The effect of technology autonomy and algorithm aversion on perceived uncertainty in purchase decisions in e-commerce

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ABSTRACT

The increasing adoption of artificial intelligence (AI) technologies in e-commerce has transformed consumer decision-making processes, raising important questions regarding consumer trust and perceptions of algorithm-driven systems. This study investigates the effects of Technology Autonomy and Algorithm Aversion on Perceived Uncertainty and examines the mediating role of Perceived Uncertainty in influencing Purchase Decisions among Indonesian e-commerce users. Employing a quantitative research design, data were collected through a survey of 140 respondents and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4. The findings reveal that Technology Autonomy significantly reduces Perceived Uncertainty, indicating that consumers are more comfortable with autonomous technologies when they are perceived as reliable and beneficial. Conversely, Algorithm Aversion significantly increases Perceived Uncertainty, reflecting consumers' skepticism toward algorithm-based recommendations and decision-making systems. However, Perceived Uncertainty does not significantly influence Purchase Decisions and fails to mediate the relationships between Technology Autonomy, Algorithm Aversion, and Purchase Decisions. These results suggest that although consumers' perceptions of AI technologies shape their levels of uncertainty, such perceptions are insufficient to directly determine purchasing behavior in the Indonesian e-commerce context. The study contributes to the emerging literature on consumer behavior and AI adoption by highlighting the limited explanatory role of perceived uncertainty in online purchase decisions and underscores the need to consider other psychological and contextual factors influencing consumer acceptance of algorithm-driven technologies.

Keywords: *Technology Autonomy; Algorithm Aversion; Perceived Uncertainty; Purchase Decision*

INTRODUCTION

E-commerce has become an integral part of people's daily lives because it simplifies the shopping process. Advances in artificial intelligence (AI) have brought about significant changes in e-commerce, leading businesses to increasingly rely on this technology to design marketing strategies tailored to individual consumer preferences (An & Ngo, 2025). Various AI-based tools, such as recommendation agents, personalization systems, and predictive analytics, are being used to transform the way consumers interact with online platforms (Hassan et al., 2025). For companies, this technology can provide more targeted product recommendations, thereby potentially increasing sales and strengthening customer loyalty (Rohden & Espartel, 2024).

From a consumer perspective, the implementation of AI provides a more efficient shopping experience by simplifying the decision-making process, minimizing the complexity of searches, and reducing choice overload. Although AI is designed to provide a more efficient shopping experience, the use of this technology can also increase perceived uncertainty in the purchasing process (Rohden & Espartel, 2024). Perceived uncertainty is a condition in which individuals feel uncertain about the outcome of a purchase decision. In the context of e-commerce, uncertainty is an inherent characteristic because it is influenced by the online environment and information asymmetry between sellers and buyers (Lopez et al., 2024). Increased perceived uncertainty is a significant issue because it can lower consumer satisfaction with decision-making and reduce the likelihood of making a purchase (Rohden & Espartel, 2024).

This study uses the Unified Theory of Acceptance and Use of Technology (UTAUT) as its primary framework because the model has demonstrated strong explanatory power in predicting behavioral intention and technology use across various contexts (Venkatesh et al., 2003). In addition, UTAUT has been widely extended by incorporating context-specific external variables, thereby enhancing its explanatory capability in different technology adoption settings (Ahmed et al., 2023; Hakimi et al., 2024; Xue et al., 2024). In this context, this flexibility is utilized to explain the dynamics of purchase decisions on e-commerce platforms that use AI-based recommendation systems (Chen et al., 2021). The application of AI has also given rise to the phenomenon of "technology autonomy"a condition in which systems become increasingly autonomous to the point of being able to make decisions on behalf of consumers (Sohn, 2024). This level of autonomy has the potential to reduce consumers' perception of personal control and increase perceived uncertainty (Rohden et al., 2025). When the decision-making process is facilitated by AI, consumers tend to experience a decrease in their perceived level of control over the choices they make, thereby increasing their sense of uncertainty (Rohden & Espartel, 2024).

In addition to technology autonomy, another emerging phenomenon is algorithm aversion the tendency of individuals to reject or distrust recommendations provided by algorithms, even though algorithms perform better in various decision-making situations (Mahmud et al., 2023). Low trust in technology and a limited understanding of how AI works lead consumers to perceive decisions generated by algorithms as riskier, thereby reinforcing perceived uncertainty in the decision-making process (Mahmud et al., 2023; Rohden & Espartel, 2024).

Although the relationship between AI and consumer behavior has been extensively studied, there are still several research gaps. Rohden & Espartel (2024) note that no study has yet explored in depth technology autonomy and algorithm aversion as factors explaining the increase in perceived uncertainty resulting from the use of AI. Furthermore, Rohden et al. (2025) have not directly tested the effect of "technology

autonomy" on perceived uncertainty in the context of purchase decisions on e-commerce platforms. On the other hand, research on algorithm aversion has largely been conducted in the context of managerial decision-making or in developed countries, whereas research on general consumers in the e-commerce environment of developing countries, particularly Indonesia, remains relatively limited (Yang et al., 2019; Mahmud et al., 2023; An & Ngo, 2025).

Based on this gap, this study aims to analyze the effects of technology autonomy and algorithm aversion on perceived uncertainty, as well as to examine the mediating role of perceived uncertainty in the relationship between these two variables and purchase decisions on e-commerce platforms in Indonesia that utilize an Artificial Intelligence Recommendation System. This study is expected to contribute to the development of literature on digital consumer behavior while also providing insights for businesses in designing AI-based recommendation systems capable of enhancing consumer trust and reducing perceived uncertainty during the purchase decision-making process.

LITERATURE REVIEW, RESEARCH FRAMEWORK, AND HYPOTHESES

Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is recognized as one of the most extensively used frameworks for explaining individual technology adoption (Yang et al., 2025). Formulated by Venkatesh, the model draws together several earlier theories of technology acceptance, among them the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), and the Innovation Diffusion Theory (IDT). It proposes that a set of core constructs drives both the intention to use technology and actual usage behavior, and has demonstrated strong explanatory power for variance in technology adoption across a range of domains, including information systems, e-commerce, and artificial intelligence (Chen et al., 2021; Pramudito et al., 2023).

In this study, UTAUT serves as the theoretical foundation for understanding how consumers come to accept the use of Artificial Intelligence (AI) on e-commerce platforms. Beyond its core constructs, recent literature suggests that external factors such as risk perception, trust, and uncertainty also significantly shape consumer decision-making when engaging with AI-driven technology (Chen et al., 2021; Ahmed et al., 2023; Xue et al., 2024). On this basis, UTAUT provides a suitable framework for examining the interrelationships among Technology Autonomy, Algorithm Aversion, Perceived Uncertainty, and Purchase Decision.

Technology Autonomy

Technology autonomy refers to a technology's ability to perform tasks and make decisions independently without direct intervention from users (Sohn, 2024). In the e-commerce environment, autonomous technology is generally implemented through Artificial Intelligence (AI)-based recommendation systems capable of analyzing consumer preferences, processing information, and automatically providing product recommendations. Unlike conventional automated systems, autonomous technology has the ability to learn from past experiences, thereby improving the quality of its decision-making over time (Sohn, 2024).

Algorithm Aversion

Algorithm Aversion refers to an individual's tendency to reject or distrust decisions generated by algorithms, even when those algorithms have the same or even higher

accuracy rates than humans (Mahmud et al., 2023). This phenomenon arises because users prefer to rely on human judgment rather than decisions generated by artificial intelligence-based systems. According to Mahmud et al. (2023), Algorithm Aversion is influenced by various psychological barriers, such as values, traditions, and perceptions of technology. Additionally, AI systems that operate as "black boxes" often prevent users from understanding the decision-making processes carried out by the algorithms.

Perceived Uncertainty

Perceived Uncertainty refers to the degree of uncertainty consumers feel regarding the outcomes or consequences of a decision due to limited information (Lopez et al., 2024). In an e-commerce environment, uncertainty generally arises when consumers are unable to predict whether the product they have chosen will meet their needs or expectations (Chen et al., 2021). Lopez et al. (2024) explain that Perceived Uncertainty is not only related to a lack of information but also reflects a psychological state characterized by doubt regarding the outcome of the decision.

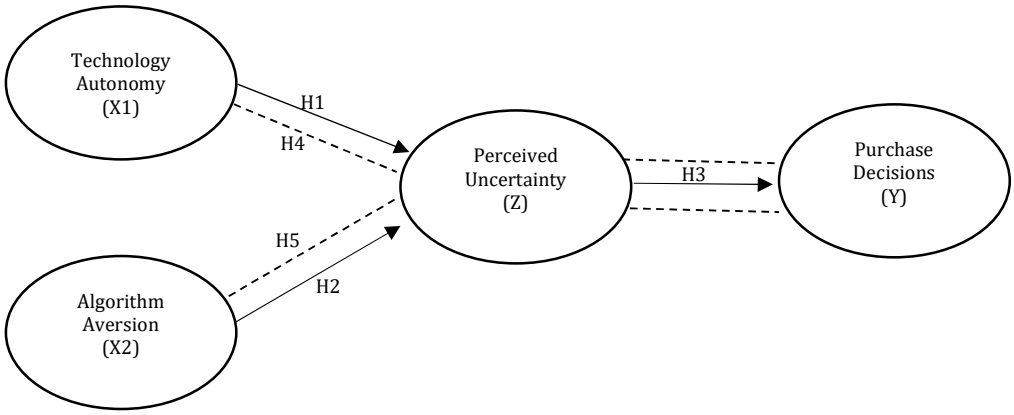
Purchase Decision

A purchase decision refers to a consumer's choice to acquire a product after weighing the various alternatives available (An & Ngo, 2025). Within consumer behavior research, this concept is frequently linked to purchase intention, an individual's inclination or willingness to make a purchase with higher purchase intention generally corresponding to a greater likelihood of actual buying behavior (An & Ngo, 2025). A range of psychological and technological factors shape purchase decisions, including trust, perceived benefits, the relevance of available information, and perceptions of the system in use. In AI-driven e-commerce specifically, purchase decisions are shaped not only by the quality of AI-generated recommendations but also by the degree of trust and uncertainty consumers experience throughout the decision-making process

Research Framework

This research framework explains the relationship between the development of e-commerce, the adoption of Artificial Intelligence (AI), and consumer purchase decisions (An & Ngo, 2025). The increasing number of e-commerce users has driven digital platforms to adopt AI technology to improve service efficiency and the user experience (Nguyen et al., 2024). In this study, AI adoption is understood through the UTAUT model as the basis for explaining consumer technology acceptance in the context of e-commerce (Hanaysha, 2022).

The use of AI technology in e-commerce then elicits various psychological responses from consumers, particularly regarding technology autonomy and algorithm aversion (Rohden et al., 2025). Technology autonomy describes the degree to which an AI system operates independently in performing functions and making decisions automatically, while algorithm aversion reflects consumers' tendency to distrust algorithmic decisions (Mahmud et al., 2023; Sohn, 2024). Furthermore, technology autonomy and algorithm aversion influence consumers' perceived uncertainty regarding the use of AI technology in the purchase decision-making process (Rohden et al., 2025). A high level of perceived uncertainty can increase consumers' doubts about the outcomes of decisions provided by AI systems, thereby impacting consumers' purchase decisions on e-commerce platforms (Rohden & Espartel, 2024). The relationships among the research variables, as developed from the theoretical and empirical literature, are summarized in the conceptual framework presented in Figure 1.



Source: Developed for this study, 2026

Figure 1
Research Framework

The Effect of Technology Autonomy (TA) on Perceived Uncertainty (PU)

Technology Autonomy (TA) refers to the extent to which technology is capable of operating and making decisions independently without user intervention (Sohn, 2024). In the context of e-commerce, autonomous technologies such as recommendation agents can interact directly with consumers and take over part of the decision-making process (Sohn, 2024). Rohden et al. (2025) demonstrate that Technology Autonomy is linked to the emergence of Perceived Uncertainty, as autonomous technologies are viewed as less predictable. This finding is consistent with the UTAUT model, which suggests that technological uncertainty gives rise to a sense of risk that can impede consumers' Purchase Decisions (Chen et al., 2021). Moreover, the use of autonomous technology diminishes consumers' perceived control over the selection process, which in turn heightens their sense of uncertainty (Rohden & Espartel, 2024). Drawing on this discussion, the following hypothesis is proposed.

H1: Technology Autonomy (TA) influences Perceived Uncertainty (PU) among e-commerce users.

The Effect of Algorithm Aversion (AA) on Perceived Uncertainty (PU)

Algorithm Aversion (AA) is an individual's tendency to reject decisions made by algorithms even when those algorithms perform better (Mahmud et al., 2023). This attitude is influenced by risk aversion and the "black box" nature of algorithms, causing consumers to feel they do not understand the decision-making process and to become uncertain about the results provided (Mahmud et al., 2023). From the UTAUT perspective, this condition falls under "perceived risk," which can hinder the purchase decision (Chen et al., 2021). Mahmud et al. (2023) also explain that the higher the perceived risk associated with an innovation, the greater the tendency for consumers to delay technology adoption. Consequently, aversion to algorithms increases perceived uncertainty in AI-based purchase decision-making processes (Rohden & Espartel, 2024). Based on this discussion, the following hypothesis is formulated.

H2: Algorithm Aversion (AA) influences Perceived Uncertainty (PU) among e-commerce users.

The Effect of Perceived Uncertainty (PU) on Purchase Decisions

Perceived Uncertainty (PU) refers to the uncertainty consumers feel regarding the consequences of a purchase decision they have made (Rohden & Espartel, 2024). In an e-commerce environment, uncertainty is one of the main barriers because it increases the perceived risk associated with the outcome of a purchase (Lopez et al., 2024). Rohden & Espartel (2024) demonstrate that increased Perceived Uncertainty reduces satisfaction with choices and decreases Purchase Decisions on platforms that use recommendation agents. These findings are supported by the UTAUT model, which states that risk perceptions stemming from uncertainty have a negative effect on decisions to use e-commerce platforms (Chen et al., 2021). Therefore, the following hypotheses are formulated.

H3: Perceived Uncertainty (PU) influences the Purchase Decision among e-commerce users.

Perceived Uncertainty (PU) acts as a mediating variable in the effect of Technology Autonomy (TA) on Purchase Decision (PD)

Technology Autonomy (TA) is estimated to influence purchase decisions indirectly through Perceived Uncertainty (PU). A high level of technology autonomy reduces consumers' perceived control over the decision-making process, thereby increasing perceived uncertainty (Rohden & Espartel, 2024; Rohden et al., 2025). Within the UTAUT framework, this uncertainty is viewed as a form of perceived risk that hinders consumers' purchase intentions and purchase decisions (Chen et al., 2021). Thus, Perceived Uncertainty serves as a mechanism that explains the relationship between Technology Autonomy and Purchase Decisions. Based on this discussion, the following hypothesis is formulated.

H4: Perceived Uncertainty (PU) acts as a mediating variable in the effect of Technology Autonomy (TA) on Purchase Decisions (PD) among e-commerce users.

Perceived Uncertainty (PU) acts as a mediating variable in the effect of Algorithm Aversion (AA) on Purchase Decision (PD)

Algorithm Aversion (AA) is estimated to indirectly influence the Purchase Decision through Perceived Uncertainty (PU). Algorithm aversion reflects low consumer trust in AI systems due to perceived risks and a lack of algorithmic transparency (Mahmud et al., 2023). In the UTAUT literature, low trust and high perceived risk are factors that hinder purchase decisions in e-commerce (Chen et al., 2021; Ahmed et al., 2023). The higher the Algorithm Aversion, the higher the Perceived Uncertainty that consumers feel toward AI recommendations, which ultimately reduces the Purchase Decision (Rohden & Espartel, 2024). Based on this discussion, the following hypotheses are formulated.

H5: Perceived Uncertainty (PU) acts as a mediating variable in the effect of Algorithm Aversion (AA) on the Purchase Decision (PD) among e-commerce users.

METHOD

This study adopts a quantitative approach, employing causal-associative research to examine the cause-and-effect relationships between the independent and dependent variables (Sugiyono, 2017). A survey research design is used, with data collected through the distribution of a structured questionnaire. Given that the research model involves

more than one independent variable and tests a mediating relationship, data analysis was performed using multivariate statistical techniques.

The study population consists of all consumers who have made purchases through e-commerce platforms in Indonesia and have used the AI recommendation system feature in their purchase decision-making process. The sampling technique used was nonprobability sampling with a purposive sampling method (Hair et al., 2020), with the following criteria for respondents: at least 18 years of age, active e-commerce users in Indonesia who have made at least one transaction in the past six months, and who have used or interacted with algorithm-based technology features while shopping. The sample size for this study was determined to be 140 respondents, consistent with the indicator-ratio guidelines applicable to the Partial Least Squares–Structural Equation Modeling (PLS-SEM) method (Lim, 2025).

Data collection for this research was conducted via an online questionnaire distributed through Google Forms. The survey instrument was constructed from operational definitions and indicators established in earlier studies, and all responses were captured on a five-point Likert scale. Analysis unfolded in two phases: descriptive statistics were first applied to profile respondent characteristics and summarize response trends across variables; this was followed by inferential analysis using PLS-SEM via SmartPLS 4, which covered the measurement model (outer model), structural model (inner model), hypothesis testing, mediation testing, and an overall assessment of model quality. Instrument validity was established via Convergent Validity indicatorsspecifically Outer Loadings and Average Variance Extracted (AVE) whereas reliability was determined using Composite Reliability and Cronbach's Alpha (Lim, 2025).

RESULTS AND DISCUSSION

Data Analysis

As an initial descriptive analysis, Table 1 summarizes the respondents' demographic profile. The information presented provides a comprehensive overview of the sample characteristics, which serves as the basis for interpreting the subsequent empirical findings.

Tabel 1
Respondent Profile

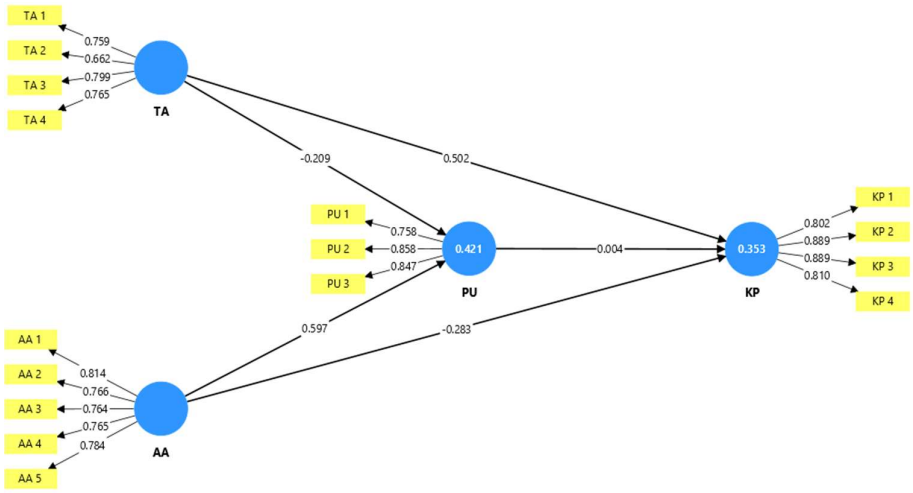
	Category	Total	Percentage
	Gender		
1	Male	67	32,1%
	Female	142	67,9%
	Age		
	18-20 years old	56	26,8%
2	21-30 years old	131	62,7%
	31-40 years old	19	9,1%
	≥ 41 years old	3	1,4%
	Purchases on e-commerce		
	≤ 3 times	33	15,8%
3	4-6 times	88	42,1%
	7-9 times	42	20,1%
	≥ 10 times	46	22%

Source: processed data, 2026

This study involved 209 respondents who were e-commerce users in Indonesia, having made online purchases within the past six months and interacted with an AI

Recommendation System feature. Data were collected online via Google Forms. The research focuses on consumer behavior on e-commerce platforms that have adopted an AI Recommendation System, aiming to examine the influence of Technology Autonomy and Algorithm Aversion on Perceived Uncertainty in the purchase decision-making process. The majority of respondents were female (67.9%), aged 21–30 (62.7%), and had made 4–6 e-commerce purchases in the past six months (42.1%), indicating that most respondents are active, experienced e-commerce users familiar with the AI Recommendation System feature.

Figure 2 presents the path diagram of the proposed structural model, illustrating the relationships among the latent variables and the hypothesized paths examined in this study.



Source: Data analyzed using SmartPLS4, 2026

Figure 2
Path Diagram

To ensure that each construct properly reflected its intended research variable, the measurement model underwent validity and reliability testing. Outer loading values and Average Variance Extracted (AVE) were used to evaluate convergent validity, whereas Composite Reliability and Cronbach's Alpha served as measures of reliability. Table 2 presents the results of the validity test for all measurement indicators. This analysis was conducted to assess whether each indicator adequately represents its corresponding construct and meets the recommended validity criteria.

Tabel 2
Validity Test

Indicator	Convergent Validity	
	Outer Loading	AVE
TA 1	0,759	0,559
TA 2	0,662	
TA 3	0,799	
TA 4	0,765	
AA 1	0,814	0,607

AA 2	0,766	
AA 3	0,764	
AA 4	0,765	
AA 5	0,784	
PU 1	0,758	0,676
PU 2	0,858	
PU 3	0,847	
PD 1	0,802	
PD 2	0,889	0,720
PD 3	0,889	
PD 4	0,810	

Source: Data analyzed using SmartPLS4, 2026

The findings confirmed that every construct met the required convergent validity threshold, with AVE values surpassing 0.50. Similarly, indicator outer loadings met the recommended thresholds overall; the one exception was indicator TA2, which recorded a slightly lower value of 0.662, but it was retained since the Technology Autonomy construct's AVE still reached 0.559. Based on these results, all indicators were considered valid measures of their respective constructs.

Following the validity assessment, the reliability of the measurement model was evaluated to determine whether the measurement instrument consistently produces stable and reliable results (Mellinger & Hanson, 2020). In PLS-SEM, internal consistency reliability is commonly assessed using Composite Reliability (CR) and Cronbach's Alpha. Composite Reliability evaluates the internal consistency of the measurement indicators, with values of 0.70 or higher indicating acceptable reliability, while Cronbach's Alpha is used to assess internal consistency, with values of at least 0.70 generally considered acceptable for confirmatory research (Lim, 2025). The reliability test results are presented in Table 3.

Tabel 3
Reliabilty Test

Variable	Composite reliability (rho_c)	Cronbach's alpha
TA	0,835	0,738
AA	0,885	0,839
PU	0,862	0,761
PD	0,911	0,869

Source: Data analyzed using SmartPLS4, 2026

The reliability test results reveal that Composite Reliability values across all variables range from 0.835 to 0.911, while Cronbach's Alpha values fall between 0.738 and 0.869. Since all these figures exceed the 0.70 minimum threshold, each construct can be regarded as exhibiting sound internal consistency and reliability.

Evaluation of the structural model, in turn, involved examining path coefficients, mediation effects, the coefficient of determination (R^2), predictive relevance (Q^2), and goodness of fit (GoF) (Lim, 2025).

After confirming the validity and reliability of the measurement model, the structural model was evaluated through the path coefficient test to examine the proposed hypotheses. This analysis determines whether the relationships among the constructs are statistically significant based on the sample data. For a two-tailed test with a 95% confidence level ($\alpha = 0.05$), a relationship is considered significant when the t-statistic is

equal to or greater than 1.96, and the p-value is less than or equal to 0.05 (Lim, 2025). The results of the path coefficient test are presented in Table 4.

Tabel 4
Path Coefficient Test

Variable	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
TA -> PU	-0,209	-0,208	0,048	4,389	0,000
TA -> PD	0,502	0,507	0,062	8,115	0,000
AA -> PU	0,597	0,602	0,050	11,877	0,000
AA -> PD	-0,283	-0,285	0,082	3,439	0,001
PU -> PD	0,004	0,008	0,091	0,045	0,964

Source: Data analyzed using SmartPLS4, 2026

The path coefficient analysis reveals that Technology Autonomy significantly and negatively affects Perceived Uncertainty ($\beta = -0.209$; $p < 0.001$), while significantly and positively affecting Purchase Decision ($\beta = 0.502$; $p < 0.001$). Algorithm Aversion, on the other hand, has a significant positive effect on Perceived Uncertainty ($\beta = 0.597$; $p < 0.001$) and a significant negative effect on Purchase Decision ($\beta = -0.283$; $p = 0.001$). Conversely, Perceived Uncertainty does not have a significant effect on Purchase Decision ($\beta = 0.004$; $p = 0.964$).

Tests of indirect effects showed that Perceived Uncertainty did not mediate the relationship between Technology Autonomy and Purchase Decision, nor the relationship between Algorithm Aversion and Purchase Decision. Both mediation paths had a p-value of 0.964 and were therefore not significant. Table 5 summarizes the results of the mediation test, showing the indirect effects of the independent variables on purchase decisions through perceived uncertainty.

Tabel 5
Mediation Test (Indirect Effect)

Variable	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
TA -> PU -> PD	-0,001	-0,002	0,019	0,045	0,964
AA -> PU -> PD	0,002	0,005	0,056	0,045	0,964

Source: Data analyzed using SmartPLS4, 2026

The coefficient of determination indicates that Technology Autonomy and Algorithm Aversion explain 42.1% of the variation in Perceived Uncertainty ($R^2 = 0.421$), while Technology Autonomy, Algorithm Aversion, and Perceived Uncertainty explain 35.3% of the variation in Purchase Decision ($R^2 = 0.353$). Both values fall into the moderate category. The results of the predictive relevance test show a Q^2 value of 0.401 for Perceived Uncertainty and 0.335 for Purchase Decision. Since all Q^2 values exceed zero, the model demonstrates strong predictive relevance for its endogenous variables. Table 6 reports the coefficient of determination (R^2) and predictive relevance (Q^2) results, providing an assessment of the model's ability to explain and predict the endogenous constructs.

Tabel 6
Coefficient of Determination & Predictive Value of Relevance

Variabel	R-square	Q^2predict
PU	0,421	0,401
PD	0,353	0,335

Source: Data analyzed using SmartPLS4, 2026

The goodness-of-fit assessment produced an SRMR value of 0.071, which falls below the 0.08 threshold. This indicates that the research model achieves a good fit and is appropriate for examining the relationships among the study variables. Table 7 presents the Goodness of Fit (GoF) results, which provide an overall assessment of the model's performance by evaluating the combined quality of the measurement and structural models.

Tabel 7
Goodness of Fit (GoF)

Variable	Estimated model
SRMR	0,071

Source: Data analyzed using SmartPLS4, 2026

The Effect of Technology Autonomy (TA) on Perceived Uncertainty (PU)

Study findings reveal that Technology Autonomy (TA) exerts a significant negative influence on Perceived Uncertainty (PU). In other words, as consumers perceive greater technological autonomy in e-commerce AI recommendation systems, their level of perceived uncertainty during the purchase decision-making process correspondingly decreases. Conversely, if consumers assess that the AI recommendation system has a low ability to provide recommendations independently, the level of perceived uncertainty will increase.

These findings indicate that respondents tend to trust the ability of AI recommendation systems to assist in the product search and selection process (Nguyen et al., 2024). When technology is able to provide recommendations that are perceived as relevant, accurate, and tailored to users' needs, consumers feel more confident about the available options, thereby reducing uncertainty in the purchasing process (An & Ngo, 2025). In other words, the presence of technology capable of operating autonomously does not necessarily increase uncertainty; on the contrary, it can actually foster consumer confidence when making decisions.

The findings of this study also support the concept in the Unified Theory of Acceptance and Use of Technology (UTAUT) model, which explains that positive perceptions of technology will increase users' acceptance of that technology (Wu et al., 2022). When consumers perceive that an AI recommendation system can provide benefits in the purchasing process, they tend to have greater confidence in the recommendations provided (An & Ngo, 2025). This, in turn, reduces the level of uncertainty felt by consumers.

The Effect of Algorithm Aversion (AA) on Perceived Uncertainty (PU)

The results of the study show that Algorithm Aversion (AA) has a positive and significant effect on Perceived Uncertainty (PU). This finding indicates that the higher the level of consumer aversion or distrust toward algorithm-based recommendation systems, the

higher the level of perceived uncertainty consumers experience in the purchase decision-making process. Conversely, the lower the level of algorithm aversion among consumers, the lower the level of perceived uncertainty they experience.

These results are consistent with the notion of "Algorithm Aversion," which holds that people tend to undervalue or reject algorithm-driven decisions in favor of their own judgment or human-made decisions, even when algorithms perform equally well or better (Nguyen et al., 2024). Within e-commerce specifically, consumers exhibiting stronger algorithm aversion are more likely to doubt whether AI recommendation systems can genuinely grasp their needs and preferences (Hardcastle et al., 2025). This study's findings also lend support to the UTAUT premise that risk perception is a critical determinant of consumers' technology acceptance (Wu et al., 2022). When applied to the context of Indonesian e-commerce users, the findings imply that the effectiveness of AI-based recommendation systems depends not only on the sophistication of the underlying technology, but equally on the platform's ability to foster user trust in its algorithms.

The Effect of Perceived Uncertainty (PU) on Purchase Decisions (PD)

Findings from the third hypothesis test show that Perceived Uncertainty does not exert a significant effect on Purchase Decision. This finding suggests that although consumers perceive uncertainty in the use of AI recommendation systems, this condition is not a primary factor in determining their Purchase Decision (An & Ngo, 2025). These findings are inconsistent with the theoretical framework developed in this study. Uncertainty is viewed as one of the main barriers in the e-commerce environment because it can increase the perception of risk and reduce consumers' willingness to make purchases (Lu & Chen, 2021; Lu et al., 2022). Rohden & Espartel (2024) explain that increased perceived uncertainty can lower consumer satisfaction with the choices made and reduce the tendency to proceed with the purchase process.

The differences in these research findings may be attributed to the characteristics of respondents who are accustomed to using e-commerce platforms and interacting with AI-based recommendation systems (Lopez et al., 2024). Consumers' prior experience enables them to proceed with purchases even when there is a certain degree of uncertainty in the decision-making process. Consumers tend to place greater weight on the benefits provided by recommendation systems such as ease of product search, time efficiency, and personalized recommendations than on the uncertainty they experience during the purchasing process (Nguyen et al., 2024; An & Ngo, 2025). From the UTAUT perspective, these results indicate that uncertainty or perceived risk is not a dominant factor influencing purchasing behavior in the context of this study (Wu et al., 2022).

Perceived Uncertainty (PU) acts as a mediating variable in the effect of Technology Autonomy (TA) on Purchase Decision (PD)

The results of the fourth hypothesis test indicate that Perceived Uncertainty does not mediate the effect of Technology Autonomy on Purchase Decision. These findings differ from the theoretical argument developed by Rohden & Espartel (2024), who argue that the use of increasingly autonomous technology can reduce consumers' perceived control, thereby increasing perceived uncertainty, which ultimately has the potential to reduce purchase intention. This discrepancy in results may be attributed to the characteristics of the study's respondents, the majority of whom are active e-commerce users and are accustomed to interacting with artificial intelligence-based recommendation systems (Frischknecht, 2021; Lopez et al., 2024). A high level of familiarity with the technology

allows consumers to proceed with purchases even when a certain degree of uncertainty remains in the decision-making process (Lopez et al., 2024). This suggests that consumers place greater weight on the practical benefits provided by recommendation systems than on the uncertainty experienced during the purchasing process. These findings can also be explained through the UTAUT framework, which emphasizes that technology acceptance is influenced not only by perceptions of risk or uncertainty but also by other factors such as performance expectancy and perceived usefulness that encourage individuals to continue using the technology despite the presence of certain potential risks (Wu et al., 2022)

Perceived Uncertainty (PU) acts as a mediating variable in the effect of Algorithm Aversion (AA) on Purchase Decision (PD)

The results of the fifth hypothesis test indicate that Perceived Uncertainty does not mediate the effect of Algorithm Aversion on Purchase Decision. These findings are inconsistent with the hypothesis that was formulated. Theoretically, algorithm aversion is expected to increase consumers' uncertainty regarding AI recommendation outcomes, which in turn reduces consumers' propensity to make a purchase (Lu & Chen, 2021). Mahmud et al. (2023) explain that algorithm aversion arises because consumers lack trust in black-box algorithmic systems, thereby increasing their perception of risk and uncertainty. Furthermore, Rohden & Espartel (2024) state that increased perceived uncertainty can reduce satisfaction with the choices made and decrease consumers' propensity to proceed with the purchase process. Within the UTAUT framework, this condition is also associated with risk perceptions that have the potential to hinder technology usage behavior and consumers' purchase decisions (Wu et al., 2022).

However, the results of this study indicate that Perceived Uncertainty does not serve as a mediating mechanism for the effect of Algorithm Aversion on Purchase Decisions. This may be due to the characteristics of the respondents, who are accustomed to using e-commerce platforms and AI-based recommendation systems (Kenesei et al., 2022). Although some respondents expressed skepticism toward algorithms, they still made purchases based on other factors such as product needs, ease of transaction, platform user experience, and the benefits provided by the recommendation system (Hardcastle et al., 2025). Consequently, perceived uncertainty was not strong enough to significantly influence the purchase decision.

CONCLUSION AND SUGGESTION

Based on the data analysis and hypothesis testing, several conclusions can be drawn. Technology Autonomy exerts a significant negative influence on Perceived Uncertainty, meaning that as consumers perceive greater autonomy in the technology, their sense of uncertainty during the purchase decision process diminishes. In contrast, Algorithm Aversion shows a significant positive effect on Perceived Uncertainty, indicating that stronger tendencies to distrust or reject algorithmic recommendations correspond with heightened perceived uncertainty. Nevertheless, Perceived Uncertainty itself does not significantly affect Purchase Decisions, nor does it mediate the influence of either Technology Autonomy or Algorithm Aversion on Purchase Decisions. Taken together, these results suggest that while Technology Autonomy and Algorithm Aversion do shape consumers' perceived uncertainty, this uncertainty does not ultimately determine their purchase decisions on e-commerce platforms. Accordingly, this study offers a meaningful contribution to understanding the role of Perceived Uncertainty in the adoption of AI-based recommendation systems within the e-commerce sector.

It is recommended that future research build upon this model by including further variables likely to influence purchase decisions for instance, trust, perceived usefulness, perceived ease of use, perceived risk, or customer experience. Research could also be expanded by examining a wider range of e-commerce platforms or comparing different types of AI technology, such as chatbots versus AI assistants, while diversifying respondent samples across age groups, digital literacy levels, or AI usage frequency. These directions would help produce a richer and more nuanced picture of consumer behavior toward AI-based technologies.

From a practical perspective, e-commerce platforms should not only focus on increasing the level of AI automation but also on enhancing consumers' trust in AI-driven services. Providing transparent AI recommendations, allowing users to maintain control over personalized features, integrating customer reviews and social proof, and offering access to human assistance when needed can reduce perceived uncertainty and algorithm aversion. These strategies are expected to strengthen consumer confidence and ultimately improve purchase decisions.

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