6th CoMBInES
Volume 6 No 1 (2026)

Accepted : July 11th, 2026
Published : September 30th, 2026
DOI : 10.37253/combines.v6i1.12758

Conference on Management, Business, Innovation, Education and Social Science
https://journal.uib.ac.id/index.php/combines

Beyond Adoption: Explaining Student Engagement with AI through an Extended TAM–UTAUT Framework

***Yip Yen San*[1]**
yipys@utar.edu.my

***Chan Pui Yee*[2]**
pychan@utar.edu.my

***Chew Wei Xian*[3]**
weixianchew943@gmail.com

***Foong Yu Xing*[4]**
foong1020@gmail.com

[1234] Teh Hong Piow Faculty of Business and Finance, Universiti Tunku Abdul Rahman, Malaysia

Abstract

Artificial Intelligence (AI) is increasingly integrated into higher education, yet existing studies mainly focus on students' intention to use technology rather than their actual engagement with AI learning tools. This study examines the factors influencing student engagement with AI among Generation Z students in Malaysian private higher education institutions. The study extends the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) by incorporating technological, social, and psychological factors to explain student engagement with AI. A quantitative cross-sectional design was adopted using an online survey questionnaire, with data collected from 304 students. Multiple regression analysis was conducted to examine the relationships between these factors and student engagement. The findings indicate that perceived usefulness, performance expectancy, social influence, perceived trust, and perceived risk significantly and positively influence student engagement, while perceived ease of use is insignificant. The positive relationship between perceived risk and engagement suggests that students may perceive the benefits of AI as outweighing potential risks. The study contributes to the technology acceptance literature by extending TAM and UTAUT beyond behavioural intention towards engagement outcomes and offers practical insights for higher education institutions implementing AI in learning environments.

Keywords:
Artificial Intelligence; Technology Acceptance Model (TAM); UTAUT; Student Engagement; Higher Education

Introduction

The use of Artificial Intelligence (AI) in tertiary education is transforming the educational landscape, offering customized learning experiences, intelligent tutoring systems, automated assessments, and real-time decision-making.Artificial intelligence is transforming higher education by providing personalized instruction, intelligent tutoring, automatic assessment and real time decision making. The adoption of AI by private higher education institutions (PHEIs) has become more prevalent with support from initiatives like the Digital Education Policy (DePAN) and the Malaysia Education Blueprint 2025. This is especially so for Generation Z learners who often use AI to fulfill their academic needs such as information retrieval, summarization, and content generation. Research today indicates that artificial intelligence has the potential to enhance the educational setting and involvement by means of customization, instantaneous feedback, and cooperative learning.

While the use of AI in education is increasing, much of the current research has focused on technology adoption and behavioural intention, but not on the level of student engagement, which is a vital measure of educational effectiveness. In addition, factors of technology acceptance are usually discussed individually without connecting any cognitive factors (Perceived Ease of Use and Perceived Usefulness), social factors (Social Influence and Performance Expectancy) and psychological factors (Perceived Trust and Perceived Risk). Likewise, issues of privacy, trust, and AI-generated outcomes are under-researched from an ethical perspective. Furthermore, there is not much empirical evidence on the students in Generation Z in the Malaysian private higher education institutions.

Following the research gaps outlined and the increasing application of artificial intelligence in higher education, this research will focus on analysing the factors that affect the use of AI tools among Generation Z students in Malaysian private higher education institutions. The research objectives of this research are:

1. To examine how PEoU, PU, SI, and PE influence student engagement with AI tools.
2. To assess the effects of PT and PR on students' engagement with AI-enabled learning technologies.
3. To test an integrated framework explaining student engagement with AI in higher education.

Literature Review

Artificial Intelligence (AI) has significantly transformed higher education through personalized learning, intelligent tutoring system, automated feedback , and generative AI applications (Bagozzi, 2007; Venkatesh & Davis, 2000). Despite the growing aoption of AI technologies, limited research has explored the factors that influence students' engagement with AI beyond technology acceptance. This study develops an integrated conceptual

framework by combining the Technology Acceptance Model (TAM) (Davis, 1989), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), and trust-risk perspectives to examine students' engagement (SE) with AI-supported learning in Malaysian private higher education institutions. Specifically, the study investigates how perceived ease of use (PEOU), perceived usefulness (PU), social influence (SI), performance expectancy (PE), perceived trust (PT), and perceived risk (PR) influence students' behavioural, emotional, and cognitive engagement with AI-supported learning. The findings from previous studies suggest that students' engagement with AI is shaped by more than just the usability of the technology and its expected academic benefits. According to Oc et al. (2025) and Pitts et al. (2025), factors such as institutional support, social influence, trust in AI systems, and concerns about privacy, ethics, and reliability also play important roles in determining how students engage with AI-supported learning. By integrating these psychological and contextual factors with established technology acceptance theories, this study provides a broader understanding of student's engagement with AI in higher education. The proposed framework serves as a foundation for future empirical research and offers practical insights for educators and higher education institutions seeking to promote the responsible and effective use of AI in teaching and learning process.

Proposed Conceptual Framework

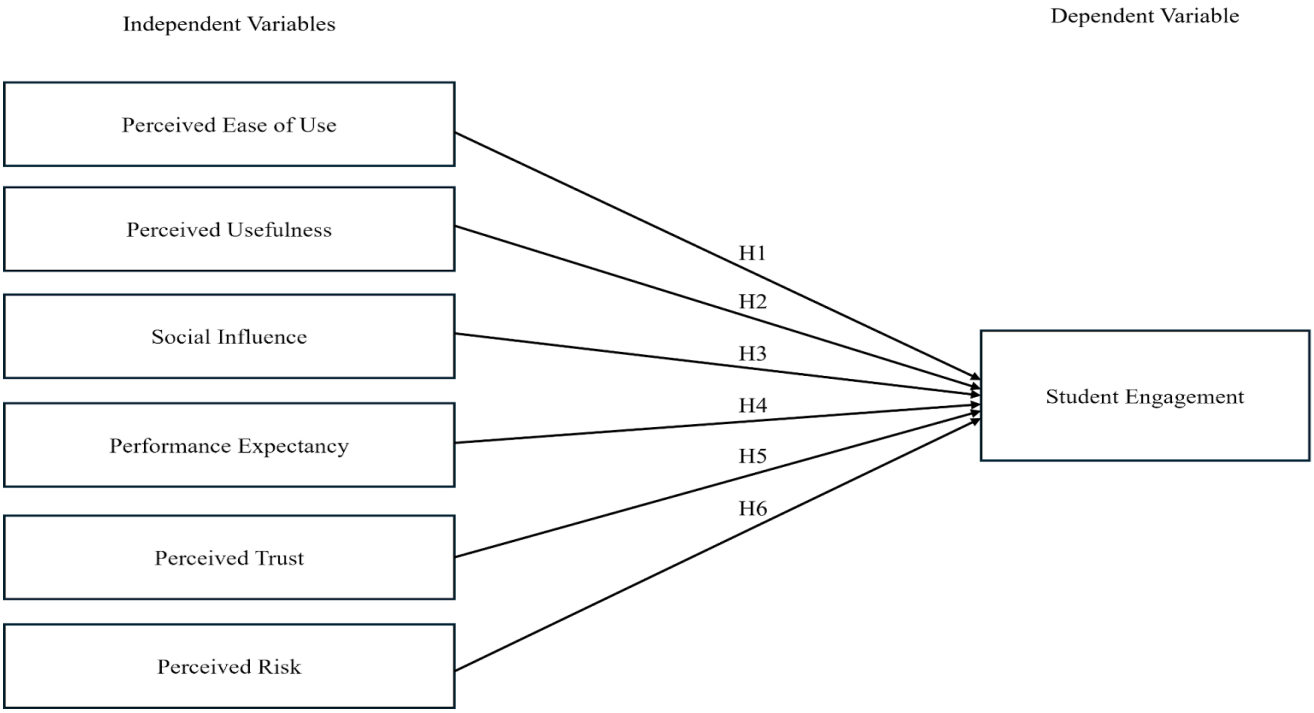


Fig 1 Proposed Conceptual Framework

Methodology

This study employed a quantitative causal research design to better understand the factors that shape students' engagement with AI in Malaysian private higher education institutions (Bougie & Sekaran, 2025). Data were collected from students who had experience

in using AI tools, including ChatGPT, NotebookLM, QuillBot, and so forth, as part of their learning academic activities. Based on the findings from Etikan et al. (2016) and Naderifar et al. (2017), since a comprehensive sampling frame was unavilable, participants were recruited through snowball sampling. This approach resulted in 300 valid responses from students across several Malaysian private universities. Prior to the main survey, the questionnaire was reviewed by academic experts and refined through a pilot study involving 30 students to ensure the clarity, reliability, and suitability of the measurement items. The questionnaire was developed by adapting validated measurement scales from previous research. İt assessed PEOU, PU, SI, PE, PT, PR and SE using a five-point Likert scale. The responses were analysed using IBM SPSS Statistics to summarize the data and evaluate the relationships among the proposed constructs.

Findings

Descriptive Analysis

Based on Table 1, the data were collected from 304 valid responses from Generation Z students in Malaysian private higher education institutions. The majority of the sample were female (68.4%) and Chinese (95.1%) with most of the respondents being enrolled in Year 3 programmes (36.2%). Results showed a high level of AI adoption for academic purposes. AI-learning tool which used the most was ChatGPT (98.7%), followed by Canva (75.0%), Turnitin (64.5%), Quillbot (62.8%), and Grammarly (60.9%). Conversely, advanced AI tools like DeepSeek, Copilot, Perplexity, NotebookLM and Grok were used at relatively low rates (under 16.5%). The findings suggest that AI tools have become part of students' learning activities, particularly in content generation, academic writing, language improvement, and learning support.

Table 1 Profile of Respondents and AI Tools Used for Academic Purposes (N = 304)

Category	Variable	Frequency (n)	Percentage (%)
Gender	Male	96	31.6
	Female	208	68.4
Ethnicity	Chinese	289	95.1
	Malay	7	2.3
	Indian	7	2.3
	Others	1	0.3
Current Academic Level	Foundation	40	13.2
	1st year	80	26.3
	2nd year	64	21.1
	3rd year	110	36.2
	4th year	10	3.3
AI Tools Used*	ChatGPT	300	98.7
	Canva	228	75.0
	Turnitin	196	64.5

	QuillBot	191	62.8
	Grammarly	185	60.9
	Google Gemini	86	28.3
	Other tools†	<50	<16.5

† Includes DeepSeek, Copilot, Perplexity, NotebookLM, and Grok

Reliability and Inferential Analysis

Table 2 showed that the measurement scales had very high reliability (Cronbach's alpha coefficients: 0.907–0.946). Multiple linear regression analysis showed that the model was statistically significant and accounted for 63.6% of the variances in student engagement in AI-based learning technologies. Performance Expectancy (β=0.250, p<0.001) and Perceived Usefulness (β=0.250, p<0.001) were the main predictors of the students' engagement followed by Perceived Trust (β=0.185, p<0.001), Perceived Risk (β=0.180, p=0.001) and Social Influence (β=0.111, p=0.034). Nevertheless, the Perceived Ease of Use did not significantly impact student engagement (β = –0.038, p = 0.580). The results indicate that students' use of artificial intelligence (AI) tools is mainly driven by perceived educational benefits, performance improvements, trust and social influence and not the usability of the system. The result of regression equation is expressed as:

SE = 1.962 - 0.035(PEoU) + 0.249(PU) + 0.107(SI) + 0.249(PE) + 0.168(PT) + 0.187(PR)

Table 2 Summary of Reliability, Correlation, Regression Results, and Hypothesis Testing (N = 304)

Construct	Cronbach's (α)	Correlation (r)	β	p-value	Hypothesis	Decision
PEoU	0.907	Positive, significant	−0.038	0.580	H1	Not supported
PU	0.933	0.688***	0.250	<0.001	H2	Supported
SI	0.921	Positive, significant	0.111	0.034	H3	Supported
PE	0.946	0.727***	0.250	<0.001	H4	Supported
PT	0.918	Positive, significant	0.185	<0.001	H5	Supported
PR	0.912	Positive, significant	0.180	0.001	H6	Opposite direction
SE	0.935	—	—	—	—	—

DISCUSSION

The findings show that the proposed model has strong explanatory power in predicting students' engagement with AI-supported learning. Among the proposed factors, PU, SI, PE, PT and PR were found to have significant positive effects on student engagment, whereas PEOU was not a significant predictor. PE and PU emerged as the most influential factors, suggesting

that students are more willing to engage with AI tools when they believe these technologies can enhance their academic performance and improve learning efficiency (Maryono et al., 2026). Additionally, SI also contributed positively, indicating that encouragement from lecturers, peers, and the wider academic environment supports students' use of AI in their learning activities. Trust in AI systems was identified as a important factor, highlighting that confidence in the reliability and credibility of AI tools encourages sustained engagement. İnterestingly, PR showed a positive relationship with student engagement. İt shows that concerns about privacy or reliability do not necessarily discourage AI use (Kasneci et al., 2023 & UNESCO, 2023). İnstead, students apprear to recognise the educational benefits of AI and continue using these tools despite being aware of potential risks. Overall, the findings demonstrate that students' engagement with AI is influenced more by its perceived value, expected benefits, and trustworthiness than by its ease of use.

Limitations And Future Studies

This study has several limitations. First, the cross-sectional design precludes the ability to measure changes in students' patterns of using AI over time. Second, the results are not generalizable to private higher education institutions due to the use of the non-probability sampling method. Third, common-method bias and inaccuracies in self-reported data may not accurately reflect the true extent of AI use behavior. Future research should include objective measures of AI usage, larger and more diverse samples, including both public and private institutions, and longitudinal designs. The proposed model can be further expanded to include other factors like AI literacy, technology anxiety, and institutional AI governance in future research.

Ethics Statements

An ethic statement confirming that approval was obtained from ethical committee with approval number, U/SERC/78-538/2025 and relevant informed consent was obtained from respondents.

Author Statements

Yip Yen San wrote the introduction, discussion, limitations and future studies. Chan Pui Yee wrote the literature review and research methodology. Chew Wei Xian and Foong Yu Xing performed the data collection and data analysis.

Declaration Of Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

References

Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the association for information systems, 8*(4), 3. https://doi.org/10.17705/1jais.00122

Bougie, R., & Sekaran, U. (2025). *Research Methods for Business, with eBook Access Code: A Skill Building Approach*. John Wiley & Sons.

Davis, F. D. (1987). *User acceptance of information systems: the technology acceptance model (TAM)*. https://www.researchgate.net/publication/30838394_User_acceptance_of_information_systems_the_technology_acceptance_model_TAM

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics, 5*(1), 1-4.

Kasneci, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., ... & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences, 103*, 102274. https://doi.org/10.1016/j.lindif.2023.102274

Maryono, M., Puspitasari, D., & Purwanto, P. (2026). Factors Influencing the Active Engagement of Undergraduate Students in Blended Learning. Suranaree Journal of Social Science, 20(1), ID-e282320. https://doi.org/10.55766/sjss282320

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball sampling: A purposeful method of sampling in qualitative research. *Strides in development of medical education, 14*(3), 1-6.

Oc, Y., Gonsalves, C., & Quamina, L. T. (2025). Generative AI in higher education assessments: Examining risk and tech-savviness on student's adoption. *Journal of Marketing Education, 47*(2), 138-155. https://doi.org/10.1177/02734753241302459

Pitts, G., Marcus, V., & Motamedi, S. (2025). Student perspectives on the benefits and risks of AI in education. *arXiv preprint arXiv:2505.02198*. https://doi.org/10.48550/arXiv.2505.02198

UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO Publishing.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science, 46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view1. *MIS quarterly, 27*(3), 425-478. https://doi.org/10.2307/30036540