety as a moderator adds an emotional and boundary-condition perspective to the literature, acknowledging that AI-driven features do not influence all consumers in the same way. This is important because consumer reactions to AI are not always favorable; some users may experience discomfort, uncertainty, or fear when engaging with highly automated, human-like, or difficult-to-understand systems.

In the context of Pakistan, where, amidst a surge in digitalization and online retail adoption, there are few empirical investigations into AI-mediated consumer behaviour, the study is also noteworthy. Given that citizens of different countries are likely to respond differently to AI based on their familiarity with the related technologies, culture of trust, levels of digital literacy, and uncertainty avoidance, localized evidence from Pakistan is needed. Practically, the results can help e-commerce firms, digital marketers, and platform designers pinpoint the AI-enabled features that are most likely to stimulate purchase intention as well as which psychological conditions increase their effectiveness. If personalization and transparency are found to be important, companies can devote resources towards more personalized recommendations and clearer communication about their AI. Should AI anxiety undermine these effects, thereafter, managers will need to mitigate consumer fear, confusion, and resistance. This study is also relevant to policy and society as it provides insights into transparency, trust, and responsible AI deployment in a digital commerce world, while exposing the human face of technology transformation. It further contributes by employing a methodologically driven approach of testing a mediated-moderated model, as opposed to one that merely assesses for pure direct effects, offering a richer explanation of AI-enabled purchase intention in e-commerce.

2. Literature Review

2.1 Theoretical Background

This study is rooted in the S-O-R theory, which elaborates on how external triggers influence internal psychological states leading to a behavioral response (purchase intention). Recent research has shown that the S-O-R model is very fitting for digital and online commerce, as consumers do not act immediately to platform traits but instead interpret them cognitively and affectively before choosing whether or not to purchase. For example, Yang et al. (2024) adopted S-O-R to explore the relationship between e-commerce live-streaming and found that those cues are platform-related, comparing internal consumer evaluations, which finally influence purchase intention. Zhou et al. (2022) also adopted an S-O-R framework to account for online payment intention based on platform, product, and contributor related stimuli, whilst Busalim et al., as one of the most common frameworks to explain S-O-R in

social commerce because it demonstrates how platform characteristics, trust on the communication, attitudes, and engagement have an effect on consumer response (2025).

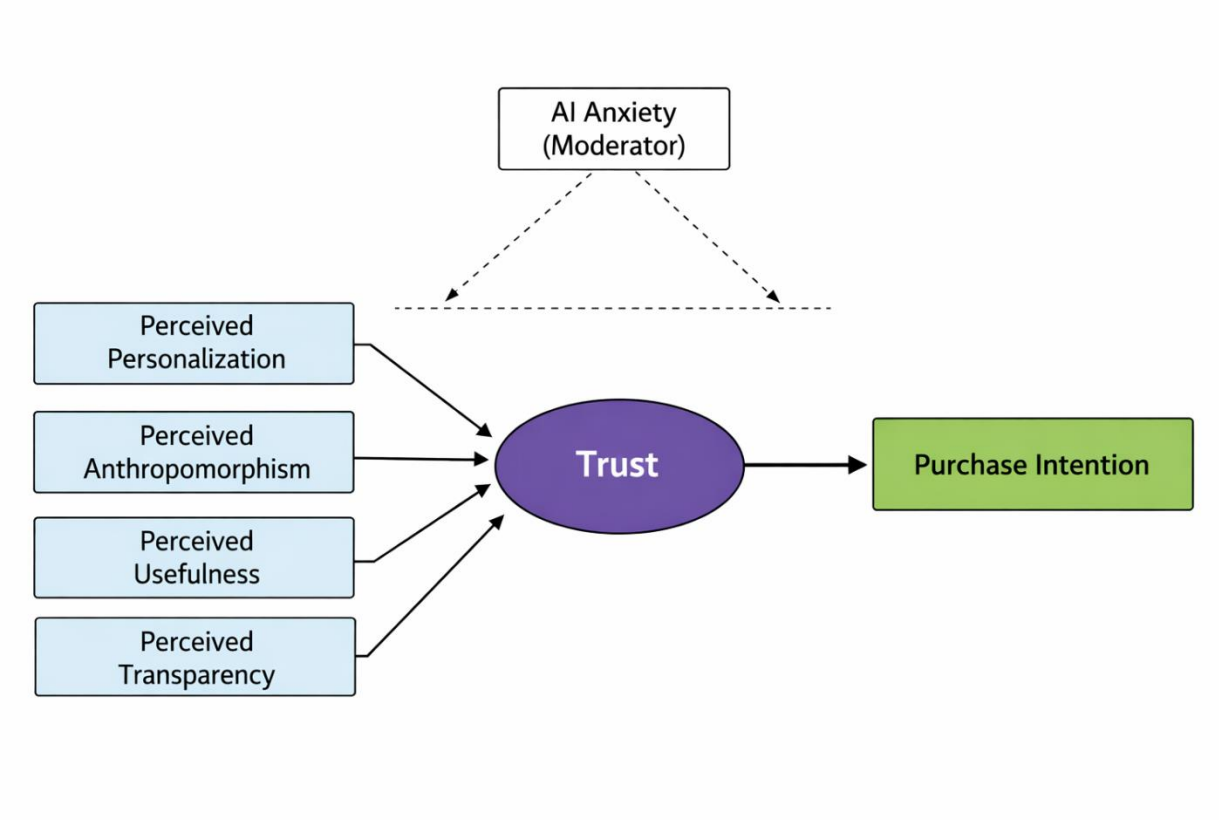
One of the major strengths of S-O-R for this study is that it allows for multiple simultaneous extrinsic cues, which is essential in AI-enabled e-commerce. Consumers face bundles of signals, including personalization, design of interfaces, social cues, quality of information offered in interactions with consumers, disclosure, and responsiveness signalled during servicing. The S-O-R framework enables those features to be treated as stimuli, while internal states such as trust, perceived value, pleasure or satisfaction (or anxiety), are conceived of as the organism, and purchase intention becomes the response. (It is in line with this logic that Hameed et al. (2025) demonstrated that trust, perceived value, and pleasure are affected by relational bonds and reduce uncertainty—and therefore result in heightened purchase intention. Similarly, Jabeen et al. In Pakistan, Abid et al. (2024) employed S-O-R to describe online purchasing behavior by classifying marketplace elements as stimuli, trust as the organism, and online buying behavior as the response.

Perceived personalization, perceived anthropomorphism, perceived usefulness, and perceived transparency act as stimuli in the present framework under this lens because they can be conceived of as external characteristics of the AI-mediated shopping environment that exist before intention formation. Literature supports this view. In the advertising and retail context, personalized content that is artificial intelligence-driven is treated more as a contextual signal informing internal evaluations and outcomes. In the context of service-chatbot research, anthropomorphism is used as an IOT (Internet of Things) environmental design signal to elicit psychological responses. For example, Lu et al. (2025) demonstrated that anthropomorphic chatbot cues shape consumer gratification and encourage purchase intentions. Likewise, Rabbanee et al. (2024) used S-O-R to demonstrate that anthropomorphic features directly affect the value perception and satisfaction of users, confirming that humanlike design characteristics act as stimuli. Transparency-related disclosure in AI advertising is a market signal of its own that has been shown to shape trust and response (see the Vietnam AI-disclosure study referenced in your text). Within S-O-R, trust is the main organism variable because it serves as an indicator for the internal psychological assessment by which a consumer determines that it would be appropriate to trust and depend on information provided inside an AI-enabled platform (or in its messages or recommendations), i.e., that it is credible, reliable, and safe enough.

Jabeen et al. (2023) corroborate this conceptualization, showing that trust was the organism connecting advertising and risk cues to online purchasing behavior, and Hameed et al. (2025) demonstrate that trust is a fundamental internal state in live-stream retail. Previous studies by Lu, Fan and Zhou (2016) also considered trust as an internal mechanism linking social presence and purchase intention. More recent research into the disclosure of AI found similar trust mediation: a cue related to (non-legal) disclosure affects purchase intention via trust. The response for this study is purchase intention that aligns at full strength with S-O-R applications in digital commerce. Yang et al. Zhou et al. (2024) conceptualized purchase intention as the dependent variable in e-commerce live-streaming. (2022) studied the intention to pay in online knowledge markets, and Lu et al. (2025) focused on the end result

of anthropomorphic chatbot experiences, which was purchase intention. These studies confirm that S-O-R is a well-established in predicting marketplace intentions and not just attitudes. Including AI anxiety is also theoretically justified within the S-O-R framework, as this interpretation of a negative internal state (stress, fear, uncertainty, and anxiety) can be integrated into the model along with positive states within the organism. Jabeen et al. (2024) showed that risk stimuli can disrupt internal psychological states and weaken online buying behavior. Therefore, AI-related cues can both fortify purchase intention in certain consumers or create unpleasantness and loss of control in others. Thus, the anxiety of AI is a suitable internal state that can undermine a favorable translation of stimuli related to AI into an appropriate response.

Figure No 1: Conceptual Framework



2.2 Perceived Personalization and Purchase Intention

Perceived personalization, indicating the extent to which marketing messages, product recommendations, and shopping experiences are aligned with specific customer needs and preferences, is a major driver of consumer response in digital commerce (Lee et al., 2022). In the online environment, personalization minimizes irrelevant information and can make shopping more efficient and relevant (with search) as well as immersive (increasing its engagement level). An and Ngo (2025) found that perceived personalization drives purchase intention in the context of Vietnam's digital advertising, using perceived relevance, trust, and usefulness to explain that effect. Likewise, Odoom, Kosiba, and Dzorifa (2022) found that ad personalization has a positive influence on online purchase intention; however, the

relationship is influenced by relevance and intrusiveness. The same beneficial influence also manifests in social media and mobile contexts. Lee and Park (2022) found that social media personalized advertising enhances purchase intention, but may act indirectly by way of intrusiveness-related mechanisms. For mobile social media fashion advertisement, Serrano-Malebrán and Arenas-Gaitán (2021) confirmed the positive impact of personalization on perceived usefulness, thereby promoting intention to buy under the S-O-R perspective.

This relationship is also supported by studies on online shopping and recommendation systems. Personalized product recommendations enhance the quality of decision making, as they mitigate information underload and extreme frustration - Huang and Zhou (2019). VR fashion apps providing personalized experiences promote positive in-app purchasing intention (Lau & Ki, 2021), and personalization in agricultural live-streaming commerce is positively related to perceived value and purchase intention (Tan, 2024). Notably, earlier research (Pappas et al., 2014) reported that online shopping personalization influences purchase intention through both cognitive and emotional pathways. More recently, Zhang et al. This reinforces the idea proposed by (2023) that situational factors, such as personalized recommendations imparted through stimuli, trigger impulsive purchase intention in mobile commerce. Likewise, Lo et al. (2026) found that the quality of personalized recommendations in the fashion e-commerce context towards immersion, perceived value, and purchase intention led to post-purchase satisfaction and return intention. Qadri et al. (2026) demonstrated that AI-generated personalization encourages sustainable buying intention, but dependent on the relevance of the topics being addressed, and privacy and intelligence transparency considerations.

2.3 Perceived Anthropomorphism and Purchase Intention

Perceived anthropomorphism, a variable in the relationship between consumers and their experiences with products, chatbots, digital assistants, or artificial intelligence (AI) interfaces that consumers perceive as possessing human characteristics of warmth, intelligence, emotion(s), personality, or social presence. Anthropomorphism is salient in digital commerce as organizations increasingly construct AI-enabled interfaces that mimic human interaction to overcome the inherently impersonal form of online shopping. Thus far, research has shown that consumers tend to show higher levels of trust and engagement when they perceive AI systems as being more human-like, leading to increased purchase intention. For example, Balakrishnan et al. (2024) revealed in their study about conversational commerce that perceived anthropomorphism greatly enhances positive attitude toward and purchase intention of digital assistants. Li, Hou, and Tan (2024) further found that chatbot warmth and competence affect purchase expectations through perceived humanness and perceived persuasiveness, indicating that anthropomorphism operates by altering the social capability of the AI in terms of both appearing socially capable as well as seemingly effective in persuasion. Similarly, El-Naggar et al. (2025) found that anthropomorphic cues influence consumer gratifications, which, in turn, regulate purchase intentions. Anthropomorphism also plays a role in AI-product environments. Thus, based on Zhang and Wang (2023), the study examined whether anthropomorphic appearance would influence purchase intention differently for different types of products: low anthropomorphic appearance would promote,

whereas high anthropomorphic features would promote the intention to buy utility AI vs. hedonic AI, respectively.

In shopper-facing retail tech, Barney and colleagues (2022) have previously described one form of anthropomorphism as enhancing purchase intentions, but adding a secondary anthropomorphistic element does not significantly further boost this effect. This indicates that a small amount of human-likeness is good, but too much anthropomorphic layering may dilute the marginal benefit. This relationship is also supported by field evidence. Igarashi et al. (2026) conducted a real-world experiment on a cosmetic e-commerce website and found that anthropomorphic chatbot design influenced how users purchased from the website, both for one-time purchases, showing stronger effects and subscription purchase behavior. Likewise, Malhotra et al. (2023) confirmed that perceived anthropomorphism enhances shopping experience and purchase intent through intermediary processes of perceived animacy and perceived intelligence, with trust in AI moderating some of these processes. Specifically, Wang and colleagues (2025) showed that anthropomorphism affects trust and behavioral reactions towards generative-AI-powered marketing communication, whereas Gomes et al. (2025) found that the anthropomorphism of chatbots positively influences customer purchasing decisions, mediated by satisfaction, trust, and loyalty. But the literature also warns that anthropomorphism is not universally helpful. Li et al. (2026) on the effect of anthropomorphism of virtual-streamers on purchase intention based on price-expectation discrepancy, and field evidence from new internet research showing that anthropomorphism conveying wrong linguistic-visual combination harms persuasion (and purchase-intention). Broadly, anthropomorphism works to help, but only when it fits within the wider transactional and motivational context.

2.4 Perceived Usefulness and Purchase Intention

Perceived usefulness is defined as the extent to which consumers feel that using a system, platform, or technology enhances shopping performance, promotes decision quality and time saving, or makes the purchase process more effective. For years, it has been regarded as one of the most powerful predictors of consumer acceptance and purchase intention in digital commerce. Peña-García et al. (2020) note that the perceived usefulness includes the extent to which e-commerce systems help in making decisions during online purchases. (2023) shows that perceived usefulness has a significant impact on consumers' digital shopping intention.

Findings presented on its use in advanced digital contexts still suggest that usefulness continues to positively correlate with purchase intention. Through AI-powered personalized advertising, An and Ngo (2025) identified perceived usefulness as one of the mechanisms that drive purchase intention through AI-enabled personalization. Roy et al. (2025) also stated that perceived usefulness affects the intention to purchase online in AI-enabled purchasing environments. These results suggest that consumers do not just react to innovation or automation: They care about whether AI helps them make better shopping decisions more quickly and conveniently. We see a similar positive effect of usefulness on commerce based on social media and communication.com=>com use cases. Harrigan et al. (2021) identified that expected usefulness and peer communication are building blocks of online purchase intention in social-media environments. For example, Botha and Reyneke (2015) also found

that perceived usefulness was one of the significant factors shaping online purchase intention along with social presence, trust, and privacy concerns. At the retailer level, Noei et al. Establishing Perceived Usefulness for Store Site (2024) encouraged participation and reduced shopping-related risk, helping support the purchase intention. In this regard, Emerald reported a similar result regarding online shopping intention during the COVID-19 period with respect to the relation of perceived utility and behavioral intention (as cited in your retrieved text). In studies of online reviews and online apparel-making purchase intention, it has also been found that consumers are willing to buy when the particular information is perceived as useful. Useful, too, does not always function purely directly. Wistedt et al. (2024)686 Transferred from cross-border e-commerce; in their longitudinal study, they revealed that perceived usefulness does not directly and significantly influence purchase intention, but through trust and commitment. Harrigan et al. (2021) use the trust-based procedures rooted in perceived usefulness to ground purchase intention as well. Wider syntheses like Handoyo et al. (2024) and the Springer study on digital shopping intention referenced in your text affirm that usefulness continues to be significantly apparent across numerous digital environments, although its precise driver path may differ.

2.5 Perceived Transparency and Purchase Intention

When it comes to digital- and technology-mediated markets, perceived transparency serves as an important driver of consumer behavior since it relates to how open, understandable, and honest a firm/platform/message is judged (Barbaro et al. 2019). Transparency in online commerce decreases vagueness, which improves trust when faced with uncertainty and information deficits. Zhou et al. (2018) offered direct evidence by demonstrating how perceived information transparency in B2C e-commerce facilitates significant positive online purchase intention. Recent research also reveals that transparency is still important in AI-enabled settings. Wang and Qiu (2024) showed that technological transparency of AI in digital endorsers positively impacts purchase intentions, while Wang et al. (2025a) showed that transparency in generative AI-driven marketing communication has a significant impact on subsequent purchase-related responses (2025a). More than AI disclosure, Montecchi et al. (2024) show that perceived brand transparency enhances brand evaluations and increases purchase intention, and Sansome et al. (2025) provided evidence that transparency has even more impact in higher-risk or personally relevant social contagion purchase decisions.

Transparency also works at the level of design and information presentation. Wang et al. (2025b) found that transparent design positively influences consumer imagination, anticipated service quality, and purchase intention. But being transparent does not always have a linear upside. Chu et al. (2025) reveal that price transparency has a substantial influence on purchase intention, but lower transparency actually tends to develop higher purchase intention by increasing information diagnosticity in that context. Research into supply-chain and traceability makes the transparency–purchase intention connection even stronger. In the context of information usefulness and trust, Lam (2024) proved that traceability information improves both while through the food supply chain, consumer trust transparency and traceability positively impact purchasing behaviours, creating interaction

between trust, traceability, and purchasing behaviours (Nguyen & Nguyen, 2025). Woodroof et al. (2018) found that the selected image in promotional communication significantly influenced participants' responses; as such, we suggest examining how the choice of visuals in organic posts affects engagement with post content for future research. (2020) that influencer transparency impacts perceived product efficacy and purchase intentions, and Hernandez et al. (2022) also found that two-sided advertising featuring transparency cues enhances purchase intention, even among skeptical consumers. In sum, transparency tends to increase purchase intention because it reduces uncertainty and increases credibility and confidence, with the form and context of transparency being important.

2.6 Trust as a Mediator

Among mediating mechanisms, trust is one of the most accepted theories in digital consumer behavior literature due to its capability of translating some external cues into purchase intention. Consumers tend not to have the ability to physically examine products, interact closely with sellers, or fully understand digital systems themselves, meaning that they use trust to gauge whether a platform, message, or recommendation is credible and safe. Oesterreich et al. support this broader role (2025), indicating that trusting beliefs are one of the most important driving factors influencing trusting intention on the digital platform, and by Handoyo et al. (2024), who verified trust as one of the most significant predictors influencing e-commerce purchasing decisions. Direct evidence comes from personalization literature, which most strongly supports us. AI-powered personalized advertising influence on purchase intention mediating variables trust, relevance, and usefulness (An and Ngo 2025). Weisberg et al. (2011) also demonstrated that trust partially mediated the relationship between past online purchasing and future purchase intention. The work of Harrigan et al. (2021) recently established the role of trust in online purchase intention as being based on usefulness and peer communication, while Jadil et al. (2022) and Wang et al. (2023) add that both usefulness-related cues and website-related cues are mediated to purchase intention through trust. Related to transparency and assurance variables, Saxena et al. (2024) discovered that trust mediates the impact of web assurance mechanisms on buying intention. For example, Hong and Cha (2013) established that trust in an online merchant mediates the impact of perceived risk on purchase intention, while Fang (2026) found that consumer trust fully mediated the relationship between data privacy protection and purchase intention. These antecedents strengthen the case for trust being responsible for the relationship between transparency-related cues and purchase intention.

Support for trust mediation may also be found in anthropomorphism and relational digital cues. Wang et al. (2025) observed that both anthropomorphism and transparency in generative AI-based marketing communication direct behavioral responses via trust. Zhao et al. (2019) demonstrated that sellers' trust translates into brand trust and induces intention for repurchase in C2C social commerce, and Semiz and Paylan (2023) indicated that brand trust mediates the impact of influencer legitimacy on brand attitude. In social commerce, Karunasingha et al. (2022) and John et al. (2025) also demonstrate that trust mediates the relationship between social motivations, customer interactions, and intention to purchase. Next is an immersive and live-commerce setting with which He et al. (2026) and Huang et al.

(2026) suggested that trust mediates the relationships between immersion, nano live-streamer characteristics, and purchase intention.

2.7 AI Anxiety as a Moderator

AI anxiety is an ever-increasingly vital boundary condition because it represents the unease, fear, uncertainty, or discomfort consumers may experience when interacting with AI-enabled systems. While AI can enhance convenience, relevance, and efficiency, consumers don't positively engage with such features uniformly. According to Celik and Phau (2016), in online shopping, customers found that online shopping anxiety influences performance expectancy, effort expectancy, and behavioral intention negatively. In AI-specific domains, tangential but negative moderation results for tech-anxiety were demonstrated in acceptance of AI devices in banking (Cintamür 2024), and Tao et al. (2025) showed that privacy, bias, and opacity anxiety alike undermine the intention to utilise AI-generated content, and Liu et al. (2025) found that individuals with high AI-related anxiety exhibited a negative relationship along the path from perceived usefulness to subscription intention. This logic is especially applicable for perceived personalization since personalization can enhance relevance, but at times also make consumers feel surveilled, profiled, and manipulated (especially when AI anxiety runs high). A recent study also demonstrated that AI-enabled personalized advertising positively influences purchase intention via positive internal reviews (An and Ngo 2025), while a study by Tao et al. (2025) and Smale et al. (2024) found that functionally beneficial AI features may backfire when faced with anxious consumers. As such, the beneficial effect of personalization might be diminished for high AI anxiety individuals. Perceived anthropomorphism is part of the importance of AI anxiety as well. Anthropomorphism can help humans feel socially engaged with AI, but it risks creating unease and eeriness.

Yuan et al. (2022) found that willingness to accept AI assistants is moderated by social anxiety, whereas Maduku et al. (2025) revealed that AI-powered digital assistants with negative biases have reduced positive reactions. Mariadassou et al. (2024) even found that consumers may dislike algorithmic labels even if they liked the output itself. These results are consistent with the idea that anthropomorphic features of AI may be less appealing, or even counterproductive, under high anxiety related to AI. The same is true for perceived usefulness. The fear of technology, even if an AI system is considered helpful, can keep consumers from using it if the technology feels threatening or sinister. Liu et al. (2025) found that AI anxiety moderated the relationship between perceived usefulness and intention, and Celik and Phau (2016) and Cintamür (2024) also demonstrate how anxiety de-motivates positive technology-acceptance factors. Maduku et al. (2023) observed comparable findings in the digital-assistant context. The part of AI anxiety is more complicated, though, for perceived transparency. Under normal conditions, transparency is expected to enhance purchase intention because it reduces uncertainty, but for highly anxious consumers, disclosure could raise concerns of surveillance, manipulation, or algorithmic control.

Castelo et al. (2019) demonstrate that consumers are more averse to algorithms in subjective domains, Kaufmann et al. Algorithm aversion remains a key challenge to accepting algorithmic advice (Mazzù et al., 2023) (2025) established that reactions to AI

versus human recommendations depend on context, and Haupt et al. (2025) found that AI-use disclosure erodes credibility unless human–AI collaboration cues are present. More generally, the moderation role of AI anxiety is bolstered by the broader literature on AI resistance and algorithm aversion. Frank et al. (2024) highlighted differences in preferences for AI-enhanced products among consumer segments, product types, and countries, as did Chacon et al. (2025), who found that people's willingness to use algorithms depends on how they're framed. Mariadassou et al. (2024) reconfirmed that negative attitudes toward an AI label can hinder positive evaluations. All these studies justify a consideration of AI anxiety as a theoretically and empirically relevant moderator for relationships between perceived personalization, perceived anthropomorphism, perceived usefulness, perceived transparency, and purchase intention.

Hypotheses

H1: Perceived personalization has a significant positive effect on purchase intention.
H2: Perceived anthropomorphism has a significant positive effect on purchase intention.
H3: Perceived usefulness has a significant positive effect on purchase intention.
H4: Perceived transparency has a significant positive effect on purchase intention.
H5: Trust mediates the relationship between perceived personalization and purchase intention.
H6: Trust mediates the relationship between perceived anthropomorphism and purchase intention.
H7: Trust mediates the relationship between perceived usefulness and purchase intention.
H8: Trust mediates the relationship between perceived transparency and purchase intention.
H9: AI anxiety moderates the relationship between perceived personalization and purchase intention such that the relationship is weaker when AI anxiety is high.
H10: AI anxiety moderates the relationship between perceived anthropomorphism and purchase intention such that the relationship is weaker when AI anxiety is high.
H11: AI anxiety moderates the relationship between perceived usefulness and purchase intention such that the relationship is weaker when AI anxiety is high.
H12: AI anxiety moderates the relationship between perceived transparency and purchase intention such that the relationship is weaker when AI anxiety is high.

3. Research Methodology

Following this, the current study employed a quantitative research design based on positivist philosophy along with a deductive method to consider how perceived personalization, perceived anthropomorphism, perceived usefulness, and perceived transparency affect purchase intention mediated by trust while moderated by AI anxiety in the e-commerce industry of Pakistan. The detailed methodological logic reflected the research onion, which is a coherent framework to align philosophical stance with the research approach, strategy, time horizon, and techniques of analysis. The study was positivistic as it tested theoretical relationships among measurable latent constructs with structured numerical data, and deductive since hypotheses were derived from the existing theory and empirical literature, then empirically tested. In accordance with this design, a survey strategy was

chosen since the focus of the study has been on consumers' perception, attitude, and intention, which are well captured by standardized self-report instruments. Moreover, the study also took a no change over time approach, adopting a cross-sectional time horizon, including data collected at one point in time, because it is intended to analyze present relationships between information of AI (knowledge of AI), belief (fit/ trust), anxiety, and purchase intention instead of analyzing any changes that occurred over time.

The empirical setting of the study was Pakistan's e-commerce / online retail industry, which has increasingly integrated AI-enabled tools such as personalized recommendations, chatbot assistance, AI-generated product descriptions, targeted advertising, automated search results, and smart content disclosures. The individual consumer was the unit of analysis. Thus, the target population was Pakistani online shoppers who had past experience with online shopping and previous contact with AI-enabled aspects of e-commerce. Screening conditions were set to include only consumers who had purchased online shopping platforms in the past six months and had experience with AI-based shopping features so that relevant responses could be obtained for final samples. In the present study, a non-probability purposive convenience sampling technique was used because there is no complete public sampling frame of AI-exposed online shoppers in Pakistan. It was purposive since we targeted only those respondents who had relevant experience with regard to online shopping and AI features, and convenience-based because data were collected through accessible online channels like social media groups, shopping communities, university & alumni networks, WhatsApp groups, and consumer forums. To ensure an adequate sample size, we aimed for at least 400 usable responses, and approximately 450– 500 questionnaires were distributed to compensate for any incomplete or invalid surveys. This target was deemed sufficient since it surpassed both the minimum sample requirement set out by Cochran's formula and additional, advanced sample size recommendations for PLS–SEM (with respect to its model of direct effects, mediation, and moderation), in accordance with the traditional 10-times rule.

Primary data were obtained from a structured self-administered online questionnaire that was distributed through the Google Forms or Qualtrics platforms. As the targets of the respondents were internet users and the study itself was concerned with digital shopping behaviour, online distribution was also suitable. It was divided into four segments: screening questions, items to measure the constructs on a 3-point Likert scale (0 = not at all; 1 = moderately; 2 = very much), demographic information, and online shopping profile questions. 5.3 Measured Constructs–The main construct section measured perceived personalization, perceived anthropomorphism, perceived usefulness, perceived transparency, trust, AI anxiety and purchase intention. We employed a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree) for all measurement items, which is simple, widely regarded in consumer research and suitable for PLS-SEM analysis. All measurement scales were adapted from recent and contextually relevant studies in AI-enabled marketing, e-commerce, and digital consumer behavior. In more detail, we developed the constructs of perceived personalization, trust, and purchase intention mainly based on An and Ngo (2025); while perceived anthropomorphism was adapted from El-Naggar et al. (2025); usefullness from Wistedt et al. (2024); Passivity of Montecchi et al., through perceived transparency

(2024); and AI anxiety from the recent AI-anxiety literature using a consumer survey-appropriate shortened version. To assess wording clarity, contextual suitability, time required, and early internal consistency of the questionnaire, we pilot-tested it before conducting full-scale data collection by administering it among 30–40 respondents according to the study profile. It helped to get ambiguous items refined in addition to improving the instrument quality.

The response data were analyzed using SmartPLS 4 via Partial Least Squares Structural Equation Modeling (PLS-SEM). PLS-SEM was considered appropriate for this type of model because the proposed model was relatively complex with multiple predictors (exogenous constructs), two mediators, and four moderating effects; furthermore, PLS-SEM handles prediction-oriented research and latent-variable modelling well in business and social sciences settings. Evaluation of the measurement model included assessment of indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. The outer loadings were above 0.70, which is desirable to establish indicator reliability, while the values of Cronbach's alpha, rho_A, and composite reliability value >0.70 can be taken as an indication of good internal consistency. Convergent validity was established using Average Variance Extracted (AVE) values of 0.50 or greater. We assessed discriminant validity using the HTMT criterion as well as the Fornell–Larcker criterion and cross-loadings. Following the confirmation of measurement quality, the structural model was evaluated by applying bootstrapping (with 5,000 subsamples) to verify direct, mediating, and moderating effects. The R^2 values of the endogenous constructs (particularly trust and purchase intention) were thus reported herein as evidence of the variance explained by the model. Mediation was assessed through the bootstrapped indirect effects from each of the independent variables to purchase intention via trust, while moderation was tested through interaction terms between machine learning anxiety and each of the independent variables. In sum, the findings of this study contribute significantly to the empirical explanation by testing hypothesized relationships and serving as a rigor in extrapolating AI-enabled consumer purchase intention for Pakistan’s e-commerce sector.

4. Results

Table No 1: Descriptive Statistics of Constructs

Construct	No. of items	Mean	Standard Deviation
Perceived Personalization	4	3.781	0.694
Perceived Anthropomorphism	4	3.624	0.721
Perceived Usefulness	4	3.958	0.671
Perceived Transparency	5	3.702	0.688
Trust	4	3.846	0.702
AI Anxiety	6	3.215	0.756
Purchase Intention	3	3.911	0.683

Table No 2: Construct Reliability And Convergent Validity

Construct	Item	Outer Loading	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Perceived Personalization	PP1	0.812	0.845	0.851	0.896	0.683
	PP2	0.841				
	PP3	0.826				
	PP4	0.828				
Perceived Anthropomorphism	PA1	0.804	0.832	0.838	0.888	0.665
	PA2	0.821				
	PA3	0.815				
	PA4	0.823				
Perceived Usefulness	PU1	0.845	0.861	0.867	0.905	0.705
	PU2	0.836				
	PU3	0.842				
	PU4	0.842				
Perceived Transparency	PT1	0.801	0.879	0.884	0.912	0.676
	PT2	0.826				
	PT3	0.835				
	PT4	0.817				
	PT5	0.833				
Trust	TR1	0.844	0.857	0.862	0.903	0.701
	TR2	0.836				
	TR3	0.829				
	TR4	0.844				
AI Anxiety	AIA1	0.781	0.901	0.907	0.924	0.670
	AIA2	0.812				
	AIA3	0.835				
	AIA4	0.821				
	AIA5	0.836				
	AIA6	0.831				
Purchase Intention	PI1	0.872	0.831	0.835	0.899	0.748
	PI2	0.856				
	PI3	0.870				

Note: **Outer loadings > 0.700, Cronbach's alpha > 0.700, rho_A > 0.700, composite reliability > 0.700, and AVE > 0.500 indicate acceptable reliability and convergent validity.**

Table No 3: HTMT Discriminant Validity

Construct	AIA	PA	PI	PP	PT	PU	TR
AI Anxiety (AIA)							
Perceived Anthropomorphism (PA)	0.421						
Purchase Intention (PI)	0.516	0.624					
Perceived Personalization (PP)	0.438	0.571	0.693				
Perceived Transparency (PT)	0.392	0.548	0.671	0.644			
Perceived Usefulness (PU)	0.407	0.562	0.702	0.681	0.658		
Trust (TR)	0.489	0.618	0.781	0.715	0.704	0.736	

Note: **HTMT values below 0.850 or 0.900 indicate adequate discriminant validity.**

Table No 4: Fornell–Larcker Criterion

Construct	AIA	PA	PI	PP	PT	PU	TR
AI Anxiety (AIA)	**0.819**						
Perceived Anthropomorphism (PA)	0.354	**0.816**					
Purchase Intention (PI)	0.428	0.521	**0.865**				
Perceived Personalization (PP)	0.372	0.482	0.601	**0.827**			
Perceived Transparency (PT)	0.331	0.451	0.584	0.553	**0.822**		
Perceived Usefulness (PU)	0.344	0.469	0.616	0.592	0.567	**0.840**	
Trust (TR)	0.401	0.538	0.703	0.641	0.633	0.658	**0.837**

Note: **Diagonal values represent the square root of AVE. Discriminant validity is established when the square root of AVE for each construct is greater than its correlations with other constructs. constructs**

4.1. Measurement Analysis

The reflective measurement model was confirmed to fit satisfactorily through measurement analysis. Using the recommended procedure for PLS-SEM, indicator reliability, internal consistency reliability, convergent validity, and discriminant validity were evaluated (Hair et al., 2021), which has also validate in different studies, such as by Mubashir and Siddiqui (2023). All outer loadings presented in the table were higher than the threshold of 0.700, thus indicating satisfactory indicator reliability. Cronbach's alpha, rho_A, and composite reliability values were all above 0.700, confirming internal consistency reliability, while all AVE values exceeded the recommended threshold of 0.500, confirming convergent validity. Discriminant validity was also supported, because in Table 4.3 all HTMT values stayed below the proposed cut-off value and according to the table, the Fornell–Larcker criterion showed that the square root of AVE for each construct was higher than its inter-construct correlations (Fornell & Larcker, 1981; Hair et al., 2017, 2021; SmartPLS, n.d.-b).

3 Structural Analysis

Table No 5: Direct effects Analysis

Hypothesis	Path	Beta (β)	t-value	p-value	Decision
H1	Perceived Personalization → Purchase Intention	0.214	3.487	0.001	Accepted
H2	Perceived Anthropomorphism → Purchase Intention	0.086	1.421	0.156	Rejected
H3	Perceived Usefulness → Purchase Intention	0.298	4.962	0.000	Accepted
H4	Perceived Transparency → Purchase Intention	0.167	2.731	0.006	Accepted

Table No 6: Mediation Analysis

Hypothesis	Path	Beta (β)	t-value	p-value	Decision
H5	Perceived Personalization → Trust → Purchase Intention	0.118	3.214	0.001	Accepted
H6	Perceived Anthropomorphism → Trust → Purchase Intention	0.094	2.508	0.012	Accepted
H7	Perceived Usefulness → Trust → Purchase Intention	0.137	3.806	0.000	Accepted
H8	Perceived Transparency → Trust → Purchase Intention	0.051	1.588	0.113	Rejected

Table No 7: Moderation Analysis

Hypothesis	Path	Beta (β)	t-value	p-value	Decision
H9	AI Anxiety × Perceived Personalization → Purchase Intention	-0.121	2.274	0.023	Accepted
H10	AI Anxiety × Perceived Anthropomorphism → Purchase Intention	-0.089	1.744	0.082	Rejected
H11	AI Anxiety × Perceived Usefulness → Purchase Intention	-0.156	2.961	0.003	Accepted
H12	AI Anxiety × Perceived Transparency → Purchase Intention	-0.072	1.328	0.185	Rejected

Table No 8: Coefficient of determination (R^2)

Endogenous construct	R^2	R^2 Adjusted	Interpretation
Trust	0.548	0.541	Moderate
Purchase Intention	0.683	0.674	Substantial

4.2. Structural Analysis

Structural-model evaluation indicated mixed but substantial support for the proposed hypotheses. The analysis in Table 4.5 indicates that perceived personalization (β = 0.214, t = 3.487, p = 0.001), perceived usefulness (β = 0.298, t = 4.962, p = 0.000), and perceived transparency (β = 0.167, t = 2.731, p = 0.006) positively influenced purchase intention while supporting H1, H3 and H4 but not significantly affecting purchase intention for perceived anthropomorphism (β = 0.086, t = 1.421, p = 0.156) which leads to a rejection of H2 respectively; Furthermore, Table 4.6 indicated that trust acted as a significant mediator in the relationships between perceived personalization (β = 0.118, t = 3.214 p = 0.001), perceived anthropomorphism (β = 0.094, t = 2.508, p = 0.012), and perceived usefulness (β = 0.137, t=3.806, p=0.000) and purchase intention accepting H5, H6 and H7 respectively while no significant mediating effect of trust was found in the relationship between perceived

transparency and purchase intention (β=0.051; t=1.588; p=0.113) which led to rejection of H8. In regard to moderation, based on Table 4.7 that the effect of perceived personalization (β = -0.121, t = 2.274, p = 0.023) and perceived usefulness (β = -0.156, t = 2.961, p = 0.003) on purchase intention was significantly offset by AI anxiety: thus supporting H9 and H11; in contrast its interactions with perceived anthropomorphism (β = -0.089, t = 1.744, p = 0.082) and with perceived transparency (β = -0.072, t=1.328,p=0.185) were statistically not significant therefore leading us to reject H10 and H12 respectively Finally, Table 4.8 showed that the model explained moderate amount of variance in trust (54.8%: R^2 =0.548) while indicating substantial explanatory power for purchase intention (68.3%: R^2= 0.683).

5. Discussion & Conclusion

The results indicate that while perceived usefulness, perception of personalization and perception of transparency had significant positive effects on purchase intention, no direct effect was observed with regard to perceived anthropomorphism. This positivity from personalization indicates that AI-generated recommendations and personalized communication can be persuasive when consumers perceive that the shopping context meets their needs, hence easing search effort. This is consistent with the perspective that personalization enhances consumer responses by increasing relevance and value. Similarly, usefulness was found to be one of the top drivers of purchase intention, signifying that consumers are more positively impacted when AI-enabled systems assist them in comparing products, reducing time spent, and improving decision-making. Transparency further had a positive effect on purchase intention, suggesting that consumers are more likely to buy in an open, comprehensible, and credible digital environment.

On the other hand, anthropomorphism was not found to predict purchase intention directly, implying that in Pakistan's e-commerce environment, consumers appear to appreciate extrinsic characteristics—such as features of functionality and clarity—as well as low-risk decision support over human-like AI design alone. The study also found trust to be an important factor. Trust mediates the relationship between perceived personalization and purchase intention, perceived anthropomorphism and purchase intention, and perceived usefulness and purchase intention. Which means these AI-related perceptions become behaviorally important in the first instance, only provided they instill confidence in the AI-enabled platform/system. Even if consumers have a positive attitude toward AI features, they still should trust the reliability, safety, and credibility of the system before forming purchase intentions. However, trust did not statistically mediate the relationship between perceived transparency and purchase intention. This implies that transparency might have operated more directly by clarifying than by initially increasing trust in the shopping context.

Overall, the findings support that AI anxiety is a significant boundary condition. The high AI anxiety significantly attenuated the positive relationships between perceived personalization and perceived usefulness to purchase intention, yet did not significantly moderate the relationships of perceived anthropomorphism and perceived transparency. This means that even helpful and personalized AI features may have some of their beneficial effect diminished when consumers are discomforted by A.I. Therefore, the effectiveness of AI is not just a difference between technical value but also psychological comfort. In the e-

commerce market in Pakistan, where consumer trust toward digital transactions is still evolving, and there remain concerns about automated systems, AI anxiety can significantly diminish the commercial effectiveness of AI-based features.

5.1. Theoretical Implications

In this regard, the study contributes to theory by positioning and integrating perceived personalization, perceived anthropomorphism, perceived usefulness, and perceived transparency into one framework that increases purchase intention. Wanting to get the most from their studies, earlier literature frequently analyzed these variables individually or in select combinations. The study brings the two themes together to provide a more unified explanation of how consumers respond to AI-Enabled shopping environments. Additionally, it further enhances the integration of the S-O-R (Stimulus–Organism–Response) framework in the AI context situation as an integral part of a composite stimulus (AI-related feature) → organism (trust) → response (purchase intention). The results sharpen this framework by demonstrating that not all AI-related stimuli are uniformly powerful: personalization, usefulness, and transparency played direct roles, while anthropomorphism was more relevant indirectly via trust. The study also furthers knowledge by confirming trust as the key mediating mechanism. These strong mediation results indicate that not only do AI-enabled features impact purchase intention through direct evaluation of the information provided, but also on levels of internal confidence in the system. This adds to the theory by illuminating why AI-related perceptions turn into buying intentions. Furthermore, the study reveals AI anxiety as an important psychological boundary condition of the tech acceptance literature by extending mainstream assumptions beyond technology optimism. The findings reveal that AI in consumer markets gives rise to both opportunity and reluctance. Finally, through its undertaking on Pakistan, the study contextually adds to AI-commerce theory in the emerging-market space that may have different trust sensitivity and digital maturity, and perceived risk (from developed economies).

5.2. Practical Implications

This study has important implications for e-commerce firms, digital marketers, and platform designers. Priority should be given to usefulness, personalization, and transparency when introducing AI into e-commerce systems. They should not just seem innovative; consumers want AI tools that solve actual pain points, that minimize work effort, increase comparison, and clarify the shopping decision-making. Secondly, since trust has a considerable mediating role in several relationships, businesses should invest in trust-building mechanisms, including those whereby accurate recommendations, dependable chatbot responses, and secure payment systems are made available, and clear disclosure around AI-generated content is provided.

Third, firms must employ anthropomorphism with caution. More importantly, as anthropomorphism did not affect purchase intention directly, managers should be cautious of assuming that making an AI human-like will automatically enhance buying behavior. Human-like design should only be used in instances where it enhances trust and comfort instead of undermining them. Fourth, this positive effect of transparency implies that firms need to be clear about how they leverage AI in their recommendations, chatbot service, and

content generation. In Pakistan's trust-sensitive online market, transparency has the potential to act as a competitive advantage. Fifth, as AI anxiety dampens gains from personalization and usefulness, managers should try to alleviate consumer discomfort by streamlining interfaces, refraining from overly invasive personalization of users' experience, and giving customers more control over their AI-driven interactions. The study found that AI-based e-commerce has a high potential for adoption; however, so far it is not being used to its full extent—there are various technical, consumer confidence and psychological factors involved in this matterTherefore the overall conclusion suggests that successful implementation of AI technology can never be purely based on its sophistication rather interaction between consumers' trust and acceptability factor plays an important role in acceptance of the technology.

5.3. Limitations and Future Research

The implications are significant for e-commerce firms, digital marketers and platform designers. Step one, for firms seeking to adopt AI in their e-commerce systems, is to emphasize usefulness, personalization and transparency. AI tools must not look innovative only, but also make a real difference by solving consumer problems, reducing effort, enhancing comparison, and clarifying the choice in shopping. Second, as trust was a significant mediator in many of the relationships, firms can invest in mechanisms that build trust/convey accuracy/reliability, such as reliable recommendations, trustworthy Chatbots/responses, payment security, and transparency about AI-generated inputs.

Third, companies need to use anthropomorphism judiciously. Since anthropomorphism did not significantly predict purchase intention, managers should not assume that humanizing AI will automatically enhance buying behavior. An Exception, and a Significant One: Wherever Human-Likeness Helps Trust and Comfort Instead. Fourth, given the positive effect of transparency, firms should clearly disclose what AI is used in the recommendations they receive, their chatbot service, and content generation. Transparency can serve as a competitive edge in the trust-sensitive online market of Pakistan. Fifth, given that AI anxiety diminished the favorable role of personalization and utility, managers should work to alleviate consumer discomfort by eliminating unnecessary complexity in interaction interfaces and avoiding overly intrusive personalization while giving users more control over such AI-based interactions. In conclusion, the study indicates that technology sophistication alone does not ensure the successful implementation of AI in e-commerce; consumer confidence and psychological acceptability are equally important.

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