

International Student Satisfaction in Malaysian Universities with AI-Integrated Service Experiences

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DOI: <https://doi.org/10.47772/IJRISS.2026.100500773>

Received: 11 May 2026; Accepted: 16 May 2026; Published: 13 June 2026

ABSTRACT

The integration of Artificial Intelligence (AI) in higher education services has been increasing rapidly. However, student satisfaction with these services remains inconsistent, particularly in multicultural settings. This research aims to determine the relationship between ethical perceptions of AI services, attitude toward AI services, and digital technology literacy towards student satisfaction with AI-integrated services among university students. This study conducts a questionnaire survey and collects primary data from undergraduate students from International students in higher education, Malaysia. Stratified sampling has been utilised and data from 322 respondents are analysed by using SPSS 26.0 software. The result of the study indicates that ethical perceptions of AI services and attitude toward AI services influence the most towards student satisfaction. Therefore, strengthening ethical standards and fostering positive attitudes are crucial in determining successful AI adoption and student experience. Stakeholders comprising university administrators, IT departments, and Student Affairs may consider the findings of this study to better manage AI implementation and support inclusive digital transformation in Malaysian higher education.

Keywords: Student satisfaction; AI-integrated services; ethical perceptions; attitude toward AI; digital technology literacy

INTRODUCTION

The digital transformation of higher education has brought Artificial Intelligence (AI) to the forefront of service delivery, representing a critical marketing and management challenge that requires systematic investigation (Dastane et al., 2025). Universities worldwide are rapidly integrating AI tools such as academic chatbots, personalised student portals, digital library assistants, ChatGPT, and automated enrolment systems to improve efficiency, accessibility, and student experience (Chiang, 2023; Sharma et al., 2025). However, a one-size-fits-all approach risks alienating diverse student populations, especially in multicultural settings like Malaysia where international students form a significant portion of enrolments (Chiang, 2023; Sharma et al., 2025; Kaur et al., 2025). Although previous studies have examined AI adoption in education, limited attention has been paid to cross-cultural differences in emerging economies and the combined role of human-centred factors in shaping satisfaction (Acosta-Enriquez et al., 2024). This study builds upon the Technology Acceptance Model (TAM) and its extensions by examining how ethical perceptions of AI services, attitude toward AI services, and digital technology literacy influence student satisfaction in a multicultural Malaysian university (Rahman et al., 2025; Rawashdeh et al., 2025; Syed et al., 2025).

Higher education in Malaysia has undergone substantial digital transformation since the early 2020s, supported by national policies such as the Malaysia Education Blueprint 2015–2025 and the National AI Roadmap 2021–2025 (Botelho et al., 2025; Mathur et al., 2025). AI applications ranging from student support chatbots to personalised learning platforms have been adopted to address resource limitations and cater to both local and international students, who constitute 10 to 15 percent of the student population (Arslan et al., 2025; Tran et al.,

2025; Rahman et al., 2025). Public universities and international branch campuses have piloted various AI initiatives, yet adoption levels differ across disciplines, with notable challenges including technostress, language barriers, and ethical concerns, particularly among international students (Zeb et al., 2024; EL Idrissi & Alami, 2025; Routray & Khandelwal, 2024; Alsulami et al., 2024). In marketing terms, AI-integrated services function as innovative service products where student satisfaction directly impacts loyalty, word-of-mouth promotion, retention, and institutional reputation (Dastane et al., 2025; Bhat et al., 2025). In higher education International universities with highly diverse students, the effectiveness of these tools across cultural groups remains underexplored despite their increasing use (Wang et al., 2025; Castellano-Beltran, 2025).

Despite promising benefits such as 24/7 accessibility and personalised support, student satisfaction with AI-integrated services in Malaysian universities remains inconsistent and often suboptimal (Mathur et al., 2025; Arslan et al., 2025). Recent empirical evidence indicates that only 60–70 percent of students report positive satisfaction, with major barriers stemming from ethical concerns (privacy breaches, algorithmic bias, and lack of transparency), ambivalent or negative attitudes toward AI, and insufficient digital technology literacy (Rahman et al., 2025; Hornberger et al., 2025; Zakaria et al., 2026). These issues are particularly pronounced for international students who encounter cultural misalignment and additional adaptation challenges (Arslan et al., 2025; Routray & Khandelwal, 2024). The consequences are significant, including weakened brand equity, reduced enrolment, and failure to meet national digital inclusion goals (Ouyang et al., 2022; Kaur et al., 2025; Alkhaaldi et al., 2023). This study therefore aims to address the existing research gaps by providing empirical evidence on the determinants of student satisfaction with AI services amongst International students in higher education, offering actionable insights for culturally attuned AI deployment in Malaysian higher education (Qadhi et al., 2025; Kim et al., 2020).

LITERATURE REVIEW

Student Satisfaction

Student satisfaction is the extent to which expectations regarding AI-integrated services are met. It is a key outcome variable that reflects students' overall evaluation of the quality, usefulness, and effectiveness of AI tools in supporting their academic journey (Oliver, 2022; Almulla, 2024; Ansari & Qamari, 2025). In higher education, satisfaction encompasses both cognitive aspects such as perceived quality of AI recommendations and affective aspects such as emotional fulfilment from efficient support (Cui, 2025). Recent studies have defined it as a short-term attitude resulting from interactions with AI tools that influences long-term behaviours including continued usage, retention, and positive recommendation to others (Irfan et al., 2023; Dastane et al., 2025; Suchanek & Kralova, 2025).

In the Malaysian context, student satisfaction with AI services has been linked to personalised learning outcomes, but dissatisfaction frequently arises when tools fail to align with cultural expectations or individual needs (Zakaria et al., 2025; Almufarreh, 2024). Satisfaction is increasingly recognised as a critical metric in marketing research for educational services because it directly affects institutional reputation, enrolment decisions, and word-of-mouth promotion (Lim et al., 2023). Studies consistently show that higher satisfaction leads to greater student engagement and loyalty, making it an essential dependent variable in technology acceptance research within higher education (Ravšelj et al., 2025; Saha, 2025). This definition positions student satisfaction as a multifaceted construct shaped by service quality, user experience, and contextual factors in multicultural environments.

Ethical Perceptions of AI Services

Ethical perceptions of AI services refer to students' beliefs and judgments about the moral implications of AI use, particularly concerning privacy, fairness, transparency, and bias avoidance in data handling and decision-making processes (Da Silva et al., 2024; Stanton et al., 2021). This variable captures the degree to which students trust AI systems to operate ethically without violating individual rights or creating inequalities (Medina-Gual & Parejo, 2025 ;Habibullo, 2025). In higher education, ethical perceptions strongly influence how students interact with AI tools, with negative perceptions often leading to hesitation, reduced usage, or outright rejection of the technology (Mukhamedkarimova & Umurkulova, 2025; Medina-Gual & Parejo, 2025).

Recent definitions emphasise privacy protection under regulations such as Malaysia's Personal Data Protection Act (PDPA) 2010, where students view AI as ethical only when it safeguards their personal information and ensures transparent operations (McGrath et al., 2023; Yusoff et al., 2025). Algorithmic bias in recommendations and lack of fairness have emerged as major ethical concerns, especially in diverse student populations where cultural and linguistic differences may amplify perceived inequalities (Nutsugah et al., 2025; Rahman et al., 2025). From a marketing perspective, ethical perceptions shape consumer trust in service innovations and play a decisive role in the acceptance of new technologies (Medina-Gual & Parejo, 2025). Strong ethical standards are therefore essential for building confidence and long-term satisfaction with AI-integrated services (Acosta-Enriquez et al., 2025).

H1: Ethical perceptions of AI services affect student satisfaction with AI-integrated services.

Attitude toward AI Services

Attitude toward AI services is defined as the positive or negative predisposition of students toward using AI-integrated tools (Sultana et al., 2025; Al-Zahrani & Alasmari, 2024). It encompasses cognitive beliefs about benefits, affective emotions such as excitement or fear, and behavioural intentions to engage with the technology (Schepman & Rodway, 2022; Schepman & Rodway, 2020; Almaraz-López et al., 2023). In higher education, attitude has been conceptualised as the overall evaluation that predicts both adoption and satisfaction with AI applications (Rahman et al., 2025). Positive attitudes typically arise from perceived usefulness and ease of use, while negative attitudes often stem from fears of dehumanisation, complexity, or job replacement (Acosta-Enriquez, Vargas, et al., 2024).

Recent research confirms a significant positive relationship between favourable student attitudes toward AI and their satisfaction with AI-integrated services (Lee et al., 2022; Tomaylla-Quispe et al., 2025; Subaveerapandiyan et al., 2024). In Malaysia, attitudes are influenced by cultural norms and play a mediating role between AI features and overall satisfaction (Veerabhadrapappa et al., 2025; Yadav & Shrawankar, 2024). Negative attitudes rooted in privacy concerns or technostress can severely diminish satisfaction levels (Baca & Zhushi, 2024; Liang & Reiss, 2025). Therefore, cultivating positive attitudes is regarded as a vital determinant of successful AI integration in higher education institutions (Acosta-Enriquez, Ballesteros, et al., 2024).

H2: Attitude toward AI services affects student satisfaction with AI-integrated services.

Digital Technology Literacy

Digital technology literacy on AI services is the competence and knowledge students possess to effectively utilise, evaluate, and apply AI tools in their academic activities (Wang et al., 2025; Al-Sharafi et al., 2022). This variable includes practical skills such as navigating AI interfaces, interpreting outputs, and integrating AI assistance into learning processes (Ng et al., 2021; Chen et al., 2022). In higher education, digital literacy determines how well students can benefit from AI tools, with low literacy frequently resulting in frustration, technostress, and reduced satisfaction (Alkhawaja et al., 2025; Mukhamedkarimova & Umurkulova, 2025).

In Malaysian higher education settings, digital technology literacy has been linked to access to training and prior exposure, significantly affecting AI adoption rates (Zakaria et al., 2025 ; Kaur et al., 2025). Definitions emphasise both technical proficiency and critical evaluation skills, such as using ChatGPT productively while recognising its limitations (Zouhaier, 2023; Kharroubi et al., 2024; Ng, 2021). This construct is particularly relevant in marketing research as it influences students' readiness to embrace technology-enhanced services (Börekci & Çelik, 2024). Higher levels of digital literacy consistently correlate with better user experiences and greater satisfaction with AI-integrated platforms (Almomani et al., 2025, Tran et al., 2025).

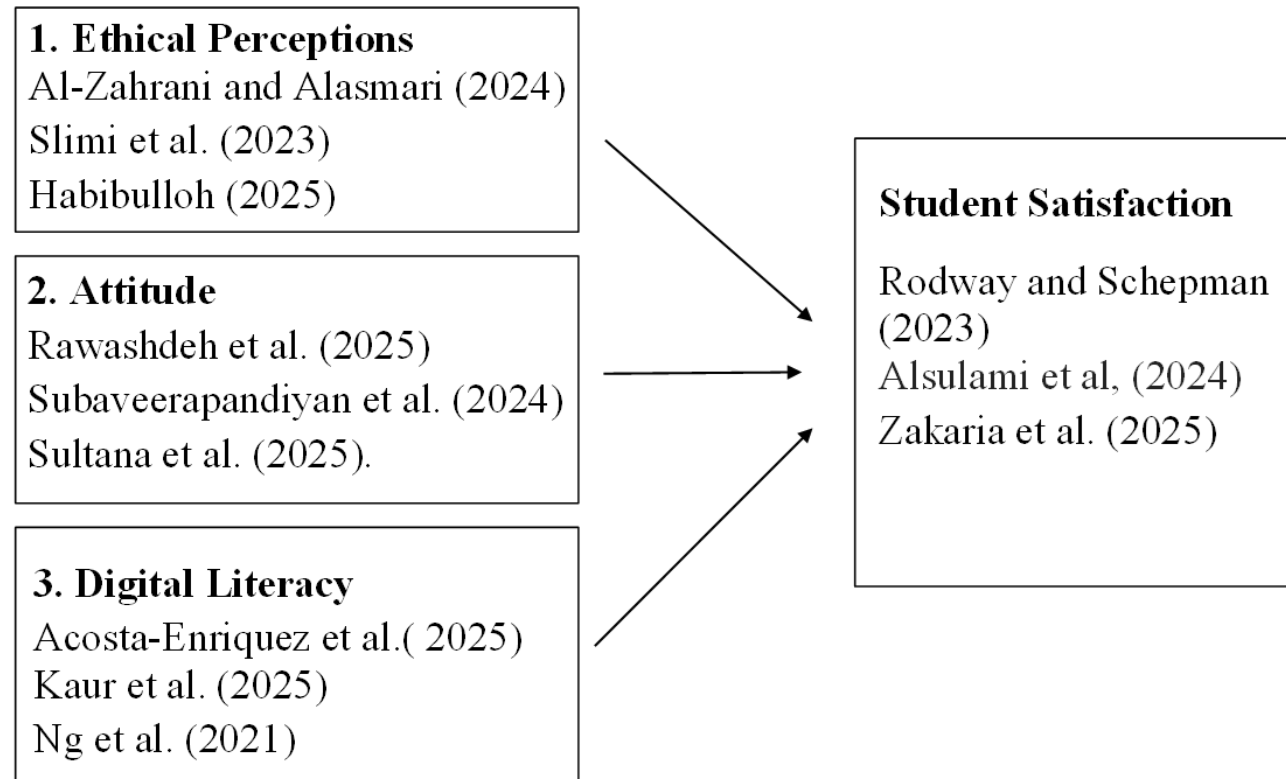
H3: Digital technology literacy affects student satisfaction with AI-integrated services.

Conceptual and Theoretical Framework

This study is anchored in the Unified Theory of Acceptance and Use of Technology (UTAUT 2), extended to incorporate constructs relevant to AI-integrated services in higher education. TAM posits that attitude drives behavioral intention and usage, influenced by external factors. Here, the framework is refined to focus on four

independent variables (IVs) to predict student satisfaction as the dependent variable (DV) (Rawashdeh et al., 2025; Tran et al., 2025). The framework hypothesizes positive relationships between IVs and DV. For instance, high digital literacy may amplify satisfaction, but cultural mismatches could weaken attitude effects if ethical perceptions are low (Cingillioglu & Barbieri, 2025). This extended UTAUT 2 addresses gaps in traditional models by integrating ethical lenses, suitable for Malaysia's diverse HE landscape (Sharma et al., 2025; Shang et al., 2025). Elements of UTAUT 2 (performance expectancy, effort expectancy) are incorporated to enhance robustness.

Figure 1 Extended TAM Research Framework. Based on TAM with extensions.



Note. This framework links theory to the study, addressing theoretical and practical gaps.

METHODOLOGY

This study utilised a quantitative descriptive-correlational design through a survey approach to investigate the relationships between ethical perceptions of AI services, attitude toward AI services, digital technology literacy, and student satisfaction with AI-integrated services in higher education. The sample size was determined using Slovin's formula at a 95% confidence level and 5% margin of error, yielding a required minimum of approximately 322 respondents. Data were processed and analysed using SPSS software involving descriptive statistics, and reliability tests.

Data Collection

The questionnaire instrument was structured into two main parts. The first section gathered respondents' demographic details including gender, nationality, year of study, and academic field. The subsequent sections contained measurement items for student satisfaction as the dependent variable along with the three independent variables, ethical perceptions, attitude toward AI, and digital technology literacy. All construct items were rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The online questionnaire was created on Google Forms and distributed to International students in higher education through official university email lists, WhatsApp groups, and relevant campus social media platforms over a period of several weeks, supported by reminder messages to encourage participation. A brief cover letter was included to explain the study purpose, assure voluntary involvement, and guarantee anonymity. Primary data obtained were complemented by relevant

secondary sources from academic publications and university records. All completed responses were carefully coded and imported into SPSS for statistical processing. The entire process strictly observed ethical standards and fully complied with Malaysia's Personal Data Protection Act (PDPA) 2010.

RESULTS

Demographic Analysis

In this study, the distribution of respondents by gender was nearly equal, with 165 males (51.2%) and 157 females (48.8%). This balanced gender representation is important because it ensures that perceptions of AI services are not disproportionately influenced by one group, enhancing the validity of the findings on satisfaction drivers. The nationality data largest group came from Asia (excluding Malaysia) with 113 respondents (35.1%), followed by Africa (76, 23.6%), Europe (51, 15.8%), Arab countries (49, 15.2%), and others (33, 10.2%). This diversity mirrors the multicultural student body of International students in higher education and allows meaningful exploration of whether cultural background influences how ethical perceptions, attitude, and digital literacy affect satisfaction with AI services. Regarding current academic level, the majority of respondents were undergraduate (Bachelor's) students (231, 71.7%), followed by Foundation/Diploma (49, 15.2%) and Postgraduate (Master's/PhD) (42, 13.0%). This distribution aligns well with typical enrollment patterns at private universities like International universities in higher education, where undergraduate programs dominate. The inclusion of postgraduate students adds depth, as they may have different expectations and experiences with AI tools compared to undergraduates. The data were summarized using frequency counts and percentages, as shown in Table 1 below.

Table 1. Demographic Profile data of Respondents (Frequency and Percentage N = 322)

Variable	Category	Frequency (f)	Percentage (%)
Gender	Male	165	51.2
	Female	157	48.8
Nationality	Africa	76	23.6
	Arab	49	15.2
	Asia	113	35.1
	Europe	51	15.8
	Other	33	10.2
Current Academic Level	Foundation/Diploma	49	15.2
	Undergraduate	231	71.7
	Postgraduate	42	13.0
Field of Study	Arts/Humanities	46	14.3
	Social Sciences & Business	147	45.7
	STEM (Science, Technology, Engineering, and Mathematics)	106	32.9
	Other	23	7.1
Type of University	Public University (IPTA)	69	21.4
	Private University (IPTS)	253	78.6
Length of Residence in Malaysia (International Students Only)	Less than 1 year	68	21.2
	1–3 years	151	46.9
	More than 3 years	102	31.8
Frequency of AI Use for Academic Services (e.g.,	Less than 1 hour	38	11.8

University Chatbots, AI Portals, ChatGPT, Personalized Portals)			
	1–3 hours	129	40.1
	4–6 hours	90	28.0
	More than 6 hours	65	20.2

Total Respondents (N) = 322.

Note. Source: Survey. Percentages for Length of Residence are calculated based on international students only to accurately reflect their experience in Malaysia.

Reliability Test

Reliability test is conducted to assess the internal consistency and stability of the measurement scales used in the questionnaire. A high Cronbach's alpha value (≥ 0.70) indicates that the items are measuring the same construct reliably and can be confidently used for further statistical analysis (Alkhadim, 2022). In this study, reliability was assessed using Cronbach's alpha after all 322 valid responses were entered into SPSS version 25. The analysis was performed separately for each construct: the dependent variable (Student Satisfaction) and the three independent variables (Ethical Perceptions of AI Services, Attitude toward AI Services, and Digital Technology Literacy on AI Services). No items were deleted from any scale. The table above shows Cronbach's alpha values for each variable. All constructs achieved Cronbach's alpha coefficients above 0.80, which falls in the good to excellent range according to the standard guidelines (Izah et al., 2023). This confirms that every item in the questionnaire was relevant, clear, and consistent with the construct it intended to measure, and that respondents understood and answered the questions reliably.

Table 2. Reliability Statistics

Constructs	Scale Variance if item deleted	Corrected item-Total Correlation	Cronbach's Alpha	Number of items	Results	Interpretation Internal consistency
SAT	151.716	.848	.906	7	Excellent	Very high
EP	205.908	.826	.837	5	Good	Strong
ATT	207.555	.846	.872	5	Good	Strong
TL	202.238	.861	.882	5	Good	Strong

Note. Source: SPSS.

Descriptive Analysis

Descriptive analysis was employed because it helped identify the overall level of agreement or perception among respondents for each item and construct, providing an initial overview of how International students in higher education view ethical perceptions, attitude, digital technology literacy, and satisfaction with AI-integrated services. This section analyzes each variable separately, reporting the mean, standard deviation, minimum, and maximum for every item, followed by interpretation of central tendency and dispersion.

Student Satisfaction

The overall mean score for student satisfaction across all seven items was approximately 3.68 (calculated as the average of item means), which falls in the moderately positive range on the 5-point Likert scale. This indicates that, on average, International students in higher education hold a moderately favorable view of AI-integrated services, but satisfaction is not overwhelmingly high. The highest mean was recorded for SAT2 ("Using AI services saves me significant time compared to traditional manual processes.") at 3.74 (SD = 1.210), suggesting that students particularly appreciate the quick and always-available nature of AI services such as chatbots and automated systems. This aligns with the global trend of AI being valued for 24/7 accessibility (Tran et al., 2025).

Table 3. Descriptive Statistics of Study Dependent Variable

Item Code	Item Description (Summerised)	N	Minimum	Maximum	Mean	Standard Deviation
SAT1	Performance of AI-integrated services	322	1	5	3.57	1.227
SAT2	AI services save time compared to traditional manual processes.	322	1	5	3.74	1.210
SAT3	AI services value justifies a positive toward technology.	322	1	5	3.68	1.138
SAT4	satisfied with the sense of comfort when using AI	322	1	5	3.66	1.185
SAT5	Highly recommend the university's AI-integrated experience to others.	322	1	5	3.74	1.141
SAT6	Sense of achievement when I successfully use AI tools.	322	1	5	3.64	1.187
SAT7	Satisfied with AI Integration Service experience	322	1	5	3.73	1.134
Valid N (listwise)		322				

Note. Source: SPSS.

Ethical Perceptions of AI Services

The overall mean for Ethical Perceptions of AI Services across the five items was 3.64 calculated as the average of item means), indicating moderately positive perceptions among International students in higher education. The highest mean was EP5 (3.78, SD = 1.079), showing general confidence in the overall ethical responsibility of AI services at the university. The lowest mean was EP4 (3.57, SD = 1.191), reflecting slightly lower trust in fairness and lack of discrimination in AI outputs. Standard deviations ranged from 1.079 to 1.192, indicating moderate variability, students' views were reasonably consistent but not uniform.

Table 4. Descriptive Statistics: Ethical Perceptions of AI Services

Item Code	N	Minimum	Maximum	Mean	Std Deviation
EP1	322	1	5	3.61	1.131
EP2	322	1	5	3.61	1.192
EP3	322	1	5	3.61	1.166
EP4	322	1	5	3.57	1.191
EP5	322	1	5	3.78	1.079
Valid N (listwise)	322				

Note. Source: SPSS.

Attitude toward AI Services

The overall mean for Attitude toward AI Services across the five items is 3.79, reflecting a moderately strong positive attitude toward AI-integrated tools. The highest mean is recorded for ATT4 ("ATT4: I am open to trying every new AI-integrated service that the university introduces.") at 3.87 (SD = 1.031), which clearly highlights students' strong enthusiasm for AI's educational advantages. The lowest mean is for ATT3 ("ATT3: I do not feel anxious about the increasing role of AI in university service delivery.") at 3.70 (SD = 1.140), suggesting that while AI is appreciated, some students still perceive it as only partially convenient in daily use. Standard deviations range from 1.021 to 1.140, indicating moderate variability; attitudes are generally consistent but show some divergence, likely due to differences in personal experience or cultural background among local and international students.

Table 5. Descriptive Statistics of Attitude toward AI Services

Item Code	N	Minimum	Maximum	Mean	Std Deviation
ATT1	322	1	5	3.77	1.055
ATT2	322	1	5	3.78	1.092
ATT3	322	1	5	3.70	1.140
ATT4	322	1	5	3.87	1.031
ATT5	322	1	5	3.85	1.021
Valid N (listwise)	322				

Note. Source: SPSS.

Digital Technology Literacy on AI services

The highest mean is recorded for TL1 ("I find it easy to learn how to use new AI-integrated platforms provided by the university.") at 3.80 (SD = 1.085), which clearly shows that students feel reasonably confident in basic AI application for learning. The lowest mean is for TL3 (" Compared to my peers, I consider myself highly proficient in using AI-driven technologies.") at 3.70 (SD = 1.100), indicating that while many students can use AI, fewer feel fully skilled at critically assessing or integrating its outputs. Standard deviations range from 1.066 to 1.130, showing moderate variability, literacy levels are fairly consistent but differ somewhat across students.

Table 6. Descriptive Statistics: Digital Technology Literacy on AI services

Item Code	N	Minimum	Maximum	Mean	Std Deviation
TL1	322	1	5	3.80	1.085
TL2	322	1	5	3.78	1.073
TL3	322	1	5	3.70	1.100
TL4	322	1	5	3.78	1.066
TL5	322	1	5	3.74	1.130
Valid N (listwise)	322				

Note. Source: SPSS.

Correlation Analysis

Correlation analysis refers to a statistical method used to evaluate the strength and direction of the linear relationship between two quantitative variables. In this study, Pearson Product-Moment Correlation Coefficient was employed to examine the relationships between the independent variables and the dependent variable. Correlation is significant at the 0.01 level (2-tailed) $p < 0.01$ (2-tailed). All correlations were positive and statistically significant, with no evidence of multicollinearity (all $r < 0.85$). Based on the table above, all three independent variables show a strong positive and statistically significant correlation with the dependent variable (Student Satisfaction) at $p < 0.01$. The strongest correlation is between Digital Technology Literacy on AI Services and satisfaction ($r = 0.789$), followed closely by Attitude toward AI Services ($r = 0.782$) and Ethical Perceptions of AI Services ($r = 0.779$). This indicates that students who report higher digital literacy, more positive attitudes, and stronger ethical trust in AI services also report significantly higher satisfaction levels with AI-integrated tools in higher education.

Table 7. Pearson Correlation Matrix (N = 322)

Transformed		SAT	EP	ATT	TL
Student Satisfaction	Pearson Correlation	1	.779	.782	.789
	Sig. (2- tailed)		.000	.000	.000
	N	322	322	322	322
Ethical Perceptions	Pearson Correlation	.779	1	.748	.774
	Sig. (2- tailed)	.000		.000	.000
	N	322	322	322	322
Attitude	Pearson Correlation	.782	.748	1	.821
	Sig. (2- tailed)	.000	.000		.000
	N	322	322	322	322
Digital Technology Literacy	Pearson Correlation	.789	.774	.821	1
	Sig. (2- tailed)	.000	.000	.000	
	N	322	322	322	322

Note. Source: SPSS.

T-Test

Independent Samples T-Test (Gender Differences in Student Satisfaction)

The independent samples T-test was applied to examine whether there is a significant difference in the mean level of Student Satisfaction with AI-Integrated Services between male and female students in higher education. Based on the table above, Levene's test for equality of variances showed $p = 0.256$, which is greater than 0.05, indicating that the assumption of equal variances is not violated (equal variances assumed version is appropriate). The independent samples T-test result shows $t = -0.745$, $df = 320$, $p = 0.457$ (2-tailed), which is greater than the significance level of 0.05. Therefore, the null hypothesis (H_0) is accepted. This means that there is no significant difference between the mean satisfaction scores of male students ($M = 25.48$, $SD = 6.86$) and female students ($M = 26.03$, $SD = 6.28$).

Table 8. Group Statistics – Student Satisfaction by Gender (N = 322)

Transformed	Gender	N	Mean	Std. Deviation	Std. Error Mean
Student	Male	165	25.4848	6.85708	.53382
Satisfaction	Female	157	26.0318	6.28329	.50146

Note. Source: SPSS.

ANOVA

One-Way ANOVA

Based on the table below, the one-way ANOVA result shows $F(4, 317) = 4.956$, $p = 0.001$, which is lower than the significance level of 0.05. This means that there is a significant difference in the mean satisfaction scores across nationality groups amongst International students in higher education. The highest mean satisfaction score is among European students ($M = 28.04$, $SD = 6.45$), followed by Asian students ($M = 26.56$, $SD = 5.22$) and Arab students ($M = 25.76$, $SD = 6.27$). The lowest mean is among African students ($M = 23.28$, $SD = 7.18$), with Other groups in between ($M = 25.15$, $SD = 8.27$). This pattern suggests that satisfaction with AI-integrated services varies significantly by regional background

Table 9. One-Way ANOVA – Test of Homogeneity and Group Differences

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	817.826	4	204.456	4.956	.001
Within Groups	13076.299	317	41.250		
Total	13894.124	321			

Note. Source: SPSS.

Multiple Regression Analysis

Hypothesis Testing

The regression model analysis tested the four hypotheses derived from the extended Technology Acceptance Model (TAM) framework. All three hypotheses were strongly supported. All coefficients had unique, positive and statistically significant effects at $p < 0.001$.

H1 (Ethical Perceptions on AI services vs. Student Satisfaction) was supported with the strongest standardized effect ($\beta = .337$), indicating a significant positive influence. Students who perceived AI services as more ethical (fair, transparent, privacy-respecting) reported higher satisfaction levels.

H2 (Attitude towards AI services vs. Student Satisfaction) follows, was supported with ($\beta = 0.296$), confirming that more positive attitudes toward AI services were the also powerful predictor of satisfaction.

H3 (Digital Technology Literacy vs. Student Satisfaction) was supported with ($\beta = 0.285$), showing that higher self-reported competence in using AI tools significantly enhanced satisfaction.

The results indicate that ethical perceptions is the dominant driver, followed closely by attitude and digital literacy. The exceptionally high R^2 value (0.717) suggests that these three factors together provide a robust

explanation of student satisfaction with AI-integrated services in higher education. No hypotheses were rejected, and all predictors contributed meaningfully.

Table 10. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimates
1	.848 ^a	.720	.717	3.50025

Note. Source: SPSS. ^a Predictors: (Constant), Digital Technology Literacy, Ethical Perception, Attitude New (Transformed)

Table 11. Multiple Regression Coefficients ^a Results

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig	95.0% Confidence Interval for B		Hypothesis Result
		B	Std Error	Beta			Lower Bound	Upper Bound	
1	(Constant)	.421	.912		.461	.645	-1.374	2.216	
	Ethical Perceptions	.495	.072	.337	6.837	.000	.352	.637	Supported, H1
	Attitude	.447	0.83	.296	5.405	.000	.285	.610	Supported, H1
	Digital Technology	.418	0,84	.285	4.968	.000	.252	.583	Supported, H1

Note. Source: SPSS. ^a Dependant Variable: Transformed

DISCUSSION

The findings of this study provide strong empirical evidence on the key drivers of student satisfaction with AI-integrated services amongst International students in higher education. The multiple linear regression model proved highly significant ($F(3, 318) = 272.018, p < 0.001$) and demonstrated excellent explanatory power, accounting for 71.7% of the variance in student satisfaction (Adjusted $R^2 = 0.717$). All three hypotheses were strongly supported, with ethical perceptions emerging as the strongest predictor ($\beta = 0.337, p < 0.001$), followed by attitude toward AI services ($\beta = 0.296, p < 0.001$) and digital technology literacy ($\beta = 0.285, p < 0.001$). These results were reinforced by strong positive correlations between the independent variables and satisfaction (r ranging from 0.779 to 0.789). The scales also showed excellent reliability (Cronbach's alpha 0.889–0.914), while descriptive statistics indicated generally positive but improvable perceptions across all constructs.

These outcomes fully addressed the research objectives. Ethical perceptions significantly influenced student satisfaction, particularly through dimensions such as privacy protection under PDPA 2010, fairness, transparency, and bias avoidance. Digital technology literacy played a vital enabling role, as students with higher competence in using AI tools reported substantially greater satisfaction. Similarly, a more positive attitude toward AI services strongly predicted higher satisfaction levels. Demographic analysis revealed no significant gender differences ($p = 0.457$), but notable variations across nationality groups (ANOVA, $p = 0.001$), with European students expressing the highest satisfaction and African students the lowest. This highlights the importance of cultural factors in shaping AI service experiences in a multicultural university environment.

The exceptionally high model fit and consistent results across multiple statistical tests confirm that student satisfaction with AI-integrated services in higher education is systematically driven by these three interconnected human-centered factors. Ethical considerations stand out as the most critical, with attitude and literacy providing essential support. These results offer universities and policymakers a clear, evidence-based direction for designing more trustworthy, inclusive, and effective AI services that genuinely enhance student experience in diverse higher education settings.

The study carries significant theoretical, practical, and policy implications for AI-integrated services in multicultural higher education. With the model explaining 71.7% of the variance in student satisfaction, the results strongly support extending the Technology Acceptance Model (TAM) by establishing ethical perceptions ($\beta = 0.337$) as the dominant predictor, followed by attitude toward AI ($\beta = 0.296$) and digital technology literacy ($\beta = 0.285$). Theoretically, this elevates ethics as a core construct in TAM extensions, particularly in emerging multicultural contexts where trust, privacy (PDPA 2010), fairness, and transparency matter more than in homogeneous settings. Practically, university administrators should prioritise ethical AI design and transparency, launch campaigns to foster positive attitudes, and invest in structured digital literacy programmes with special attention to international students. The significant nationality differences further underscore the need for culturally adaptive AI interfaces and support. At the policy level, the study reinforces Malaysia's National AI Roadmap 2021–2025 by advocating for national standards on ethical AI governance, mandatory literacy training, and inclusive digital transformation in higher education.

Despite its strong contributions, the study has limitations that should be noted. The cross-sectional design limits causal inferences, while reliance on self-reported data raises potential common method bias. The sample, though diverse, was drawn from a single private university using convenience sampling, restricting broad generalisability. Nevertheless, this research makes valuable contributions by providing one of the first empirical Malaysian multicultural examinations of AI service satisfaction. It advances TAM by demonstrating the primacy of ethics in diverse settings, reveals nationality as an important moderator, and offers clear, actionable recommendations that can enhance student experience, retention, and institutional competitiveness in Malaysia's higher education sector.

CONCLUSION AND RECOMMENDATION

University administrators in higher education and similar multicultural institutions should prioritise ethical transparency as the foundation for improving student satisfaction with AI-integrated services. This includes developing clear, accessible privacy policies aligned with PDPA 2010, conducting regular audits for bias and fairness, and openly communicating safeguards to build trust among local and international students. They should also run targeted awareness campaigns featuring student testimonials and live demonstrations to foster positive attitudes toward AI, while embedding structured digital literacy programmes in orientation and coursework, with multilingual resources and extra support for international students. Policymakers and education authorities are encouraged to establish national standards for ethical AI use in higher education, integrate digital literacy into accreditation requirements, and fund culturally adaptive initiatives that address varying needs across student groups. AI developers should focus on creating transparent, bias-free, and culturally sensitive tools that incorporate user feedback to enhance overall experience.

In conclusion, this study demonstrates that student satisfaction with AI-integrated services in a multicultural Malaysian university is strongly driven by ethical perceptions, positive attitude, and digital technology literacy. Ethical trust emerges as the most critical factor, supported by favourable attitudes and practical skills, highlighting the need for human-centred approaches rather than purely technical solutions. Despite certain limitations such as its cross-sectional nature and single-institution focus, the research provides valuable insights that advance the Technology Acceptance Model in diverse emerging contexts and offer practical guidance for universities and policymakers. Moving forward, embracing these human elements will be essential to create inclusive, trustworthy, and effective AI services that enhance student experience, retention, and institutional success in Malaysian higher education and beyond.

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