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The Influence of Baidu AI Chatbot Ernie on Perceived Usefulness and Ease of Use Among University Students in China

Djatmiko[1*], Tommy Tanu Wijaya[2], Jun Yuan Huang[1], Esayas Teshome Taddese[3]

[1] Faculty of Education, Southwest University, Chongqing, China
[2] Faculty of Education, Beijing Normal University, Beijing, China
[3] Faculty of Education and Humanities, UNITAR International University, Malaysia

*Corresponding author: djatmikosuwandi@gmail.com

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Abstract: *The purpose of this study is to evaluate the influence of Baidu's AI Chatbot Ernie on university students' perceptions and behaviors in China. Drawing on the Technology Acceptance Model (TAM), the research investigates how perceived usefulness and ease of use of the chatbot impact students' attitudes towards AI, usage behavior, satisfaction levels, and intentions to continue using the technology. Surveys were administered to 93 university students, incorporating diverse demographic variables and utilizing statistical analyses, including t-tests, ANOVA, and correlation matrices. The findings reveal that perceived usefulness significantly affects usage behavior and intentions to continue using the chatbot, while perceived ease of use notably influences satisfaction and continuance intentions. However, no significant relationships were found between perceived usefulness or ease of use and attitudes towards AI. These results underscore the nuanced roles of perceived utility and usability in shaping students' acceptance and ongoing engagement with AI-driven educational tools.*

Keywords: Artificial intelligence, AI Chatbot, Baidu, Ernie, Technology Acceptance Model

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1. Introduction

Baidu's AI chatbot Ernie has the potential to influence the writing proficiency of university students in China positively. Research has shown that chatbots can be effective tools for language learning, leading to increased satisfaction and engagement among students (Huang et al., 2021; Shim et al., 2023). Additionally, the use of AI chatbots in educational settings has been linked to improved learning outcomes and decreased stress and anxiety among students (Bi et al., 2023). Furthermore, the implementation of chatbot-mediated immediacy for synchronous communication has been found to personalize learning based on student behavior, enhancing the overall learning experience (Jasin et al., 2023). As the COVID-19 pandemic has accelerated the shift to online learning, it is crucial to explore the impact of AI chatbots, such as Ernie, on students' satisfaction and learning outcomes in the online education context (Jiang et al., 2021).

Moreover, the influence of AI on students' writing proficiency is evident in the context of EFL learning, especially during the COVID-19 pandemic, where Chinese university students' perceptions of teacher ICT competence and computer-assisted language learning (CALL) technologies have been found to impact their learning enjoyment, anxiety, and boredom (Shao

et al., 2023). Furthermore, the use of AI in educational settings has the potential to automatize the grading of free-text answers and essays, thereby influencing students' writing strategies and proficiency (Nagy & Molontay, 2023). Additionally, the integration of powerful multimodal AI technologies in schools has been shown to facilitate collaborative data analysis and insight development among students (Stenliden & Nissen, 2021). The influence of AI on students' writing proficiency is also intertwined with their acceptance and continuance intention to adopt AI-powered educational tools, such as intelligent tutoring systems, for English learning (Ni & Cheung, 2022). Furthermore, the impact of AI on students' writing skills and motivation has been explored in the context of flipping EFL collaborative writing courses with video clips, highlighting the potential influence on subsequent academic writing at higher education levels (Fathi et al., 2022).

The paper aims to conduct an empirical study with a focus on evaluating the influence of Baidu's AI Chatbot Ernie on the perceived usefulness and ease of use among university students in China. This research endeavors to provide a deeper understanding of how AI chatbots are perceived and adopted in an educational context. It specifically assesses the impact of perceived usefulness and ease of use on students' attitudes towards AI, investigates the influence of interaction with Ernie on students' usage behavior and satisfaction, and examines the correlation between perceived ease of use and perceived usefulness with students' future intentions to continue using the AI chatbot. By doing so, the study contributes valuable insights into the implementation and effectiveness of AI chatbots in educational settings, enriching the broader discourse on AI technology adoption among university students.

2. Literature Review

Artificial Intelligence in Education

Artificial Intelligence (AI) has gained significant importance in education, particularly in the realm of writing assistance tools. The use of AI-powered digital writing assistants has been shown to be effective in improving writing skills among students in higher education (Nazari et al., 2021). These tools provide personalized and autonomous learning modes, balancing the processing of educational resources and gradually improving teaching efficiency (Wang et al., 2023). However, concerns have been raised about the potential abuse of AI writing tools by students, which could undermine the pedagogical value of writing assignments (Hostetter et al., 2023). Despite these concerns, the incorporation of AI, including machine learning and natural language processing, into foreign language learning and teaching has been recognized as a way to alleviate the challenges of academic writing (Pokrivčáková, 2019).

The influence of artificial intelligence (AI) on learning outcomes has been the subject of extensive research (Chai et al., 2020). Chai et al. (2020) highlighted that understanding the potential of AI to promote social goods influences students' attitudes towards its use. Ouyang et al. (2023) proposed an integrated approach of AI models and learning analytics to improve student learning in online engineering courses. Hutson et al. (2022) confirmed that the current use of AI in education leads to positive outcomes, including improved learning outcomes for students and increased access. Overall, AI has been found to impact medical students' preferences for radiology as their future career, with rapid advances in AI in radiology negatively influencing participants (Dahmash et al., 2020).

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a widely used theoretical framework for understanding users' acceptance of technology. It focuses on two key factors: Perceived

Usefulness (PU) and Perceived Ease of Use (PEOU) (Davis, 1989). Perceived Usefulness refers to the user's belief that the technology will enhance their performance, while Perceived Ease of Use relates to the user's judgment of the ease with which they can use the technology (Al-Suqri, 2014). These two factors are central to the TAM and are known to significantly influence users' intention to use a particular technology (Menabò et al., 2021). Furthermore, the TAM has been used to assess the acceptance of technology in different cultural contexts, such as in Kuwait Al-Shammari (2014) and Malaysia (Mahomed et al., 2018). These studies have highlighted the impact of cultural dimensions on the perceived usefulness and ease of use of technology, emphasizing the need to consider cultural factors when applying the TAM.

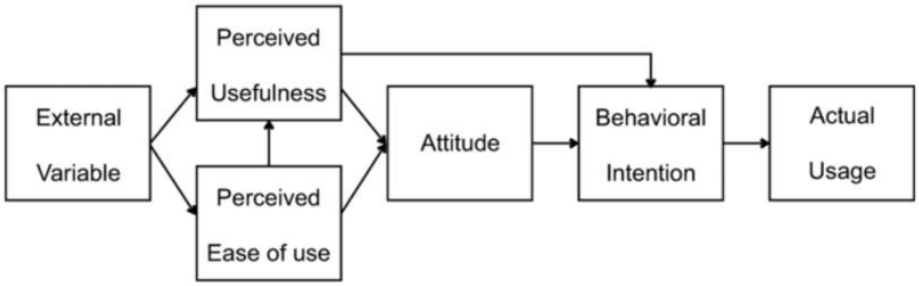

Figure 1: Technology Acceptance Model (TAM)

3. Methodology

The study utilized a quantitative research design to assess the impact of Baidu's AI Chatbot Ernie on university students in China. The research aimed to evaluate how perceived usefulness and ease of use of the AI chatbot influence students' attitudes towards AI, usage behavior, satisfaction, and their intentions to continue using the chatbot in the future. Surveys were distributed to collect numerical data from the participants, which were then analyzed using statistical techniques such as t-tests and ANOVA. The primary objective of this study was to understand how the perceived usefulness and perceived ease of use of Baidu's AI Chatbot Ernie affect various dependent variables among university students in China. Specifically, the study sought to explore the relationships between these perceptions and students' attitudes toward AI, their usage behavior, satisfaction levels, and their intentions to continue using the chatbot.

Two main questions guided the research:

RQ1. How do perceived usefulness and perceived ease of use of Baidu's AI Chatbot Ernie affect students' attitudes towards AI, usage behavior, and satisfaction?

RQ2. What is the relationship between perceived usefulness and perceived ease of use and students' intentions to continue using Baidu's AI Chatbot Ernie in the future?

The study collected data from 93 university students in China. The participants were selected to provide a diverse sample in terms of demographics and their interactions with Baidu's AI Chatbot Ernie. The survey included various demographic variables to capture a comprehensive profile of the respondents. The demographic profile of the respondents (Table 1) reveals a balanced representation across various categories. The gender distribution indicates a slight majority of female participants, with 52 females (55.9%) compared to 41 males (44.1%). Research has shown that gender can influence technology acceptance and usage behavior (Ong & Lai, 2006; Venkatesh & Morris, 2000). The age group of respondents shows a diverse range, with the largest group being 18-25 years old (39.8%), followed by those aged 31 and above (22.6%), 26-30 years old (21.5%), and under 18 years old (16.1%). Age has been identified as

a significant factor in technology adoption and usage, with younger individuals generally more receptive to new technologies (Morris & Venkatesh, 2000; Thong, Hong, & Tam, 2006).

In terms of academic qualifications, the respondents were fairly evenly distributed, with 39 (41.9%) holding a Bachelor's degree, 32 (34.4%) having a Doctorate or higher, and 22 (23.7%) possessing a Master's degree. Education level can influence individuals' technology skills, knowledge, and attitudes (Hargittai, 2010; van Deursen & van Dijk, 2011). Regarding AI usage duration, a significant portion of respondents had used AI for more than a year (37.6%), while others had varied experience: under 3 months (23.7%), 6-12 months (21.5%), and 3-6 months (17.2%). Experience with a technology can affect perceptions, attitudes, and usage behavior (Thong, Hong, & Tam, 2006; Venkatesh et al., 2003). This demographic diversity provides a comprehensive view of university students' engagement with Baidu's AI Chatbot Ernie, encompassing a wide range of experiences and backgrounds. Understanding the characteristics of users is crucial for designing and implementing effective technology interventions (Venkatesh, Thong, & Xu, 2016; Ajzen, 1991).

Table 1: Demographics of the Respondents

Demographics	Description	Frequency	Percentage (%)
Gender	Male	41	44.1
	Female	52	55.9
Age Group	Under 18	15	16.1
	18-25	37	39.8
	26-30	20	21.5
	31 and above	21	22.6
Academic Qualification	Bachelor	39	41.9
	Master	22	23.7
	Doctorate and above	32	34.4
AI Usage Duration	Under 3 Months	22	23.7
	3-6 Months	16	17.2
	6-12 Months	20	21.5
	More than 1 year	35	37.6

4. Results

The descriptive statistics table (Table 2) provides a detailed summary of the key variables measured in the study, highlighting the central tendency and dispersion of the data. For Perceived Usefulness, the mean scores are 3.44 (PU1) and 3.43 (PU2), with standard deviations of 1.42 and 1.31, respectively, indicating a moderate level of perceived usefulness among respondents. This aligns with previous research that has found perceived usefulness to be a key determinant of technology acceptance (Davis, 1989; Davis et al., 1989). The Perceived Ease of Use items (PE3 and PE4) have means of 2.90 and 3.18, with standard deviations of 1.21 and 1.24, respectively, suggesting that ease of use is perceived to be slightly above average. Ease of use has been identified as another important factor in technology acceptance models (Davis, 1989; Venkatesh & Davis, 2000).

Attitudes Towards AI, measured by five items (AT5 to AT9), have mean scores ranging from 2.90 to 3.33 and standard deviations between 1.28 and 1.44, indicating varied attitudes towards AI with a general trend towards neutrality. Research has shown that attitudes can significantly influence behavioral intentions and usage behavior (Ajzen, 1991; Thong et al., 2006). Usage

Behavior, captured by four items (UB10 to UB13), shows mean scores from 3.00 to 3.57, reflecting moderate engagement with the AI chatbot. Actual usage is the ultimate dependent variable in many technology acceptance models (Davis, 1989; Davis et al., 1989). Satisfaction, assessed through five items (SA14 to SA18), exhibits mean scores between 3.05 and 3.37, with standard deviations ranging from 1.14 to 1.39, indicating moderate satisfaction levels. User satisfaction is a key outcome variable in information systems research and has been linked to continued usage intentions (Bhattacherjee, 2001; DeLone & McLean, 2003). Lastly, Intentions to Continue Using the AI chatbot (IC19 and IC20) have mean scores of 3.00 and 3.37, with standard deviations of 1.32, suggesting a moderate likelihood of continued use. Continuance intention is a crucial variable in post-acceptance models of IS continuance (Bhattacherjee, 2001; Thong et al., 2006). The 25th, 50th, and 75th percentiles further provide insights into the distribution of responses, generally showing that most students' perceptions and behaviors are centered around the middle of the scale.

Table 2 also presents the Scale Reliability Analysis, offering an assessment of the internal consistency of the scales measured in the study. Perceived Usefulness and Perceived Ease of Use have relatively low Cronbach's Alpha values of 0.104 and 0.249, respectively, with each construct measured by 2 items. These values suggest limited internal consistency, indicating that the items may not be highly correlated with one another. This is inconsistent with previous research that has found these constructs to be reliable and valid measures of technology acceptance (Davis, 1989; Davis et al., 1989). Attitudes Towards AI, assessed with 5 items, also shows a low Cronbach's Alpha of 0.083, implying poor reliability for this scale. This is concerning, as attitudes have been identified as important predictors of technology usage behavior (Ajzen, 1991; Thong et al., 2006). Usage Behavior, measured with 4 items, has a slightly higher but still moderate Cronbach's Alpha of 0.256. The Satisfaction scale, with 5 items, exhibits the highest reliability among the constructs with a Cronbach's Alpha of 0.408, yet it is still below the commonly accepted threshold for acceptable reliability (DeVellis, 2016). Intentions to Continue Using AI, measured with 2 items, has a Cronbach's Alpha of 0.232. Overall, these results indicate that the scales used in the study have varying levels of internal consistency, with most showing poor to moderate reliability, highlighting the need for potential refinement of the measurement items (Straub, 1989).

Table 2: Descriptive Statistics

Variable	Item	Mean	Std Dev	Cronbach's Alpha	25%	50%	75%
Perceived Usefulness	PU1	3.44	1.42	0.104	2	4	5
	PU2	3.43	1.31		3	4	4
Perceived Ease of Use	PE3	2.90	1.21	0.249	2	3	4
	PE4	3.18	1.24		2	3	4
Attitudes Towards AI	AT5	2.90	1.44	0.083	2	3	4
	AT6	3.16	1.30		2	3	4
	AT7	3.24	1.28		2	3	4
	AT8	3.33	1.37		2	4	4
	AT9	3.12	1.28		2	3	4
Usage Behavior	UB10	3.33	1.34	0.256	2	4	4
	UB11	3.57	1.27		3	4	5
	UB12	3.24	1.29		2	3	4
	UB13	3.00	1.34		2	3	4
Satisfaction	SA14	3.05	1.27	0.408	2	3	4
	SA15	3.16	1.39		2	3	4

	SA16	3.37	1.14		2	4	4
	SA17	3.06	1.21		2	3	4
	SA18	3.08	1.33		2	3	4
Intentions to Continue Using	IC19	3.00	1.32	0.232	2	3	4
	IC20	3.37	1.32		2	4	4

The hypotheses were rigorously tested using t-tests and ANOVA to determine the relationships between perceived usefulness, perceived ease of use, and various dependent variables. Each hypothesis was evaluated at a significance level of 0.05, providing insights into the statistical relevance of the relationships. The results indicated that there was no significant positive relationship between Perceived Usefulness and Attitudes Towards AI (H1) or between Perceived Ease of Use and Attitudes Towards AI (H2), leading to the rejection of these hypotheses. This suggests that students' general attitudes towards AI are influenced by factors beyond the perceived usefulness and ease of use of a specific AI chatbot. This finding contradicts previous research that has found perceived usefulness and ease of use to be significant predictors of attitudes towards technology (Davis, 1989; Venkatesh & Davis, 2000). Conversely, the analysis revealed significant positive relationships for some hypotheses. Perceived Usefulness was found to have a significant impact on Usage Behavior (H3), indicating that students who found the chatbot useful were more likely to use it frequently. This is consistent with TAM and other technology acceptance models that have consistently found perceived usefulness to be a strong predictor of actual usage behavior (Davis, 1989; Thong et al., 2006).

However, there was no significant relationship between Perceived Ease of Use and Usage Behavior (H4). This is surprising, as ease of use has been identified as an important factor in technology acceptance and usage (Davis, 1989; Venkatesh & Davis, 2000). Furthermore, while Perceived Usefulness did not significantly affect Satisfaction (H5), Perceived Ease of Use did (H6), implying that ease of use plays a crucial role in how satisfied students feel with the chatbot. This finding aligns with the IS Success Model, which posits that system quality (which includes ease of use) is a key determinant of user satisfaction (DeLone & McLean, 2003). Both Perceived Usefulness (H7) and Perceived Ease of Use (H8) significantly influenced students' Intentions to Continue Using the chatbot, highlighting that both constructs are critical in determining the likelihood of continued use and recommendation of the AI technology. This is consistent with post-acceptance models of IS continuance, which emphasize the importance of perceived usefulness and ease of use in shaping continuance intentions (Bhattacherjee, 2001; Thong et al., 2006).

Table 3: Results Hypothesis Testing

Hypothesis	P-Value	Standard Error	R Squared	F-Statistic	ANOVA	Results
H1: There is a positive relationship between Perceived Usefulness and Attitudes Towards AI.	0.522	0.109	0.001	0.337	0.798	Rejected
H2: There is a positive relationship between Perceived Ease of Use and Attitudes Towards AI.	0.126	0.115	0.022	2.674	0.052	Rejected
H3: There is a positive relationship between Perceived Usefulness and Usage Behavior.	0.000	0.095	0.126	4.895	0.003	Supported

H4: There is a positive relationship between Perceived Ease of Use and Usage Behavior.	0.355	0.108	0.029	2.268	0.086	Rejected
H5: There is a positive relationship between Perceived Usefulness and Satisfaction.	0.332	0.104	0.006	0.581	0.629	Rejected
H6: There is a positive relationship between Perceived Ease of Use and Satisfaction.	0.002	0.107	0.074	3.730	0.014	Supported
H7: There is a positive relationship between Perceived Usefulness and Intentions to Continue Using.	0.001	0.100	0.090	3.992	0.010	Supported
H8: There is a positive relationship between Perceived Ease of Use and Intentions to Continue Using.	0.004	0.109	0.062	3.172	0.028	Supported

5. Conclusion

The findings based on the research questions regarding the influence of Baidu's AI Chatbot Ernie on university students' perceived usefulness, perceived ease of use, and various dependent variables, including attitudes towards AI, usage behavior, satisfaction, and intentions to continue using the chatbot.

Research Question 1: How do perceived usefulness and perceived ease of use of Baidu's AI Chatbot Ernie affect students' attitudes towards AI, usage behavior, and satisfaction?

The analysis showed that perceived usefulness and perceived ease of use had different impacts on the dependent variables. The hypotheses testing revealed that there was no significant positive relationship between perceived usefulness and attitudes towards AI, as indicated by the rejection of H1 (p-value = 0.522). Similarly, H2 was also rejected (p-value = 0.126), indicating that perceived ease of use did not significantly influence students' attitudes towards AI. These results suggest that students' general attitudes towards AI are influenced by factors beyond the perceived usefulness and ease of use of a specific AI chatbot.

However, the impact of perceived usefulness on usage behavior was significant. The analysis supported H3 (p-value = 0.003), indicating that students who find the chatbot useful are more likely to use it frequently. Conversely, perceived ease of use did not significantly affect usage behavior, leading to the rejection of H4 (p-value = 0.355). This suggests that while perceived usefulness is a key driver of actual usage behavior, ease of use alone is not sufficient to increase usage frequency. For satisfaction, perceived ease of use played a crucial role. The analysis supported H6 (p-value = 0.002), indicating that ease of use significantly influences students' satisfaction with the chatbot. On the other hand, perceived usefulness did not significantly affect satisfaction, as shown by the rejection of H5 (p-value = 0.332). These findings imply that while ease of use is important for students' satisfaction, usefulness primarily drives their actual engagement with the chatbot.

Research Question 2: What is the relationship between perceived usefulness and perceived ease of use with students' intentions to continue using Baidu's AI Chatbot Ernie in the future?

Both perceived usefulness and perceived ease of use were found to significantly influence students' intentions to continue using the chatbot. The analysis supported H7 (p-value = 0.001),

showing a significant positive relationship between perceived usefulness and students' intentions to continue using the chatbot. Similarly, H8 was also supported (p-value = 0.004), indicating that perceived ease of use positively influences students' future usage intentions.

These results highlight that students who perceive the chatbot as both useful and easy to use are more likely to continue using it in the future. The significant relationships emphasize the importance of both constructs in ensuring the sustained adoption and recommendation of AI technologies in educational settings. The overall analysis provides a comprehensive understanding of how perceived usefulness and ease of use influence various outcomes related to the AI chatbot, offering valuable insights for enhancing its implementation and effectiveness in educational contexts.

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