

The Impact of AI Autonomy on Consumers' Purchase Intention

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Abstract: This paper explores the impact of AI autonomy on consumers' purchase intention. Although highly autonomous AI can improve consumption efficiency and platform performance, excessive autonomous decision-making may weaken consumers' sense of control, trigger algorithm aversion, and reduce trust, thereby decreasing purchase intention. The study proposes that perceived transparency plays a key mediating role in this process. Due to the "black-box" nature of highly autonomous AI, consumers often find it difficult to understand the rationale behind AI-driven decisions, which undermines trust in both the platform and the algorithm and subsequently affects purchasing decisions. In addition, product knowledge is found to moderate this relationship. Consumers with higher levels of product knowledge are more sensitive to algorithm transparency and are therefore more likely to perceive the negative effects of highly autonomous AI. Based on these findings, this paper provides theoretical insights for optimizing AI-powered consumer services and enhancing consumer acceptance.

Keywords: AI Autonomy; Algorithm Aversion; Perceived Transparency; Purchase Intention.

1. Introduction

With the widespread application of artificial intelligence (AI) in consumer markets, services such as intelligent recommendations, automatic subscription renewals, and AI-assisted purchasing have become important tools for e-commerce platforms to improve operational efficiency. AI autonomy refers to the ability of AI systems to independently complete product selection, decision-making, and transaction processes without continuous user intervention. Existing studies have primarily focused on the positive effects of AI autonomy, such as improving efficiency, enhancing precision marketing, and reducing operational costs, suggesting that highly autonomous AI can optimize consumption processes and increase platform performance [1]. However, limited attention has been paid to its potential negative psychological effects on consumers, including reduced trust, loss of perceived control, and psychological resistance. Moreover, most studies on the negative impacts of AI have concentrated on high-risk domains such as healthcare and finance [2], while research in everyday consumption contexts remains insufficient.

From a practical perspective, the negative consequences of highly autonomous AI have gradually emerged. For example, Amazon's automatic subscription renewal service triggered large-scale customer cancellations due to insufficient disclosure, while JD.com's AI-assisted ordering service generated numerous complaints after bypassing user confirmation procedures. These cases indicate that excessive AI autonomy may lead to consumer resistance and consequently influence purchasing behavior. Therefore, based on the theory of algorithm aversion, this paper systematically reviews the relationships among AI autonomy, perceived transparency, product knowledge, and consumers' purchase intention. It aims to explore the underlying mechanisms through which highly autonomous AI affects consumer decision-making and to provide theoretical support for optimizing AI-driven services, enhancing consumer trust, and increasing purchase intention.

2. Conceptual Definitions

2.1. AI Autonomy

AI autonomy is a core technological characteristic that describes the ability of artificial intelligence to operate independently of human intervention and to perform environmental perception and behavioral decision-making tasks autonomously (Lee et al., 2021). From a technical perspective, AI autonomy refers to the capability of intelligent systems to rely on algorithmic logic and users' historical data to independently conduct information processing, decision-making, and task execution without real-time human instructions (Zhang & Wang, 2023). In the context of e-commerce, AI autonomy is typically classified according to the degree of human intervention, the level of decision-making authority, and the extent of process automation [1]. Low-autonomy AI primarily serves as an assistive tool, operating strictly in accordance with users' explicit instructions and performing basic functions such as keyword searching, product filtering, and information sorting, with decision-making authority remaining largely under human control. In contrast, highly autonomous AI possesses independent decision-making authority and can complete the entire consumption process—including intelligent product recommendations, order generation, payment processing, and order modification—without requiring repeated user confirmation, thereby reducing human control over decision-making (Gu et al., 2024). In summary, the degree of human intervention, decision-making autonomy, and process automation are the commonly accepted criteria used in the academic literature to distinguish different levels of AI autonomy.

2.2. Perceived Transparency

Perceived transparency is a subjective cognitive evaluation variable that reflects consumers' perceptions of the clarity and understandability of algorithmic operations. Unlike the objective explainability of algorithms from a technical

perspective, perceived transparency emphasizes consumers' subjective understanding of algorithmic logic, recommendation criteria, and data usage practices [4]. In intelligent consumption scenarios, high algorithmic transparency indicates that a platform actively discloses its algorithmic rules, recommendation logic, and the scope of data collection and usage, thereby reducing information asymmetry between the platform and consumers. In contrast, low transparency is characterized by the "algorithmic black box," where the operational mechanisms of algorithms remain opaque and inaccessible, making it difficult for consumers to trace decision sources or understand the underlying logic behind intelligent recommendations and automated operations (Lee & See, 2004).

Existing studies have shown that algorithmic transparency is a crucial prerequisite for building consumer trust in algorithms and reducing perceived risk. The level of perceived transparency directly influences consumers' subsequent purchasing decisions and behavioral responses [10].

2.3. Product Knowledge

Product knowledge is a key indicator of consumer heterogeneity, reflecting the extent to which consumers possess and accumulate professional knowledge regarding product attributes, industry standards, and product structures [8]. Based on differences in information-processing capabilities, consumers can be classified into high-product-knowledge and low-product-knowledge groups. Consumers with high product knowledge possess a well-developed understanding of products, strong critical thinking skills, and systematic information-processing abilities. They are more capable of evaluating the rationality of algorithmic recommendations and tend to have higher expectations regarding algorithm transparency and professionalism (Wang et al., 2025). In contrast, consumers with low product knowledge have limited expertise and weaker information-processing capabilities. Their purchasing decisions often rely on heuristic cues such as brand reputation, platform popularity, and intuitive recommendations rather than in-depth evaluation of product information (Choi & Kim, 2019).

Therefore, product knowledge serves as an important boundary condition that influences consumers' sensitivity to intelligent algorithms and their responses to AI-driven recommendations.

3. Theoretical Foundation

3.1. Control Deprivation Theory and Algorithm Aversion

According to Control Deprivation Theory, when individuals lose their decision-making authority, they tend to experience negative psychological reactions [3]. Applying this theory to intelligent consumption contexts, Lee et al. (2021) found that highly autonomous AI can weaken consumers' perceived control over decision-making, thereby triggering psychological resistance and reducing purchase intention. Meanwhile, the concept of algorithm aversion suggests that consumers are less tolerant of errors made by algorithms than those made by human decision-makers [9]. When highly autonomous AI makes recommendation errors or order-processing mistakes, consumers are more likely to attribute responsibility to the algorithm, which increases perceived risk and negative emotions, ultimately lowering

their willingness to purchase.

Existing studies have primarily focused on the positive effects of AI autonomy, such as improving efficiency and reducing operational costs [1], while paying relatively little attention to its negative psychological consequences for consumers. In recent years, as more cases highlighting the drawbacks of AI have emerged, scholars have begun to investigate its potential risks. Longoni et al. (2019) found that highly autonomous AI may lead to trust erosion and increased risk concerns [2]. However, most of this research has been conducted in high-risk domains such as healthcare and finance. Evidence from real-world e-commerce cases, including Amazon's automatic subscription renewal service and JD.com's AI-assisted ordering service, suggests that highly autonomous AI can provoke consumer complaints, subscription cancellations, and other forms of resistance, thereby reducing purchase intention.

Based on the existing literature and practical evidence, the following hypothesis is proposed:

H1: Compared with low-autonomy AI, highly autonomous AI significantly reduces consumers' purchase intention.

3.2. The Mediating Role of Perceived Transparency

The "algorithmic black box" is a typical characteristic of highly autonomous AI. Such systems rely on complex algorithmic models to make decisions, resulting in opaque and concealed decision-making processes that consumers often find difficult to understand (Lee & See, 2004). As a result, consumers' perceived transparency is reduced. Existing studies on mediating mechanisms have notable limitations, as most research focuses on positive technological attributes such as perceived usefulness and personalized experiences, emphasizing how AI promotes purchase intention while overlooking the mediating roles of negative cognitive evaluations, including transparency and trust [5].

In the field of algorithm transparency, previous studies have primarily concentrated on improving technical explainability through Explainable Artificial Intelligence (XAI) [4], with limited attention given to the direct relationship between algorithm transparency and consumer purchasing decisions [4]. Evidence from business practice further demonstrates the importance of transparency. For example, Instagram's opaque AI recommendation algorithm faced legal challenges from users, as its hidden recommendation logic generated user resistance and discouraged engagement with product-related links (BBC, 2022). Similarly, Taobao's early intelligent recommendation system, which lacked explanations for recommendations, experienced relatively high product return rates. After recommendation explanations were added and transparency was improved, the platform reported a 12% increase in product conversion rates.

These findings suggest that perceived transparency serves as a crucial mediating variable linking AI autonomy and purchase intention. Highly autonomous AI may reduce perceived transparency, weaken trust in algorithms, increase perceived risk, and ultimately decrease consumers' willingness to purchase. Therefore, the following hypothesis is proposed:

H2: Perceived transparency mediates the relationship between AI autonomy and consumers' purchase intention.

3.3. The Moderating Role of Product Knowledge

Consumer heterogeneity is an important factor influencing perceptions of AI technologies, and product knowledge directly shapes consumers' information-processing styles and sensitivity to algorithmic systems. According to Information Processing Theory, consumers with high levels of product knowledge possess strong analytical and systematic information-processing capabilities [8]. They are more likely to scrutinize the logic behind AI-driven decisions, pay close attention to the rationality and professionalism of algorithmic recommendations, and exhibit greater sensitivity to a lack of transparency. In contrast, consumers with low levels of product knowledge tend to rely on heuristic decision-making, using peripheral cues such as brand reputation and platform credibility rather than engaging in extensive information processing. As a result, they place relatively lower demands on algorithmic transparency.

Differences in product knowledge lead to varying perceptions of AI transparency, thereby influencing the strength of the relationship between AI autonomy and perceived transparency. Evidence from Xiaomi's online retail platform supports this moderating mechanism: technology enthusiasts with higher product knowledge showed a significantly greater increase in conversion rates after reviewing AI-generated performance information than ordinary consumers with lower product knowledge. Therefore, the "black-box" nature of highly autonomous AI is likely to have a stronger negative impact on perceived transparency among high-product-knowledge consumers, while its effect on low-product-knowledge consumers is relatively weaker.

Based on the above discussion, the following hypothesis is proposed:

H3: Product knowledge negatively moderates the relationship between AI autonomy and perceived transparency, such that the negative effect of AI autonomy on perceived transparency is stronger for consumers with higher levels of product knowledge.

Conclusion

This research remedies prior literature's overfocus on AI's advantages [1, 2], extends relevant theories into daily e-commerce consumption, supplements antecedent studies of perceived transparency and boundary research of product knowledge heterogeneity [4, 8]. Besides, it complements existing research on AI personalized recommendation and consumer purchase decision in online retail scenarios [6], and

deepens the research on the connection between AI autonomy, institutional trust and user acceptance proposed in previous technology adoption literature [7]. Practically, platforms ought to limit AI's autonomous permissions, boost algorithm transparency, and implement differentiated information disclosure for consumers with varying product knowledge. Future work may verify the model empirically and examine cross-category differences alongside new moderators.

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