



Beyond AI Adoption: Understanding Student Satisfaction and Continuance Intention in ChatGPT Use for Higher Education

Kevin Pangestu*, Siti Rahayu, Juliani Dyah Trisnawati

Universitas Surabaya, Indonesia

Email : kevinpgstu.9@gmail.com

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ABSTRACT

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*Corresponding Author

The growing adoption of generative artificial intelligence (AI) in higher education highlights the need to understand factors influencing students' satisfaction and continued use of ChatGPT. This study aims to examine the effects of information quality, service quality, perceived enjoyment, perceived usefulness, and perceived ease of use on satisfaction and continuance intention, while testing the direct and moderating role of need for interaction with a service employee (NFI-SE). A quantitative causal design was employed using data from 211 respondents aged 18–25 who had used ChatGPT for academic purposes. Data were collected through an online questionnaire and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4. The results show that information quality, service quality, perceived enjoyment, perceived usefulness, and perceived ease of use positively and significantly affect satisfaction. Satisfaction significantly predicts continuance intention, while enjoyment, usefulness, and ease of use also directly influence continuance intention. NFI-SE positively affects satisfaction and strengthens several relationships. The study concludes that human interaction complements AI adoption, implying that institutions should integrate ChatGPT with sustained human academic guidance.

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INTRODUCTION

Artificial intelligence (AI) is increasingly embedded in higher education, shaping how students learn and access academic support. This matters beyond universities because graduates' AI competencies will shape future workplaces, public services, and society (Oktarina & Israhadi, 2023; Wahab & Suhardi, 2026). The expansion of intelligent tutoring systems, adaptive learning, and learning analytics demonstrates that AI is becoming part of education infrastructure (Demartini et al., 2024; Essa et al., 2023). Students therefore need AI systems that are genuinely useful, accessible, reliable, and integrated with human guidance.

Understanding why students accept and continue using AI is essential for maximizing educational benefits while preventing inappropriate dependence. Thus, examining student satisfaction and continuance intention toward AI is socially important for responsible digital transformation in higher education.

Despite its potential, the growing use of AI creates a general problem: availability does not automatically produce sustained or responsible adoption. Students may continue using AI when they perceive it as useful, easy, enjoyable, and capable of delivering information (Manaf et al., 2026; Mu'amalah, 2024). However, uncertainty and ethical concerns, limited AI literacy, and poor understanding of AI may reduce trust and satisfaction (Daher, 2025; Ng et al., 2023). Dependence on AI can become problematic when students substitute automated assistance for critical thinking or human academic guidance. Consequently, identifying determinants of satisfaction and continued use is necessary to support adoption strategies that balance technological efficiency with educational quality and human involvement (Hafiduddin et al., 2024; Ishak et al., 2026).

This problem is particularly visible following ChatGPT's emergence, which became a prominent generative AI application after its launch in late 2022. The platform exceeded one hundred million users within two months after launch, accelerating discussions about AI adoption (Bouteraa et al., 2024; Perkins, 2023). Unlike conventional chatbots, ChatGPT can generate relevant responses, correct errors, and maintain conversational coherence through a generative pre-trained transformer architecture (Chang et al., 2023; Hashem et al., 2024). University students use it for various activities, including finding references, drafting assignments, revising language, and checking academic grammar. In Indonesia, this expanding practice makes student perceptions important because positive experiences may encourage continued use over time, while weak AI literacy may intensify uncritical dependence.

Previous research provides explanations for technology satisfaction and continuance intention. Ishak et al., (2026) developed a model for AI-powered service chatbots by integrating information quality and service quality from the DeLone and McLean model, perceived usefulness and perceived ease of use from the Technology Acceptance Model, perceived enjoyment, and need for interaction with a service employee (NFI-SE). Their findings indicated that these perception constructs generally strengthened satisfaction and continuance intention, whereas NFI-SE negatively affected satisfaction and moderated relationships involving perceived ease of use and usefulness (Ishak et al., 2026; Manaf et al., 2026). However, the model was developed in a commercial service context, where interaction with employees differs substantially from academic interaction involving lecturers, peers, and institutional support.

Other studies reveal that these relationships are not universally consistent. Duong (2026) found that satisfaction mediates relationships between user perceptions and AI-use intention in higher education, although perceived effectiveness did not consistently predict satisfaction. Sari et al., (2024) showed that perceived enjoyment and usefulness significantly influenced satisfaction, whereas perceived ease of use did not. These differences suggest that context and user characteristics can alter relationships. Nevertheless, limited research has examined NFI-SE as a moderator of ChatGPT use among university students (Arifin et al., 2025; Hidayah & Minarti, 2025). Evidence is also insufficient about whether human interaction remains influential when students use generative AI with lecturers and teaching staff (Cotton et al., 2023; Wang et al., 2023). This unresolved issue constitutes an important research gap.

The state of the art lies in extending AI chatbot acceptance models to generative AI use in universities. Rather than treating ChatGPT merely as a technological tool, this study positions student satisfaction as a mechanism connecting perceptions and continuance intention and examines NFI-SE as a contextual moderator. This approach is important because educational AI operates within a hybrid environment where AI coexists with human academic relationships. By testing information quality, service quality, perceived enjoyment, perceived usefulness, perceived ease of use, satisfaction, and NFI-SE together, the study can clarify which factors influence adoption. The findings can help institutions and developers design AI services that complement rather than marginalize human academic interaction.

Accordingly, the research problem concerns whether and how ChatGPT perceptions and experiences shape student satisfaction and continuance intention, and whether human interaction changes them. The study examines the effects of information quality and service quality on satisfaction; the effects of perceived enjoyment, usefulness, and ease of use on satisfaction and continuance intention; and the effect of satisfaction on continuance intention. It also tests whether NFI-SE directly influences satisfaction and moderates relationships between the three perception variables and satisfaction. The argument is that students are more likely to remain satisfied and use ChatGPT when it is useful, easy, enjoyable, and high-quality, but stronger needs for human interaction may alter these effects.

RESEARCH METHODS

This study employed a quantitative approach with a causal research design to examine the relationships among information quality, service quality, perceived enjoyment, perceived usefulness, perceived ease of use, need for interaction with a service employee, satisfaction, and continuance intention in students' use of ChatGPT (Ahmad & Soma, 2025; Suriono & Dewantoro, 2026).

The causal design was selected because the study aimed to empirically test the proposed relationships among the constructs and determine the extent to which students' perceptions influence satisfaction and their intention to continue using ChatGPT. The research model was adapted primarily from Ashfaq et al. (2026) and supported by previous studies on AI adoption and continuance intention. The study involved 211 valid undergraduate student respondents who had used ChatGPT for academic purposes.

The research was conducted among undergraduate students in higher education institutions in Indonesia. Indonesia was selected as the research context because the adoption of generative AI, particularly ChatGPT, has expanded rapidly among university students for learning, assignment completion, information searching, and academic writing. This context provides an appropriate setting for examining students' perceptions, satisfaction, and continuance intention toward AI-based educational services. The target population consisted of students aged 18–25 years who had used ChatGPT at least twice for academic purposes. Respondents were selected using purposive sampling based on predetermined inclusion criteria. Students outside the age range, on academic leave, enrolled above the master's level, or using ChatGPT exclusively for non-academic purposes were excluded. With 37 measurement indicators, the minimum sample requirement was 185 respondents, while 211 valid responses were obtained.

Data were collected through an online questionnaire distributed using Google Forms through student networks, academic groups, and social media. The questionnaire was selected because it enabled the researchers to reach students from different higher education contexts efficiently and systematically. Before completing the questionnaire, respondents answered screening questions to confirm their eligibility. The instrument consisted of reflective indicators adapted from Ashfaq et al. (2026), covering information quality, service quality, perceived enjoyment, perceived usefulness, perceived ease of use, need for interaction with a service employee, satisfaction, and continuance intention. All items were measured using a five-point Likert scale. A pilot test was conducted with students having characteristics similar to the target population to evaluate the clarity and comprehensibility of the questionnaire before the main data collection. Data management involved data condensation through screening and removing incomplete responses, data display through descriptive summaries and construct-level tabulation, and data verification through consistency checks before statistical analysis.

The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4 (Sabol et al., 2023; Sasongko et al., 2025). The analysis consisted of measurement-model and structural-model evaluation. The measurement model was assessed through outer loadings, average variance

extracted (AVE), composite reliability, Cronbach's alpha, and discriminant validity (Ismail et al., 2023; Yun et al., 2023). Indicators with outer loadings of 0.70 or higher and constructs with AVE of 0.50 or higher were considered acceptable, while composite reliability and Cronbach's alpha were used to assess internal consistency (Hair et al., 2019). The structural model was evaluated using R-square, path coefficients, T-statistics, and P-values. Hypotheses were supported when T-statistics exceeded 1.96, P-values were below 0.05, and the relationship followed the hypothesized direction. Data verification was conducted by examining the consistency of measurement and structural results and confirming the proposed direct and moderating relationships. In addition, the validity of the research findings was strengthened through instrument adaptation from established studies, pilot testing, predetermined respondent criteria, and systematic screening of questionnaire responses.

Based on the theoretical framework and relationships among the variables described above, the proposed research model was developed to examine the direct and moderating effects among the study constructs. The research model and hypothesized relationships are presented in Figure 1.

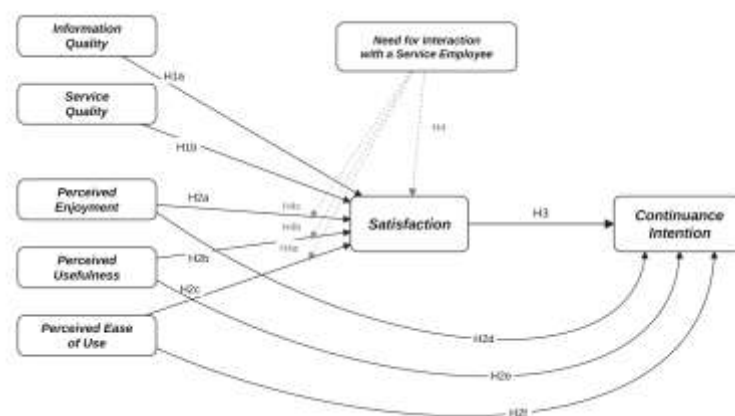


Figure 1. Research Model and Hypothesized Relationships

Figure 1 illustrates the proposed research model, showing the hypothesized direct effects of information quality, service quality, perceived enjoyment, perceived usefulness, and perceived ease of use on satisfaction and/or continuance intention, as well as the moderating role of need for interaction with a service employee.

RESULTS AND DISCUSSION

Results

Respondent Profile

The study involved 211 student respondents who met the eligibility criteria: aged 18 to 25, domiciled in East Java, and having used ChatGPT at least

twice for academic purposes. Respondent characteristics by highest education and occupation are shown in Table 4.1. By education, most respondents hold a bachelor's degree (S1), 125 people or 59.2 percent, followed by senior high school graduates (47 people, 22.3 percent), diploma holders (24 people, 11.4 percent), and master's degree holders (15 people, 7.1 percent). By occupation, most respondents are private-sector employees (91 people, 43.1 percent), followed by students (45 people, 21.3 percent), self-employed (38 people, 18.0 percent), civil servants (35 people, 16.6 percent), and others (2 people, 0.9 percent). This composition shows that ChatGPT use is not limited to currently enrolled students but also includes graduates who are already working, so the usage experience captured in this study is relatively diverse.

Table 4.1 Respondent Characteristics

Characteristics	Category	Frequency	Percentage
Education	Bachelor's (S1)	125	59,2%
	Senior Highschool	47	22,3%
	Diploma	24	11,4%
	Master's (S2)	15	7,1%
Occupation	Private Employees	91	43,1%
	Student's	45	21,3%
	Self-Employed	38	18,0%
	Civil Servant	35	16,6%
	Others	2	0,9%

Source: *Processed by Researcher, 2026*

Measurement Models

The measurement model and the structural model estimated in SmartPLS 4 are presented in Figure 4.1. The arrows from each construct to its indicators form the outer (measurement) model, and the numbers on them are outer loadings. All outer loadings range from 0.743 to 0.909, above the 0.7 threshold. The arrows between constructs form the inner (structural) model, and the numbers on them are path coefficients (original sample) labeled with their hypothesis codes. Among the direct effects on satisfaction, information quality has the largest coefficient (H1a = 0.309), followed by perceived enjoyment (H2a = 0.305), perceived usefulness (H2b = 0.273), perceived ease of use (H2c = 0.265), and service quality (H1b = 0.236). Perceived enjoyment, perceived usefulness, and perceived ease of use also affect continuance intention directly (H2d = 0.252, H2e = 0.206, H2f = 0.252), and satisfaction has the strongest direct effect on continuance intention (H3 = 0.374).

NFI-SE is shown in orange because it acts as a moderator. Its direct effect on satisfaction is H4 = 0.106, and the dashed arrows pointing to the paths from PE, PU, and PEOU to satisfaction represent its moderating effects (H4c = 0.105, H4b = 0.118, and H4a = 0.150). The values inside the SAT and CI ellipses are R-

Square values, namely 0.617 for satisfaction and 0.540 for continuance intention, both in the moderate category.

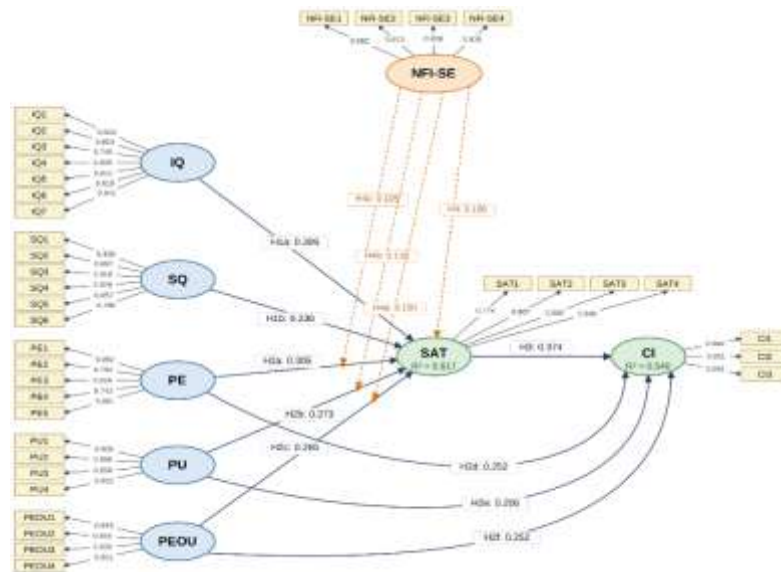


Figure 4.1 Measurement and Structural Model

Source: *Processed by Researcher, 2026*

Evaluation of the measurement model shows that all indicators on the eight research variables are valid. Outer loading values range from 0.743 to 0.909, well above the 0.7 threshold, and average variance extracted values range from 0.652 to 0.765, above the 0.5 threshold. The reliability results in Table 2 show that all variables have composite reliability between 0.893 and 0.934 and Cronbach's alpha between 0.821 and 0.916. Both are well above the required thresholds, so all constructs are reliable. The cross loading test also shows that each indicator correlates more strongly with its own variable than with other variables, so the discriminant validity criterion is met for all constructs.

Table 4.2 Convergent Validity and Composite Reliability

Variable	Outer Loading Range	AVE	Composite Reliability	Cronbach's Alpha
<i>Information Quality</i>	0,745–0,841	0,652	0,929	0,911
<i>Service Quality</i>	0,799–0,887	0,703	0,934	0,916
<i>Perceived Enjoyment</i>	0,743–0,882	0,677	0,913	0,880
<i>Perceived Usefulness</i>	0,850–0,909	0,765	0,928	0,897
<i>Perceived Ease of Use</i>	0,832–0,851	0,712	0,908	0,866
<i>Need for Interaction with a Service Employee</i>	0,838–0,873	0,727	0,914	0,875
<i>Satisfaction</i>	0,774–0,887	0,719	0,911	0,869
<i>Continuance Intention</i>	0,851–0,868	0,736	0,893	0,821

Source: *Processed by Researcher, 2026*

Coefficient of Determination

Structural model evaluation shows R-Square values of 0.617 for satisfaction and 0.540 for continuance intention. Both fall in the moderate category (Hair et al., 2019). The exogenous variables in the model thus explain 61.7 percent of the variation in satisfaction and 54.0 percent of the variation in continuance intention, while the remainder is explained by factors outside this model.

Table 4.3 R-Square

Endogenous Variable	R-Square	Category
Satisfaction	0,617	Moderate
Continuance Intention	0,540	Moderate

Source: *Processed by Researcher, 2026*

Direct Effects

Hypothesis testing with bootstrapping shows that, of the thirteen hypotheses tested, eleven are supported and two are not, as shown in Table 4.4 H1a and H1b are both supported with strong significance, in line with Ashfaq et al. (2020), who found that information quality and service quality are the main factors shaping chatbot user satisfaction. This confirms that the accuracy, currency, and clarity of ChatGPT's answers, along with its response speed and solution accuracy, play an important role in shaping students' satisfaction when they use it for academic activities. The original-sample coefficients also show that information quality contributes slightly more to satisfaction than service quality. This suggests that students prioritize the accuracy and trustworthiness of ChatGPT's answers over the technical aspects of the interface and response speed.

Table 4.4 Hypothesis Test Results

Items	Hypothesis Path	Original Sample	T-Statistics	P-Values	Description
H1a	Information Quality → Satisfaction	0,309	5,942	0,000	Accepted
H1b	Service Quality → Satisfaction	0,236	5,759	0,000	Accepted
H2a	Perceived Enjoyment → Satisfaction	0,305	7,595	0,000	Accepted
H2b	Perceived Usefulness → Satisfaction	0,273	6,119	0,000	Accepted
H2c	Perceived Ease of Use → Satisfaction	0,265	5,287	0,000	Accepted
H2d	Perceived Enjoyment → Continuance Intention	0,252	5,113	0,000	Accepted

H2e	<i>Perceived Usefulness → Continuance Intention</i>	0,206	4,111	0,000	Accepted
H2f	<i>Perceived Ease of Use → Continuance Intention</i>	0,252	4,646	0,000	Accepted
H3	<i>Satisfaction → Continuance Intention</i>	0,374	6,310	0,000	Accepted
H4	<i>NFI-SE → Satisfaction</i>	0,106	2,211	0,027	Not Accepted
H4a	<i>NFI-SE × Perceived Ease of Use → Satisfaction</i>	0,150	2,928	0,003	Not Accepted
H4b	<i>NFI-SE × Perceived Usefulness → Satisfaction</i>	0,118	2,570	0,010	Accepted
H4c	<i>NFI-SE × Perceived Enjoyment → Satisfaction</i>	0,105	2,703	0,007	Accepted

Source: Processed by Researcher, 2026

Discussion

The findings confirm that perceived enjoyment, perceived usefulness, and perceived ease of use influence satisfaction and continuance intention. This pattern is consistent with Ashfaq et al. (2026), who identified these perceptions as determinants of chatbot satisfaction, and with Sari et al. (2024), who found significant effects of enjoyment and usefulness on satisfaction. However, the present findings differ from Sari et al. (2024) regarding ease of use, which was insignificant in their mobile shopping context. This difference suggests that ease of use may become more consequential when generative AI is used for academic activities (Al-Shaikh et al., 2024; Bouteraa et al., 2024). The findings therefore extend technology acceptance evidence by showing that positive perceptions operate across satisfaction and continuance intention.

Satisfaction emerged as the strongest direct predictor of continuance intention ($\beta = 0.374$), while enjoyment, usefulness, and ease of use also retained direct effects. This finding supports Ashfaq et al. (2026), Duong (2026), and Sari et al. (2024), which emphasize satisfaction as a determinant of continued digital technology use. The results also indicate that satisfaction does not completely account for continuance intention because the three perception variables independently predict continued ChatGPT use (Yıldız & Nur, 2024; Zheng, 2026). Theoretically, this finding strengthens the integration of technology acceptance and satisfaction perspectives by demonstrating complementary rather than exclusively mediated mechanisms (Christina & Indra, 2025; Saleh et al., 2025). Practically, educational institutions should therefore improve both user experience and usefulness when encouraging sustained, responsible ChatGPT adoption.

The most distinctive finding concerns need for interaction with a service employee (NFI-SE). Although NFI-SE significantly predicts satisfaction, its

positive direction contradicts the hypothesized negative effect reported by Ashfaq et al. (2026). Similarly, NFI-SE strengthens rather than weakens the relationship between perceived ease of use and satisfaction, while also strengthening the effects of usefulness and enjoyment (Hafiduddin et al., 2024; Ishak et al., 2026). This divergence can be explained by contextual differences: commercial chatbots often address transactional service problems, whereas ChatGPT in higher education operates alongside lecturers and academic guidance. Theoretically, the result suggests that NFI-SE is context-dependent rather than inherently detrimental to satisfaction. Its contribution lies in extending Ashfaq et al.'s model into generative AI-based higher education (Ashfaq et al., 2026; Abbas et al., 2022).

The positive moderating role of NFI-SE further indicates that human interaction and AI assistance can function as complementary resources in educational settings. This interpretation is consistent with De Silva et al. (2025), who emphasized ChatGPT as supporting rather than replacing academic guidance, and with Yang et al. (2025), who highlighted the importance of positioning AI alongside instructors. The findings refine technology acceptance and expectation-confirmation perspectives by showing that students' need for human interaction can strengthen favorable perceptions of AI when guidance remains available. Practically, universities should avoid implementing ChatGPT as a substitute for lecturers. Instead, institutions should establish AI-supported learning strategies that preserve opportunities for consultation, clarification, feedback, and support.

Overall, the findings demonstrate that information quality, service quality, enjoyment, usefulness, and ease of use jointly shape satisfaction and continued ChatGPT use, while human interaction modifies these relationships. The moderate R^2 values for satisfaction (0.617) and continuance intention (0.540) indicate that additional determinants remain relevant. Trust in AI and AI literacy are important areas for future research, although they were not examined in this study. Theoretically, the study contributes by demonstrating that the Ashfaq et al. (2020) framework remains useful for generative AI but requires contextual adaptation of NFI-SE mechanisms. Practically, developers should prioritize accurate, relevant, reliable, responsive services, while institutions should integrate ChatGPT with sustained human academic guidance systems.

CONCLUSION

This study demonstrates that the continued use of ChatGPT in higher education is shaped not only by information and service quality but also by students' enjoyment, perceived usefulness, ease of use, and satisfaction. The most important insight is that the need for human interaction should not be viewed as a barrier to AI adoption; rather, in educational contexts, human guidance can

complement AI and strengthen favorable user perceptions. Scientifically, the study contributes by extending the chatbot satisfaction–continuance model of Ashfaq et al. (2020) to generative AI in higher education and showing that the role of human interaction is context-dependent. Practically, the findings encourage developers to prioritize reliable information and service quality, while institutions should integrate ChatGPT as a complement to lecturers rather than a replacement. However, the study is limited to 211 respondents aged 18–25 in East Java and focuses exclusively on ChatGPT, while moderate R^2 values indicate that other factors may remain relevant. Future research should examine broader populations, other generative AI platforms, and additional variables such as AI literacy and trust to strengthen the model's generalizability and explanatory power.

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