



Identifying the causes and effects of generative AI use among university students

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ARTICLE INFO

Article history:

Received 14 August 2025

Revised 12 March 2026

Accepted 19 August 2026

Published 30 September 2026

Keywords:

Generative Artificial Intelligence

ChatGPT

University Students

Exploratory Factor Analysis

Academic Integrity

Digital Literacy

DOI: 10.24191/ijms.v11i2.24257

Citation in APA:

Normadiana Mohammad Hanapi, Mohd Mawardi Mohd Kamal, & Awang Nasrizal Awang Ali. (2026). Identifying the Causes and Effects of Generative AI Use Among University Students. *International Journal of Service Management and Sustainability*, 11(2), 88 – 98.

ABSTRACT

This study investigates the motivations and perceived consequences of generative artificial intelligence (GenAI) use among university students, with particular emphasis on ChatGPT and similar large language models. A structured online survey was administered to 155 students across diverse disciplines and educational levels. Using Exploratory Factor Analysis (EFA), a validated five-item scale was identified, capturing core perceived benefits of GenAI use, including enhanced creativity, increased efficiency, improved engagement, reduced academic stress, and support for writing and critical thinking. Descriptive analysis revealed that the primary motivators for adoption were time-saving, assistance in understanding complex concepts, improved academic performance, and accessibility, while lecturer encouragement played only a minimal role. While students reported substantial gains in productivity, creativity, and conceptual understanding, concerns were also raised regarding overreliance, diminished critical thinking, and ethical issues surrounding academic integrity. These findings underscore the pressing need for universities to establish clear policies, integrate AI literacy into their curricula, and promote ethical, pedagogically sound applications of GenAI. The study provides empirical evidence to inform institutional strategies for leveraging the benefits of AI while mitigating its potential drawbacks in higher education.

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1. INTRODUCTION

Generative artificial intelligence (GenAI) technologies are transforming the landscape of higher education. Large language models (LLMs) such as ChatGPT provide students with novel avenues for generating written content, seeking academic guidance, and supporting learning activities (Bender et al., 2021; Rossi et al., 2024). Their intuitive interfaces, rapid response times, and broad applicability across disciplines, from the humanities to STEM, have accelerated adoption. For many students, GenAI's capacity for instant feedback, idea generation, and task automation aligns seamlessly with the efficiency demands of modern academic programmes (Apriani et al., 2025). In addition, GenAI is increasingly viewed as a learning companion, offering personalised support that traditional resources often cannot provide. Its widespread availability also means that students are engaging with AI tools both inside and outside formal academic settings, blurring the line between structured learning and independent exploration.

Despite these advantages, the rapid integration of GenAI into higher education presents complex pedagogical and ethical challenges. Concerns include potential declines in critical thinking, heightened risks of academic dishonesty, and overreliance on AI that may erode fundamental scholarly competencies (Bittle & El-Gayar, 2025; Pervaiz et al., 2025). Furthermore, institutional policies, faculty preparedness, and curriculum adaptations have often lagged behind technological advancements, leaving students without consistent guidance on the appropriate and ethical use of these tools (Tzirides et al., 2024; Zhou et al., 2025).

Understanding the drivers behind GenAI adoption and the perceived academic, behavioural, and ethical impacts is therefore critical. Such insights can inform strategies to leverage the benefits of GenAI while mitigating its risks. Addressing this gap, the present study investigates the motivations influencing university students' use of generative AI and explores the range of effects, both positive and negative, that they experience. The findings are intended to guide educators in developing effective teaching strategies, assist policymakers and higher education institutions in formulating appropriate regulations and support frameworks, and help students themselves cultivate more responsible and informed use of GenAI tools.

2. LITERATURE REVIEW

Emerging research on the adoption of GenAI in higher education converges on several key thematic areas. Grounding this investigation in established theories of technology adoption enhances both its validity and analytical scope. The Unified Theory of Acceptance and Use of Technology (UTAUT) and its extension, UTAUT2, serve as robust models for explaining user intentions and actual behaviours regarding new technologies. UTAUT highlights performance expectancy, effort expectancy, social influence, and facilitating conditions as key determinants, while UTAUT2 incorporates hedonic motivation, price value, and habit, better capturing individual technology use in contemporary contexts. Additionally, the Technology Acceptance Model (TAM3) emphasizes the central roles of perceived usefulness and perceived ease of use, delineating how these perceptions, shaped by factors like experience and anxiety, predict attitudes and intentions towards technology use.

By structuring the research framework around these theories, this study systematically investigates the motivators and mediators of GenAI adoption in higher education, offering empirically grounded insights for both scholars and practitioners. By structuring the research framework around these theories, this study systematically investigates the motivators and mediators of GenAI adoption in higher education, offering

empirically grounded insights for both scholars and practitioners. Specifically, the framework integrates UTAUT2 constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) and TAM3 constructs (perceived usefulness and perceived ease of use) as key motivators of adoption. These constructs have been widely validated in technology acceptance studies, providing a strong theoretical foundation for examining how students perceive and adopt emerging technologies. In the context of GenAI, performance expectancy refers to students' expectations that AI tools will enhance their efficiency and academic performance. In contrast, effort expectancy reflects the importance of simple and intuitive interfaces in encouraging use. Social influence captures the role of peers and educators in shaping students' attitudes towards AI adoption, whereas facilitating conditions highlight the importance of institutional support, access, and infrastructure. From TAM3, perceived usefulness and ease of use remain critical in determining whether students translate initial exposure to GenAI into consistent academic practices. Together, these motivators influence students' actual use of GenAI, which subsequently leads to both positive outcomes (such as productivity, creativity, engagement, and improved academic performance) and negative outcomes (such as overreliance, ethical risks, and reduced critical thinking). Figure 1 illustrates the conceptual framework that underpins and guides the present study.

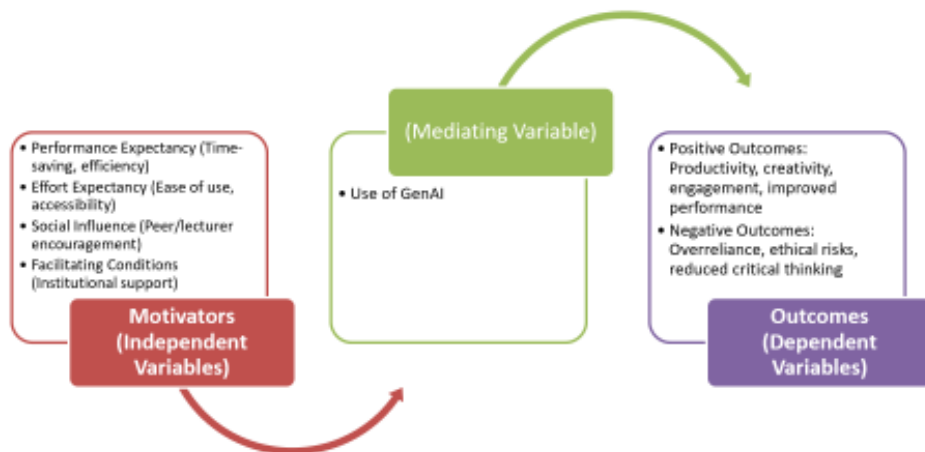


Fig. 1. Research framework for GenAI adoption among university students, underpinned by UTAUT2 and TAM3.

Perceived usefulness consistently emerges as a primary driver of adoption, as reflected in technology acceptance models such as UTAUT2 (Acosta-Enriquez et al., 2024). Students value GenAI for simplifying complex tasks, providing immediate support, and enhancing efficiency in academic workflows (Chen et al., 2025; Lee et al., 2024). Beyond practical utility, GenAI aligns with students' need for faster learning cycles and immediate feedback in demanding academic environments, making its usefulness not only a technological feature but also an enabler of achievement. Ease of access further strengthens adoption, as user-friendly interfaces and freely available platforms reduce technical and financial barriers (Mustofa et al., 2025). The ability to interact through simple prompts, without technical expertise, makes GenAI attractive across disciplines, while free or low-cost access promotes inclusivity. However, disparities may arise between students using advanced premium versions and those limited to basic free tools, raising questions of fairness in higher education.

Social influence, through peer recommendations and faculty endorsements, legitimises AI use and encourages integration into academic routines (Apriani et al., 2025). Peers often act as early adopters, introducing GenAI for brainstorming, summarising, or drafting work. Faculty support, though limited, shapes students' confidence in ethical use, especially when reinforced by institutional signals, such as course guidelines, tutorials, or workshops. In such contexts, students perceive the use of GenAI not only as beneficial but also as part of a normative academic practice.

The reported effects of GenAI use are nuanced and often contradictory. Positive outcomes include improved academic writing, enhanced creativity, and personalised learning support, which can foster deeper engagement and conceptual understanding (Rossi et al., 2024). For example, it was found that AI-assisted idea generation can broaden conceptual frameworks and facilitate mastery learning approaches (Chen et al., 2025).

Conversely, overreliance on AI may diminish intrinsic motivation and reduce opportunities for critical engagement, potentially undermining analytical and independent thinking skills (Pervaiz et al., 2025). Ethical challenges, particularly regarding plagiarism, originality, and the legitimacy of AI-assisted work, remain unresolved among both students and educators (Bittle & El-Gayar, 2025; Chen et al., 2025). Equity concerns have also emerged, as students with stronger digital literacy or greater access to technology tend to benefit disproportionately, raising questions about fairness and inclusivity (An et al., 2025; Zhou et al., 2025).

While prior research has largely examined educator perspectives and institutional policies, fewer studies focus on the student perspective, even though students are the primary users of GenAI in higher education. This study addresses this gap by applying robust statistical analysis to survey data, aiming to provide a systematic understanding of the motivators and consequences that shape student adoption. The findings aim to guide educators in designing effective teaching strategies, assist institutions in developing clear policies, and inform policymakers on promoting responsible integration of GenAI.

3. RESEARCH METHODOLOGY

3.1 Research Design

This study employed a quantitative, cross-sectional survey design to examine university students' motivations for, and perceived effects of, using generative AI tools, with a primary focus on ChatGPT. The survey gathered data on usage patterns, adoption drivers, and perceived academic and behavioural outcomes.

3.2 Participants and Sampling

The target population comprised undergraduate and postgraduate students from diverse academic disciplines. A convenience sampling approach was adopted, selecting participants based on accessibility and voluntary participation. In total, 200 questionnaires were distributed, of which 155 were returned and deemed usable, yielding a response rate of 77.5%. This rate is considered acceptable for survey-based research in higher education, as it reflects a substantial level of student engagement and willingness to share experiences with GenAI tools.

The final sample of 155 respondents was diverse in terms of gender, academic level, and field of study, allowing for a balanced representation across the student population. By adopting a convenience sampling approach, the study was able to capture insights from students with varying levels of exposure to GenAI, ranging from early adopters to occasional users. While convenience sampling may limit generalisability, it is well-suited for exploratory studies of emerging technologies where the goal is to identify patterns, trends, and perceptions rather than establish population-wide estimates. All responses were treated with strict confidentiality, and participation was voluntary, with students free to withdraw at any stage of the process.

3.3 Instrumentation

A structured questionnaire was developed, informed by validated measurement scales and contemporary themes in the field of GenAI literature. The instrument comprised four main sections:

- (i) Demographics – Collected data on age, gender, faculty affiliation, and year of study, enabling subgroup analysis.
- (ii) Usage Patterns – Assessed frequency and context of ChatGPT use, including applications in coursework, research, coding, and other academic or personal tasks.
- (iii) Motivational Factors – Measured perceived usefulness, ease of use, curiosity, social influence, and institutional support, drawing on established technology adoption frameworks. The design and refinement of these measurement items followed methodological guidance from Min et al. (2024), who outlined psychometric approaches to scale development, as well as Pham et al. (2025), who demonstrated the application of exploratory factor analysis (EFA) for validating adoption-related constructs.
- (iv) Perceived Impact – Captured both positive (e.g., enhanced learning support, creativity, efficiency) and negative (e.g., dependency, ethical concerns, skill deterioration) outcomes, using Likert-scale items.

This instrument was designed to yield a comprehensive understanding of how students interact with GenAI, the factors influencing adoption, and the multifaceted effects within higher education contexts.

4. RESULTS AND DISCUSSION

4.1 Sample and Data Collection

A five-item scale measuring the consequences of generative AI usage was administered to 155 university students across multiple institutions via online learning platforms over a one-month period. Responses were collected on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A cover letter accompanied the survey, explaining the study's purpose, assuring participants of confidentiality, and informing them of their right to withdraw at any stage.

In terms of demographics, 54% of respondents were female and 46% male. The most represented age group was 18–21 years. Regarding education level, 45% held a diploma, 28% a bachelor's degree, 18% a master's degree, and 9% a PhD. Participants represented a broad disciplinary spread, with 51% ($n = 79$) from Science and Engineering, followed by Social Sciences (23%, $n = 35$), Arts and Humanities (10%, $n = 15$), Business and Economics (9%, $n = 14$), and Health Sciences (7%, $n = 12$).

4.2 Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis (PCA) to examine the underlying structure of the five-item scale. Sampling adequacy was assessed using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett’s Test of Sphericity.

Table 1 presents the results. The KMO value was 0.840 ($p < 0.001$), exceeding the recommended minimum of 0.60, indicating acceptable sampling adequacy. Bartlett’s Test was statistically significant ($\chi^2 = 364.734$, $df = 10$, $p < 0.001$), confirming that the correlation matrix was suitable for factor extraction.

Table 1. KMO and Bartlett’s Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.840
Bartlett’s Test of Sphericity	Approx. Chi-Square	364.734
	Df	10
	Sig.	<.001

4.3 Factor Loading and Communalities

All communalities exceeded the recommended threshold of 0.40, with factor loadings ranging from 0.699 to 0.865 (Table 2). The highest loading was for “*AI enhances creativity and idea generation*” (0.865), followed by “*AI increases efficiency in completing assignments*” (0.849) and “*AI makes learning more interactive and engaging*” (0.848). The lowest loading was for “*AI helps improve writing and critical thinking skills*” (0.699), which, while comparatively lower, still met the accepted standard. These results confirm that all items contributed meaningfully to the latent construct, with creativity, efficiency, and interactivity emerging as the most prominent perceived benefits.

Table 2. Factor Loadings and Communalities for Consequences of Generative AI Usage

Item	Factor Loading	Communalities
AI enhances creativity and idea generation.	0.865	0.748
AI increases efficiency in completing assignments.	0.849	0.721
AI makes learning more interactive and engaging.	0.848	0.719
AI reduces academic stress and workload.	0.761	0.579
AI helps improve writing and critical thinking skills.	0.699	0.489

4.4 Factors Influencing the Use of Generative AI

Figure 2 illustrates the main factors motivating students’ adoption of generative AI tools. The most cited reason was time-saving (28%), underscoring efficiency as a key value. This was followed closely by AI’s ability to clarify complex concepts (26%), reflecting its role as a learning facilitator. 21% cited improved academic performance, while accessibility and cost-free availability were noted by 18% of respondents. Only 7% indicated lecturer encouragement, suggesting that adoption is largely self-driven rather than institutionally motivated.

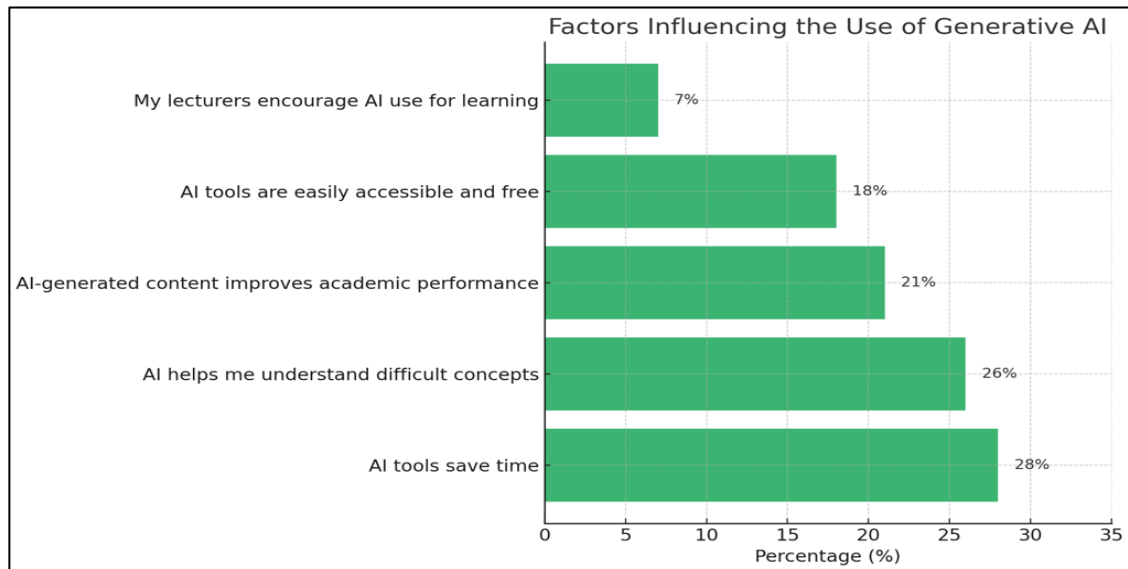


Fig. 2. Factors Influencing the Use of Generative AI.

4.5 Findings

The findings of this study provide compelling evidence on the key drivers and consequences influencing the use of generative AI among university students. The Exploratory Factor Analysis (EFA) confirmed the validity of a five-item scale measuring perceived consequences of generative AI use in academic contexts. All items loaded strongly onto a single factor, with loadings ranging from 0.699 to 0.865 and communalities exceeding the acceptable threshold of 0.40. These results align with prior research, which indicates that factor loadings above 0.70 and communalities above 0.50 reflect strong contributions to the underlying construct (Karimian & Chahartangi, 2024; Shrestha, 2021). The high factor loadings observed, particularly for items such as “AI enhances creativity and idea generation” and “AI increases efficiency in completing assignments”, suggest that students perceive AI tools as highly beneficial for improving academic productivity, creativity, and engagement.

The study also examined the motivations driving students’ adoption of generative AI. Descriptive findings indicate that practical benefits are the most prominent. Notably, 28% of students reported using AI to save time, 26% valued its ability to simplify complex concepts, 21% associated it with improved academic performance, and 18% cited accessibility and cost-effectiveness as key benefits. Surprisingly, only 7% identified lecturer encouragement as a motivating factor, suggesting a gap between institutional influence and student-driven adoption. This supports the finding that students often explore AI tools autonomously, with institutional guidance lagging behind technological uptake (Baek et al., 2024).

These patterns reflect a broader trend in higher education, where learners independently engage with emerging technologies to enhance their academic experience. Students perceive generative AI not only as accessible and efficient but also as a valuable learning companion. However, the limited role of lecturer encouragement indicates opportunities for educators and institutions to play a more proactive role in fostering responsible and pedagogically sound AI use.

Hence, this study confirms that generative AI is widely adopted for its practical benefits, particularly its ability to save time, enhance understanding, and support academic performance. The strong psychometric properties of the measurement instrument also validate its application in future research on AI perceptions in education. Future studies could expand the sample size, integrate qualitative insights, and explore the ethical or long-term implications of AI use in academic contexts.

To add, the resulting factor structure reveals several main motivators:

- (i) Saving time: Students value faster task execution, reduced workload time, and the ability to focus on other priorities, reflecting a strong preference for efficiency.
- (ii) Understanding difficult concepts: AI helps simplify complex theories or technical content, offering instant explanations and functioning as a readily available learning aid.
- (iii) Improving academic performance: AI-assisted work is perceived as higher quality, helping refine assignments and boost grades.
- (iv) Accessibility and cost-effectiveness: Free or low-cost tools available anytime and anywhere enhance equal access to learning resources.
- (v) Lecturer encouragement: Some students adopt AI based on educator suggestions, but institutional influence is minimal compared to self-driven use.

Also, four major clusters of outcomes were identified:

- (i) Productivity & Efficiency: AI speeds up assignment completion, reduces repetitive work, and frees time for other academic or personal activities.
- (ii) Cognitive & Learning: Improves understanding of challenging content, supports independent learning, and reduces frustration with difficult topics.
- (iii) Academic Performance: Enhances the quality of academic output, provides better structure and clarity, and assists in exam and assessment preparation.
- (iv) Creativity & Engagement: Stimulates idea generation, promotes innovative thinking, and makes learning more engaging and motivating.

Differences among students were also evident. Some prioritised time-saving and efficiency, while others valued concept simplification or performance enhancement, reflecting variations in learning needs rather than disciplinary background (Rossi et al., 2024; Zhou et al., 2025).

Student responses further revealed advanced digital engagement, as many critically evaluated AI outputs and refined them through multiple prompts. This indicates strong digital literacy, despite ongoing concerns about bias and misinformation (Chen et al., 2025).

Overall, the results highlight that effective use of generative AI requires a balance between clear motivations and awareness of ethical and cognitive challenges. They also point to the need for institutional policies that incorporate technical training, ethical guidelines, and reflective practices to maximise benefits while mitigating risks (An et al., 2025; Tzirides et al., 2024).

5. CONCLUSION

This study demonstrates that the adoption of generative AI among university students is primarily motivated by its capacity to save time, simplify complex material, and enhance academic output. The validated five-item measurement scale provides a reliable tool for future research into perceptions of AI in higher education.

The implications are twofold:

- (i) For educators – Greater involvement is needed in guiding students towards responsible AI use through explicit policies, ethical frameworks, and curriculum integration.
- (ii) For researchers – Future work should extend beyond quantitative measures to include qualitative insights and longitudinal tracking to capture evolving perceptions and behaviours.

By aligning institutional strategies with students' demonstrated needs and motivations, universities can leverage generative AI as a catalyst for learning innovation while safeguarding academic integrity and equity.

6. ACKNOWLEDGEMENTS/ FUNDING

This work received no specific grant from any funding agency. The authors sincerely thank Universiti Teknologi MARA (UiTM) Cawangan Sarawak and Pahang for the support and resources provided throughout this research. We are also grateful to our colleagues and students who contributed their time and insights during data collection. Special thanks are extended to all participants whose cooperation made this study possible.

7. CONFLICT OF INTEREST STATEMENT

The authors declare no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

8. AUTHORS' CONTRIBUTIONS

Awang Nasrizal Awang Ali: Investigation, writing-original draft, writing-review and editing, and supervision; **Normadiana Mohammad Hanapi:** Conceptualisation, methodology, data curation, formal analysis, visualization, software, and validation; **Mohd Mawardi Mohd Kamal:** Formal analysis, visualization, software, and validation.

9. DECLARATION OF GENERATIVE AI IN THE WRITING PROCESS

The authors used QuillBot and Grammarly to assist with language editing and proofreading during manuscript preparation. The authors take full responsibility for the content and final version of the manuscript.

10. DATA AVAILABILITY/ SUPPLEMENTARY MATERIALS

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

11. ETHICS STATEMENT

This study was conducted as a self-funding project in 2025. The authors acknowledge the importance of research ethics and conducted the research professionally, hence provide this clarification for transparency.

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