



Effect of Digital Literacy and Willingness to Adopt Artificial Intelligence Technologies Among University Students

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ABSTRACT

This study explored the role of digital literacy in determining the acceptance level of Artificial Intelligence (AI) technology among students of Universities in Lahore, Pakistan. The quantitative and correlational nature of the research design was informed by a positivist research philosophy. Data were collected using a structured questionnaire, and completed by 492 students (undergraduate and graduate) of two public and two private universities. The instruments assessing digital literacy and AI willingness to adopt, demonstrated high internal consistency with Cronbach's alpha values of .890 and .922, respectively. Data analysis included descriptive and inferential statistics, and a regression analysis. Results of the main regression equation indicated a strong, positive relationship between digital literacy and the willingness to adopt AI technology ($R = .784$, $R^2 = .614$, $\beta = .784$, $p \leq .001$). This suggests digital literacy accounts for 61.4% of the willingness to adopt AI. Other positive relationships were noted between digital literacy and the dimensions of willingness to adopt AI (i.e., academic-work and teaching-practice). These findings illustrate the role of digital competencies in students' engagement with AI technology. The study recommends that universities enhance digital and AI literacy, and promote and guide students on the use of AI, the internet and other information sources, and ethical practices and academic integrity.

Introduction

The integration of technology into higher education has challenged students to develop a more critical digital literacy to meet the demands of higher education. Digital literacy enables students to identify, assess, interpret, and integrate information critically and ethically in the digital environment (Georgopoulou et al., 2025). This study explores the digital literacy of university students as the ability to use digital technology to access and evaluate online information and engage productively and responsibly with digital information and resources. The focus is on students' perceived digital competencies rather than on students' objectively measured digital skills. The rise of digital learning environments and the integration of AI in teaching and learning has impacted students' roles and responsibilities in higher education. Students are challenged to evaluate the trustworthiness and credibility of digital information, choose which digital technology is fit for purpose, and use digital resources to learn and study in an independent and self-directed manner. Digital literacy is a foundation for the use of more complex tools and technologies. While students may not understand the inner workings of AI, engaging and using AI in an ethical manner is important (Reddy et al., 2020). Responsible use of digital and AI technology requires students to think critically and ethically in the digital world. A more in-depth understanding of students' digital literacy helps to explore students' preparedness for technology enhanced higher education.

More artificial intelligence (AI) tools are becoming available, giving university students more opportunities to use AI in their learning, research and productivity. Some AI tools, like chatbots and information retrieval systems, can help students produce ideas and feedback, and help them organize and explain concepts (Grajeda et al., 2024). The availability of AI tools does not mean students will use them to do academic tasks. Students will consider ease of use, usefulness, trust, confidence and other factors like accuracy, privacy, integrity, ethics, and the tools' impact on learning, before deciding to use AI in academic tasks. Willingness to use AI to help them academically means students see AI as having a positive impact on their academic tasks (Dahri et al., 2024). Students can recognize the value AI can have on their academic tasks, but because of uncertainty or ethics, may not want to use it. Concerns related to ethics and uncertainty are the main reasons students do not use AI for academic tasks, despite recognizing the positive value AI can have on their academic tasks. Recent research focuses on understanding students' concerns related to ethics and uncertainty and how it relates to AI literacy and the acceptance of AI-related technology (Lintner, 2024; Qi, 2025). Therefore, it is important to study students' concerns related to ethics and uncertainty as a separate educational and behavioral construct, and not only from students' access to technology.

The relationship between digital literacy and acceptance of AI technologies can be explained by considering the skills required to interact with advanced digital environments. Students with higher levels of digital literacy can understand how to engage with and use AI technologies, create effective prompts, and recognize when AI has produced wrong or misleading answers. They are also able to incorporate digital outputs into their academic tasks (Ciampa et al., 2023). Positive experiences with using AI technologies strengthens students' perceptions about the technologies' usefulness and ease of use. The relationship between digital literacy and acceptance of AI technologies aligns with the Technology Acceptance Model (TAM). In fact, perceived usefulness and perceived ease of use have been shown to predict individuals' acceptance of technologies (Davis, 1989). Although the model was published many years ago

and therefore does not mention AI, its underlying principles can be applicable to students' perceptions of emerging education technologies. There is also supporting empirical evidence to examine the relationship between digital literacy and acceptance of AI technologies. Borekci and Celik (2024), in their study of 154 students in Türkiye, examined digital literacy and acceptance of AI technologies within the framework of the TAM. More recently, Qi (2025) examined AI literacy and behavioral intention of 359 students in Chinese universities. AI literacy predicted behavioral intention, and the relationship was positive and significant. Performance expectancy, effort expectancy, and social influence were also found to be positively associated with AI literacy and behavioral intention of using the technology. Although AI literacy and digital literacy are related, they are distinct from each other. Evidence regarding AI literacy does not automatically validate the role of digital literacy.

The fast adoption of AI in higher education means additional empirical work is needed to examine the connection between students' current digital competencies and their preparedness to use AI. Crompton and Burke (2023) undertook a systematic review of 138 research studies published from 2016 to 2022 and examined the growing body of work in the area of AI in higher education. They reviewed the extent of the possibilities and the variety of ways in which AI is being studied in higher education. Similar research has been conducted to examine the integration of AI and the acceptance of digital technologies, as well as the development of AI literacy. For example, in 2024 Lintner reviewed 16 scales related to AI literacy and identified research and validation gaps, stressing the need for clarity and adequate measurement in this area. While these research studies have accelerated understanding and integration of AI in education, different contexts may demand research to examine the relationship between users' digital literacy and their preparedness to embrace AI. Contexts in which users do not have easy access to the Internet, digital devices, or AI may be candidates for this type of research. For example, Pakistan has diverse contexts for students' access to technology, including digital and AI. There may also be differences in students' exposure to ICT and learning opportunities offered by educational institutions.

This study has the potential to impact multiple fields including educational research, university teaching, and higher education institutional planning concerning the responsible use of AI. From a theoretical standpoint, the study may contribute to the acceptance of technology by recognizing general digital literacy as a possible predictor of students' intent to use AI technologies. Where other studies concern specialized AI literacy, this study considers the digital competencies students may have prior to using AI-based educational applications. The findings of the study could help university administrators, teacher educators and curriculum developers determine if digital literacy of students is related to their willingness to incorporate AI in academic activities. The results of such a relation may prompt universities to consider the development of digital literacy of their students by providing activities that include evaluating information, engaged digital problem-solving, and responsible participation in online activities. The results of such activities could help students engage critically with AI. The study may prompt universities to move beyond the assumptions of digital expertise with different devices equating readiness with advanced technologies. The results may help universities to strategically integrate AI technologies to address values and ethics in teaching and learning.

This study aims to analyze the relationship between the level of digital literacy and the inclination of university students in Pakistan to adopt AI technologies. The study will assess the

level of digital literacy of the students and determine their willingness to adopt AI technologies. The study will also analyze if the level of digital literacy significantly impacts the inclination of students to adopt AI technologies. This study aims to identify if the level of digital literacy of students impacts the willingness of students to integrate AI technologies in their learning. This study will contribute evidence to enrich digital literacy and A.I. integration frameworks in Higher Education Institutions. The study may also identify other variables and constricts including, the acceptance level of AI in learning, trust and ethics in AI integration, perceived usefulness of AI, and the level of integration support by institutions. The study also aims to determine how digital competencies of students shape their willingness to embrace learning enhancement technologies. This study focuses on the following research questions.

1. How does digital literacy influence the willingness to accept artificial intelligence (AI) technologies among university students?
2. Do the subscales of digital literacy influence the willingness subscale to accept AI technologies among university students?

Literature Review and Theoretical Perspective

The following section includes a scholarly literature review, a theoretical framework, the nature of the relationship between the variables, and the research gap. This section used the Technology Acceptance Model (TAM) primarily, and the Unified Theory of Acceptance and Use of Technology (UTAUT) as the second framework.

Digital Literacy Among University Students

Digital literacy is defined by the ability to use digital tools to search and evaluate online information, as well as create and share digital content. This involves the use of technology appropriately, address and resolve problems, and make ethical judgments in virtual environments (Tinmaz et al., 2022). Digital literacy is essential for university students to independently evaluate the quality of information they use for learning and research. In Zhao et al. (2021), they conducted a systematic review on digital competence among university students to analyze the development and assessment of digital competencies in higher education. Based on their review, the authors outlined the importance of digital literacy and other digital competencies in enhancing the educational processes and integrating them within the modern academic practices.

Artificial Intelligence (AI) is rapidly advancing and changing how higher education students are taught and assessed. To fully participate in an activity utilizing AI, students need to understand how AI works, consider its reliability, evaluate possible errors and make reasoned decisions about when and how to use AI. Almatrafi et al. (2024) conducted a systematic review of 47 studies of AI literacy and identified six main dimensions: recognizing, understanding, using and applying, evaluating, creating and navigating ethically AI. Although these dimensions are associated with AI literacy, they reflect the level of digital literacy students need to engage productively with different AI tools. The authors admit these dimensions extend the field of digital literacy. While general digital literacy may equip students to engage productively with AI, this does not mean students understand how AI works or can make decisions related to AI systems.

Willingness to Adopt Artificial Intelligence Technologies

Willingness to adopt AI technologies signifies the tendencies, preferences and readiness of individuals to interact with Artificial Intelligence (AI) in order to achieve different goals (Jiang et al., 2024). In the context of higher education, it refers to how students are inclined to use generative AI (e.g. ChatGPT) or other AI-based tutoring systems and tools, automatic writing assistants and other AI-based applications in academic learning, teaching and research. In this regard, adoption-willingness indicates how students are inclined to use AI in achieving their academic goals and not how frequently they use AI. Students may have a positive attitude towards the use of a particular AI tool but use the tool less frequently. Similarly, a student may frequently use an AI tool, but not view it as integral to the student's academic goals. Hence when evaluating students' use of AI, it is essential to analyse students' attitudes, intentions and actual use of AI technologies.

The acceptance of Artificial Intelligence (AI) in university contexts is impacted by several technological, psychological, and contextual factors. The review identified 50 studies on the acceptance of AI in university contexts (2024). The studies relied on the UTAUT2 (Unified Theory of Acceptance and Use of Technology 2) framework. The authors found performance expectancy and hedonic motivation as key determinants in terms of intent and use, while perceived ease of use and social influence were found to be relevant among students. Thus, the willingness of students to adopt AI is not necessarily impacted by the students' technical skills (Acosta-Enriquez et al., 2024). Other factors, such as students' expectations regarding the academic benefits of using the AI, the effort required to use the technology, and people's attitudes, may play a role. In addition, students may consider various aspects regarding the appropriateness of using AI in a given academic task, for example, AI's potential to overcome limitations in academic integrity and overreliance. Therefore, the willingness to adopt AI in education should be conceptualized as a new construct to represent students' intent and receptiveness to using AI in their educational activities.

Digital Literacy and AI Adoption: Empirical Evidence

Digital literacy could help students to engage with the digital interfaces of AI-based resources to formulate queries, appraise the information returned, and address technology-related issues. Students who are more digitally resourceful are likely to view AI tools as easier and more helpful for completing academic tasks. Hence, their willingness to experiment with different AI tools is likely to be higher. While this may well be the case, it also seems likely that digitally-savvy students may be more aware of the limitations of AI, including misinformation, as well as the privacy, security and ethical issues, and as such may be more cautious and selective in their adoption of AI tools. Research from less-developed countries may provide useful insights in the field. Musyaffi et al. (2024) conducted a study based on the TAM to examine the acceptance level of AI by 218 accounting students. In addition to digital literacy, they evaluated risk awareness and acceptance of AI. While digital literacy and risk awareness are important components, this study provided evidence of the importance of perceived risks to student responses to AI. Although the study offers relevant evidence, its focus on accounting students limits the generalisability of the findings to university students in other fields of study.

Evidence on AI literacy is related, but distinct from digital literacy. Qi (2025) assessed AI literacy and other technology acceptance factors with a sample of 359 Chinese university

students using structural equation modeling. The researchers found that AI literacy was a major behavioral intention factor influencing the acceptance of AI, and incorporated other UTAUT variables. The study supports the idea that students may have certain technology acceptance attitudes and intentions toward AI, and this is likely to change with further advances in the field. Because AI literacy is focused on understanding and mastery of artificial intelligence, this does not automatically imply that digital literacy may also be a predictor of similar attitudes toward AI. The importance of student competencies and attitudes is further substantiated with the emerging AI literacy divide. The research suggests differences in university students' knowledge and use of Generative AI, and students with lower AI literacy levels were fearful and more cautious, and students with higher AI literacy levels were more likely to be productive and use Generative AI (Chee et al., 2025). These results show the necessity to consider student competencies when studying AI engagement. The body of literature suggests a justification for researching whether general digital literacy is a predictor for the inclination to utilize AI technologies, while being mindful that acceptance could also be determined by the educational context and perceived usefulness, trust, and risk.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is the main theoretical framework of this study. TAM is a theory developed by Davis (1989) to describe why individuals adopt and use a certain information technology. TAM focuses on two key beliefs: perceived usefulness and perceived ease of use. Perceived usefulness explains the degree to which a person believes that the use of a technology will improve his or her performance. Perceived ease of use, on the other hand, explains the degree to which a person believes that the use of a technology will require a low level of effort. TAM is backed by ample evidence and has proven its utility across a wide variety of contexts. Although TAM was developed many years before generative AI became popular, the central components of TAM can be used to elucidate why students are willing to adopt AI applications in higher education (Tahar et al., 2020).

The current study uses TAM to explain the potential relationship between digital literacy and the adoption of AI technologies. It can be easier for digitally savvy users to interact with AI technologies and incorporate them into learning activities. For example, articulating what AI technologies should be used for may be related to the usefulness of AI technologies in writing, research, learning, and other areas, and may henceforth develop the intention to adopt AI technologies. The current study, however, does not measure perceived usefulness or ease of use as distinct constructs. Therefore, TAM should be rather used as a framework to describe and provide a reasonable, logical basis to understand relationships rather than as a complete model to be tested empirically.

The use of TAM to study the acceptance of AI in higher education is relatively recent. The AI acceptance systematic review highlighted the importance of performance expectancy and other acceptance-related factors in explaining the intention to use AI in the university context (Ali et al., 2024). Likewise, Musyaffi et al. (2024) used TAM to investigate digital literacy and risk awareness in conjunction with students' acceptance of AI in higher education. The findings suggest the use of TAM in understanding the relationship between students' digital competencies and their acceptance of AI in higher education. Nevertheless, the findings highlight that the presence of digital competences may not be the single factor driving the intention to adopt AI in higher education.

Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh et al. (2003) focuses on performance expectancy, effort expectancy, social influence, and the facilitating conditions. Performance expectancy is defined as the degree to which an individual believes that a specific technology will help achieve his/her job objectives and benefits. Effort expectancy is defined as the degree of ease with which a person can use the technology. Social influence is defined as the degree to which important others (e.g., peers and supervisors) in the social environment of an individual support the use of technology. The facilitating conditions are defined as the resources and support available to help the individual employ the technology.

These constructs are applicable to university students because the acceptability of AI to students may depend on AI's academic value, perceptions of their peers and instructors, and the availability of adequate digital facilities to support their studies. UTAUT has been shown to be relevant to the field of higher education by Xue et al. (2024) who conducted a systematic review of 162 studies to determine the current state of research in higher education. The review showed performance expectancy to be the main influence on behavioral intention across the studies. In addition, Qi (2025) integrated AI literacy with the UTAUT constructs to study the intent of Chinese University students to use AI. These studies depict a focus on individuals' competencies and acceptance-related beliefs to understand students' intent to adopt emerging technologies.

For the current study, UTAUT suggests why the relation between digital literacy and the willingness to adopt AI may differ among students and education contexts. A digitally literate student may still be hesitant to adopt AI if the student perceives the technology to be unreliable and/or provides limited academic benefits. Furthermore, the student may be hesitant to adopt AI due to a lack of adequate tools and/or the absence of techniques to make the tools work for her/him/they. The acceptance of AI among students may be impacted positively by teachers' techniques and encouragement, and/or expectations about the usefulness of AI (Wang & Li, 2024). However, the absence of the assessment of digital literacy and the willingness to adopt AI would place UTAUT more as a supporting theoretical perspective than a fully articulated and integrated multidimensional theory.

Integrating the Theoretical Perspectives

The integration of TAM and UTAUT offers a solid theoretical basis for studying the relationship between digital literacy and the inclination to adopt AI technologies. TAM rests on perceived usefulness and ease of use, and acceptance is explained in this framework. UTAUT extends this and incorporates anticipated performance benefits, effort, social influence and facilitating conditions. Digital literacy can be seen as an individual competency that helps students evaluate AI's potential value. Willingness to adopt AI is the behavioral intention the study aims to explain. The theoretical argument being made is that more developed digital literacies may correlate with a higher acceptance of AI. Students who are more digitally literate may be better suited to understand and engage with various AI tools in an educational context. While digital literacy may help individuals better identify risks, it doesn't always mean that more digitally literate individuals would be less likely to adopt AI. More digitally literate individuals may understand the risks and limitations of certain AI tools and decide not to use them. While using digital literacy as an explanation is one way to try to predict students' acceptance of AI, other psychological, technological, and institutional factors also need to be considered in predicting

their behavior. The theories and perspectives presented help build a framework to incorporate digital literacy while identifying other impacts that may be at play.

Methodology

Research Design

Using quantitative methods, this research adopted a correlational survey research design to examine the relationship between students' digital literacy and their willingness to adopt Artificial Intelligence (AI) technologies in the case of students from universities located in Lahore, Pakistan. This research was located in the positivist research paradigm. The emphasis in this paradigm is to systematically measure and assess observable phenomena. This research adopted a quantitative approach because both constructs were measured using a questionnaire and assessed in a statistical manner. A correlational research design provided the researchers an opportunity to examine the relationship between the two variables, but in an un-manipulated form. In this case, the researchers treated digital literacy as an independent variable and the willingness to adopt AI technologies as a dependent variable. Since this is a non-experimental design, associations and statistical predictions were interpreted.

Population and Sample

The target population consisted of students enrolled in bachelor's and master's degrees of Science at public and private universities in Lahore, Pakistan. Variations in digital competencies and inclination to adopt AI technologies were documented by studying students from various academic disciplines. The final sample consisted of 492 students from a public and a private university. Of these, 259 (52.6%) were male students and 233 (47.4%) were female students. The sample included 354 (72.0%) bachelor's students and 138 (28.0%) master's students, and represented both undergraduate and graduate students. Students of the disciplines of humanities and social sciences, computer and information technology, and economics and administration were included in the study. A multistage sampling method was followed. At the first stage, public and private universities were considered different institutional strata, and one university was selected from each type. At the second stage, three major faculty areas, i.e. economics and administration, computer and information technology, and humanities and social sciences, were purposively selected. At the third stage, students from the previously selected institutional and faculty areas were sampled using simple random sampling. Thus, the methodology ensured representation of both the institutional and faculty types. The findings of the study, however, should be generalized with caution, as it included only two universities located in the same city.

Research Instruments

The survey used in the study comprised of four sections. The first section was for the signed informed consent. The second section was for the respondent's demographic information. The third section contained the Digital Literacy Scale (DLS), and the last section was the Artificial Intelligence (AI) Willingness to Adopt Scale (AIWAS). The Likert type scale was used for both the DLS and the AIWAS. The scales were developed based on existing digital competence frameworks and theory of planned behavior and acceptance of technology to adapt to the higher education context.

Digital Literacy Scale

Digital literacy was measured based on the Digital Competence Framework for Citizens (DigComp), which is a framework by the European Commission, 2016, and adapted by the researcher. The framework comprises of three different types of literacies, which are information literacy, communication literacy, and technical literacy. The final scale comprised of 40 statements, 10 statements each for information and communication literacy, and 20 statements for technical literacy. A five Likert type scale was used to express the respondent's agreement or disagreement to the statements. A pilot study was conducted to test the instrument's clarity and assess its internal consistency. The final instrument demonstrated a Cronbach's alpha of .890. Regarding the subscales, the communication literacy and technical literacy subscales had a Cronbach's alpha of .760 and .885 respectively, whereas information literacy had a Cronbach's alpha of .698. Given the overall scale had an acceptable reliability, the information literacy subscale should be analyzed with caution.

AI Willingness to Adopt Scale

A researcher-developed scale informed by the Technology Acceptance Model (TAM; Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003), was used to assess students' AI technology adoption inclination. This scale included 40 items that were organized across three dimensions. The first dimension included 20 items pertaining to AI use in research activities. The second dimension included 10 items pertaining to AI use in teaching practice. The final dimension included 10 items pertaining to AI use in academic work. Based on the findings from the pilot study, Cronbach's alpha was 0.922 for the AI Willingness to Adopt Scale, and was 0.898, 0.807, and 0.805 for research activities, teaching practice, and academic work, respectively. Internal consistency of the overall scale and the three dimensions of the scale was rated good to high. Given that the focus of the study was on assessing students' stated willingness to adopt AI technology, as opposed to assessing the objective, sustained use of AI technologies, the author posited that the scale is sufficiently valid.

Validity and Pilot Testing

A panel of experts assessed content relevance, clarity, and alignment with the objective of the study, with regard to the initial draft of the questionnaire. An initial pool of 150 items was developed and reviewed by academic experts with appropriate educational and research background. Based on the recommendations, some items were removed or modified due to unclear expression, redundancy, and/or inadequate association with the intended constructs and/or lack of relevance to the research questions. The research instrument was further tested for validation through pilot testing by 50 university students not comprising the main sample. The final draft of the research instrument was developed through expert review, and the tool was further reduced to 80 items encompassing the two main scales of interest. The combined 80 items instrument yielded an overall Cronbach's alpha of .926 in the pilot study, reflecting a high level of internal consistency. Individual scale reliability coefficients were examined to assess the consistency of the digital literacy and adoption of AI measures.

Data Collection Procedure

Once we got approval from the concerned university authorities, we started collecting data. For data collection, we went to different departments. We explained the purpose of the study to the participants, and then, we asked them to fill out the questionnaire based on their own experiences and views. The participation in this study was voluntary, and we got a signed informed consent from the participants before they filled out the questionnaire. The purpose of the signed consent form was to let the participants know their right to refuse participation and to make them understand that they had the right not to disclose any of their personal information. The study was conducted to collect the data that will be used for coding, screening and performing statistical analysis. The questionnaire captured some of the participants' demographic data such as their gender, university/college, type of university, place of residence, semester, CGPA, academic level, available digital devices, faculty and department. These variables helped us to describe our sample and assess differences in digital literacy and inclination toward using AI among different groups.

Data Analysis

The collected data was analyzed using descriptive and inferential statistics. For descriptive statistics, frequencies, percentages, means, and standard deviations were used to summarize the demographic information of the participants and to illustrate their levels of digital literacy and willingness to adopt AI technologies. To assess University students' digital literacy in relation to their interest in AI, a simple linear regression analysis was performed. Digital literacy was conceptualized as the predictor variable and the degree of participants' willingness to adopt AI technologies was the dependent variable. Prior to the performance of any inferential statistic, the data was evaluated for missing data, outliers and the assumptions relevant to each statistical technique. For linear regression, the assumptions of the independent and uncorrelated nature of the errors and the normality of the residuals and influence cases were evaluated.

Results

Table 1 Demographic details of the participants

Sr. No.	Demographic Variables	Categories	F	%	M
1	Gender	Male	259	52.6	1.47
		Female	233	47.4	
2	University Type	Public	238	48.4	1.51
		Private	254	51.6	
3	CGPA	2.00-2.5	32	6.5	2.75
		2.6-3.00	113	23.0	
		3.1-3.5	290	58.9	
		3.5+	57	11.6	
4	Available devices	PC	91	18.5	2.10
		Laptop	258	52.4	
		Mobile	143	29.1	

Table 1 shows the demographic characteristics of 492 participants. Regarding gender, 259 (52.6%) participants were male and 233 (47.4%) were female, thus, the sample was almost

equally distributed by gender. With respect to university type, 238 (48.4%) participants were students of public universities and 254 (51.6%) were students of private universities. Regarding CGPA, 290 (58.9%) participants had a CGPA between 3.1 and 3.5 and 113 (23.0%) had a CGPA between 2.6 and 3.00. 57 (11.6%) of the participants had a CGPA above 3.5 and 32 (6.5%) had a CGPA between 2.00 and 2.5. As regards access to digital devices, laptops (258, 52.4%) and mobile phones (143, 29.1%) were the most and second most used devices respectively, while PCs (91, 18.5%) were the least used devices.

Table 2 Regression Analysis for to find out the effect of DLSCALE to OVERALL scale

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.943 ^a	.889	.889	8.52203

Predictors: (Constant), OVERALL

Table 2a

Model		Unstandardized Coefficients	Std. Error	Standardized Coefficients	T	Sig.
		B		Beta		
1	(Constant)	7.477	1.620		4.615	.000
	OVERALL	.473	.008	.943	62.664	.000

Dependent Variable: DLSCALE

According to Table 2, the regression analysis revealed that the OVERALL scale had a very strong and significant effect on the DLSCALE. The model accounted for 88.9% of the variance in DLSCALE ($R = .943$, $R^2 = .889$), thus, indicated very strong and positive predictive power. The beta coefficient for OVERALL ($B = .473$, $\beta = .943$), indicated that every unit increase in OVERALL, resulted in a 0.473 unit increase in DLSCALE. The relationship was highly significant ($T = 62.664$, $p = .000$). Hence, OVERALL was a strong predictor. In conclusion, the model indicated that positive and strong changes in OVERALL affected DLSCALE in a similar manner.

Table 3 Regression Analysis for to find out the effect of WLSCALE to OVERALL scale

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.953 ^a	.909	.909	8.52203

a. Predictors: (Constant), OVERALL

Table 3a

Model		Unstandardized Coefficients	Std. Error	Standardized Coefficients	T	Sig.
		B		Beta		
1	(Constant)	-7.477	1.620		4.615	.000
	OVERALL	.527	.008	.953	69.924	.000

a. Dependent Variable: WLSCALE

Table 3 illustrates that regression analysis reveals a positive, strong and highly significant effect of the OVERALL scale on WLSCALE. The model shows an exceptionally high level of correlation ($R = .953$) and a high level of confidence to explain the variance in WLSCALE ($R^2 = .909$, 90.9%). The coefficient for the OVERALL scale ($B = .527$, $\beta = .953$) shows that for every one unit increase in the OVERALL scale, the WLSCALE increases by .527 units. The coefficient is highly significant ($T = 69.924$, $p = .000$) and supports OVERALL is a powerful determinant of WLSCALE. The model strongly supports improvements in the OVERALL factor of the variables resulted in increased level of the WLSCALE factor.

Table 4 Regression Analysis for to find out the effect of ILSCALE to WLSCALE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.674 ^a	.454	.453	4.76024

a. Predictors: (Constant), WLSCALE

Table 4a

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.947	.810		13.514	.000
	WLSAL E	.154	.008	.674	20.184	.000

a. Dependent Variable: ILSUBSCALE

Table 4 illustrates that regression analysis reveals a positive, moderate and highly significant effect of WLSCALE on ILSCALE. The model illustrates a correlation level of $R = .674$ and is able to explain 45.4% of the variance in ILSCALE ($R^2 = .454$). The regression coefficient ($B = .154$, $\beta = .674$) shows that for each one unit increase in WLSCALE, the ILSCALE increases by 0.154 units. The coefficient is highly significant ($T = 20.184$, $p = .000$) and supports WLSCALE serves as an important factor in determining ILSCALE. The model suggests that an increase in WLSCALE results in an increase in ILSCALE to a moderate level.

Table 5 Regression Analysis for to find out the effect of CLSCALE to WLSCALE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.675 ^a	.456	.454	5.34545

a. Predictors: (Constant), WLSCALE

Table 5a

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.102	.910		10.006	.000
	WLSAL	.173	.009	.675	20.250	.000
	E					

a. Dependent Variable: CLSUBSCALE

Table 5 indicates that WLSALE has a moderately positive and statistically significant impact on CLSCALE. The model fits well with a correlation value of $R = .675$, explaining 45.6% of the variance ($R^2 = .456$), and thus has a reasonable level of confidence in its predictions. The unstandardized coefficient ($B = .173$) states that for every one unit increase in WLSALE, CLSCALE is expected to increase by 0.173 units, and the moderate effect size is confirmed by the standardized Beta (.675). The effect is also statistically significant ($T = 20.250$, $p = .000$). Thus, in terms of the model, an increase in WLSALE is positively associated with CLSCALE.

Table 6 Regression Analysis for to find out the effect of TLSCALE to WLSALE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.764 ^a	.584	.583	9.45910

a. Predictors: (Constant), WLSALE

Table 6a

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.843	1.610		7.357	.000
	WLSALE	.397	.015	.764	26.204	.000

a. Dependent Variable: TLSUBSCALE

Table 6 indicates that WLSALE has a strong positive and statistically significant impact on TLSCALE. The model also has a good fit and explains 58.4% of the variance ($R^2 = .584$) with a correlation value of $R = .764$. The regression coefficient ($B = .397$) states that for every one unit increase in WLSALE, TLSCALE is expected to increase by 0.397 units. The effect size is also confirmed by the standardized Beta (.764), and the WLSALE variable is also a highly significant predictor ($t = 26.204$, $p = .000$). Thus, in the model, an increase in WLSALE is also positively associated with TLSCALE.

Table 7 Regression Analysis for to find out the effect of WLR SCALE to DLSCALE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.784 ^a	.614	.614	8.94675

a. Predictors: (Constant), DLSCALE

Table 7a

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.509	1.724		2.616	.009
	DLSCALE	.441	.016	.784	27.945	.000

a. Dependent Variable: WLSUBSCALE

Table 7 shows a strong, positive, and statistically significant relationship between the two constructs: DLSCALE and WLSUBSCALE. The regression model shows a correlation of $R = .784$. The model also shows 61.4% of the variance in WLSUBSCALE is explained by DLSCALE, demonstrating a strong and positive relationship between the constructs. The coefficient of the model ($B = .441$) shows that a positive change in DLSCALE of 1 unit will lead to a positive change in WLSUBSCALE of .441 unit, all else being equal. The standardized Beta of .784, confirms the strong and positive relationship, and is also in the same direction as the coefficient of the model. The coefficient of the model and the standardized Beta both support the same relationship, which is that an increase in DLSCALE leads to an increase in WLSUBSCALE. The Beta value also shows the strength and positivity of the relationship. The construct, DLSCALE is also highly significant ($T = 27.945$, $p = .000$) in the model.

Table 8 Regression Analysis for to find out the effect of WLTPSCALE to DLSCALE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.634 ^a	.403	.401	6.35091

a. Predictors: (Constant), DLSCALE

Table 8a

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.624	1.224		3.779	.000
	DLSCALE	.204	.011	.634	18.170	.000

a. Dependent Variable: WLTPSUBSCALE

Table 8 shows the regression model also shows a moderate and positive relationship between DLSCALE and WLTPSCALE. The model shows a correlation of $R = .634$. The model also explains 40.3% of the variance in WLTPSCALE. The coefficient of the model ($B = .204$) shows that a positive change in DLSCALE by 1 unit will lead to a positive change in WLTPSCALE by .204 unit, all else being equal. The standardized Beta of the model (.634) supports a moderate and positive relationship, also in the same direction as the coefficient of the model. The WLTPSCALE construct is also highly significant ($T = 18.170$, $p = .000$), thus, showing the relationship between DLSCALE and WLTPSCALE, and that an increase in DLSCALE will also lead to an increase in WLTPSCALE.

Table 9 Regression Analysis for to find out the effect of WLAWSCALE to DLSCALE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.711 ^a	.506	.505	5.96993

a. Predictors: (Constant), DLSCALE

Table 9a

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.049	1.150		-.043	.966
	DLSCAL	.236	.011	.711	22.383	.000
	E					

a. Dependent Variable: WLAWSUBSCALE

Table 9 indicates a positive and strong effect of DLSCALE on WLAWSCALE. A $R = .711$, 50.6% explained variance ($R^2 = .506$), and a substantial effect on WLAWSCALE prediction is apparent. The results further suggest that, on average, a one-unit change in DLSCALE is associated with a 0.236-unit change in WLAWSCALE. The strong and positive effect is further corroborated by the value of the standardized Beta at .711. The coefficient is highly significant ($T = 22.383$, $p = .000$), and the constant is not. As such, there is evidence to support the positive and strong change DLSCALE has on WLAWSCALE.

Discussion

The present study examined the relationship between digital literacy and university students' willingness to adopt artificial intelligence (AI) technologies. The findings indicated a strong positive and statistically significant predictive relationship between digital literacy and the reported willingness-to-adopt measure. This finding suggests that students with higher digital literacy scores tended to report greater willingness to adopt AI technologies. Nevertheless, the interpretation of this result depends on confirming that the dependent variable in the original SPSS output represents the intended overall willingness-to-adopt construct rather than a subscale. The positive relationship observed in this study is consistent with emerging research highlighting the importance of digital competencies in students' engagement with AI. Musyaffi et al. (2024), in an open-access study of students in a developing-country context, found that digital literacy significantly influenced perceived ease of use in AI-supported learning. Their findings suggest that students' existing technological competencies may help them navigate AI applications and perceive them as more manageable. Although perceived ease of use is not identical to willingness to adopt AI, it provides a plausible explanation for why digital literacy may be associated with students' readiness to engage with these technologies. The present findings extend this line of inquiry by indicating a strong statistical relationship between digital literacy and the willingness-related measure examined in the current sample.

An alternative explanation for this correlation is that students who possess higher levels of digital literacy have the ability to interact with more complex digital environments. Students who can

effectively access and analyze information, as well as integrate digital tools to facilitate their academic tasks and endeavors, are able to access and explore various AI tools. This is especially useful when students must construct prompts, evaluate and interpret AI responses, consider the context of AI-generated content, and make a judgment on the appropriateness of generated content for academic integrity. Digital literacy, however, should not be equated to AI literacy. AI literacy is composed of understanding AI's capabilities and limitations, as well as the moral and ethical implications in the use of AI. Because of this, the findings of the study confirmed a considerable correlation, which supported the case for other competencies related to AI to explain the remaining variance in users' willingness to adopt AI in the classroom.

Recent evidence also indicates that willingness to adopt AI is influenced by factors beyond general digital competence. Alshammari et al. (2025), in an open-access study published in *Scientific Reports*, examined AI adoption among undergraduate students and found that AI readiness, interactivity, and ethical awareness significantly predicted students' adoption intentions, whereas trust and performance did not show significant effects in their model. These findings suggest that AI adoption is multidimensional and may depend on students' preparedness to use AI, their experiences of interacting with AI applications, and their awareness of responsible use. In this context, digital literacy may represent an important enabling competency, but it should not be assumed to be the sole determinant of adoption. Future research could examine whether digital literacy predicts willingness to adopt AI after accounting for AI readiness, perceived usefulness, self-efficacy, ethical awareness, and perceived risk. The additional analyses showed positive correlations between digital literacy and the two other related dimensions of reported willingness. The results of the study indicate that positive digital competencies, or digital literacy, were related to reported willingness to utilize AI for academic tasks, as well as other academic activities and situations. It can not be assumed, however, that the reported differences were statistically different unless properly tested. Moreover, the true meaning of the 'teaching-practice' dimension should be defined, as the study participants were university students.

The findings have potential implications for higher education institutions seeking to support responsible AI adoption. Rather than focusing exclusively on introducing AI applications, universities could strengthen students' broader digital competencies and provide opportunities to develop AI-specific skills. These opportunities may include evaluating the accuracy and credibility of AI-generated information, recognising potential biases, protecting personal data, using AI transparently, and applying AI tools in accordance with academic-integrity requirements. The importance of such preparation is also reflected in Alshammari et al. (2025) findings concerning AI readiness and ethical awareness. However, the present study did not evaluate a digital-literacy intervention; consequently, these recommendations represent implications for educational practice rather than demonstrated intervention effects.

There were several limitations in the study that should be taken into account when interpreting the results. First, the correlational survey design means that there are no causal relationships established. Although there was a positive correlation between digital literacy and the outcome variable in the regression model, it doesn't mean that by improving digital literacy of students, they will become more willing to adopt AI. Second, the sample consisted of only one public and one private university of Lahore, which means the findings may not apply to other universities of Pakistan and different educational scenarios. Third, the study relied on self-report measures, and

there may be a large difference between what the participants reported and their real digital skills and the real world use of AI. Furthermore, regression tables should be validated to determine that predictors and outcome variables are defined correctly, and that overall scores are not used to predict subscales that make up the overall scores.

Conclusion

The current research investigated the relation of digital literacy of university students of Pakistan with their acceptance level of Artificial Intelligence (AI) technologies. The result revealed that, digital literacy has a strong, positive and a predictive relationship with the stated willingness of the respondents. Therefore, respondents with relatively higher level of digital literacy were found to be more willing to interact with AI technologies. Positive association has also been found between digital literacy and both academic-work/teaching-practice dimensions. Positive association of digital literacy with accepting the use of AI in education reinforces the importance of digital competencies. The present research has been an attempt to fill the research gap in the area of AI adoption in higher education, by providing evidence from university students of Lahore. Findings of the study recommend universities to take initiatives to develop students' digital literacy, while at the same time prepare students to use AI in an effective, critical, ethical and responsible manner. The focus of the educational initiatives may be on evaluating AI generated information, setting limits to personal data, protecting academic integrity and trust, and reflecting on AI systems and their functions. Such initiatives are likely to help the students to engage intelligently with AI-supported learning and other academic activities. Limitations of the study notwithstanding, the results reveal a predictive relationship between digital literacy and students' readiness to adopt AI. Further research is needed to cover a broader sample of higher education students and investigate other concepts such as AI readiness, AI ethics, and the level of AI literacy and digital literacy held by students. Other kinds of research, e.g. longitudinal and intervention, may help determine whether improvements in digital literacy helped students shift their position regarding the acceptance of AI in teaching and learning. The study helps identify digital literacy as an important element that higher education institutions should take into account in order to understand the AI adoption behavior of their students. It indicates that higher education institutions should take active steps to equip their students to be capable, competent and responsible for the use of AI in their educational activities and practices.

Recommendations

Based on the findings of the study, the following recommendations are proposed to augment university students' willingness to accept AI in Higher Education.

1. Higher education institutions should provide students opportunities to cultivate their digital competencies. These could include: critical evaluation of online information, online digital communication, digital information searching and the use of digital technologies. Engaging students with these competencies, would build confidence to interact with emerging AI technologies.
2. Higher education institutions should embed AI-related activities in their academic programmes to develop students' understanding of the limitations of AI, and how to use AI in an appropriate and responsible manner for academic tasks.
3. University students should be trained in the use of AI in research, academic writing, and learning, and to evaluate the trustworthiness of the information AI generates. Students should

also be made aware of data privacy and transparency, as well as moral and academic obligations.

4. Universities need to create and publicize policies and guidelines regarding the use of AI in academic work. Students should be able to understand the differences between appropriate and inappropriate uses of AI in academic work.
5. It's imperative that students are able to fact check AI generated responses, analyze the accuracy of information, and come to their own conclusions, rather than rely on AI to do the work for them. Programs focusing on digital and AI literacy should consider teaching students how to do the previous steps rather than teaching students how to use technology to do the steps for them.
6. When integrating AI into academic work, universities should analyze the digital access divide to best incorporate AI into academics. Programs should be designed in a manner that allows all students the opportunity to build their digital and AI literacy skills, rather than only allowing students with more means to gain these skills.
7. Future studies should research students attending a broader range of public and private universities, and explore if the digital literacy and AI acceptance divide varies with educational level, educational discipline, or access to technology. Researchers also should consider other elements of AI such as AI Readiness and ethics.

Most importantly, focus should be on responsible AI and building digital and AI literacy skills to prepare for the future. These elements should be the focal point of research rather than assuming that only digital literacy affects willingness to accept AI.

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