

Analyzing the Impact of Customer Service Chatbots on User Satisfaction

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Abstract— In this current digital era, chatbot apps are widely used in customer service with great automation, round-the-clock customer service, and constant customer support. The main problems with chatbots are that they are unable to provide the intended end solution and fail to reproduce the typical customer experience with human interaction. This research aims to see the impact of customer service chatbots on user satisfaction. This paper uses a quantitative review method that results from the translation of the impact given by the Customer service chatbot. The results of this study show that customer service chatbots for most users increase their satisfaction compared to conventional customer service, with chatbots providing customer comfort and efficiency, reducing customer service time, improving information, increasing productivity, and giving customers tailored experiences. The findings in this research benefit the industry by allowing it to evaluate its chatbot applications because customer satisfaction becomes a fundamental issue in this research. Customers may choose a different application from competitors if a company fails to address this issue.

Keywords— chatbots, customer service, artificial intelligence, AI-based chatbot, customer service, user satisfaction

I. INTRODUCTION

Chatbot apps are commonly utilized in customer care in the contemporary digital era with excellent automation, 24/7 customer service, and consistent customer assistance [1]. The primary issues with chatbots are their inability to deliver the desired result and their inability to mimic the customary consumer experience that comes from human interaction [2]. Many companies are already using chatbots for their services, example of chatbots, includes but not limited to Amazon's Alexa[3], Microsoft's Cortana[4], and Apple's own Siri[5]. Besides the all-purpose chatbots, many companies also developed their own chatbots to handle specific tasks namely Vira by BCA to assist in banking[6] and Bang Joni by BJTech in 2017 [7]. This study aims to investigate the impact of customer assistance chatbots on user satisfaction [2][8]. Literature Review begins with a look at the chatbots' early development and consumer use and related topics on relations between chatbots and customer satisfaction [9].

II. LITERATURE REVIEW

A. Natural Language Processing Models

BERT is both intuitive theoretically and robustly experimentally. On eleven natural language processing tasks [10]. Numerous varieties appear after the initial BERT, including BIOBERT, ClinicalBERT, AraBERT, SciBERT, RoBERTa, DeBERTa, AlphaBERT, BERTje, DistlBERT, AIBERT, BioALBERT, MobileBERT, FlauBERT, SqueezeBERT, CamemBERT [11], GPT-3 [12]. One of GPT-3's key advantages is its size: with billions of parameters and access to enormous volumes of data ChatGPT [13][14].

B. Perceived Ease of Use

Perceived ease of use is defined as the degree to which a person believes that using a particular system would be free of effort [15][16].

C. Perceived Usefulness

The extent to which an individual considers that employing a certain system will increase performance in a task is also one of the definitions of perceived usefulness [17][18].

D. Perceived Trust

The user's level of assurance in the mobile technology service itself is referred to as trust [19]. People choose to employ chatbots if their trust difficulties do not prevent them from doing so as one of their top choices for customer care [20].

E. Perceived Intelligence

Perceived intelligence is defined as formed perceptions about how effective, useful, goal-directed, and autonomous a Personal Intelligence Agent [21].

F. Technological Anxiety

An attitude that can be applied to numerous sorts of technology is technology anxiety. [22].

G. Adoption Intention of Chatbots

Adoption intention (AIN) is the arbitrary likelihood that a person will engage in a particular behavior. [23].

H. User Satisfaction

The opportunities offered by various chatbots with AI capabilities allow businesses to access cutting-edge software, modern platforms, and high-tech equipment without having to spend a lot of money on developing and maintaining a sizable and expensive IT infrastructure [20].

III. METHOD

This research makes use of the quantitative approach. This study, which employs a quantitative research methodology, is based on material about chatbot applications for customer service that can be found in books, journals, and conference papers. Many online libraries and databases, including IEEE, Google Scholar, Scopus, and ScienceDirect, contain the data that follows the study question. This research technique is supported by the use of programs such as SPSS, SmartPLS, and Microsoft Excel.

A. Model

The suggested model for the data is presented in the literature review above. An online survey was used to collect the data for this study.

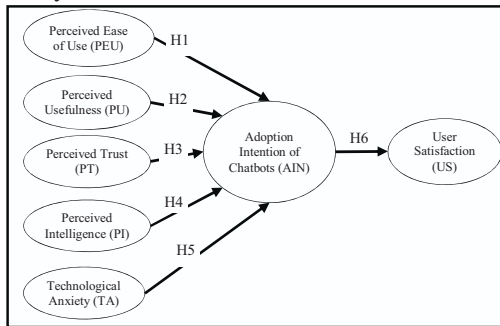


Fig. 1. Proposed Research Model [23]

B. Data Sources

During this research, data from one hundred online survey respondents who used customer service chatbots was collected. Demographics of respondents aged 18 to over 40 years, located in Jakarta, Indonesia, and surrounding cities (Jakarta, Bogor, Depok, Tangerang, and Bekasi) Respondents who filled out the survey were employed, including private employees, civil servants, entrepreneurs, and students.

C. Analysis Method

This study uses partial least square structural equation modeling and multivariate statistical analysis. (PLS-SEM).

TABLE I. VARIABLES AND INDICATORS

Variable and Indicators		Ref
Perceived Ease of Use (PEU)		
When interacting with chatbots, little thought is required.	PEU1	[1], [2], [20], [24]
Chatbots are simple to employ for customer service.	PEU2	

My customer care chatbot conversation is simple and easy to grasp.	PEU3	
Customer support chatbots are easy to use.	PEU4	
Perceived Usefulness (PU)		
Chatbots are helpful for customer support.	PU1	[1], [20], [23], [25]
Chatbots make my customer service experience more effective.	PU2	
Chatbots for customer service enhance my efficiency on a daily basis.	PU3	
I think chatbots are a great tool for customer service overall.	PU4	
Perceived Trust (PT)		
I feel that the information provided by chatbots for customer service is honest	PT1	[1], [20], [23], [25]
I feel chatbots for customer service are trustworthy	PT2	
I feel chatbots for customer service are authentic	PT3	
I feel that chatbots for customer service have the necessary ability to provide the solution	PT4	
Perceived Intelligence (PI)		
I believe chatbots are capable of customer assistance.	PI1	[1], [26]–[28]
I believe chatbots are knowledgeable when it comes to customer service.	PI2	
Customer service chatbots, in my opinion, are responsible	PI3	
Customer care chatbots, in my opinion, are clever and logical.	PI4	
Technological Anxiety (TA)		
When I use technology, such as chatbots, for customer service, I can experience some issues.	TA1	[23], [28]–[30]
I can't keep up with new technical developments	TA2	
I feel uneasy about using technologies like chatbots for customer support.	TA3	
Words relating to technology are challenging to comprehend	TA4	
Adoption Intention of Chatbots (AIN)		
In the future, I intend to deploy chatbots for customer service	AIN1	[20], [23], [31], [32]
In the future, I want to use chatbots for customer service and troubleshooting	AIN2	
There's a chance I'll advise my friends to employ chatbots for customer service	AIN3	
I'm open to using chatbots in customer assistance soon	AIN4	
User Satisfaction (US)		
My expectations were met by the chatbot	US1	[25], [33]–[35]
My requirements were met effectively by the chatbot. (e.g., seeking information, making troubleshooting)	US2	
The assistance I received from the chatbot I utilized was satisfactory	US3	
In general, I was happy with the chatbot I utilized	US4	

IV. RESULTS AND DISCUSSION

A. Measurement Model: Validity and Reliability

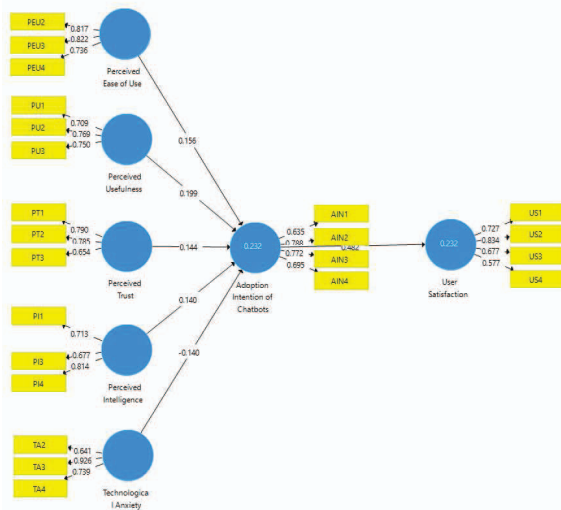


Fig. 2. Path Coefficient Output of Model

This model used three assessment tools: outer-loading, composite reliability (CR), and Cronbach's alpha (CA). This result is then analyzed with average variance extracted (AVE), which should fall between 0.5 and above. Then the reliability is measured using outer loading, with values ranging from 0.577 to 0.834, and a score above 0.5 is recommended. On the other hand, construct reliability is measured with Cronbach's alpha, with a score ranging from 0.588 to 0.718. The results of these tools are presented in Table II.

TABLE II. CONSTRUCT VALIDITY & RELIABILITY

No	Variables/Indicators	Cross Loading	CA	CR	AVE
1	PEU		0.703	0.835	0.629
2	PEU2	0.817			
3	PEU3	0.822			
4	PEU4	0.736			
5	PU		0.598	0.787	0.553
6	PU1	0.709			
7	PU2	0.769			
8	PU3	0.750			
9	PT		0.597	0.789	0.556
10	PT1	0.790			
11	PT2	0.785			
12	PT3	0.654			
13	PI		0.588	0.780	0.543
14	PI1	0.713			
15	PI3	0.677			
16	PI4	0.814			
17	TA		0.718	0.817	0.604
18	TA2	0.641			
19	TA3	0.926			
20	TA4	0.739			
21	AIN		0.698	0.815	0.526
22	AIN1	0.635			
23	AIN2	0.788			
24	AIN3	0.772			
25	AIN4	0.695			
26	US		0.669	0.800	0.504

27	US1	0.727			
28	US2	0.834			
29	US3	0.677			
30	US4	0.577			

Table II shows that the CA score varied between 0.588 and 0.718. The AVE score ranges from 0.504 to 0.629, while the outer loading value from 0.577 to 0.834.

B. Structural Model: Path Coefficient, T-Statistics, R², Q²

TABLE III. PATH COEFFICIENT

Relation	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
PEOU -> AIN	0.156	0.152	0.111	1.403	0.161
PU -> AIN	0.199	0.202	0.096	2.078	0.038
PT -> AIN	0.144	0.16	0.109	1.314	0.189
PI -> AIN	0.14	0.151	0.093	1.507	0.132
TA -> AIN	-0.14	-0.147	0.123	1.138	0.255
AIN -> US	0.482	0.5	0.095	5.081	0.000

Table III shows the result of the T-test model with a 95% confidence interval. With a 95% confidence interval, the p value should be 0.05 to show the significance of the study. In table III, all variables with a P value 0.05 mean the hypotheses can be accepted as correct as they show significance. In table IV, the result of R squared was presented with a score ranging from 0.192 to 0.232. The R² score shows the accuracy of the endogenous construct. The closer the value is to 1, the more accurate this PLS model is at analyzing the data in the study.

TABLE IV. R SQUARE

Construct	R Square	R Square Adjusted
AIN	0.232	0.192
US	0.232	0.224

According to Table IV's results, which display the values of R Square and R Square Adjusted, the dependent variables Adoption Intention of Chatbots (AIN) and User Satisfaction in the model used in this study each have variances of 23.2% and 23.2%, respectively. A PLS model proves more accurate at evaluating research data the closer the value is near 1. First, the findings indicate that users believe customer service chatbots have lived up to their expectations of usefulness. Second, the study's tests of a number of critical factors designed to determine whether the technology was able to achieve its adoption goal yielded encouraging results.

V. CONCLUSION

The issues with deploying chatbots in customer care stem from their robotic nature, which may make it difficult for customers and chatbots to communicate effectively. This study tries to learn what characteristics consumers look for in an efficient customer support chatbot in order to address this issue. Using all of the prior adoption models and frameworks, the study was able to support its hypothesis about the variables that are crucial for raising customer satisfaction levels while employing customer care chatbots. Furthermore, researching how chatbot-mediated customer care affects customer loyalty and retention would be a wise move for businesses looking to improve their client connections in the

digital age. Future Scholars and researchers can examine the effects of incorporating emotional intelligence into chatbots to improve their capacity to recognize users' emotions from their messages and react appropriately, potentially leading to higher user satisfaction.

REFERENCES

- [1] J. Balakrishnan and Y. K. Dwivedi, "Conversational commerce: entering the next stage of AI-powered digital assistants," *Ann Oper Res*, 2021, doi: 10.1007/s10479-021-04049-5.
- [2] I. Lubbe and N. Ngoma, "South African Journal of Information Management," 2021, doi: 10.4102/sajim.
- [3] "Amazon Alexa – Learn what Alexa can do | Amazon.com." <https://www.amazon.com/b?ie=UTF8&node=21576558011> (accessed Jun. 20, 2023).
- [4] "Cortana | Microsoft." <https://www.microsoft.com/en-us/cortana> (accessed Jun. 20, 2023).
- [5] "Siri - Apple." <https://www.apple.com/siri/> (accessed Jun. 20, 2023).
- [6] "Apa Itu Chatbot?" <https://wartaekonomi.co.id/read219026/apa-itu-chatbot> (accessed Jun. 20, 2023).
- [7] "7 Perusahaan Ini Kembangkan Chatbot di Indonesia." <https://wartaekonomi.co.id/read218807/7-perusahaan-ini-kembangkan-chatbot-di-indonesia> (accessed Jun. 20, 2023).
- [8] J. Yun and J. Park, "The Effects of Chatbot Service Recovery With Emotion Words on Customer Satisfaction, Repurchase Intention, and Positive Word-Of-Mouth," *Front Psychol*, vol. 13, May 2022, doi: 10.3389/fpsyg.2022.922503.
- [9] V. Pitardi and H. R. Marriott, "Alexa, she's not human but... Unveiling the drivers of consumers' trust in voice-based artificial intelligence," *Psychol Mark*, vol. 38, no. 4, pp. 626–642, Apr. 2021, doi: 10.1002/mar.21457.
- [10] J. Devlin, M.-W. Chang, K. Lee, and K. Toutanova, "BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding," Oct. 2018, [Online]. Available: <http://arxiv.org/abs/1810.04805>
- [11] A. H. Mohammed and A. H. Ali, "Survey of BERT (Bidirectional Encoder Representation Transformer) types," in *Journal of Physics: Conference Series*, IOP Publishing Ltd, Jul. 2021, doi: 10.1088/1742-6596/1963/1/012173.
- [12] L. Floridi and M. Chiriatti, "GPT-3: Its Nature, Scope, Limits, and Consequences," *Minds and Machines*, vol. 30, no. 4, Springer Science and Business Media B.V., pp. 681–694, Dec. 01, 2020, doi: 10.1007/s11023-020-09548-1.
- [13] B. D. Lund, "A Brief Review of ChatGPT: Its Value and the Underlying GPT Technology Anonymous Web and Libraries and Information Organizations View project Skills, Traits, and Preparation for Instructional Librarians View project", doi: 10.13140/RG.2.2.28474.06087.
- [14] H. Gimpel *et al.*, "Unlocking the Power of Generative AI Models and Systems such as GPT-4 and ChatGPT for Higher Education A Guide for Students and Lecturers Torsten Eymann 2, 6 Executive Summary," 2023.
- [15] A. Hussain, E. O. C. Mkpogio, and M. M. Yusof, "Perceived usefulness, perceived ease of use, and perceived enjoyment as drivers for the user acceptance of interactive mobile maps," in *AIP Conference Proceedings*, American Institute of Physics Inc., Aug. 2016, doi: 10.1063/1.4960891.
- [16] D. L. Kasilingam, "Understanding the attitude and intention to use smartphone chatbots for shopping," *Technol Soc*, vol. 62, Aug. 2020, doi: 10.1016/j.techsoc.2020.101280.
- [17] N. Gümüş and Ö. Çark, "THE EFFECT OF CUSTOMERS' ATTITUDES TOWARDS CHATBOTS ON THEIR EXPERIENCE AND BEHAVIORAL INTENTION IN TURKEY," *Interdisciplinary Description of Complex Systems*, vol. 19, no. 3, pp. 420–436, 2021, doi: 10.7906/indexs19.3.6.
- [18] "3. Analisa Faktor Faktor Adopsi chatbot Line SMB TELKOM Pendekatan Technology Acceptance model yang di modifikasi".
- [19] M. I. R. M. Jaradat, A. A. Moustafa, and A. M. Abedallah Mohammed, "Exploring perceived risk, perceived trust, perceived quality and the innovative characteristics in the adoption of smart Government services in Jordan," *International Journal of Mobile Communications*, vol. 16, no. 1, p. 1, 2018, doi: 10.1504/ijmc.2018.10006981.
- [20] N. I. Mohd Rahim, N. A. Iahad, A. F. Yusof, and M. A. Al-Sharafi, "AI-Based Chatbots Adoption Model for Higher-Education Institutions: A Hybrid PLS-SEM-Neural Network Modelling Approach," *Sustainability (Switzerland)*, vol. 14, no. 19, Oct. 2022, doi: 10.3390/su141912726.
- [21] S. Moussawi and M. Koufaris, *Perceived Intelligence and Perceived Anthropomorphism of Personal Intelligent Agents: Scale Development and Validation*. [Online]. Available: <https://hdl.handle.net/10125/59452>
- [22] H. Jon-Chao, H. Chan-Jer, D. Chien-Yun, H. Ming-Yueh, L. Pei-Hsin, and C.-C. Lee, "Technology Anxiety and Implicit Learning Ability Affect Technology Leadership to Promote the use of Information Technology at Elementary Schools," *Procedia Soc Behav Sci*, vol. 64, pp. 555–563, Nov. 2012, doi: 10.1016/j.sbspro.2012.11.065.
- [23] R. Pillai and B. Sivathanu, "Adoption of AI-based chatbots for hospitality and tourism," *International Journal of Contemporary Hospitality Management*, vol. 32, no. 10, pp. 3199–3226, Oct. 2020, doi: 10.1108/IJCHM-04-2020-0259.
- [24] M. Van Eeuwen, "Mobile conversational commerce: messenger chatbots as the next interface between businesses and consumers."
- [25] D. H. Huang and H. E. Chueh, "Chatbot usage intention analysis: Veterinary consultation," *Journal of Innovation and Knowledge*, vol. 6, no. 3, pp. 135–144, Jul. 2021, doi: 10.1016/j.jik.2020.09.002.
- [26] S. Moussawi and M. Koufaris, *Perceived Intelligence and Perceived Anthropomorphism of Personal Intelligent Agents: Scale Development and Validation*. [Online]. Available: <https://hdl.handle.net/10125/59452>
- [27] S. Moussawi, M. Koufaris, and R. Benbunan-Fich, "How perceptions of intelligence and anthropomorphism affect adoption of personal intelligent agents," *Electronic Markets*, vol. 31, no. 2, pp. 343–364, Jun. 2021, doi: 10.1007/s12525-020-00411-w.
- [28] H. Alboqami, "Factors Affecting Consumers Adoption of AI-Based Chatbots: The Role of Anthropomorphism," *American Journal of Industrial and Business Management*, vol. 13, no. 04, pp. 195–214, 2023, doi: 10.4236/ajbm.2023.134014.
- [29] L. Li, K. Y. Lee, E. Emokpae, and S. B. Yang, "What makes you continuously use chatbot services? Evidence from chinese online travel agencies," *Electronic Markets*, vol. 31, no. 3, pp. 575–599, Sep. 2021, doi: 10.1007/s12525-020-00454-z.
- [30] L. Rajaobelina, S. Prom Tep, M. Arcand, and L. Ricard, "Creepiness: Its antecedents and impact on loyalty when interacting with a chatbot," *Psychol Mark*, vol. 38, no. 12, pp. 2339–2356, Dec. 2021, doi: 10.1002/mar.21548.
- [31] S. Kuberkar and T. Kumar Singhal, "Factors Influencing Adoption Intention of AI Powered Chatbot for Public Transport Services within a Smart City," *International Journal on Emerging Technologies*, vol. 11, no. 3, pp. 948–958, 2020, [Online]. Available: www.researchtrend.net
- [32] M. Song, X. Xing, Y. Duan, J. Cohen, and J. Mou, "Will artificial intelligence replace human customer service? The impact of communication quality and privacy risks on adoption intention," *Journal of Retailing and Consumer Services*, vol. 66, p. 102900, May 2022, doi: 10.1016/J.JRETCONSER.2021.102900.
- [33] D. M. Nguyen, Y. T. H. Chiu, and H. D. Le, "Determinants of continuance intention towards banks' chatbot services in vietnam: A necessity for sustainable development," *Sustainability (Switzerland)*, vol. 13, no. 14, Jul. 2021, doi: 10.3390/su13147625.
- [34] C. L. Hsu and J. C. C. Lin, "Understanding the user satisfaction and loyalty of customer service chatbots," *Journal of Retailing and Consumer Services*, vol. 71, p. 103211, Mar. 2023, doi: 10.1016/J.JRETCONSER.2022.103211.
- [35] "Arreza, Mariae Khrisna Baring, 'The Quality of Service and User Satisfaction of Airline Chatbots', 2022, doi: 10.22334/jbhost.v8i1.346."