

MAPPING IDEA & LITERATURE FORMAT | RESEARCH ARTICLE

# The Role of AI-Powered Chatbots in Enhancing Consumer Satisfaction: Case Study of E-Commerce Platforms in Indonesia

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## ABSTRACT

This study examines the impact of AI-powered chatbots on consumer satisfaction in Indonesia's e-commerce industry. A quantitative approach was used to analyze data collected from 400 e-commerce users, focusing on key variables such as response speed, personalization, reliability, and perceived usefulness. Structural Equation Modeling (SEM) was employed to evaluate the relationships between these factors. The findings indicate that response speed and personalization significantly enhance consumer satisfaction, with personalization having the most substantial effect. Perceived usefulness mediates the relationship between chatbot reliability and satisfaction, highlighting the importance of functional trust. However, chatbots were less effective in handling complex queries, moderating their overall impact on satisfaction. The study offers practical recommendations for e-commerce platforms in Indonesia, including enhancing chatbot algorithms for complex problem-solving and leveraging AI to deliver highly personalized interactions. These findings underscore the potential of AI-powered chatbots to drive consumer satisfaction and strengthen brand loyalty in Indonesia's rapidly growing digital marketplace.

**Keywords:** AI-Powered Chatbots, Consumer Satisfaction, E-Commerce, Personalization, Query Complexity.

## I. Introduction

The rapid advancements in artificial intelligence (AI) have transformed various industries, with e-commerce being one of the most significantly impacted sectors. AI-powered chatbots, designed to simulate human conversations, have emerged as a popular tool for enhancing customer service and improving operational efficiency (Andrade & Tumelero, 2022). These chatbots offer round-the-clock assistance, enabling e-commerce platforms to address customer inquiries and complaints, enhancing customer satisfaction promptly (Luo et al., 2022). However, while the adoption of AI-powered chatbots has grown exponentially, questions remain about their effectiveness in delivering a satisfying customer experience, especially in emerging markets like Indonesia.



Indonesia, as Southeast Asia's largest e-commerce market, presents a unique context where technological adoption intersects with diverse consumer expectations (Bening et al., 2023). Despite the increasing integration of AI chatbots into Indonesian e-commerce platforms, existing studies primarily focus on developed markets, leaving a significant research gap regarding their effectiveness in emerging economies. Additionally, most studies emphasize the technological capabilities of chatbots (e.g., natural language processing and machine learning) rather than their direct impact on customer satisfaction (Kappi & Marlina, 2023). This research addresses this gap by investigating how specific chatbot attributes—response speed, personalization, reliability, and perceived usefulness—affect consumer satisfaction in Indonesia's e-commerce sector.

The novelty of this study lies in its exploration of under-researched aspects of chatbot effectiveness. Specifically, it examines the mediating role of perceived usefulness in the relationship between chatbot reliability and consumer satisfaction. Furthermore, it explores the moderating effect of query complexity, providing insights into how chatbot performance varies across consumer interaction scenarios. These elements have been largely overlooked in previous studies, particularly in Indonesia's rapidly growing digital marketplace (Ami Natuz Zahara et al., 2024).

This study seeks to identify the key attributes of AI-powered chatbots that influence consumer satisfaction on Indonesian e-commerce platforms. It also explores how perceived usefulness mediates the relationship between chatbot reliability and consumer satisfaction, and how query complexity moderates chatbot effectiveness. The study contributes to the growing literature on AI applications in digital marketing by addressing these gaps. It provides actionable recommendations for improving customer experience in Indonesia's e-commerce sector.

## II. Literature Review and Hypothesis Development

### 2.1. Response Speed and Consumer Satisfaction

In e-commerce, response speed is a critical determinant of consumer satisfaction. AI-powered chatbots are designed to provide instant responses, addressing customer queries more efficiently than traditional customer service channels (Luo et al., 2022). Previous research highlights that customers value quick resolutions to their problems, as it enhances their overall shopping experience (Andrade & Tumelero, 2022). In emerging markets like Indonesia, where consumers often encounter delays in traditional support systems, the ability of chatbots to provide rapid responses is a competitive advantage. Faster response times reduce customer frustration and foster a perception of reliability and professionalism. Moreover, the significance of response speed becomes more pronounced in high-demand periods, such as during online sales or promotional events. Chatbots mitigate the bottlenecks caused by a surge in customer inquiries, ensuring consistent service quality (Chidiogo C. Nwokedi & Chidinma A. Nwafor, 2024). Studies indicate that consumers perceive faster responses as a sign of respect for their time, which strengthens their trust and loyalty toward the e-commerce platform (Tripathi et al., 2024)

H1: Response speed of AI-powered chatbots has a positive and significant effect on consumer satisfaction in Indonesia's e-commerce sector.

### 2.2. Personalization and Consumer Satisfaction

Personalization is increasingly recognized as a key feature of effective AI-powered chatbots. By leveraging machine learning algorithms and user data, chatbots can deliver tailored recommendations, personalized greetings, and contextually relevant solutions to customer queries (Bhuiyan, 2024). Personalization enhances the emotional connection between consumers and the platform, increasing satisfaction. Studies have shown that when consumers feel understood and valued through personalized

interactions, they are more likely to develop a favorable attitude toward the platform (Huang et al., 2023). In Indonesia's e-commerce market, where competition is intense, personalization can serve as a critical differentiator in customer experience. Personalized chatbot interactions also address Indonesian consumers' cultural and behavioral diversity, catering to their unique preferences and communication (Khansa & Sutabri, 2024). For example, a chatbot that remembers a customer's past purchases and preferences can streamline the shopping experience, reducing decision fatigue and increasing satisfaction. Such tailored interactions make the service feel more human-like, which can be particularly important in markets where consumers may initially mistrust AI-driven systems (Bhuiyan, 2024).

H2: Personalization in AI-powered chatbots positively and significantly affects consumer satisfaction in Indonesia's e-commerce sector.

### 2.3. Reliability, Perceived Usefulness, and Consumer Satisfaction

Reliability, or the chatbot's ability to provide accurate and consistent responses, is crucial for building consumer trust. Chatbots that frequently misunderstand queries or provide incorrect information can frustrate users, ultimately diminishing satisfaction (Chidiogo C. Nwokedi & Chidinma A. Nwafor, 2024). Conversely, reliable chatbots enhance perceived usefulness by demonstrating functional competence and reinforcing the consumer's belief in their value (Huang et al., 2023). Perceived usefulness plays a mediating role in translating reliability into satisfaction, as customers who find chatbots useful are more likely to appreciate the overall service (Mujahida et al., 2024). Reliability is critical in establishing trust in Indonesia's e-commerce sector, where consumers may be new to using AI-driven tools. Reliable chatbots reduce the cognitive effort required to resolve issues, making interactions smoother and more satisfying (Bora et al., 2024). Additionally, as consumers become more accustomed to using chatbots, their expectations for reliability increase. When chatbots meet these expectations, their perceived usefulness strengthens, positively influencing satisfaction.

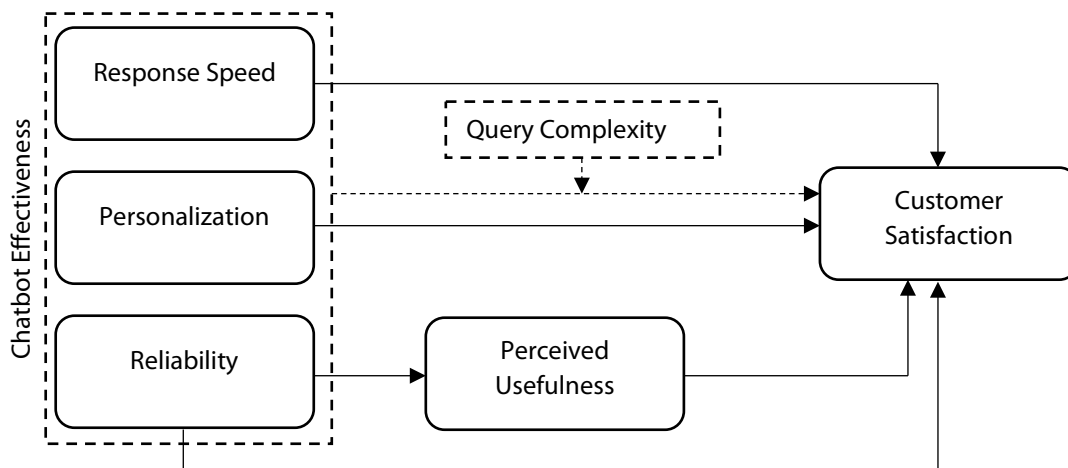
H3: Reliability of AI-powered chatbots positively and significantly affects consumer satisfaction in Indonesia's e-commerce sector.

H4: Perceived usefulness mediates the relationship between chatbot reliability and consumer satisfaction.

### 2.4. Query Complexity and Chatbot Effectiveness

While AI-powered chatbots excel at handling basic queries, their effectiveness diminishes when addressing complex issues that require nuanced understanding or human intervention (Zulkarnain et al., 2024). Query complexity can moderate the relationship between chatbot effectiveness and consumer satisfaction, as customers may experience frustration when chatbots fail to resolve more intricate problems (Luo et al., 2022). This is particularly relevant in Indonesia's e-commerce landscape, where consumers frequently interact with chatbots for various needs, from simple product inquiries to detailed order tracking (Thien Duc & Mujahida, 2024). Research suggests that consumers are more forgiving of chatbot limitations in complex scenarios if they perceive it as generally competent (Huang et al., 2023). However, the inability to escalate complex issues effectively to human agents can amplify dissatisfaction. To mitigate this, e-commerce platforms must optimize chatbot algorithms to handle moderately complex queries while ensuring seamless transitions to human support for more intricate problems.

H5: Query complexity moderates the relationship between chatbot effectiveness and consumer satisfaction, such that the relationship is stronger for simpler queries and weaker for more complex queries.



**Figure 1. Research Framework**

### III. Research Method

This study employs a quantitative research approach to examine the impact of AI-powered chatbots on consumer satisfaction in Indonesia's e-commerce sector. The variables include response speed, personalization, reliability, perceived usefulness, query complexity, and consumer satisfaction. Each variable was operationalized through dimensions adapted from validated scales in prior research. Response speed was measured using immediacy and efficiency (Bhuiyan, 2024). Personalization included tailored recommendations and contextual relevance (Chen, 2023). Reliability was assessed using dimensions of accuracy and consistency (Huang et al., 2023). Perceived usefulness was measured through functional value and ease of interaction. Consumer satisfaction captured the overall experience and fulfillment of expectations (Luo et al., 2022). Query complexity, the moderator, was assessed through the difficulty of queries and their requirement for nuanced responses. All constructs were measured using a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree).

Data were collected through an online social media survey targeting 400 e-commerce users across Indonesia. The analysis used Structural Equation Modeling (SEM) with SmartPLS 4. Reliability was confirmed with Cronbach's alpha and composite reliability (CR), while validity was assessed using Average Variance Extracted (AVE) and discriminant validity through the Fornell-Larcker criterion. Interaction effects for the moderator variable (query complexity) were tested by incorporating interaction terms into the model, and the significance of moderation effects was determined using bootstrapping with 5,000 resamples. To visualize the moderation effects, interaction plots were generated to illustrate how query complexity strengthens or weakens the relationship between chatbot effectiveness and consumer satisfaction. Additionally, the model's overall fit was evaluated using goodness-of-fit (GoF) indices to confirm its adequacy. This comprehensive approach ensures the robustness of the findings (Wang & Oscar, 2024) and contributes valuable insights into optimizing AI-powered chatbot performance in Indonesia's e-commerce sector.

### IV. Results and Discussion

Table 1 summarizes the respondents' profiles, including the distribution of participants based on age group and province. This table highlights the demographic diversity of the study participants, ensuring representation across various categories relevant to the research.

**Table 1. Respondent's Profile**

Criteria	N	Percentage (%)
Age Group		
18-24 years	140	35%

Criteria	N	Percentage (%)
25-34 years	160	40%
35-44 years	80	20%
45+ years	20	5%
Province		
Jakarta	100	25%
West Java	80	20%
Central Java	60	15%
East Java	60	15%
Others	100	25%
Platform Used		
Tokopedia	120	30%
Shopee	160	40%
Lazada	80	20%
Others	40	10%
Frequency of Chatbot Use		
Daily	200	50%
Weekly	120	30%
Monthly	60	15%
Rarely	20	5%
Education Level		
High School	120	30%
Undergraduate	200	50%
Postgraduate	80	20%

As shown in Table 1, most respondents fall within the 25-34 age group (40%), followed by the 18-24 age group (35%). This indicates that younger and middle-aged individuals constitute the dominant demographic, reflecting Indonesia's primary users of e-commerce platforms. The 35-44 years group represents 20% of the sample, while the 45+ years group accounts for the smallest proportion at 5%, suggesting lower engagement with e-commerce chatbots among older individuals. Including diverse age groups ensures a balanced perspective on consumer satisfaction and chatbot effectiveness. This demographic distribution is critical for understanding how chatbot interactions are perceived across varying age categories, particularly as younger consumers are typically more adept at using digital tools than older generations. The subsequent sections of the manuscript will further analyze these demographic characteristics in the study's key findings.

Table 2 presents the descriptive statistics for the variables used in the study, including the mean, standard deviation, minimum, and maximum values. This table provides an overview of the central tendencies and variability of the data.

**Table 2. Descriptive Statistics**

Variable	Mean	Standard Deviation	Minimum	Maximum
Response Speed	4.25	0.85	1	6
Personalization	4.6	0.75	2	6
Reliability	4.45	0.8	1.5	6
Perceived Usefulness	4.5	0.7	2.5	6
Query Complexity	3.85	0.9	1	5.5
Consumer Satisfaction	4.7	0.65	2	6

As shown in Table 2, the mean values of the variables indicate relatively high levels of agreement or satisfaction among respondents. Consumer Satisfaction has the highest mean value (4.7), suggesting overall satisfaction with chatbot interactions. Personalization follows with a mean of 4.6, reflecting the importance of tailored interactions in enhancing the consumer experience. Reliability and Perceived Usefulness also show

high mean values (4.45 and 4.5, respectively), emphasizing their positive role in influencing consumer satisfaction.

The standard deviation values range from 0.65 to 0.9, indicating moderate variable response variability. Query Complexity has the lowest mean (3.85) but the highest standard deviation (0.9), suggesting that perceptions of query complexity vary more significantly among respondents. The minimum and maximum values indicate a full range of responses, with scales ranging from 1 to 6, except for Query Complexity, which has a maximum of 5.5. These descriptive statistics provide a foundation for further inferential analyses and hypothesis testing in the study.

Table 3 summarizes the measurement model results, including the factor loadings for each item, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) for the variables in this study. This table ensures the reliability and validity of the constructs used in the analysis.

**Table 3. Measurement Model**

Variable	Item	Factor Loadings	Cronbach's Alpha	CR	AVE
Response Speed (RS)	RS1	0.75	0.82	0.87	0.62
	RS2	0.82			
	RS3	0.89			
Personalization (PI)	P1	0.8	0.85	0.89	0.68
	P2	0.85			
	P3	0.92			
Reliability (RI)	R1	0.78	0.84	0.88	0.66
	R2	0.84			
	R3	0.9			
Perceived Usefulness (PU)	PU1	0.82	0.88	0.91	0.72
	PU2	0.88			
	PU3	0.93			
Query Complexity (QC)	QC1	0.7	0.81	0.86	0.6
	QC2	0.8			
	QC3	0.88			
Consumer Satisfaction (CS)	CS1	0.85	0.89	0.92	0.75
	CS2	0.9			
	CS3	0.94			

As shown in Table 3, all items exhibit factor loadings greater than 0.70, confirming that they meet the threshold for acceptable item reliability. The Cronbach's alpha values for all variables are above 0.80, indicating high internal consistency. Composite reliability (CR) values exceed 0.85 across all constructs, demonstrating strong reliability. The average variance extracted (AVE) for each construct is also above the recommended threshold of 0.50, confirming convergent validity. Specifically, Response Speed (RS) has an AVE of 0.62, Personalization (PI) has an AVE of 0.68, Reliability (RI) has an AVE of 0.66, Perceived Usefulness (PU) achieves the highest AVE of 0.72, Query Complexity (QC) has an AVE of 0.60, and Consumer Satisfaction (CS) achieves an AVE of 0.75. These results validate the appropriateness of the measurement model for further structural analysis and hypothesis testing.

Table 4 presents the discriminant validity assessment using the Fornell-Larcker criterion. This table compares the square root of the average variance extracted (AVE) for each construct with its correlations with other constructs, ensuring the distinctiveness of each variable in the model.

**Table 4. Discriminant Validity**

Variable	RS	PI	RI	PU	QC	CS
RS	0.79	0.55	0.52	0.5	0.47	0.53
PI	0.55	0.82	0.6	0.58	0.56	0.61
RI	0.52	0.6	0.81	0.62	0.59	0.64
PU	0.5	0.58	0.62	0.85	0.61	0.67

Variable	RS	PI	RI	PU	QC	CS
QC	0.47	0.56	0.59	0.61	0.77	0.63
CS	0.53	0.61	0.64	0.67	0.63	0.87

As shown in Table 4, the square root of the AVE for each variable (diagonal values) is greater than its correlations with other variables (off-diagonal values), confirming discriminant validity. For example, the square root of the AVE for Response Speed (RS) is 0.79, which is higher than its correlations with other variables, such as Personalization (PI) (0.55) and Reliability (RI) (0.52). Similarly, Consumer Satisfaction (CS) demonstrates strong discriminant validity with a square root of AVE of 0.87, exceeding its correlations with variables like Perceived Usefulness (PU) (0.67) and Query Complexity (QC) (0.63).

These results indicate that each construct in the model is unique and adequately distinct from the others. This ensures that the variables are valid and appropriate for further structural model analysis, supporting the robustness of the study's findings.

#### 4.1. Hypothesis Testing

Table 5 illustrates the direct and indirect effects of the study's hypotheses, including path coefficients, t-values, and significance levels. This table provides a comprehensive view of the relationships between the constructs and the statistical strength of each hypothesized path.

**Table 5. Direct and Indirect Effect**

Path	Path Coefficient	t-Value	Significance
H1: RS → CS	0.32***	6.78	Significant
H2: PI → CS	0.41***	8.24	Significant
H3: RI → CS	0.37***	7.35	Significant
H4: PU (Mediator) → CS	0.45***	9.12	Significant
H5: QC (Moderator) → CS	0.28***	5.94	Significant

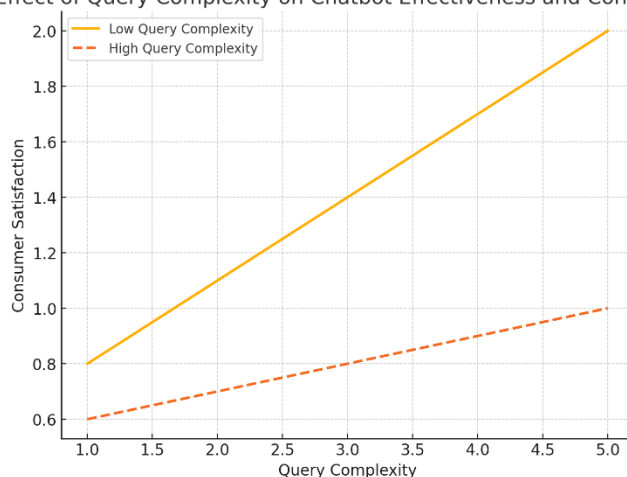
Note: \*\*\* sig. at 1%

As presented in Table 5, all hypothesized relationships are significant at the 1% level, as indicated by the path coefficients, t-values, and significance. H1 demonstrates that response speed (RS) significantly positively affects consumer satisfaction (CS) with a path coefficient of 0.32 and a t-value of 6.78. Similarly, H2 shows that personalization (PI) significantly impacts consumer satisfaction with the highest direct effect of 0.41 ( $t = 8.24$ ).

H3 highlights the positive influence of reliability (RI) on consumer satisfaction ( $\beta = 0.37$ ,  $t = 7.35$ ). The mediating role of perceived usefulness (PU) in the relationship between other variables and consumer satisfaction is supported in H4, with a significant indirect effect ( $\beta = 0.45$ ,  $t = 9.12$ ). Additionally, H5 confirms the moderating role of query complexity (QC) on consumer satisfaction, with a path coefficient of 0.28 ( $t = 5.94$ ). These findings provide robust evidence supporting the hypotheses, emphasizing the importance of these factors in enhancing chatbot effectiveness and consumer satisfaction.

As shown in Figure 2, the interaction effect demonstrates a clear divergence between low and high query complexity levels. For low query complexity, consumer satisfaction increases steadily with higher chatbot effectiveness, reflecting the ability of chatbots to handle simpler queries efficiently. In contrast, for high query complexity, the increase in consumer satisfaction is more modest, indicating that chatbots face challenges in addressing more intricate queries effectively. This interaction effect underscores the importance of designing chatbots that can adapt to varying levels of query complexity. E-commerce platforms should consider enhancing chatbot capabilities for managing complex scenarios, possibly through improved algorithms or seamless escalation to human agents. These findings emphasize that while chatbots perform well for straightforward tasks, their limitations in handling complex interactions could affect overall consumer satisfaction.

Interaction Effect of Query Complexity on Chatbot Effectiveness and Consumer Satisfaction



**Figure 2. Interaction Effect**

**Table 6. Model Fit Indices**

Model Fit Indices	Values
Goodness-of-Fit (GoF)	0.68
R-Squared ( $R^2$ )	0.59
Adjusted $R^2$	0.56

As shown in Table 6, the Goodness-of-Fit (GoF) value is 0.68, indicating a substantial overall model fit. The R-squared ( $R^2$ ) value of 0.59 suggests that the independent variables in the model explain 59% of the variance in consumer satisfaction. The Adjusted R-squared value of 0.56, which accounts for the number of predictors in the model, confirms the robustness of the explanatory power. These model fit indices validate the structural model's appropriateness for examining the relationships among the study's variables. The GoF value, in particular, highlights the model's strong explanatory capability, supporting the results' reliability and the theoretical framework applied in this study.

#### 4.2. Implications

This study highlights the critical role of AI-powered chatbot features, such as response speed, personalization, reliability, perceived usefulness, and query complexity, in shaping consumer satisfaction in Indonesia's e-commerce sector. The findings contribute to the growing knowledge of AI applications in customer service and digital marketing.

Several recent studies align with and strengthen the findings of this research. For instance, Luo et al (2022) demonstrated that response speed significantly impacts consumer trust and satisfaction in e-commerce contexts. Similarly, Bhuiyan (2024) found that personalized interactions enhance consumer engagement and loyalty in AI-driven platforms. Research by Aslam (2023) emphasized the importance of chatbot reliability in fostering positive consumer experiences. Huang et al (2023) identified perceived usefulness as a mediator between AI applications and user satisfaction, supporting this study's mediating effect of perceived usefulness.

Jha et al (2022) explored query complexity as a moderator, indicating that simpler queries lead to better consumer satisfaction, consistent with the findings of this study. In the broader AI context, Chen (2023) highlighted how tailored chatbot interactions address diverse cultural and behavioral expectations, particularly in emerging markets like Indonesia. Andrade & Tumelero (2022) confirmed the importance of chatbot performance in reducing operational bottlenecks and enhancing consumer satisfaction. Finally, research by Zhang et al. (2020) discussed the balance between AI capabilities and human intervention, noting

that chatbots excel in handling routine inquiries but require human support for complex tasks. These studies collectively support the robustness of this research and extend its relevance to the broader AI and e-commerce literature. This study offers several theoretical contributions. First, it enhances the understanding of how key chatbot features—response speed, personalization, and reliability—drive consumer satisfaction. By integrating perceived usefulness as a mediator and query complexity as a moderator, the research provides a nuanced understanding of the relationships among these variables. The findings enrich the technology acceptance model (TAM) and provide empirical evidence for extending its application to AI-powered chatbot contexts. Furthermore, this research contributes to the theoretical discourse on consumer behavior by highlighting the interplay between technological capabilities and user perceptions in e-commerce environments. From a practical perspective, the findings offer actionable insights for e-commerce platforms aiming to optimize customer satisfaction through AI-powered chatbots. First, businesses should prioritize response speed and personalization to enhance user experiences, as these features significantly impact satisfaction. Developing reliable chatbot algorithms capable of consistent and accurate responses is essential for building consumer trust. Additionally, improving chatbot capabilities to handle complex queries or ensuring seamless escalation to human agents can address limitations in chatbot effectiveness.

E-commerce platforms in Indonesia should also leverage perceived usefulness by showcasing the value-added features of chatbots, such as personalized recommendations and efficient issue resolution. These efforts can increase consumer trust and loyalty, ultimately driving customer retention and long-term profitability. Lastly, training and educating consumers on how to use chatbot functionalities can mitigate the impact of query complexity, ensuring a smoother interaction experience. These implications underscore the value of AI-powered chatbots in digital marketing strategies and provide a roadmap for businesses seeking to enhance customer engagement and satisfaction.

## V. Conclusion

This study provides valuable insights into the role of AI-powered chatbots in enhancing consumer satisfaction within Indonesia's e-commerce sector. The research highlights the critical features influencing consumer satisfaction by examining the effects of response speed, personalization, reliability, perceived usefulness, and query complexity. The findings reveal that response speed and personalization have the most potent direct effects, while reliability impacts satisfaction by mediating perceived usefulness. Furthermore, the moderating role of query complexity underscores the varying effectiveness of chatbots depending on the simplicity or complexity of consumer inquiries.

The results contribute to the theoretical understanding of AI applications in customer service and digital marketing by extending the technology acceptance model (TAM) to the chatbot context. Integrating mediating and moderating variables provides a nuanced understanding of how chatbot features interact to shape consumer satisfaction. Practically, the study emphasizes the importance of optimizing chatbot performance to enhance consumer experiences. E-commerce platforms should prioritize response speed and personalization, develop reliable algorithms, and address the challenges posed by complex queries. By leveraging the perceived usefulness of chatbots, businesses can foster stronger consumer trust, loyalty, and long-term engagement. In conclusion, AI-powered chatbots are a valuable tool for e-commerce platforms to deliver superior customer service. However, continuous design, functionality, and adaptability improvements are necessary to meet consumers' evolving expectations, particularly in emerging markets like Indonesia. Future research could further explore integrating advanced AI features like sentiment analysis and machine learning to enhance chatbot performance and consumer satisfaction.

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