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Adopting Artificial Intelligence in Higher Education: Insights from the UTAUT Framework on Student Intentions

Noorizan Mohamad Mozie[a*], Norfazlina Ghazali[b], Liatul Izian Ali Husin[c]

[abc]*Faculty of Business and Management, Universiti Teknologi MARA, 42300 Puncak Alam, Selangor, Malaysia*

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ABSTRACT

The integration of Artificial Intelligence (AI) into higher education is gaining momentum, offering innovative tools that improve student engagement, support individualized learning, and enhance academic performance. While global statistics indicate that approximately 86% of students used AI for academic purposes, its adoption among Malaysian undergraduates remains relatively limited. This is despite ongoing national efforts such as the Malaysia Digital Economy Blueprint (MyDIGITAL), which seeks to accelerate digital transformation across sectors including education. Understanding the drivers and barriers to AI adoption in higher education is crucial for developing effective strategies that can enhance teaching and learning experiences. This study investigates the factors influencing students' intentions to adopt AI in university settings. Guided by the Unified Theory of Acceptance and Use of Technology (UTAUT), the study focuses on four core constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. This study will employ a quantitative, cross-sectional survey to examine factors influencing undergraduate students' intention to use artificial intelligence (AI) in Malaysian universities. Data will be collected from a convenience sample of undergraduate students through an online questionnaire adapted from the UTAUT framework. A minimum of 137 participants will be targeted to ensure sufficient statistical power. The data will be analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS, which is suitable for exploratory research involving complex models. This study will extend the UTAUT framework to AI adoption among Malaysian undergraduates and will generate practical insights to guide educator training, institutional support strategies, and digital policy development under initiatives like MYDIGITAL.

1. Introduction

Artificial Intelligence (AI) is becoming a pivotal force in higher education, transforming the ways students interact with course content and how instructors approach teaching. Across the globe, AI technologies such as intelligent tutoring systems, automated grading tools, and adaptive learning platforms are creating more engaging and tailored educational experiences (Holmes et al., 2019; Zawacki-Richter et al., 2019). A recent survey by the Digital Education Council (2024) found that about 86% of university

students worldwide have utilized AI tools for academic purposes, with a significant portion accessing these tools regularly.

In Malaysia, the government's vision for AI adoption in higher education is clearly articulated in the Malaysia Digital Economy Blueprint (MyDIGITAL), which sets the target for Malaysia to become a regional AI leader by 2030 (Malaysia Digital Economy Corporation, 2021). Supporting this agenda, Malaysian universities have started embedding AI-related subjects within their academic programs. For example, the University of Malaya has established a specialized Centre for Artificial Intelligence Technology to promote AI research and learning across disciplines (Universiti Malaya, 2023). Similarly, Universiti Teknologi Malaysia offers focused AI courses within its computing faculty, including subjects like machine learning and robotics (Universiti Teknologi Malaysia, 2023). Multimedia University incorporates AI and data analytics modules in its computer science curriculum to prepare students for industry demands (Multimedia University, 2022). Asia Pacific University provides a dedicated Bachelor's degree concentrating on AI, covering advanced topics such as natural language processing and neural networks (Asia Pacific University, 2023). Open University Malaysia integrates AI-powered tools like chatbots and adaptive learning platforms to personalize student learning experiences (Open University Malaysia, 2022). Additionally, institutions such as Universiti Teknikal Malaysia Melaka, Universiti Pendidikan Sultan Idris, and Universiti Putra Malaysia have also expanded their course offerings to include AI and digital technologies, supporting national efforts to cultivate a digitally skilled workforce (Malaysia Digital Economy Corporation, 2021).

Despite these advancements, the perceptions and intentions of undergraduate students towards AI use in learning across Malaysian universities remain underexplored. Most existing studies focus on faculty members, postgraduate students, or broad technology adoption trends, leaving a gap in understanding undergraduate students' readiness and behavioral intentions regarding AI-enabled educational tools (Helmiatin et al., 2024; Mohsin et al., 2024). Various factors influence AI adoption, including peer influence, institutional preparedness, cultural attitudes, and infrastructure availability, which differ among campuses and regions. Moreover, concerns about data privacy, apprehension toward emerging technologies, and uneven implementation of AI frameworks present additional challenges (Dwivedi et al., 2019; Williamson & Eynon, 2020).

The UTAUT model is particularly relevant to Malaysian undergraduates because it provides a structured way to evaluate key psychological and contextual factors that shape technology adoption especially in a culturally diverse, digitally transforming nation like Malaysia. Undergraduate students are often digital natives, yet their adoption of AI tools is not guaranteed due to varying levels of exposure, digital literacy, institutional support, and cultural attitudes. In Malaysia, where universities range from highly urbanized, tech-equipped campuses to those in more rural or resource-constrained settings, UTAUT's constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) offer a robust lens to capture these contextual differences. Furthermore, Malaysian undergraduates represent the future workforce targeted by national digital initiatives; thus, understanding their behavioral intentions through a well-established framework like UTAUT is both timely and strategic.

To fill this research gap, this study applies the Unified Theory of Acceptance and Use of Technology (UTAUT) framework (Venkatesh et al., 2003) to assess how performance expectancy, effort expectancy, social influence, and facilitating conditions affect Malaysian undergraduate students' intentions to adopt AI in their academic pursuits. The insights derived aim to assist policymakers, educators, and university leaders in crafting inclusive, focused strategies that support sustainable and effective AI integration within Malaysia's higher education system.

This study extends previous Malaysian UTAUT research in several keyways. First, while earlier studies have predominantly focused on faculty members, postgraduate students, or general educational

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technologies, this study narrows the focus to undergraduate students, a critical yet underexplored demographic in AI adoption literature. Second, by specifically examining AI-enabled educational tools rather than generic e-learning systems or ICT usage, the study reflects the current shift toward more advanced, intelligent technologies that align with Malaysia's MyDIGITAL Blueprint. Third, this study captures a post-pandemic educational landscape where digital transformation has accelerated, making insights more relevant to today's learning environments. By integrating contemporary policy directions and institutional efforts, this study offers timely, actionable data to support AI-related strategy development within Malaysia's higher education sector.

The study explores the following questions:
RQ1: What is the relationship between performance expectancy and student's intention to use AI?
RQ2: What is the relationship between effort expectancy and student's intention to use AI?
RQ3: What is the relationship between social influence and students' intention to use AI?
RQ4: What is the relationship between facilitating conditions and students' intention to use AI?

2. Literature Review

2.1 *Introduction*

The integration of Artificial Intelligence (AI) in higher education is a transformative development that has attracted significant scholarly and policy attention in recent years. AI applications offer adaptive learning, personalized feedback, and data-driven insights that can enhance student learning outcomes and teaching efficiency (Zawacki-Richter et al., 2019). Despite these potentials, the adoption of AI among students, particularly in Malaysia, remains at an early stage. National initiatives such as the Malaysia Digital Economy Blueprint (MyDIGITAL) underscore the government's push for digital adoption in education and beyond (Economic Planning Unit, 2021). AI tools have been shown to improve student satisfaction and engagement by providing personalized learning experiences and efficient academic support (Dahri, Yahaya, Al-Rahmi, Vighio, Alblehai, Soomro, & Shutaleva, 2024). However, empirical evidence indicates varying levels of technology acceptance among undergraduates (Devisakti et al., 2024). To understand these dynamics, the Unified Theory of Acceptance and Use of Technology (UTAUT) provide a well-established framework for examining students' behavioral intentions toward new educational technologies. The UTAUT model integrates elements from eight earlier technology acceptance models and posits that four constructs which are performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) are central determinants of technology adoption (Venkatesh et al., 2003). In the Malaysian context, Mohsin et al. (2024) specifically apply UTAUT to examine AI adoption in higher education, focusing on these four constructs.

2.2 Variables and hypotheses development

Performance Expectancy (PE) reflects the belief that using AI will enhance academic performance. A recent meta-analysis of GenAI adoption reported a strong positive correlation between PE and students' behavioral intention (Tian et al., 2024). Similarly, in post-pandemic Bangladesh, PE was a strong predictor of continued e-learning use, stronger than other variables such as Effort Expectancy (Hossain et al., 2024).

H1: Performance expectancy has a significant positive influence on student's intention to use AI

Effort Expectancy (EE) reflects the ease of use and perceived simplicity of a technology. Research consistently demonstrates that EE positively predicts students' intention to adopt e-learning and AI-related tools. For instance, a study in Bangladesh during the post-pandemic period revealed that EE strongly influenced tertiary students' continued intention to use e-learning systems, particularly when platforms were designed with intuitive features (Hossain et al., 2024). Similarly, recent findings among Chinese

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postgraduate students using AI showed that EE had a significant positive effect on behavioral intention, even though its impact was smaller compared to PE (Wang et al., 2025; Handoko et al. 2024). In contexts where digital literacy levels vary, such as Malaysia, tools that minimize cognitive load and reduce navigation barriers are more likely to be accepted. This suggests that AI adoption strategies must emphasize training and user-centered design to reduce perceived complexity.

H2: Effort expectancy has a significant positive influence on student's intention to use AI

Social Influence (SI) concerns the degree to which students perceive that peers, lecturers, or institutions expect them to use a particular technology. Recent research highlights that SI remains significant in influencing student adoption of new educational technologies. For example, Hossain et al. (2023) found that SI was a key predictor of continued use of e-learning platforms among university students in Bangladesh. Similarly, a study in Malaysia applying UTAUT to AI adoption. The study confirmed that encouragement from peers and lecturers significantly influenced students' willingness to engage with AI tools (Mohsin et al., 2024). Arguments from earlier research (Bokhari & Meyong, 2023; Venkatesh et al., 2012) suggest that social norms and cultural context can strengthen the role of SI, particularly in collectivist societies such as Malaysia where group endorsement carries considerable weight. Therefore, leveraging peer networks and lecturer advocacy may be crucial to promoting AI adoption among undergraduates.

H3: Social influence has a significant positive influence on student's intention to use AI

Facilitating Conditions (FC) capture the degree to which students believe that organizational and technical resources are available to support technology use. In the Chinese context, FC was also shown to influence LMS adoption, with technical support and infrastructure acting as enablers (Lai et al., 2024). Previous research consistently argues that inadequate infrastructure, poor internet connectivity, and insufficient institutional support remain barriers to technology adoption in higher education (Ahmad et al., 2023; Nikolopoulou, 2023). In Malaysia, where digital disparities exist across universities, FC becomes particularly relevant. Students may be motivated and perceive usefulness, but without institutional readiness such as access to devices, reliable networks, and technical assistance, the adoption of AI will remain constrained.

H4: Facilitating conditions has a significant positive influence on student's intention to use AI

2.3 The limitations of previous review

While the adoption of Artificial Intelligence (AI) in higher education through the UTAUT framework has shown promising results, several limitations and areas for further research remain. The current research predominantly focuses on STEM disciplines, leaving a gap in understanding AI adoption in non-STEM fields (Acosta-Enriquez, Farroñan, Zapata, Garcia, Rabanal-León, Angaspilco & Bocanegra, 2024). Another limitation is the regional concentration of studies, which may not capture diverse perspectives and contextual differences in AI adoption across various educational settings. This current study will add to the current literature by focusing on the Malaysian context.

2.4 The relevance of UTAUT theory for the study

The reviewed evidence underscores that performance expectancy, effort expectancy, social influence, and facilitating conditions remain relevant and empirically supported predictors of students' adoption of educational technologies, including AI. While some critics argue that UTAUT may oversimplify cultural and ethical factors (Dwivedi et al., 2019), its constructs continue to provide a holistic and practical lens for understanding adoption behaviors. By incorporating both individual perceptions (PE, EE), social reinforcement (SI), and institutional readiness (FC), UTAUT offers a robust theoretical framework that aligns well with Malaysia's higher education landscape. Thus, this study's adoption of UTAUT is justified,

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as it enables a comprehensive examination of both psychological and contextual determinants of AI adoption among undergraduates.

3. Methodology

The study will employ a quantitative research design to investigate the factors influencing undergraduate students' intention to use artificial intelligence (AI) in Malaysian higher education. A cross-sectional survey approach will be utilized enabling data collection at a single point in time to assess students' perceptions and intentions regarding AI adoption. The target population will comprise undergraduate students enrolled in Malaysian higher education institutions. A convenience sampling technique will be applied to select participants, as it facilitates access to students who are readily accessible and willing to take part in the study. The required sample size is determined using GPower for a multiple regression model with four predictors. The analysis utilized an alpha level of 0.05, a power of 0.80, and a medium effect size (f^2 = 0.15). Given that an 80% power is generally regarded as the minimum acceptable threshold in most social science research (Gefen, Rigdon, & Straub, 2011), the desired sample size was determined to be 85. To further validate this calculation, Cohen (1992) sample size table will also be considered. Based on the assumption of a 5% significance level, an 80% statistical power, and an R^2 value of at least 0.10, Cohen's table suggests a minimum sample size of 137 participants, especially when accounting for the four arrows pointing at the latent variable in this study. Therefore, the researchers set the final minimum sample size for this study at 137 participants to ensure robust statistical power and align with Cohen's (1992) recommendations.

A structured questionnaire will be developed based on the Unified Theory of Acceptance and Use of Technology (UTAUT) framework by Venkatesh et al. (2003). The instrument will consist of 19 items covering four constructs which are performance expectancy, effort expectancy, social influence, and facilitating conditions. All items measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). In addition, demographic information such as gender, age, year of study, program of study, and prior exposure to AI tools will be collected. To establish content validity, the questionnaire will be reviewed by academic experts in educational technology and piloted with a small of undergraduate students. Feedback will be used to refine item clarity and relevance. Reliability and validity will be further assessed during the main analysis through Cronbach's alpha, composite reliability, and average variance extracted (AVE). Ethical considerations will be strictly observed. Participation will be voluntary, inform consent will be obtained from all respondents, and anonymity and confidentiality will be assured. No personally identifiable information will be collected.

Data will be collected through an online survey distributed to undergraduate students in Malaysian higher education institutions. For data analysis, this study will employ Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4.1.0.4. This analytical technique will be appropriate given the study's exploratory nature and its capability to manage complex models with multiple predictors are highlighted (Hair et al., 2020).

4. Contributions and Implications

This study will contribute both theoretically and practically to the field of technology adoption in higher education.

4.1 Theoretical Contribution

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By applying the Unified Theory of Acceptance and Use of Technology (UTAUT) framework specifically to artificial intelligence adoption among Malaysian undergraduates, this study will extend the existing body of knowledge in two ways. First, it will validate the relevance of UTAUT constructs which are performance expectancy, effort expectancy, social influence, and facilitating conditions, in the context of emerging AI tools rather than traditional ICT or e-learning systems. Second, it will provide empirical evidence from a non-Western, developing country perspective, thereby enriching the cross-cultural application and generalizability of UTAUT.

4.2 Practical Contribution

The findings will provide concrete recommendations for higher education stakeholders. For educators, results will inform the design of teaching strategies and digital literacy training that enhance students' readiness to use AI tools. For institutional leaders, the study will highlight infrastructural and support mechanisms (e.g., access to AI platforms, technical support, and peer/lecturer advocacy) that can increase adoption rates. For policymakers, the insights will serve as evidence-based input to refine digital education strategies under national initiatives such as the Malaysia Digital Economy Blueprint (MyDIGITAL), ensuring alignment with students' needs and adoption behaviors.

5. **Conclusions**

This study outlines a proposed study that applies the UTAUT framework to examine the determinants of undergraduate students' intention to adopt artificial intelligence (AI) in Malaysian higher education. By focusing on performance expectancy, effort expectancy, social influence, and facilitating conditions, the study establishes a theoretical foundation for understanding AI adoption among undergraduates, a group that remains underexplored in the Malaysian context. The proposed framework contributes to theory by extending UTAUT to emerging AI tools and to practice by offering insights that can guide educator training, institutional support strategies, and policy development under initiatives such as MyDIGITAL. The next phase will involve empirical validation to generate evidence-based recommendations that support effective AI integration in higher education.

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Conflict of interest statement

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

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