



RELATIONSHIP BETWEEN UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT) CONSTRUCTS AND DIGITAL LITERACY AMONG UNIVERSITY STUDENTS

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KEYWORDS	ABSTRACT
UTAUT; digital literacy; performance expectancy; effort expectancy; social influence; facilitating conditions; prospective teachers; higher education	Digital literacy is widely treated as a core competency in higher education, yet little is known about how students' perceptions of technology relate to it. This study examined the relationship between the constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT) and digital literacy among university students enrolled in education programs. A quantitative, correlational design was used. Data were collected from 1,098 undergraduate students (91.5% of 1,200 questionnaires distributed) at three universities in Lahore District, Pakistan, who were selected through purposive and convenience sampling. The instrument had a reliability coefficient of 0.82. Pearson correlation showed a moderate positive relationship between the UTAUT constructs overall and digital literacy ($r = 0.499$, $p < 0.001$). Performance expectancy ($r = 0.403$) and effort expectancy ($r = 0.397$) showed moderate correlations with digital literacy, while social influence ($r = 0.338$) and facilitating conditions ($r = 0.269$) showed weaker ones; all four were statistically significant ($p < 0.001$). Students who perceive digital tools as useful and easy to use therefore tend to report higher digital literacy, and peer support and institutional resources appear to matter somewhat less. Teacher education programs may benefit from combining digital skills training with attention to how students perceive technology. The study has clear limits: it covered three universities in one district, it measured perceived rather than performance-based digital literacy, and its correlational design does not allow causal conclusions.
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Introduction

Digital technologies have changed how people teach, learn, and produce knowledge. Universities worldwide now rely on virtual libraries, online training, digital assessment systems, and collaborative platforms to support instruction, and students no longer simply receive technology; they actively use it to study, communicate, and work together. This has made digital literacy a pressing concern in higher education, where it is widely regarded as a key competency for academic and professional success (Ng, 2012; van Laar et al., 2017; Zhao et al., 2021). Access to technology does not, however, guarantee that it will be used well. Students' perceptions, motivation, and social environment all shape whether and how they adopt digital tools, a process that the Unified Theory of Acceptance and Use of Technology (UTAUT) describes in a systematic way (Venkatesh et al., 2003).

UTAUT draws on earlier technology acceptance models and identifies four core constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. Together, these explain a person's intention to use a technology and their actual use of it. The theory has been applied widely in education, but most studies have asked what predicts the adoption of a particular technology or the intention to keep using it (Dwivedi et al., 2019; Scherer et al., 2019; Xue et al., 2024). Research on digital literacy has largely followed a different path. It has concentrated on skills, problem solving, and responsible use, rather than on the perceptions and circumstances that shape how students engage with digital tools. The present study tries to link these two lines of work by examining how UTAUT constructs relate to digital literacy among university students.

Digital technology can support learning and engagement, but it can also widen existing inequalities. Students with better access and stronger skills are in a better position to benefit from digital resources, while those with less access or skill risk being left behind (Hatlevik & Christophersen, 2013; Hatlevik et al., 2015, 2018).

Digital literacy refers to the ability to use digital technologies and information effectively. It involves more than access: it concerns how people locate, integrate, and critically apply information through digital devices. Gilster (1997) popularized the term, using it for the knowledge and skills needed to find and use information from a range of digital sources for a particular purpose. Traditional literacy centered on reading and writing; in the information age it has widened to include the ability to access, organize, and share information through information and communication technologies (ICT). As more services move online, digital competence is now counted among the essential life skills (Zhao et al., 2021).

The question is especially timely. Over the past decade, higher education has moved steadily toward digitalization, and during the COVID-19 pandemic digital learning became the only practical option for many students. Universities are under growing pressure to prepare graduates with the digital, adaptable, and lifelong learning skills that work and study in a technology-rich world demand. Considerable investment has gone into digital infrastructure, yet gaps in students' digital competence do not appear to have been adequately addressed (Hatlevik et al., 2018).

Understanding what shapes digital literacy is therefore important. UTAUT offers a useful lens for this purpose, because it links students' perceived usefulness of technology (performance expectancy), its perceived ease of use (effort expectancy), the influence of peers and others (social influence), and the support available to them (facilitating conditions) to how they engage with technology (Venkatesh et al., 2003). Evidence of this kind can help institutions plan digital literacy initiatives that students are likely to accept and use, and so increase the educational value of digital technologies.

This research contributes to the literature in three ways. First, it offers recent evidence on how UTAUT constructs relate to digital literacy, a relationship that has received little attention in higher education. Second, it connects technology acceptance theory with digital literacy research, two areas that have largely developed separately. Third, it provides empirical findings that could support more integrated models of digital engagement, in which acceptance, use, and competence are treated as related aspects of students' digital experience.

By placing digital literacy within the UTAUT framework, the study responds to the need for multidimensional approaches to understanding technology use (UNESCO, 2023). It may also serve as a starting point for further research on how students' acceptance of technology relates to the development of digital skills and literacy.

Statement of the Problem

UTAUT was developed by Venkatesh et al. (2003) to explain technology acceptance, and it rests on four core constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. Earlier work suggests that these factors influence whether students take up and keep using digital technologies in learning environments (Venkatesh et al., 2003; Xue et al., 2024). In Pakistan, however, research on the topic appears to have concentrated on the acceptance of specific technologies, such as artificial intelligence tools, massive open online courses (MOOCs), and e-learning platforms, or on general technology adoption. Few studies have asked how the UTAUT constructs relate to students' digital literacy.

Universities expect students to communicate, manage information, learn, and carry out research using digital technologies. Technology has become more firmly embedded in higher education institutions (HEIs) in recent years, partly through initiatives of the Higher Education Commission of Pakistan (HEC, 2025). Even so, many students still lack the digital literacy competencies needed for effective learning and participation, and they make limited use of technology to improve their educational outcomes. Studies in Pakistan have reported uneven digital competence among students, difficulties with technology adoption, and limited institutional technology support in higher education.

A related concern is the employability skills gap. University graduates often complete their degrees without the practical digital skills that employers increasingly expect (van Laar et al., 2020), which can make further training necessary before they enter the workforce. Within UTAUT, strengthening facilitating conditions, such as IT laboratories, software training, and digital learning resources, and raising performance expectancy by showing students how digital tools advance their career

readiness, may encourage the intention to use technology and the habits of use through which these skills are acquired during university study (Xue et al., 2024).

Little empirical work addresses the direct relationship between UTAUT constructs and digital literacy among university students in Pakistan. This leaves a gap in what we know about how students' perceptions of usefulness and ease of use, social influence, and institutional support contribute to the development of their digital literacy. The relationship therefore needs to be examined empirically. The findings could inform institutional strategies for technology integration, help narrow the graduate employability gap, and support digital literacy across Pakistani HEIs.

Significance of the Study

This study aims to bring together technology acceptance theory and digital literacy research, conceptually and empirically. Both fields are concerned with the effective use of technology, yet they have developed along parallel but separate lines. UTAUT-based studies tend to define successful adoption in terms of usage behavior, whereas digital literacy studies focus on capability, critical awareness, and ethical engagement with digital media. This separation limits what we know about how students' perceptions of technology shape not only whether they use digital tools but also how competently and critically they use them (Ng, 2012; van Laar et al., 2017; Zhao et al., 2021).

By examining the link between UTAUT constructs and digital literacy, the study offers a fuller account of students' digital engagement in higher education. It treats digital literacy not only as a technical skill set but also as an outcome shaped by motivational, social, and institutional factors. This is relevant for institutions that want to move beyond simply integrating technology toward becoming digitally mature learning organizations (van Laar et al., 2017).

Objective of the Study:

The objective of the study was to:

Examine the relationship between UTAUT constructs and digital literacy, based on the responses of prospective teachers.

Theoretical Framework

UTAUT was formulated by Venkatesh et al. (2003) by synthesizing eight earlier models of technology acceptance. Its four constructs draw on several of these theories, as summarized in Table 1. Performance expectancy is the degree to which a person believes that using a technology will help them perform better; effort expectancy is the ease associated with using it; social influence is the extent to which important others are perceived to believe one should use it; and facilitating conditions are the perceived organizational and technical support for use (Venkatesh et al., 2003). In the present study, these four constructs are examined in relation to digital literacy.

Conceptual Framework

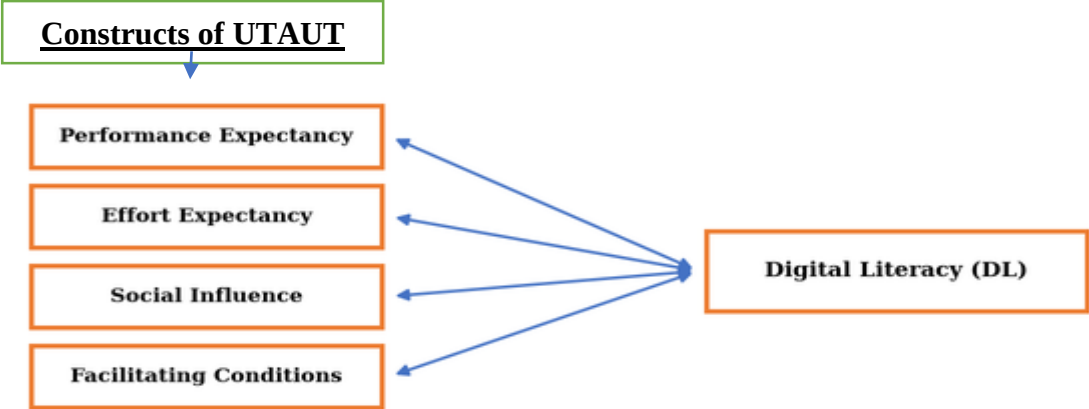


Table 1: *Constructs of UTAUT and the theories from which they derive*

Construct of UTAUT	Theory from which it derives
Performance Expectancy	Technology acceptance model (Davis et al., 1989); Motivational model (Davis et al., 1992); Social cognitive theory (Bandura, 1986)
Effort Expectancy	Technology acceptance model (Davis et al., 1989); Model of PC utilization (Thompson et al., 1991)
Social Influence	Theory of reasoned action (Fishbein & Ajzen, 1975); Theory of planned behavior (Ajzen, 1991)
Facilitating Conditions	Theory of planned behavior (Ajzen, 1991); Model of PC utilization (Thompson et al., 1991)

Methodology

This study used a quantitative, correlational design within a positivist paradigm to examine the relationship between UTAUT constructs and digital literacy. The target population was undergraduate students in education programs at three universities in Lahore District. A multi-stage non-probability sampling approach was used: the universities were selected purposively, and participants (prospective teachers) were then recruited through convenience sampling of undergraduate students enrolled in education programs. Of 1,200 questionnaires distributed, 1,098 were retrieved and analyzed, a response rate of 91.5%. Because the sample was not probability-based, the findings describe these participants and should not be generalized beyond them without caution.

Research Instrument

Data were collected with a structured questionnaire containing items on digital literacy and on the four UTAUT constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions). The UTAUT items were adapted from Venkatesh et al. (2003). All items were rated on a five-point Likert scale ranging from strongly disagree (SD) to strongly agree (SA). The instrument had an overall reliability coefficient of 0.82

Ethical Considerations

The participants were briefed about the objective of the study, and their information would be confidential and used only for research. In addition, participants were told they could opt out and drop out of this study. The questionnaires were taken with their consent.

Data Analysis

Data were analyzed using SPSS (Statistical Package for the Social Sciences) version 15.0. Descriptive statistics (frequencies and percentages, calculated from the valid responses to each item) were used to summarize responses. Pearson's correlation was used to test the relationship between each UTAUT construct and digital literacy, and between the UTAUT constructs overall and digital literacy.

Descriptive Analysis:

Table 2 presents the frequency and percentage of students' responses to each item, using the categories strongly agree (SA), agree (A), neutral (N), disagree (D), and strongly disagree (SD).

Table 2: Frequency and percentage of students' responses to the digital literacy and UTAUT items

Digital literacy and UTAUT items	SD	D	N	A	SA
Questionnaire item	f(%age)	f(%age)	f(%age)	f(%age)	f(%age)
I enjoy using digital devices.	81 7.3%	94 8.4%	270 24.2%	305 27.4%	340 30.5%
I feel comfortable using digital devices.	84 7.5%	134 12.0%	195 17.5%	302 27.1%	383 34.3%
I am aware of various types of digital devices.	42 3.8%	127 11.4%	258 23.1%	354 31.7%	317 28.4%
I understand what digital literacy is.	49 4.4%	185 16.6%	321 28.8%	250 22.4%	293 26.3%
I am willing to learn more about digital technologies	116 10.4%	221 19.8%	219 19.6%	289 25.9%	253 22.7%
I feel threatened when others talk about digital technologies	43 3.9%	246 22.1%	224 20.1%	276 24.8%	309 27.7%
I feel that i am behind my fellow students in using digital technologies	52 4.7%	143 12.8%	229 20.5%	329 29.5%	345 30.9%
I think that it is important for me to improve my digital fluency.	55 4.9%	132 11.8%	150 13.5%	393 35.2%	368 33.0%

I think that my learning can be enhanced by using digital tools and resources.	55 4.9%	132 11.8%	150 13.5%	393 35.2%	368 33.0%
I think that training in technology enhanced language learning should be included in language learning program.	71 6.4%	109 9.8%	178 16.0%	338 30.3%	402 36.1%
I understand the basic functions of computer hardware components.	88 7.9%	157 14.1%	230 20.6%	335 30.0%	288 25.8%
I have a personal homepage or a personal portfolio on the web.	89 8.0%	116 10.4%	250 22.4%	351 31.5%	292 26.2%
I use keyboard shortcuts	40 3.6%	171 15.3%	266 23.9%	309 27.7%	312 28.0%
I use the computer for learning purposes.	36 3.2%	82 7.4%	210 18.8%	423 37.9%	347 31.1%

Digital Literacy	SD	D	N	A	SA
Questionnaire items	f(%age)	f(%age)	f(%age)	f(%age)	f(%age)
I find it easy to learn something by watching it on the computer screen.	50 4.5%	126 11.3%	187 16.8%	399 35.8%	336 30.1%
I use social networking services.	28 2.5%	167 15.0%	228 20.45%	327 29.3%	345 30.9%
I feel competent in using digital learning resources.	65 5.8%	234 21.0%	232 20.8%	297 26.6%	267 23.9%
I have mobile apps you use for language learning purposes.	9 8%	189 17.0%	308 27.6%	289 25.9%	301 27.0%
I can change computer screen brightness and contrast.	38 3.4%	150 13.5%	236 21.2%	307 27.9%	367 32.9%
I can minimize, maximize and move window on the computer screen.	36 3.2%	94 8.4%	219 19.6%	380 34.1%	369 33.1%
I use a search command to locate a file.	63 5.7%	134 12.0%	193 17.3%	392 35.2%	316 28.3%
I can scan disks for virus	52 4.7%	141 12.6%	234 21.0%	314 28.2%	357 32.0%
I can write files onto a CD,a DVD or a USB drive	70 6.3%	187 16.85%	228 20.4%	307 27.5%	306 27.4%
I can create and update web pages.	59 5.3%	183 16.4%	227 20.4%	299 26.8%	330 29.6%
I can take and edit digital photos.	46 4.1%	164 14.7%	227 20.4%	377 33.8%	284 25.5%
I can record and edit digital sounds.	55 4.9%	121 10.9%	250 22.4%	420 37.7%	252 22.6%
I can record and edit digital videos	79 7.1%	129 11.6%	251 22.5%	399 35.8%	240 21.5%
I can download and use apps on digital devices.	73 6.5%	170 15.2%	203 18.2%	371 33.3%	281 25.2%
I would find the system useful in my job.	87 7.8%	139 12.5%	232 20.8%	341 30.6%	299 26.8%

Using the system enables me to accomplish tasks more quickly.	58 5.2%	146 13.1%	270 24.2%	345 30.9%	279 25.0%
Using the system increases my productivity.	46 4.1%	137 12.3%	283 25.4%	412 37.0%	220 19.7%
If i use the system I will increase my chance of getting a raise.	54 4.8%	162 14.5%	222 19.9%	388 34.8%	272 24.4%
My interaction with the system would be clear and understandable.	32 2.9%	79 7.1%	250 22.4%	420 37.7%	317 28.4%
It would be easy for me to become skillful at using the system.	51 4.6%	85 7.6%	200 17.9%	389 34.9%	373 33.5%
I would find the system easy to use.	65 5.8%	126 11.3%	182 16.3%	360 32.3%	365 32.7%
Learning to operate the system is easy for me	62 5.6%	122 10.9%	276 24.8%	309 27.7%	329 29.5%
People who influence my behavior think that I should use the system.	63 5.7%	117 10.5%	282 25.3%	329 29.5%	307 27.5%
People who are important to me think that I should use the system.	43 3.9%	131 11.7%	256 23.0%	425 38.1%	243 21.8%
The senior management of this bussiness has helped use the system.	91 8.2%	142 12.7%	217 19.5%	397 35.6%	251 22.5%
In general the organisation has supported the use of the system.	47 4.2%	151 13.5%	253 22.7%	334 30.0%	313 28.1%
I have the resources necessary to use the system.	74 6.6%	192 17.2%	268 24.0%	280 25.1%	281 25.2%
The system is compatible with other working system.	56 5.0%	141 12.6%	254 22.8%	364 32.6%	282 25.3%
A specific person or group is available for assistance with system difficulty.	19 1.7%	111 10.0%	309 27.7%	383 34.3%	274 24.6%

Inferential Analysis

Pearson correlation was used to examine the relationship between each UTAUT construct and digital literacy, and then between the UTAUT constructs overall and digital literacy. Each hypothesis is tested in turn below.

Table 3

H01: There is no significant relationship between performance expectancy and digital literacy among university students.

Correlation between performance expectancy and digital literacy

Variables	N	r	Sig. (2-tailed)
Performance Expectancy and Digital Literacy	1098	0.403	<0.001

Table 3 shows the Pearson correlation between performance expectancy and digital literacy among university students. The correlation was positive, moderate, and statistically significant ($r = 0.403$, $p < 0.001$); the null hypothesis (H01) is therefore rejected.

Table 4

H02: There is no significant relationship between effort expectancy, the second construct of UTAUT, and digital literacy.

Correlation between effort expectancy and digital literacy

Variables	N	r	Sig. (2-tailed)
Effort Expectancy and Digital Literacy	1098	0.397	<0.001

The Pearson correlation between effort expectancy and digital literacy was positive, moderate, and statistically significant ($r = 0.397$, $p < 0.001$, $N = 1098$). The null hypothesis (H02) is therefore rejected.

Table 5

H03: There is no significant relationship between social influence, the third construct of UTAUT, and digital literacy among prospective teachers.

Correlation between social influence and digital literacy among prospective teachers at university level

Variables	N	r	Sig. (2-tailed)
Social Influence and Digital Literacy	1098	0.338	<0.001

Table 5 presents the relationship between social influence and digital literacy. The correlation was positive, weak to moderate, and statistically significant ($r = 0.338$, $p < 0.001$); the null hypothesis (H03) is therefore rejected.

Table 6

H04: There is no significant relationship between facilitating conditions, the fourth construct of UTAUT, and digital literacy.

Correlation between facilitating conditions and digital literacy among prospective teachers

Variables	N	r	Sig. (2-tailed)
Facilitating Conditions and Digital Literacy	1098	0.269	<0.001

Table 6 presents the Pearson correlation between facilitating conditions and digital literacy. The relationship was positive, weak, and statistically significant ($r = 0.269, p < 0.001$); the null hypothesis (H04) is therefore rejected.

Table 7

H05: There is no significant relationship between the UTAUT constructs, taken together, and digital literacy among prospective teachers.

Correlation between the UTAUT constructs and digital literacy among prospective teachers

Variables	N	r	Sig. (2-tailed)
Digital Literacy and Constructs of UTAUT	1098	0.499	<0.001

Table 7 shows a statistically significant, moderate, positive relationship between the UTAUT constructs overall and digital literacy ($r = 0.499, p < 0.001; N = 1098$). The null hypothesis (H05) is therefore rejected.

Discussion

The findings show that students' perceptions of technology, as captured by the UTAUT constructs, are positively associated with their digital literacy. The overall relationship was moderate ($r = 0.499$), and each of the four constructs was also individually and significantly correlated with digital literacy. This pattern fits the logic of UTAUT (Venkatesh et al., 2003), in which performance expectancy, effort expectancy, social influence, and facilitating conditions shape how people accept and use technology, and it is consistent with earlier applications of the theory in education (Dwivedi et al., 2019; Xue et al., 2024). UTAUT was developed to explain intention and use rather than literacy, however, so these results support the relevance of its constructs to digital literacy without testing the model itself.

Performance expectancy ($r = 0.403$) and effort expectancy ($r = 0.397$) showed the strongest correlations with digital literacy. Students who see digital tools as useful and easy to use also tended to report higher digital literacy. This agrees with earlier work showing that perceived usefulness and ease of use influence learners' willingness to use digital technology, and with higher education studies that link these perceptions to students' digital competence and engagement in technology-enhanced learning (Dwivedi et al., 2019; Xue et al., 2024). Research has also documented differences in digital competence among students that can affect their learning experiences (Hatlevik et al., 2015, 2018). The present results are compatible with such differences but cannot reveal their source. Because the four correlations were not compared statistically, the slightly higher values for performance and effort expectancy should be read as a tendency, not a confirmed difference.

Social influence ($r = 0.338$) and facilitating conditions ($r = 0.269$) correlated more weakly with digital literacy but remained significant, which suggests that peer support, institutional resources, and the wider learning environment still matter for its development. Teacher education programs

should therefore attend both to students' digital skills and to the perceptions they hold about technology, and should strengthen the support systems that help future teachers engage confidently with technology-enhanced learning environments.

Several limitations should be kept in mind. The study was conducted in three universities in Lahore District, and participants were selected by non-probability methods, so the findings cannot be generalized to all university students in Pakistan or elsewhere. Digital literacy was measured through self-reported perceptions rather than performance-based tasks, and students may over- or underestimate their skills. The correlational design shows association, not causation: students who are more digitally literate may also hold more favorable views of technology, and the reverse may be true. Future studies could use probability samples, performance-based measures of digital literacy, and longitudinal or multivariate designs, such as regression or structural equation modeling, to examine how the UTAUT constructs jointly relate to digital literacy over time.

Conclusion

This study examined the relationship between UTAUT constructs and digital literacy among prospective teachers at university level. A moderate, positive, and statistically significant relationship was found between the UTAUT constructs overall and digital literacy ($r = 0.499$, $p < 0.001$). Performance expectancy and effort expectancy showed the strongest individual correlations, which suggests that perceived usefulness and ease of use of technology go together with higher digital literacy.

Social influence and facilitating conditions were also positively correlated with digital literacy, although less strongly, indicating that peer support, institutional resources, and technological infrastructure remain relevant to students' digital literacy.

Overall, the findings point to a meaningful association between technology acceptance and digital literacy. Teacher education programs may therefore benefit from strengthening digital literacy programs, improving technological infrastructure, and embedding digital skills training in their curricula, so that future teachers are better prepared for digital learning environments in higher education. Because the design was correlational and the sample was limited to three universities, these implications should be tested in further research.

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