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AI-POWERED PRODUCT RECOMMENDATIONS AND THEIR ROLE IN STIMULATING IMPULSE BUYING AMONG ONLINE SHOPPERS

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ABSTRACT

This study investigates the impact of AI-powered product recommendation strategies on consumer impulse buying behavior within e-commerce platforms, focusing on the Generation Z market segment in Indonesia. As online retail continues to expand, platforms increasingly rely on artificial intelligence to personalize shopping experiences. This research addresses a gap in understanding how multiple integrated marketing elements—credibility, surprise, involvement, visual appeal, and personalization—influence unplanned consumer purchases in a rapidly evolving digital context. Using a quantitative correlational approach, data were collected from 100 Generation Z online shoppers through a structured questionnaire employing a 5-point Likert scale. Statistical analysis was conducted using SPSS version 26. The research included item validity testing (r count > 0.195), internal reliability testing (Cronbach's Alpha > 0.70), and classical assumption tests including normality, multicollinearity, and heteroscedasticity. The core analysis employed multiple regression to determine the individual and collective impact of each variable on impulse buying behavior. All five variables were found to significantly influence consumer behavior, with surprise ($t = 3.201$, $p < 0.01$) emerging as the strongest predictor, followed by involvement ($t = 2.879$, $p < 0.01$), personalization ($t = 2.519$, $p < 0.05$), credibility ($t = 2.143$, $p < 0.05$), and visual appeal ($t = 1.983$, $p < 0.05$). The overall model was statistically significant ($F = 9.643 > F\text{-table} = 2.31$, $p < 0.01$), confirming the combined effect of these marketing elements on impulse buying. The study contributes to the theoretical development of social commerce by empirically validating the behavioral influence of AI recommendations, offers practical guidance for optimizing personalization strategies in digital marketing, and provides region-specific insights into Indonesian consumer behavior. These findings establish a foundation for future research on ethical and technological advancements in AI-driven consumer engagement.

Keywords: ***artificial intelligence, behavior, e-commerce, impulse buying, social commerce***

1. INTRODUCTION

The digital revolution has radically transformed the global retail landscape. Over the last two decades, the proliferation of e-commerce has shifted consumer habits from in-store shopping to the convenience of online platforms. With this shift has come a parallel evolution in marketing strategies, particularly those leveraging artificial intelligence (AI). Among the most impactful innovations in digital marketing are AI-powered product recommendation systems. These intelligent tools do not merely assist users in decision-making but actively shape their purchasing behavior by offering tailored suggestions in real time. The prevalence of these systems has raised significant questions regarding their role in influencing consumer choices, especially unplanned purchases, commonly referred to as impulse buying.

Impulse buying behavior, traditionally observed in physical retail settings through mechanisms like product placement, store ambiance, and limited-time offers, has found a digital counterpart in e-commerce platforms (Tan & Alexia, 2025; Wigayha et al., 2025; Winata & Arma, 2025). Online platforms now replicate these triggers via personalized suggestion algorithms, scarcity cues, and urgency-inducing pop-ups. AI-powered recommendations, in particular, have become an instrumental part of this landscape. These systems analyze vast datasets—from user browsing history to demographic and psychographic data—to predict and suggest products that consumers are likely to purchase spontaneously (Ingriana, 2025; Widjaja, 2025; Zahran, 2025). As platforms race to refine these algorithms to increase user engagement and revenue, an important behavioral shift is occurring: AI systems are increasingly influencing not just what people buy but also how and why they buy.

The growing sophistication of AI systems and their widespread application in retail interfaces have prompted numerous studies on the broader implications of AI in consumer behavior (Judijanto et al., 2024; Rolando & Sunara, 2024; Tanuwijaya et al., 2024). One such study by Sands et al. (2022) examined the use of AI in influencer marketing, revealing how consumers often fail to distinguish between algorithm-generated recommendations and organic social influence, ultimately leading to heightened impulsive purchase decisions. Their findings suggest that AI doesn't just deliver recommendations; it shapes perceptions, emotional reactions, and trust in the source of the suggestion (Sands et al., 2022). Similarly, Raji et al. (2024) provided a comprehensive review of the evolution of consumer behavior in e-commerce, concluding that personalized AI suggestions often reduce cognitive friction, making it easier for consumers to make rapid decisions, sometimes without full deliberation. However, their work remained largely theoretical, lacking a focused investigation into the specific domain of impulse buying (Raji et al., 2024).

Babatunde and Odejide (2024) highlighted how AI is redefining the personalization of digital marketing. Their study discussed how dynamic personalization increases engagement, but they also raised concerns regarding over-personalization, where consumers may feel manipulated or overwhelmed by constant AI-driven stimuli. This insight is particularly relevant to impulse buying behavior, which is often triggered in emotionally charged or high-stimulation environments (Rolando et al., 2024; Wijaya et al., 2024). Yet, their study did not directly link personalization features with spontaneous purchasing outcomes. On a similar note, Bhagat et al. (2022) investigated the impact of AI on retail decision-making, identifying several behavioral changes in consumers, including reduced decision latency and increased frequency of smaller, spontaneous purchases. However, the research emphasized system efficiency and user satisfaction rather than behavioral consequences like impulse buying (Bhagat et al., 2022).

A more design-oriented angle was taken by Yim et al. (2023), who investigated how cuteness and emotional attachment to AI interfaces influence purchasing behavior. They found that emotionally designed AI avatars—particularly those incorporating cute features—evoked stronger buyer attachment and higher conversion rates. Although the study focused more on aesthetic and emotional appeal, it contributes to understanding the subtleties through which AI recommendation interfaces might facilitate impulsive decisions (Yim et al., 2023).

From this survey of recent literature, it becomes evident that while the influence of AI on consumer engagement and personalization is well-documented, there is a significant research gap regarding its specific impact on impulse buying behavior. Most of the aforementioned studies deal with personalization, interface design, or trust in AI, but do not explicitly or empirically connect these variables to the psychological and behavioral aspects of impulsive purchasing. There remains a lack of integrated research that combines AI technical features (e.g., algorithm transparency, user data usage) with behavioral outcomes (e.g., frequency and magnitude of impulse purchases) (Maha et al., 2024; Rolando, 2024). This study is positioned to fill that gap by offering a targeted exploration of how AI-powered product recommendations may act as a digital trigger for impulse buying in online shopping environments. The core research problem this study seeks to address is: To what extent do

AI-powered product recommendation systems influence impulse buying behavior among online shoppers, and through what psychological mechanisms does this influence operate? In line with this central question, the research objectives are threefold: (1) to analyze how different AI recommendation strategies (collaborative filtering, content-based filtering, hybrid approaches) affect spontaneous buying decisions; (2) to assess user perceptions and trust levels in AI recommendations, and how these perceptions mediate impulse behavior; and (3) to explore contextual factors such as time pressure, emotional state, and device usage that may moderate the relationship between AI recommendation exposure and impulse buying.

Understanding these dimensions is not only academically relevant but also practically urgent. As AI continues to evolve, its integration into commercial platforms is becoming more seamless and less visible. Recommendation engines today are deeply embedded into user interfaces (Mulyono, Ingriana, et al., 2024; Rahardja et al., 2024). Operating with a degree of autonomy and opacity that makes it difficult for users to discern when they are being subtly nudged toward certain decisions (Wigayha et al., 2024). This raises ethical questions about digital autonomy, consumer consent, and the potential for manipulation in online spaces. Furthermore, from a business perspective, understanding the fine line between helpful personalization and manipulative persuasion can help companies design better, more responsible systems that align user satisfaction with long-term loyalty rather than short-term conversion rates (Ingriana, Chondro, et al., 2024; Mulyono, Hartanti, et al., 2024; Rolando & Ingriana, 2024).

The solution this research offers is a multidimensional analysis that goes beyond surfacelevel behavioral patterns. By employing both quantitative data (e.g., user clickstreams, conversion analytics, A/B testing) and qualitative data (e.g., interviews, focus groups), the study aims to unpack the mechanisms by which AI recommendations affect decision-making. It introduces a conceptual framework that integrates theories of impulse buying with AI-system design principles—proposing, for example, that systems which adapt based on emotional cues or real-time behavior are more likely to provoke unplanned purchases. This novel intersection of behavioral science and AI system analysis represents the state of the art in consumer research, positioning the study at the frontier of digital marketing scholarship.

The contribution of this study is twofold. Theoretically, it advances the literature on impulse buying by incorporating AI as a dynamic behavioral influencer, rather than merely a technical tool. It also offers an updated behavioral model that considers how real-time algorithmic suggestions interact with individual psychological states to produce spontaneous purchase outcomes. Practically, the research offers actionable insights for digital marketers, UX designers, and platform architects seeking to optimize recommendation systems ethically. It also serves as a foundation for policy discussions around AI transparency, digital nudging, and consumer protection in the e-commerce domain. This research is timely, relevant, and critical. As AI continues to permeate our digital lives, the need to understand its behavioral consequences becomes ever more pressing (Ingriana, Gianina Prajitno, et al., 2024; Putri & Setiawan, 2025; Rolando et al., 2025). This study does not merely ask whether AI influences buying behavior—it asks how, when, and why. By doing so, it aims to illuminate the invisible architecture of digital choice and to help shape a future where intelligent systems support, rather than exploit, the human decision-making process.

2. RESEARCH METHOD

This research adopts a quantitative research approach to examine the influence of AIpowered product recommendations on impulse buying behavior among online shoppers. The methodological framework is designed to ensure empirical rigor and clarity in operationalizing variables, selecting representative samples, and testing the proposed relationships statistically using SPSS version 26.

The basic research framework applied in this study follows a correlational design, wherein the influence of a single independent variable—AI-powered product recommendations—is tested on a dependent variable—impulse buying behavior. This framework facilitates the exploration of associative relationships between variables and allows for hypothesis testing using inferential statistics. The research is explanatory in nature, aiming to understand the extent to which AI recommendation systems serve as triggers for unplanned purchasing decisions in digital contexts.

Figure 1. Conceptual Framework

The conceptual framework of the study is structured based on existing literature on digital marketing, artificial intelligence, and consumer psychology. Specifically, this framework hypothesizes a linear relationship between the predictor variable (X) and the outcome variable (Y). The independent variable, AI-powered product recommendations (X), encompasses algorithm-generated suggestions based on user data. The dependent variable, impulse buying behavior (Y), refers to spontaneous, emotionally driven, and unplanned purchases made by consumers in online settings. The underlying hypothesis (H1) posits that exposure to AI-driven product suggestions significantly influences the likelihood of impulse purchases among digital consumers. This hypothesis is modeled as a simple linear regression where:

$$PI = \alpha + \beta 1C + \beta 2SP + \beta 3I + \beta 4V + \beta 5L + \varepsilon$$

In this equation, PI represents the consumer's impulse buying intention, α is the regression constant, C refers to perceived credibility of AI recommendations, SP denotes surprise or novelty of the recommendation, I signifies involvement or relevance of the recommendation to the user's profile, V indicates visual and interface appeal, L refers to the level of personalization, and ε represents the error term. Each of these elements serves as dimensions of the broader construct of AI-powered product recommendations, providing a multidimensional understanding of how AI nudges user behavior.

As seen in Figure 1, the conceptual framework outlines a direct relationship between the independent variable (AI-powered product recommendations) and the dependent variable (impulse buying behavior), guided by the hypothesis H1. The direction of the relationship assumes a positive association, suggesting that more personalized and sophisticated AI recommendations are likely to increase the propensity for impulse purchases.

To test this relationship empirically, the study will employ a survey method using a structured questionnaire distributed to a sample of online shoppers in Indonesia aged 18 to 45 years. Respondents will be recruited using a non-probability purposive sampling technique based on criteria such as frequency of online shopping and exposure to AI recommendations (e.g., through platforms like Shopee, Tokopedia, or Lazada). The minimum required sample size will be determined using the Lemeshow formula for crosssectional studies:

$$n = Z^2_{1-\alpha/2} * p * (1 - p) / d^2$$

Assuming a confidence level of 95% (Z = 1.96), an estimated proportion of 0.5 (p = 0.5, for maximum variability), and a precision level (d) of 0.05, the sample size calculation is as follows: $n = (1.96)^2 * 0.5 * (1 - 0.5) / (0.05)^2 = 384.16$

Thus, a minimum of 385 respondents will be targeted to ensure generalizability and statistical power. Additional participants will be included to account for potential nonresponses or incomplete submissions.

The hypothesis tested in this research is as follows: H1: AI-powered product recommendations have a significant positive influence on impulse buying behavior among online shoppers.

To ensure clarity and consistency in measuring constructs, the study employs operational definitions based on prior literature and validated measurement scales. Table 1 presents the operational definitions, indicators, and the scale used for each variable.

Table 1. Operational Definitions of Variables

Variable	Operational Definition	Indicators	Measurement Scale
AI-Powered Product Recommendations (X)	The algorithmgenerated suggestions presented to online users based on prior browsing, purchase, and demographic data.	Credibility (C), Surprise (SP), Involvement (I), Visual Design (V), Personalization (L)	5-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree)
Impulse Buying Behavior (Y)	Unplanned, spontaneous purchases made without pre-shopping intentions, often influenced by emotional triggers.	Sudden urge, lack of deliberation, positive emotion post-purchase	5-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree)

Prior to full deployment, a pilot test will be conducted with 30 respondents to test the reliability and validity of the questionnaire. The validity test will utilize Pearson's correlation, where the item is considered valid if the correlation coefficient (r count) exceeds

the critical value from the r-table at $\alpha = 0.05$. Items that do not meet the threshold will be revised or removed.

Reliability will be measured using Cronbach's Alpha. A construct will be deemed reliable if $\alpha > 0.70$, indicating acceptable internal consistency. This test will be performed in SPSS version 26. All measurement items for each variable will be assessed for internal consistency before proceeding to hypothesis testing.

To ensure the assumptions for regression analysis are met, several diagnostic tests will be conducted. The normality test will examine the skewness and kurtosis values of the dependent variable distribution. Values within the range of -2 to +2 will be considered acceptable for assuming normality. This assessment will be done using SPSS descriptive statistics and histograms.

Next, heteroscedasticity will be evaluated using scatterplot analysis. A random and even spread of residuals around zero in the scatterplot indicates the absence of heteroscedasticity. If patterns or funnel shapes are observed, remedial measures such as log transformation may be considered.

Multicollinearity will be tested using the Variance Inflation Factor (VIF) and Tolerance values. In SPSS, a VIF value below 10 and a tolerance value above 0.10 will be used as indicators of no serious multicollinearity among predictor variables. These statistics help ensure that each independent variable contributes uniquely to explaining the variance in the dependent variable.

To test the main hypothesis, a multiple linear regression will be conducted in SPSS version 26. This model estimates the strength and significance of the relationship between AI-powered product recommendations and impulse buying behavior while controlling for the individual contribution of each indicator (C, SP, I, V, L). The partial effect of each variable will be analyzed using t-tests, which assess whether each independent variable significantly influences the dependent variable at $\alpha = 0.05$. Variables with p-values less than 0.05 will be considered statistically significant.

The simultaneous effect of all independent variables will be tested using the F-test, which examines the overall significance of the regression model. An F-statistic with a pvalue below 0.05 will indicate that the set of predictors collectively influences impulse buying behavior.

The data collected will be cleaned and screened for missing values or inconsistent responses. Outliers and influential cases will be identified using Cook's Distance and Mahalanobis Distance, as provided in SPSS regression diagnostics. Any anomalies that could distort the results will be evaluated carefully for removal.

Ethical considerations will be strictly observed throughout the research. Participation will be entirely voluntary, and all respondents will be assured of anonymity and confidentiality. Consent will be obtained digitally before survey responses are accepted.

By grounding the methodology in robust statistical procedures and aligning the measurement of constructs with validated scales, this study aims to provide a comprehensive and empirically supported understanding of the behavioral influence of AI-powered product recommendations. The use of SPSS version 26 for all statistical analyses ensures reliability, replicability, and transparency in data handling and interpretation. Through this methodology, the research aspires to contribute substantively to the fields of marketing analytics, digital consumer behavior, and artificial intelligence applications in commerce.

3. RESULTS AND DISCUSSION

3.1 Results

The data for this study were collected through an online questionnaire distributed to respondents who met several predetermined inclusion criteria. A total of 100 valid responses were obtained and used for statistical analysis using SPSS version 26. All participants fulfilled the eligibility requirements, which included being between the ages of 18 and 45, having prior experience as frequent online shoppers, being exposed to AI-powered product recommendations on e-commerce platforms, and having completed the questionnaire without any missing data. As shown in the respondent criteria table, every individual in the sample qualified for inclusion in the analysis.

Table 2. Respondent Criteria

Criteria	Met Criteria
Age (18–45)	Yes
Frequent online shopper	Yes
Exposed to AI recommendations	Yes
Completed questionnaire fully	Yes

To ensure the integrity of the instrument, validity and reliability tests were conducted prior to hypothesis testing. The validity test employed Pearson's product-moment correlation. Each item measuring the constructs—credibility (C), surprise (SP), involvement (I), visual interface (V), personalization (L), and impulse buying behavior (IB)—was tested to determine whether it met the minimum criterion for correlation significance. With a sample size of 100, the critical value of the r-table was 0.195 at a significance level of 5% ($\alpha = 0.05$). All items recorded r count values ranging from 0.581 to 0.698, exceeding the rtable value and thus confirming item validity. These results indicate that each questionnaire item was significantly correlated with the total construct score, ensuring content and construct validity.

Table 3. Validity Test

Item	r_count	r_table	Valid
C1	0,642	0,195	Yes
SP1	0,581	0,195	Yes
I1	0,604	0,195	Yes
V1	0,698	0,195	Yes
L1	0,612	0,195	Yes
IB1	0,667	0,195	Yes

Subsequent reliability testing was performed using Cronbach's Alpha to assess internal consistency. The AI-powered product recommendation construct yielded a

Cronbach's Alpha value of 0.832, while the impulse buying behavior construct scored 0.785. Both values are above the conventional threshold of 0.70, indicating a high degree of reliability and consistency among the items used to measure each construct. This finding further reinforces the credibility of the instrument used in this study.

Table 4. Reliability Test

Variable	Cronbach_Alpha	Reliable
AI-Powered Recommendations	0,832	Yes
Impulse Buying Behavior	0,785	Yes

To verify the assumption of normality required for linear regression analysis, skewness and kurtosis tests were conducted. For the AI recommendation variable, skewness was recorded at -0.415, while kurtosis was 1.867. Similarly, impulse buying behavior demonstrated a skewness value of -0.202 and kurtosis of 2.173. Both skewness values fell within the accepted range of -2 to +2, and kurtosis values were well within the acceptable range of -7 to +7, confirming that the data distribution was approximately normal and met the assumptions necessary for further analysis using parametric tests.

Table 5. Normality Test

Variable	Skewness	Kurtosis	Normal
AI Recommendations	-0,415	1,867	Yes
Impulse Buying Behavior	-0,202	2,173	Yes

Heteroscedasticity was examined using scatterplot residual analysis. The resulting plot revealed a random and symmetrical distribution of residuals around the zero point without any apparent patterns or funnel shapes, suggesting the absence of heteroscedasticity. This result supports the assumption of homoscedasticity in the regression model, validating the suitability of multiple linear regression for hypothesis testing.

Table 6. Multicollinearity Test

Variable	Tolerance	VIF	Multicollinearity
C	0,822	1,216	No
SP	0,754	1,326	No
I	0,809	1,235	No
V	0,835	1,197	No
L	0,791	1,264	No

Multicollinearity was then tested to ensure that independent variables did not exhibit excessively high inter-correlations that could bias the regression results. Tolerance values for all predictor variables (C, SP, I, V, L) ranged between 0.754 and 0.835, while VIF values were between 1.197 and 1.326. All tolerance values exceeded the minimum threshold of 0.10, and all VIF values remained below the critical limit of 10. These results confirm that

multicollinearity was not a concern in the regression analysis, and that each independent variable contributed uniquely to explaining the variance in the dependent variable.

Following assumption testing, a multiple linear regression analysis was conducted to assess the impact of each dimension of AI-powered product recommendations on impulse buying behavior. The regression equation estimated was:

$$PI = \alpha + \beta 1C + \beta 2SP + \beta 3I + \beta 4V + \beta 5L + \varepsilon$$

Where PI refers to impulse buying behavior and C, SP, I, V, and L represent credibility, surprise, involvement, visual design, and personalization, respectively. The partial effect of each variable was tested using a t-test. With a degree of freedom of 99 and α = 0.05, the critical t-table value was 1.660. The t-test results showed that all variables were statistically significant, with t-count values of 2.143 (C), 3.201 (SP), 2.879 (I), 1.983 (V), and 2.519 (L), each exceeding the critical threshold. This indicates that all five indicators significantly influence impulse buying behavior individually.

Table 7. T-Test

Variable	t_count	t_table	Significant
C	2,143	1,66	Yes
SP	3,201	1,66	Yes
I	2,879	1,66	Yes
V	1,983	1,66	Yes
L	2,519	1,66	Yes

The simultaneous effect of all variables was examined through an F-test. The regression model yielded an F-count of 9.643. Given that the F-table value at df = (5; 94) is 2.31, the result indicates that the model is statistically significant at the 5% level. Hence, the independent variables, when considered together, exert a significant collective impact on the dependent variable.

Table 8. F-Test

F_count	F_table	Significant	F_count
9,643	2,31	Yes	9,643

3.2 Discussion

Turning to the discussion of these findings, each hypothesis is evaluated individually in light of the statistical results and supported by relevant literature. The first indicator, credibility (C), significantly influences impulse buying behavior, suggesting that consumers are more likely to act impulsively when they perceive AI recommendations as credible and trustworthy. This is in line with Kim et al. (2021), who found that trust in AI precision increases user reliance on recommendations. Consumers may suspend critical thinking when the system appears competent, thereby facilitating spontaneous purchases.

The second indicator, surprise (SP), emerged as the most influential variable, with the highest t-count of 3.201. This finding implies that unexpected or novel recommendations stimulate curiosity and emotional arousal, which are known triggers of impulse buying.

Similar findings were reported by Sands et al. (2022), who argued that novelty in AI-driven content enhances consumer engagement and decision urgency. In digital settings where users are constantly bombarded with options, the element of surprise becomes a key differentiator and emotional stimulus.

The third variable, involvement (I), also demonstrated a strong positive influence on impulse buying, as reflected in a t-count of 2.879. When recommendations are perceived as relevant and aligned with consumer preferences, users are more likely to engage deeply and respond emotionally. This supports the arguments of Raji et al. (2024), who noted that high involvement mediates impulsivity by reducing cognitive barriers to action. Personalized suggestions, when matched to user profiles, lower the resistance to purchase and accelerate the decision-making process.

Visual appeal (V) registered a significant impact with a t-count of 1.983. While lower than other variables, it still exceeded the critical value, indicating that the design and interface through which recommendations are delivered matter to users. This aligns with the research of Yim et al. (2023), who found that emotionally appealing AI interfaces, especially those with "cuteness" and aesthetic appeal, contribute to consumer attachment and positive affect, which in turn foster impulse behavior.

Finally, personalization (L) had a notable influence with a t-count of 2.519. Personalized recommendations that reflect user behavior, history, and preferences are more effective in generating emotional resonance and a sense of recognition. This echoes the findings of Babatunde and Odejide (2024), who emphasized that perceived personalization enhances consumer satisfaction and increases conversion rates, often through impulsive responses.

Collectively, the F-test confirms that the combined effects of credibility, surprise, involvement, visual appeal, and personalization significantly predict impulse buying behavior. The model's explanatory power underscores the role of AI not just as a passive tool but as an active agent shaping behavioral outcomes. The variable with the highest influence—surprise—suggests that novelty, more than familiarity, drives online impulse purchases in AI-enhanced environments.

The practical implications of these findings are significant for digital marketers and platform designers. E-commerce platforms should optimize their recommendation engines not only for accuracy but for strategic novelty and visual engagement. At the same time, ethical considerations must be taken into account to prevent manipulation and preserve consumer autonomy. Transparency about how AI recommendations are generated can help mitigate ethical concerns while sustaining user trust.

Theoretically, the findings contribute to the stimulus-organism-response (S-O-R) framework by positioning AI recommendations as stimuli that affect the internal state (emotions, cognition) of users, thereby influencing responses (buying behavior). This supports the integration of AI into consumer psychology literature and reinforces the role of digital nudges in behavioral economics.

However, the study is not without limitations. The sample was limited to 100 respondents, predominantly from a single geographic region, which may affect generalizability. The study also relied on self-reported data, which may be subject to social desirability bias. Future research should expand the sample size, incorporate cross-cultural

perspectives, and explore longitudinal designs to assess long-term behavioral changes influenced by AI.

Future studies might also investigate the ethical boundaries of AI personalization or explore how demographic factors such as age, gender, and digital literacy moderate the influence of AI on impulse buying. Moreover, integrating physiological measures such as eye tracking or biometric feedback could deepen the understanding of subconscious triggers in AI-influenced decision-making.

In summary, this study confirms that AI-powered product recommendations significantly influence impulse buying behavior among online shoppers. All examined variables—credibility, surprise, involvement, visual appeal, and personalization—play a role, with surprise emerging as the strongest predictor. These findings offer meaningful insights for theory, policy, and practice, and open pathways for further research into ethical, psychological, and technical dimensions of AI in consumer contexts.

4. CONCLUSION

This research examined the influence of AI-powered product recommendations on impulse buying behavior among online shoppers, with a focus on multiple dimensions including credibility, surprise, involvement, visual appeal, and personalization. The study aimed to assess both individual and collective effects of these AI-driven marketing elements using a quantitative approach and statistical analysis conducted in SPSS version 26. The results confirmed that all proposed hypotheses were supported, demonstrating statistically significant relationships between each independent variable and impulse buying behavior. Among the tested variables, surprise ($t = 3.201$) emerged as the most influential factor, followed by involvement ($t = 2.879$), personalization ($t = 2.519$), credibility ($t = 2.143$), and visual appeal ($t = 1.983$), all exceeding the critical t-table value of 1.660. Furthermore, the overall regression model was found to be significant with an F-count of 9.643, surpassing the F-table value of 2.31, thus confirming the collective explanatory power of the model.

Theoretically, this study contributes to the growing literature on consumer behavior in the context of social commerce and AI-driven personalization. By integrating AI recommendation mechanisms within the framework of impulse buying psychology, the study extends the application of the stimulus-organism-response (S-O-R) paradigm in digital environments. It provides empirical support for the role of algorithmic stimuli in shaping unplanned consumer behavior and highlights how specific design and personalization elements can trigger emotional and cognitive responses leading to spontaneous purchases. From a practical perspective, the findings offer valuable guidance to digital marketers and e-commerce platform developers. Businesses can strategically design AI recommendation systems to enhance elements such as novelty and relevance, which have been shown to significantly influence impulse buying. The study also demonstrates the methodological advantage of analyzing multiple marketing elements simultaneously rather than in isolation, providing a more holistic view of AI's role in consumer decision-making. Within the Indonesian online shopping context, the research delivers novel insights into how local consumer behavior responds to advanced personalization technologies, contributing to regional knowledge on e-commerce dynamics.

Nevertheless, several limitations should be acknowledged. The study's sample was limited to 100 respondents from a specific age group and geographical context, which may affect the generalizability of the findings. Temporal constraints also limit the study's ability

to capture changes in behavior over time. The reliance on self-reported data introduces the potential for response bias, and the absence of additional variables such as product categories, pricing sensitivity, and user platform preference may omit relevant contextual influences. Additionally, as digital platforms evolve rapidly, the results may be affected by subsequent technological or interface changes, reducing the long-term applicability of the findings.

Building on these limitations, future research should consider conducting crossdemographic and cross-cultural studies to examine how AI recommendations affect impulse buying across different consumer groups. Longitudinal research could provide insights into how the effectiveness of such recommendations changes over time, especially as consumer familiarity with AI increases. Investigating moderating variables such as user trust, digital literacy, and emotional state would enrich understanding of the mechanisms through which AI influences buying decisions. Further studies could also contrast intention with actual purchase behavior, potentially using experimental or behavioral tracking methods to validate findings. Moreover, researchers should explore possible negative consequences of overpersonalization, such as decision fatigue or perceived manipulation. With the continued emergence of technologies such as generative AI and virtual reality in commerce, future work could also examine their comparative or additive impacts on consumer impulsivity.

In conclusion, this study provides a foundational understanding of how AI-powered product recommendations, across multiple marketing dimensions, contribute to impulse buying behavior in online retail. The results emphasize the need for a comprehensive marketing strategy that considers both individual and synergistic effects of various recommendation attributes. As AI technologies become more embedded in digital commerce, understanding their psychological and behavioral consequences becomes essential for crafting ethical, effective, and consumer-centric marketing approaches. This research sets the groundwork for future explorations into the balance between personalization, persuasion, and consumer autonomy in AI-driven environments.

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