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An Analysis of Chatbot and Virtual Assistant Usage on Generation Z Customer Satisfaction in E-Commerce: A Case Study of Shopee Indonesia

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Abstract
The rapid growth of e-commerce in Indonesia has encouraged Shopee to rely on artificial intelligence (AI)-based chatbots and virtual assistants as part of its customer service infrastructure. Nevertheless, a gap remains between Generation Z users' expectations for fast and personalised service and the service they actually experience, particularly when dealing with complex complaints such as product returns. This study examines the effects of chatbots and virtual assistants on the customer satisfaction of Generation Z Shopee users, both individually and jointly. A causal explanatory quantitative approach was employed by distributing a five-point Likert-scale questionnaire to 141 active Generation Z Shopee users selected through purposive sampling. The data were analysed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results show that both chatbots and virtual assistants have positive and significant effects on customer satisfaction, with the virtual assistant demonstrating a slightly stronger effect. Together, the two variables explain 57.4% of the variance in Generation Z customer satisfaction. These findings support the relevance of the SERVQUAL framework in the context of AI-based services and offer practical implications for Shopee management and other e-commerce providers, particularly the need to strengthen virtual-assistant personalisation without overlooking chatbot responsiveness as users' first point of contact.

Keywords:
Chatbot; Virtual Assistant; Customer Satisfaction; Generation Z; E-Commerce; Shopee.

1. INTRODUCTION

The e-commerce industry in Indonesia has experienced remarkably dynamic growth in recent years, propelled by rising internet penetration, expanding digital infrastructure, and a fundamental shift in consumer behavior toward online transactions. Data from the Bank Indonesia consumer survey revealed that the Consumer Confidence Index reached 119.6 in January (2022), up from 118.3 the previous month, signaling a recovery in public trust toward economic conditions in the post-pandemic period (Haryono Erwin, 2022). This favorable landscape has compelled major e-commerce platforms in Indonesia to continuously innovate their service quality, including through the adoption of artificial intelligence (AI) technologies in customer service systems. Shopee, one of Indonesia's largest e-commerce platforms by active user base, has integrated chatbots and virtual assistants as core components of its customer service ecosystem to address the needs of its millions of daily users (Efawati et al., 2024).

Chatbots and virtual assistants have emerged as strategic solutions to the limitations of conventional customer service, which typically operates for only around eight hours a day. A chatbot is an AI-based computer program designed to automatically respond to user inquiries and complaints through text or voice interfaces, without requiring direct human agent involvement at every stage (Nasution & Irwan Padli Nasution, 2024). Virtual assistants, by contrast, represent a more adaptive form of AI capable of processing

conversational context at greater depth and delivering contextual, personalized services tailored to each user's specific needs. In theory, both technologies promise service efficiency that far exceeds human capacity while maintaining consistent responses to thousands of users simultaneously. In practice, however, their implementation does not always align with user expectations. Among all e-commerce user groups in Indonesia, Generation Z, defined as individuals born between 1997 and 2012, currently dominates online shopping activity. IDN Research Institute (2024), through its Indonesia Gen Z Report, recorded that 72% of Generation Z in Indonesia identifies Shopee as their primary online shopping platform. This generation grew up in a digitally immersive environment, which means their expectations regarding AI-based service quality tend to be considerably higher than those of previous generations. They demand instant, accurate, and relevant responses, as well as interaction experiences that feel natural and free of bureaucratic friction. These characteristics make Generation Z the segment most directly affected by the quality or shortcomings of chatbot and virtual assistant systems deployed by e-commerce platforms, including Shopee. Investigating Generation Z satisfaction with these two service technologies is therefore both highly relevant and increasingly urgent (Gede et al., 2024).

From a theoretical standpoint, this study is grounded in the Service Quality theory (SERVQUAL) developed by Parasuraman et al. 1988, which asserts that customer satisfaction is shaped by the size of the gap between consumer expectations prior to service use and the actual experience received afterward. In this study's context, Generation Z customer satisfaction is determined by how effectively Shopee's chatbot and virtual assistant fulfill the expectations users carry before engaging with those systems. Nurmala Dewi, (2020) reinforces this view by defining customer satisfaction as the outcome of comparing initial consumer expectations with actual service performance, whereby services that exceed expectations produce satisfaction while those that fall short result in dissatisfaction. Harazneh et al. (2020) further note that service delivery failures not only reduce customer satisfaction but also increase the psychological switching costs borne by customers, with direct implications for their loyalty and repurchase intentions.

A growing body of empirical research has provided substantial evidence of the positive influence of chatbots and virtual assistants on customer satisfaction. Nugraha et al. (2022) demonstrated that the responsiveness of AI-based chatbots significantly affects consumer satisfaction through intrinsic value, extrinsic value, and online shopping convenience. Jawahir et al. (2022) produced consistent findings in the context of the Halodoc application, where chatbot accuracy was shown to positively drive user satisfaction. On the virtual assistant side, Narita & Fauzi R. (2022) established that virtual assistant-based customer service positively and significantly influences customer satisfaction at Bank BCA, while Abrar Firdaus & Purnama Sari (2024) reported analogous findings in Telkomsel's virtual service context. Chen et al. (2021), drawing on an international e-retailing context, similarly confirmed that the usability and responsiveness of AI chatbots significantly affect customer satisfaction and online shopping experience. Vebrianti et al. (2025) further affirm that AI chatbot service quality, including response speed and information reliability, consistently serves as a strong predictor of customer satisfaction across e-commerce platforms.

The most directly relevant study and primary methodological reference for this research is Soetiyono et al. (2024), who jointly examined the effects of chatbot and virtual assistant usage on customer satisfaction using PLS-SEM with 400 respondents. Their results demonstrated that chatbots exerted a significant effect with a path coefficient of 0.372 (t-statistic = 3.706; $p < 0.05$), while virtual assistants were significant at 0.251 (t-statistic = 2.362; $p < 0.05$), yielding an R^2 of 0.347. While these findings constitute a strong empirical foundation, the study carries a notable limitation in that its sample was confined to the Tangerang region, severely restricting its generalizability to Shopee users at the national level. Furthermore, the study did not restrict its respondent segment to Generation Z, a group whose digital service expectations differ meaningfully from those of other age cohorts. Harisi & Hiwono (2024) and Takaria & Tjokrosaputro (2024) examined chatbot usage in the e-commerce context, but neither integrated virtual assistants as a simultaneously tested variable. Cat et al. (2025) and Ngo et al. (2025) explored chatbots and Generation Z within international settings, but did not cover the Shopee platform, which operates within a distinct service ecosystem.

The mapping of prior studies above reveals a critical research gap that remains unaddressed, namely the absence of a study that comprehensively tests the simultaneous influence of both chatbots and virtual assistants on Generation Z customer satisfaction on Shopee with a nationally representative sample. Rifky Ramadhani et al. 2024 and Alghaniy 2024 have specifically examined chatbots in the Shopee context, yet neither incorporated virtual assistants within a unified analytical framework. Afrina et al. (2025) conducted a comparative study across three platforms simultaneously, namely Shopee, Tokopedia, and Lazada, but their comparative approach did not yield a sufficiently detailed portrait of Shopee users specifically, particularly among Generation Z. This gap constitutes the fundamental rationale for the present study and underscores its importance to the advancement of digital marketing management literature in Indonesia.

Building on the identified research gaps, this study aims to empirically examine the influence of chatbot and virtual assistant usage on Generation Z customer satisfaction on the Shopee platform in Indonesia, both partially through H1 and H2, and simultaneously through H3. Testing was conducted using PLS-SEM via SmartPLS with 141 Generation Z active Shopee users selected through purposive sampling, following the guidelines of Hair et al. 2019. This study is expected to yield two primary contributions. Theoretically, it strengthens the application of SERVQUAL theory within the context of AI-driven service delivery in e-

commerce, particularly for the Generation Z segment. Practically, its findings are intended to serve as a guide for Shopee management and other Indonesian e-commerce operators in designing chatbot and virtual assistant systems that are more responsive, accurate, and genuinely oriented toward the satisfaction of Generation Z users, who represent the largest and most strategically significant market segment in today's digital era.

A chatbot is defined as an AI-based computer program that automatically simulates user conversations through text or voice interfaces without requiring direct human agent involvement at each stage of interaction (Nasution & Irwan Padli Nasution, 2024). In this study, the chatbot variable is measured through five core dimensions adapted from Soetiyono et al., (2024), namely responsiveness, clarity, natural language understanding, reliability, and security. A virtual assistant, by contrast, represents a more adaptive form of AI compared to conventional chatbots, as it is capable of processing conversational context at greater depth and delivering contextual services tailored to each user's specific needs. The virtual assistant variable is measured through four dimensions: clarity, responsiveness, reliability, and contextual service (Soetiyono et al. (2024). Customer satisfaction refers to the comparison between consumer expectations prior to service use and the actual experience perceived upon completion of a transaction (Nurmala Dewi, 2020). The Service Quality theory (SERVQUAL) developed by Parasuraman et al. 1988 affirms that satisfaction is shaped by the magnitude of the gap between consumer expectations and the actual service received the smaller the gap, the greater the satisfaction. This variable is assessed through five dimensions: satisfaction, trust, ease of use, relevance, and overall experience.

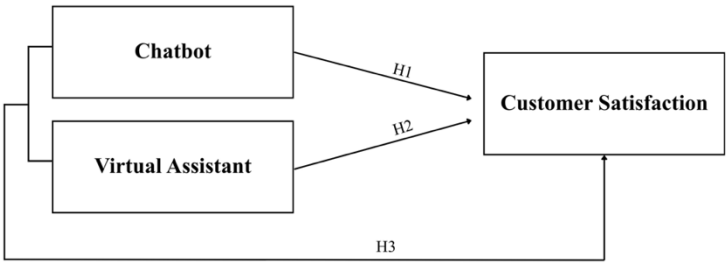

Figure 1. Research Model

Drawing on the theoretical framework and prior empirical studies reviewed above, this study proposes three hypotheses.

H1: Chatbot usage has a positive and significant effect on Generation Z customer satisfaction on the Shopee platform in Indonesia.

H2: Virtual assistant usage has a positive and significant effect on Generation Z customer satisfaction on the Shopee platform in Indonesia.

H3: Chatbot and virtual assistant usage jointly exert a positive and significant effect on Generation Z customer satisfaction on the Shopee platform in Indonesia.

2. RESEARCH METHOD

This study employs a quantitative approach with a causal explanatory design to examine the influence of chatbot and virtual assistant usage on Generation Z customer satisfaction on the Shopee platform in Indonesia. The quantitative approach was selected because the study requires data that can be measured and analyzed statistically in order to empirically test the proposed hypotheses (Sugiyono, 2022). A causal explanatory design was applied given that the objective of this research extends beyond merely describing existing conditions it seeks to establish and verify cause-and-effect relationships among the variables under investigation. Data collection was conducted online through the distribution of a questionnaire via Google Forms, targeting active Shopee users from the Generation Z cohort across Indonesia over a four-week period. The study is theoretically anchored in the Service Quality theory (SERVQUAL) formulated by Parasuraman et al. 1988, which holds that customer satisfaction is determined by the extent to which the gap between pre-service expectations and post-service perceptions is minimized.

The sampling technique employed was purposive sampling, a form of non-probabilistic sampling in which respondents are deliberately selected based on criteria relevant to the research objectives (Sugiyono, 2022). This technique was chosen because not all Shopee users have interacted with its chatbot or virtual assistant features, necessitating a rigorous screening process to ensure that the collected data authentically reflects respondents' actual experiences with the technologies under study. The eligibility criteria established for respondents were as follows: (1) belonging to Generation Z, defined as individuals born between 1997 and 2012; (2) holding an active account on the Shopee platform; and (3) having interacted with Shopee's chatbot or virtual assistant at least once within the preceding three months. The sample size was set at 141 respondents, drawing on the guidelines of Hair, Ringle, et al., 2019, calculated as 3 variables × 5 indicators × 5 = a minimum

of 75 respondents, supplemented by an additional 66 respondents as a buffer to account for potentially invalid or incomplete data, yielding a total target sample of 141 respondents.

The research instrument consisted of a questionnaire employing a five-point Likert scale, where a score of 1 indicates Strongly Disagree and a score of 5 indicates Strongly Agree. The questionnaire comprised 15 statement items adapted from Soetiyono et al., (2024). The first variable, chatbot, was measured through five indicators: (1) the ability of Shopee's chatbot to respond to inquiries promptly and on time (responsiveness); (2) the clarity and accuracy of the information communicated by the chatbot (clarity); (3) the chatbot's capacity to comprehend questions expressed in everyday conversational language (natural language understanding); (4) the chatbot's consistency in delivering accurate and dependable information (reliability); and (5) the assurance of data security and user privacy throughout the interaction (security). Nugraha et al., (2022) demonstrated that the dimensions of responsiveness and reliability are key factors that directly shape consumer satisfaction in the online shopping context.

The second variable, virtual assistant, was measured through four indicators: (1) the clarity with which the virtual assistant conveys information to users (clarity); (2) the speed and accuracy with which the virtual assistant responds to user needs (responsiveness); (3) the virtual assistant's dependability in handling a variety of tasks (reliability); and (4) its capacity to deliver services aligned with the contextual needs of the user at a given moment (contextual service). Narita & Fauzi R, (2022) established that the dimensions of ease of communication and reliability in virtual assistants positively influence customer satisfaction within digital service environments. The third variable, Generation Z customer satisfaction, was measured through five indicators: (1) the overall level of satisfaction with the service received (satisfaction); (2) trust in the information provided by the chatbot and virtual assistant (trust); (3) the ease of using the chatbot and virtual assistant features (ease of use); (4) the relevance of the assistance provided to the user's actual needs (relevance); and (5) the overall impression formed from the entirety of the user's interaction experience with both technologies (overall experience). Nurmala Dewi (2020) affirms that satisfaction arises when the actual experience perceived by consumers meets or surpasses their prior expectations.

Data analysis was conducted using Partial Least Square Structural Equation Modeling (PLS-SEM) with SmartPLS software. This method was chosen for its suitability in research involving latent variables with reflective indicators, its freedom from strict data normality requirements, and its capacity to yield accurate estimations even with moderate sample sizes. The analytical process comprised two primary stages. The first stage involved outer model testing to verify instrument validity and reliability, encompassing convergent validity assessment through factor loading values (> 0.70) and Average Variance Extracted ($AVE > 0.50$), and reliability testing via Cronbach's Alpha and Composite Reliability (both exceeding 0.70). The second stage involved inner model testing through a bootstrapping procedure with 5,000 resamples to generate t-statistic and p-value outputs as the basis for hypothesis evaluation. A hypothesis is accepted when the t-statistic exceeds 1.96 and the p-value falls below 0.05 at a 95% confidence level (Ardiansyach et al., 2022). The coefficient of determination R Square (R^2) was additionally computed to quantify the extent to which chatbot and virtual assistant usage collectively explains the variance in Generation Z customer satisfaction on Shopee. This analytical approach is consistent with the methodology applied by Soetiyono et al. 2024, who successfully demonstrated the significant influence of chatbots and virtual assistants on customer satisfaction, achieving an R^2 value of 0.347.

3. RESULTS AND DISCUSSION

3.1. Respondent Profile

A total of 141 respondents took part in this study, each of whom met the pre-established purposive-sampling criteria: membership in Generation Z (born between 1997 and 2012), possession of an active Shopee account, and prior interaction with Shopee's AI-based chatbot or customer-service feature within the preceding three months. The respondents' characteristics in terms of gender, age, education, and occupation are summarized in the table 1.

Table 1. Respondent Profile

Variable	Category	Frequency	Percentage
Gender	Female	107	75.9%
	Male	34	24.1%
Age	18–22 years	76	53.9%
	23–27 years	49	34.8%
	28–30 years	13	9.2%
	13–17 years	3	2.1%
Education	Bachelor's Degree	114	80.9%
	Senior High School / Vocational School	16	11.3%
	Diploma (D3)	6	4.3%
	Master's Degree	4	2.8%

	Other	1	0.7%
Occupation	Student	73	51.8%
	Private-Sector Employee	28	19.9%
	Entrepreneur	18	12.8%
	Civil Servant	9	6.4%
	Other	8	5.7%
	Freelancer	5	3.5%

Table 1 shows that the majority of respondents were female (75.9%) compared with male respondents (24.1%). In terms of age, respondents were dominated by the 18–22 age group (53.9%), followed by the 23–27 age group (34.8%), confirming that the sample was consistently drawn from the Generation Z age range. With respect to education, most respondents held a bachelor's degree (80.9%), while by occupation, the largest share were students (51.8%), consistent with the characteristic that most Generation Z individuals are still pursuing or have only recently completed higher education.

In addition to demographic profiling, this study also collected data on respondents' shopping behavior on Shopee, including average monthly spending and shopping frequency, as presented in Table 2.

Table 2. Respondents' Shopping Behavior Characteristics

Category	Frequency	Percentage
Average monthly spending on Shopee		
IDR 300,001 – IDR 700,000	55	39.0%
IDR 100,000 – IDR 300,000	47	33.3%
IDR 700,001 – IDR 1,500,000	21	14.9%
More than IDR 1,500,000	14	9.9%
Less than IDR 100,000	4	2.8%
Shopping frequency on Shopee		
1–3 times per month	59	41.8%
2–4 times per week	36	25.5%
Once a week	28	19.9%
Less than once a month	17	12.1%
Every day	1	0.7%

Table 2 indicates that most respondents spent between IDR 300,001 and IDR 700,000 per month shopping on Shopee (39.0%), with the most common shopping frequency being 1–3 times per month (41.8%). This finding suggests that the study's respondents were fairly regular, active Shopee users, so that their experience with Shopee's chatbot and virtual assistant can be regarded as relevant and representative.

Respondents were further asked about their purpose in using Shopee's chatbot or customer-service feature, with a multiple-choice response format allowing more than one purpose to be selected. The results are presented in Table 3.

Table 3. Purpose of Using the Shopee Chatbot / Customer Service

Purpose of Using the Shopee Chatbot / Customer Service	Count	Percentage
Checking order status	79	56.0%
Searching for product information	77	54.6%
Submitting a return / refund request	60	42.6%
Resolving a payment issue	33	23.4%
Other	16	11.3%

Table 3 shows that the most common purposes for using the Shopee chatbot or customer-service feature were checking order status (56.0%) and searching for product information (54.6%), followed by submitting return/refund requests (42.6%) and resolving payment issues (23.4%). This finding is consistent with the phenomenon raised in the introduction of this study, in which the handling of product returns constitutes one of the critical points that frequently triggers user dissatisfaction with the quality of Shopee's chatbot responses.

3.2. Measurement Model Evaluation (Outer Model)

The outer model was evaluated to ensure that the research instrument was valid and reliable for measuring the Chatbot, Virtual Assistant, and Customer Satisfaction constructs. The assessment included convergent validity, reliability, and discriminant validity, as recommended by Ghozali, 2015.

Convergent validity was assessed using outer loading values and Average Variance Extracted (AVE). The SmartPLS 4 results based on data from 141 respondents are presented in the following Table 4.

Table 4. Outer Model Algorithm

	AV	C	CS	Interpretation
AV1	0.749			Valid
AV2	0.780			Valid
AV3	0.815			Valid
AV4	0.840			Valid
C1		0.578		Valid
C2		0.783		Valid
C3		0.838		Valid
C4		0.824		Valid
C5		0.785		Valid
KP1			0.732	Valid
KP2			0.762	Valid
KP3			0.696	Valid
KP4			0.684	Valid
KP5			0.807	Valid

Table 4, shows that most indicators had outer loading values above 0.70, indicating that they strongly represented their respective latent constructs. However, three indicators had loading values below 0.70: C1 (0.554), KP3 (0.696), and KP4 (0.684). According to (Hair, Risher, et al., 2019), indicators with loadings between 0.40 and 0.70 may be retained when their removal does not substantially improve AVE or composite reliability. Accordingly, all three indicators were retained in the research model.

3.3. Average Variance Extracted (AVE)

Table 5. Average Variance Extracted (AVE)

Variable	AVE	Threshold	Interpretation
Chatbot (C)	0,589	> 0,50	Valid
Virtual Assistant (VA)	0,635	> 0,50	Valid
Customer Satisfaction (CS)	0,544	> 0,50	Valid

All three constructs had AVE values above 0.50: 0.589 for Chatbot, 0.635 for Virtual Assistant, and 0.544 for Customer Satisfaction. These results confirm that, on average, the indicators of each construct explained more than 50% of the variance of their respective constructs. Thus, convergent validity at the construct level was established, despite a small number of individual indicators having loadings below 0.70.

Table 6. Construct Reliability

Variable	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Interpretation
Chatbot (C)	0.821	0.838	0.876	Reliable
Virtual Assistant (VA)	0.808	0.816	0.874	Reliable
Customer Satisfaction (CS)	0.790	0.800	0.856	Reliable

All constructs had Cronbach's alpha and composite reliability values above 0.70, indicating good internal consistency and suggesting that the instrument can produce stable measurements under similar testing conditions.

3.4. Discriminant Validity Assessment

Table 7. Fornell-Larcker Criterion

Variable	AV	C	CS
AV	0,797		
C	0,696	0,767	
CS	0,705	0,690	0,737

The square roots of AVE on the main diagonal (VA = 0.797; C = 0.767; CS = 0.737) were all greater than the correlations between constructs in the corresponding rows and columns (0.690–0.705). This indicates that each construct demonstrated sufficient distinctiveness from the others, thereby satisfying discriminant validity according to the Fornell-Larcker criterion.

Table 8. HTMT Discriminant Validity

Variable	AV	C	CS
AV			
C	0,849		
CS	0,867	0,842	

All HTMT values between constructs (0.842-0.867) were below the 0.90 threshold recommended by Hair et al. (2019), confirming discriminant validity through the HTMT approach. Nevertheless, the HTMT value between Virtual Assistant and Customer Satisfaction (0.867) was relatively high and approached the stricter 0.85 threshold sometimes applied in confirmatory research. This proximity is understandable because, conceptually, the quality of virtual-assistant interactions and Generation Z customer satisfaction are closely related within the same AI-based service ecosystem.

3.5. Structural Model Evaluation (Inner Model) and Hypothesis Testing

After evaluating the outer model, the next stage involved assessing the inner model to determine the significance of relationships among the variables using bootstrapping with 5,000 resamples. The coefficient of determination (R-square) results is presented in Table 8.

Table 9. R-Square

Dependent Variable	R-Square	Adjusted R-Square
Customer Satisfaction (CS)	0,574	0,568

The R-square value of 0.574 indicates that Chatbot and Virtual Assistant jointly explained 57.4% of the variance in Customer Satisfaction, while the remaining 42.6% was explained by factors outside the present model. Based on the interpretation guidelines of (Ardiansyach et al., 2022) an R^2 value above 0.50 is considered strong, indicating that the structural model has substantial explanatory power for Generation Z customer satisfaction among Shopee users.

Table 10. Path Coefficients

Path	Coefficient (O)	T-statistics	P-values	Decision
Chatbot → Customer Satisfaction (H1)	0,388	3,109	0,002	Accepted
Virtual Assistant → Customer Satisfaction (H2)	0,435	4,133	0,000	Accepted

The bootstrapping results indicate that both partial hypotheses were supported because the t-statistics for both paths exceeded 1.96 and the p-values were below 0.05. The path coefficient of 0.388, with a t-statistic of 3.109 and a p-value of 0.002 (< 0.05), shows that chatbot use had a positive and significant effect on Generation Z customer satisfaction on Shopee. The more responsive, clear, and reliable the chatbot was in responding to users, the higher the level of satisfaction reported; therefore, H1 was accepted. In addition, the path coefficient of 0.435, with a t-statistic of 4.133 and a p-value of 0.000 (< 0.05), indicates that virtual assistant use had a positive and significant effect on customer satisfaction. This coefficient was slightly larger than the effect of the chatbot, suggesting that the more adaptive and contextual nature of the virtual assistant exerted a relatively stronger influence on Generation Z user satisfaction; therefore, H2 was accepted.

To address H3, namely whether Chatbot and Virtual Assistant jointly had a significant effect on Customer Satisfaction, an F-test was conducted using the R-square value from the structural model. The F-test formula used was as follows:

$$F_{hitung} = \frac{R^2 \,/\, k}{(1 - R^2) \,/\, (n - k - 1)}$$

Calculation:

$$F_{hitung} = \frac{0{,}574 \,/\, 2}{(1 - 0{,}574) \,/\, (138)} = 92{,}97$$

Table 11. Simultaneous Effect Test Results (F-Test)

R-Square	df1	df2	Calculated F	Critical F (α = 0.05)	P-value	Decision
0,574	2	138	92,97	3,06	0,000	H3 Accepted

The calculated F value of 92.97 was substantially greater than the critical F value of 3.06 at the 5% significance level (df1 = 2, df2 = 138), with $p < 0.001$. Therefore, Chatbot and Virtual Assistant jointly had a positive and significant effect on Generation Z Customer Satisfaction on the Shopee platform in Indonesia, and H3 was accepted.

It should be noted that PLS-SEM is not fundamentally based on the classical F-test used in OLS regression; rather, it relies primarily on R-square and F-square values to assess model strength. Nevertheless, the F-test derived from the R-square transformation is commonly used in Indonesian thesis and dissertation research employing PLS-SEM as supplementary evidence of joint effects, alongside R-square values and the partial hypothesis tests obtained through bootstrapping.

Table 12. Summary of Hypothesis Testing

Hypothesis	Statement	Result
H1	Chatbot has a positive and significant effect on customer satisfaction	Accepted
H2	Virtual Assistant has a positive and significant effect on customer satisfaction	Accepted
H3	Chatbot and Virtual Assistant jointly have a positive and significant effect on customer satisfaction	Accepted

4. CONCLUSION

This study shows that Generation Z customer satisfaction with Shopee is shaped by the cumulative experiences users have when interacting with chatbots and virtual assistants across multiple service dimensions. The chatbot's speed in responding to questions, clarity of information, ability to understand users' everyday language, reliability of its responses, and assurance of data security collectively shape users' initial perceptions of Shopee's automated service quality. With respect to virtual assistants, clarity of information, responsiveness to user needs, reliability in handling various tasks, and the ability to provide services suited to users' specific contexts appear to be particularly capable of meeting the expectations of Generation Z, who are accustomed to personalised digital interactions. These characteristics make the virtual-assistant experience appear more relevant and adaptive than interactions with script-based chatbots, thereby contributing relatively more strongly to perceived user satisfaction.

For Generation Z, customer satisfaction with Shopee's chatbots and virtual assistants should be understood in the context of their expectations as digitally experienced consumers. Familiarity with mobile applications and digital services may lead this generation to place greater importance on fast responses, relevant information, and convenient interactions. However, digital familiarity alone does not necessarily guarantee satisfaction. Generation Z users may also evaluate whether chatbot responses are accurate, whether virtual assistants understand their specific needs, and whether information provided can be trusted. In this regard, satisfaction is shaped not only by the availability of AI-based services but also by their ability to deliver relevant, reliable, and contextually appropriate support. These findings highlight the importance of developing chatbot and virtual assistant services that align with Generation Z's digital service expectations while maintaining accuracy, reliability, and user trust.

From a practical perspective, these findings may inform Shopee management and other e-commerce providers in Indonesia as they continue to develop both AI-based service channels in a balanced manner. Strengthening the contextual capabilities and personalisation of virtual assistants should be prioritised because their effect was relatively stronger; however, improvements in the speed and accuracy of chatbot responses should not be overlooked because chatbots often constitute the first layer of interaction with users. Such efforts may help narrow the gap between Generation Z users' expectations and the service they actually receive, particularly when handling more complex complaints such as product returns.

This study has several limitations that should be considered when interpreting the findings. First, the use of purposive sampling and the focus on a single e-commerce platform, Shopee Indonesia, may limit the generalizability of the results to other platforms and consumer groups. Future studies should consider larger and more diverse samples of Generation Z consumers to improve the robustness of the findings and examine whether the observed relationships vary across different user characteristics. Second, some indicator loadings were slightly below the recommended threshold, suggesting that the measurement instruments may benefit from further refinement. Although the HTMT results indicated acceptable discriminant validity, future research should continue to assess the reliability and validity of the measurement model. Third, the cross-sectional design limits the ability to capture changes in customer satisfaction over time. Longitudinal studies could provide a deeper understanding of how users' experiences with chatbots and virtual assistants evolve. Finally, future studies could extend the research model by incorporating theoretically relevant variables, such as trust, perceived usefulness, or personalization, to provide a more comprehensive explanation of Generation Z customer satisfaction with AI-based services in e-commerce.

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