

Effect of technology proficiency on the employability skills of final-year undergraduates

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Abstract

The employability rate is significantly dropping in developing countries like Pakistan due to various reasons including lack of technology training in educational settings. Technology-driven workplaces reported that recent graduates lacked employability skills and were unable to adopt the latest technological skills required in the digital job market. The aim of this study was to measure the effect of digital proficiency on employability skills of final-year undergraduates in public educational institutes of Lahore using the Technology Acceptance Model (TAM). This quantitative study used multistage random sampling to collect data from 560 undergraduates studying in four public universities of Lahore. The data were collected through reliable questionnaires i.e. Technology Proficiency Self-Assessment Questionnaire (TPSA-C-21) ($\alpha=.84$), and Basic Employability Skills questionnaire ($\alpha=.85$). The study found positive and moderate relationship between digital proficiency and market employability ($r=.65$). The results based on regression analysis indicated that technology proficiency explained 44% of the change in employability skills. In general, this study contributes to understanding how technology proficiency influences respective areas of employability skills differently. The recommendations of the study have also been given.

Keywords: Technology Proficiency, Employability Skills, Social Constructivism, Technology Acceptance

Introduction

The Economic Survey of Pakistan (2024-2025) expected that the overall enrollment of students in the higher education sector would increase by 0.8% in 2025, but the actual figures showed that it had declined by 16% as compared to the previous year. Although Pakistan's literacy rate remains steady at around 60%, it does not show the readiness of undergraduates to enter the job market in the 21st century. Instead, it indicates a serious problem of advanced skills mismatch in the job market and in educational institutions. Therefore, the purpose of this study is to investigate the association between technology proficiency and employability skills of undergraduates to address the substantial issue of unemployment among youth and women in Pakistan using Technology Acceptance Model and Vygotskys' Social Constructivism Theory.

Asif et al. (2023) argued that the lack of innovative skills in the rapidly evolving era can have negative impacts on the economy, leading to the rapidly declining employment rate. The disconnect between theory and the technology demands in the workplace is one of the major determinants of youth unemployment in Pakistan. As a result, according to Amin (2025), the Finance Budget (2025-2026) highlighted an anomaly in Pakistan's economy due to a sudden decline in the employment rate. Moreover, recent studies indicate that the lack of digital proficiency required by the modern job market mainly causes unemployment in developing countries, because graduates are incapable of locating jobs in the local as well as in the international job market due to inadequate training in technology proficiency (Tee et al., 2024; Ndibalema, 2025).

Literature Review

According to Unwin (2017), while students are hopeful about the prospects of information, communication and technologies (ICTs) in the classroom, as most of them acknowledge the crucial role of technology proficiency in their job readiness and have access to internet services and necessary computer equipment, but they are most likely to be dissatisfied with its availability and digital training opportunities (Mumtaz et al., 2023). Hence, students in developing countries often graduate with an intermediate level of technological competencies and prefer to use their digital skills for entertainment and socialization by limiting their demand in the workplace, which now focuses on technology-proficient employees. This study critically examines how technology proficiency impacts university students' employability skills in Pakistan, exploring this relationship in the wider perspective of the higher education framework and current job market trends.

Research Questions

1. What do final-year undergraduates perceive about their technology proficiency?
2. To what extent do final-year undergraduates demonstrate employability skills?
3. Is there significant relationship between technology proficiency and the employability skills of final-year undergraduates?
4. To what extent does technology proficiency predict the employability skills of final-year undergraduates?

Employability Skills

Employment of students has become a critical concern in the worldwide economy, as students need to demonstrate a suitable set of employability skills to enter the modern workplace, but improving the employability skills of early undergraduates is a challenge (Awadhiya, 2025). At the same time, it has been observed that the impression of employability skills has transformed over the years, having different perceptions for students, educational institutes, and employers in every timeline. Previously, these were perceived as effective communication, soft skills, technical skills, analytical skills, and problem-solving skills by students and employers (Nadarajah, 2021). However, the general understanding of employability involves three categories of skills such as (a) interpersonal skills, (b) intrapersonal skills, and (c) technological or information, communication, and technology (ICT). These are essential for enhancing the abilities of students' employment in response to the advanced requirements of the job market (Humburg & Velden, 2017). Soproni (2023) argued that this transferable nature is relevant to the digital age and can stimulate employability skills among undergraduate students.

Currently, employability skills are viewed as an interdisciplinary concept in HEIs that include various unexplored elements, such as work ethics, systems thinking skills, and information technology skills (Miller & Konstantinou, 2021). Furthermore, most companies in Pakistan are looking for employees who can adapt to new technologies and improve their professional performance at the workplace (Soproni, 2023). Nadeem et al. (2023) argued that employers are dissatisfied with the inability of graduates to keep up with the latest information.

This argument is consistent with recent research conducted in the United Kingdom because final-year students also claim that they are not ready to adapt to the digital workplace due to constant technological changes. They also raise the issue of the inadequacy of educators and their inability to offer technology training in the classroom. As a result, this hinders the development of their existing employability skills (Louw et al., 2024). Therefore, many argue that universities often fail to adequately prepare students for their careers, leaving them confused after graduation. For instance, higher education institutions often cannot train teachers to equip graduates with the necessary skills to meet the unpredictable demands of the job market (Cheng et al., 2021).

Technology Proficiency

The rapid expansion and evolution of the job market cause HEIs to adopt the latest methods in the classroom by using integrated applications and emerging technologies (John, 2025). Therefore, technology proficiency is regarded as a vital foundation in developing employability skills (Lucas et al., 2022). Technology proficiency is an evolving construct similar to employability skills, as both are constantly changing in response to technological advancements in the workplace and education sectors. A study by Ogundipe and Oyewole (2025) confirms that being proficient in technology goes beyond effectively using digital tools and it now involves applying advanced technological skills and responsibly using computer applications. Furthermore, the development of digital technologies has significantly altered the current educational framework by offering a wide range of opportunities as well as challenges for both students and educators (Gelera et al., 2024).

Teachers' technology proficiency was mostly assessed for quality teaching and learning in ICT-integrated classrooms, without demonstrating significant employability outcomes for university graduates (Gangmei & Thomas, 2025). Thus, several studies suggest that measuring students' technology proficiency is essential to better understand the pedagogical needs of technology integration and adaptability in the tech-driven workplace. For example, with the emphasis on learning digital technologies and the increasing demands of the modern job market, HEIs are actively preparing their students for their professional careers. Consequently, an effective tool to measure their technology proficiency can be very beneficial, but such an instrument has not yet been developed (Lucas et al., 2022). However, a recent study by Mariño et al. (2024) demonstrates that the technology proficiency can be effectively measured using the adaptive assessment tool called the Technology Proficiency Self-Assessment Questionnaire for 21st Century Learning (TPSA-C-21), which was originally designed to assess teachers' technology proficiency skills (Christensen & Knezek, 2016). As such, measuring students' technology proficiency can be beneficial for improving their academic achievement and can also help them be successful in the technology-driven work world (Chaw & Tang, 2023; Lucas et al., 2022).

Furthermore, to measure the level of technology proficiency, indicators like the use of integrated applications, interactive tools, and learning with emerging technologies such as LMS, MOOCs, and MOODLE have recently gained popularity in modern educational settings (Nikou & Aavakare, 2021). A similar study indicates that assessing students' academic and professional needs requires the use of integrated technologies in the classroom (Hu et al., 2021). Additionally, having a strong technology background involves a deep understanding of the World Wide Web to navigate and find reliable and authentic sources for professional and educational purposes, and it

has a significant impact on seeking a suitable job as a work search guide (He, 2024; Klein et al., 2001; Nguyen et al., 2022).

Despite the rise of modern communication tools, email remains a dominant medium due to its functionality and widespread use in professional as well as personal settings (Bouvier et al., 2024). Moreover, students who utilize emerging technology platforms can enhance their future learning capabilities and implement their knowledge in career development opportunities (Javed et al., 2022). For this reason, developing skills in emerging technologies is very crucial, and students can acquire skills using emerging technologies to succeed in the digital age workplace and strengthen their 21st-century skills (Saiedi et al., 2020). Therefore, these indicators create a systematic guideline to measure the technology proficiency of undergraduates while considering their educational performance and career prospects.

The effectiveness of these indicators in real life is, however, affected by various factors in the HEIs of Pakistan, such as a lack of digital resources, digital illiteracy among students, and the inability of educators to teach the latest technological skills, hinder the ability of students to adapt accordingly, leading to a digital divide among them (Barra et al., 2024; Pumptow & Brahm, 2023). In this way, these indicators can be used as a starting point in terms of evaluating the technology proficiency of students. However, these limitations highlight the need for a more flexible and context-based strategy to address the multidimensional nature of technology proficiency in the HEIs (Feng et al., 2025).

Relationship Between Technology Proficiency and Employability Skills

Employability skills are a combination of soft and technical skills that include a broad spectrum of 8 aptitudes like basic literacy and numeracy skills, critical thinking skills, leadership skills, management skills, information technology skills, interpersonal skills, system thinking skills, and work ethics (Humburg & Velden, 2017). Similarly, technology proficiency consists of competencies like the effective use of email, navigate and locate information using the World Wide Web, integrated applications, interaction with emerging technologies, and advanced skill learning with evolving digital tools (Christensen & Knezek, 2016). Convincing evidence has been found that shows a significant positive link between technology proficiency and employment abilities of university students.

Peng and Deng (2022) argued that technological skills are required to effectively train computer science, thinking skills, and interpersonal skills. On the other hand, students who have limited digital skills struggle to secure a job, and this highlights the emerging need to match technological competencies with the current demands of employers (Tee et al., 2024). Although a recent study by Pedregosa et al. (2025) suggests that technology proficiency is a crucial component but it showed a moderate effect on employability skills. This suggests that higher education institutes need to focus on the development of digital literacy among students with the help of modern interventions and relevant training (Khan et al., 2022). A study conducted by Tushar and Sooraksa (2023) also agrees with the narrative that technology proficiency is an integral part of the modern job market and is useful in improving basic employability skills which include critical thinking and leadership skills.

However, there are some studies that highlight inconsistencies and report that graduate students who have high levels of technological skills often fail to develop critical thinking skills,

effective communication, and teamwork skills that are required for the digital job market (Mohammed & Ozdamli, 2024; Tee et al., 2024). Lucas et al. (2022) also report a difference between actual and perceived technological skills of undergraduates. The findings show that those students who consider themselves highly trained in technology often fail in critical thinking skills tasks that are essential to get employed. This makes the students feel unprepared for the technology-oriented job market due to several reasons, such as a lack of practical exposure, real-world experience, and an outdated curriculum, and this hinders the development of their management and information technology skills (Jha, 2025). This exception indicates that although technology proficiency is an important component, the dynamic nature of employability skills requires a holistic approach to get favorable results. Therefore, it is essential to study the effect of digital proficiency on employability skills with all of its factors in order to enhance the overall employability of students.

Theoretical Framework

The primary foundation of this study was based on the Social Constructivism Theory in order to understand the development of technology proficiency and its effect on the employability skills of undergraduates. Vygotsky (1978) argues that active learning is a social phenomenon which is constructed through collaborative efforts and results in new knowledge. This connection between new knowledge and already existing cognitive knowledge helps in the development of new skills and adaptation in a rapidly changing society. Therefore, this approach took a critical look at the multifaceted construct of technology proficiency, which showed that it involves context-relevant learning. It can be achieved by creative collaborative engagement and using interactive tools in the classrooms (Rigopouli et al., 2025). A study by Hariyati et al. (2025) suggested the narrative that the constructivism approach is mostly associated with technology proficiency and is an important factor in social collaboration, critical thinking, and active participation. These elements are also essential for employability in the 21st-century job market. Moreover, it is beneficial to analyze technology proficiency from the social constructivism viewpoint because it helps students to improve their digital skills through new inquiry tools, virtual collaboration, interactive platforms, and a relevant guide provided by the teacher. As a result, it eventually enhances the problem-solving and critical thinking of students (Suryakant, 2025). Another point highlighted in this theory was that implementation of new knowledge in real-life situations helps in bridging the gap between trained workers and the online workplace (Singh et al., 2022).

However, there were few studies that highlighted differences and claimed that some students like to learn independently with flexible schedules and limited interaction. This gap explained the different results in learning and engagement productivity. It was also stated that these students showed poor outcomes in the development of technical and social skills. In conclusion, not every student gets similar benefits from the same social approach (Noguera Fructuoso et al., 2022; Virtanen & Tynjälä, 2021). The cross-cultural study by Mohammed and Kinyo (2022) also pointed out inconsistencies in this practice and suggested that collaborative learning and performance of students depend on the cultural background, classroom environment, and previous experiences.

Thus, the Technology Acceptance Model (TAM) was included in order to address these irregularities. This theoretical model has proven to be consistent with the social constructivism approach. Davis (1989) argued that this model explains the use of technology based on “perceived usefulness” and “perceived ease of use” without any social or cultural context. He also stated that this model can be used to understand different motivation levels, attitudes, and intentions of users in using digital technologies. According to Alshammari and Alkhwalidi (2025), educational and emotional support in a social environment has a positive effect on the perceived usefulness and ease of learning the recent digital technologies. Therefore, this model is useful to explain the attitudes of users towards accepting different online systems and their willingness to adopt evolving technologies (Mustafa & Garcia, 2021). This point was further clarified by a recent study that explained how this combination helps to define the personal choices to use and apply smart technologies in group settings (Gerli et al., 2022). Taylor (2018) connected this technology acceptance model to employability skills of students from a social point of view. The students usually believe that technology proficiency is one of the ways to enhance their employability skills. based on their attitudes and social learning environment.

Conceptual Framework

This conceptual framework is used to address the direct impact of technology proficiency on the employability competencies of undergraduates in Pakistani higher education institutes. It is supported by the Social Constructivism Theory by Vygotsky (1978) that suggests social collaboration for learning of new knowledge, and the Technology Acceptance Model (TAM) that focuses on the perceptual and psychological factors in order to pre-determine the use of smart technology among users (Mustafa & Garcia, 2021). The combination of these theories helps to understand the development of technology proficiency and then study its direct influence on the employability skills of higher education students. The constructivism theory acts as a mediating tool to build new knowledge in a social context. It further claims that students acquire and develop new technology skills in social gatherings in the presence of a mentor and an advanced digital setting in order to help them refine their technical and cognitive abilities. Hence, TAM reinforces this theory to better understand the development of technology proficiency by examining students’ “perceived usefulness” and “ease of use”, which further argues about their motivation to adopt and utilize new technological concepts responsibly. Therefore, these theories collectively provide a social and individual context of technology proficiency in educational settings.

Technology Proficiency as an independent variable is defined through six main indicators adapted from the TPSA C-21 instrument for students in this causal study (Merino et al., 2024). The dependent variable “Employability Skills” is measured in eight key domains, which are classified into four categories such as social, intrapersonal, technological, and professional competencies. These factors emerged from the works of Humburg and Velden (2017) and Miller and Konstantinou (2021). In conclusion, the clear conceptual and empirical framework of the study gives a direct pathway to study technology proficiency and its impacts on employability skills without any intervening variables.

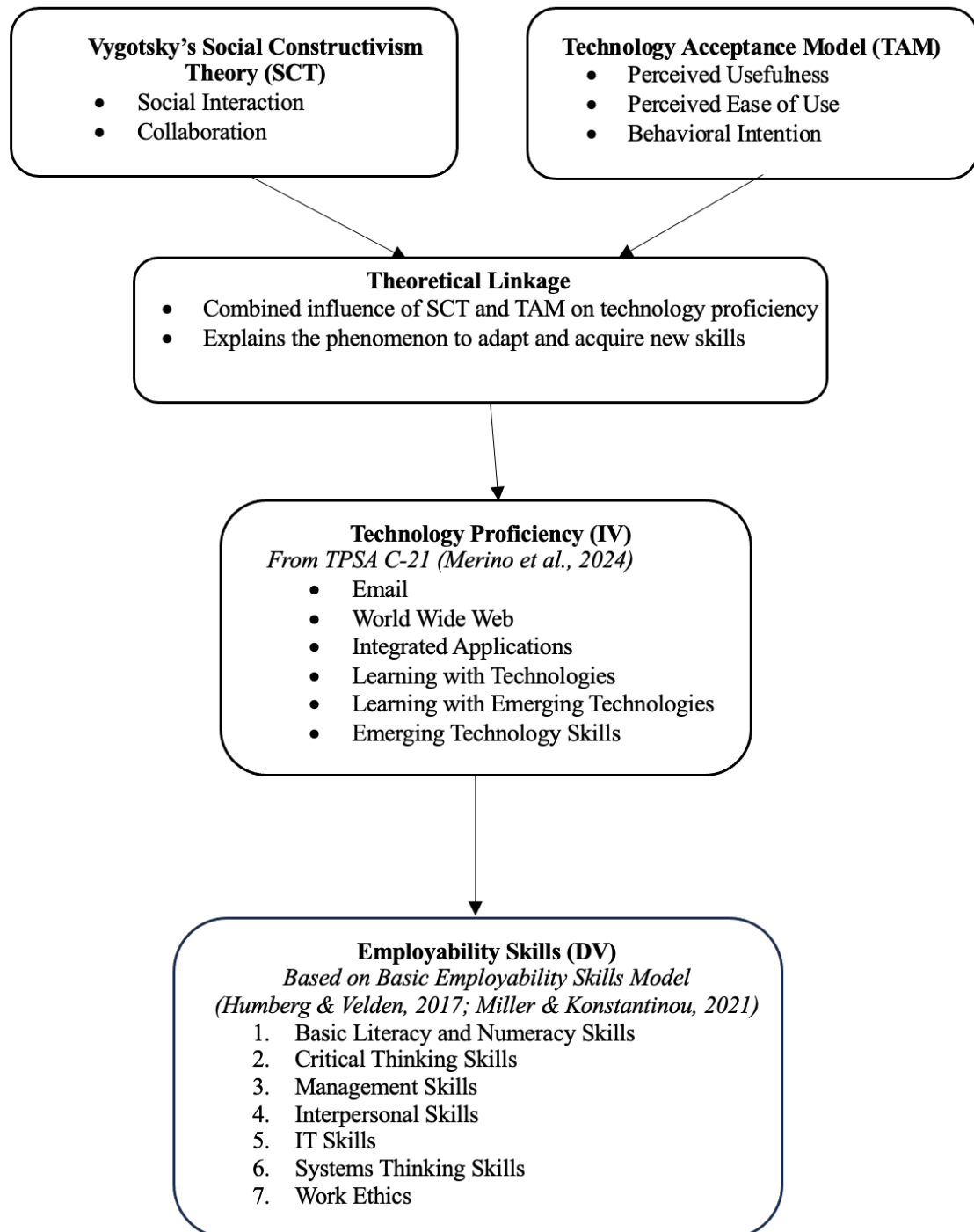


Figure 1 Conceptual framework: To investigate the effect of digital proficiency on employability skills

Note. The framework is adapted from the Social Constructivism Theory (Vygotsky, 1978) and the Technology Acceptance Model (Davis, 1989; Mustafa & Garcia, 2021).

Materials and Methods

The study is grounded in the Positivism approach, because it is related to the empirical observations to discover relationships between different variables being studied (Michell, 2003). In order to ensure the objective and empirical nature of the study, a quantitative method was used to collect, analyze, and interpret data numerically (Mohajan, 2020). Then, a correlational survey design was implemented to explore how the independent variable causes changes in the dependent variables in a systematic way. The respondents of the study were 560 final-year undergraduates from 4 public universities in Lahore selected randomly through multistage random sampling.

Table 1 Multistage Random Sampling of Public Universities in Lahore (N= 560).

Stage	LCWU (7)	GCU (5)	PU (23)	EU (5)
Stage 1	Faculty of Arts and Social Sciences	Faculty of Languages	Faculty of Life Sciences	Faculty of Education
Stage 2	Department of Economics and Department of Philosophy	Department of English Literature and Department of Linguistics and Language Studies	Department of Botany and School of Biochemistry and Biotechnology	Department of STEM Education and Department of Educational Leadership and Policy Studies
Stage 3	140 undergrads	140 undergrads	140 undergrads	140 undergrads
Total Sample				560

Note. LCWU = Lahore College for Women University; GCU = Government College University; PU = University of the Punjab; EU = University of Education.

The respondents of the study were final-year undergraduates. The target population was 560 students from 4 public universities, such as the University of the Punjab Lahore (PU), Government College University Lahore GCU), Lahore College for Women University LCWU), and University of Education Lahore (EU). In order to minimize the selection bias, a multistage random sampling technique was used. At the cluster stage, 4 universities out of 17 public universities in Lahore were randomly selected. At the second stage, one faculty and 2 departments were drawn randomly from each selected university, resulting in 8 departments in total. The final stage included the random selection of 140 final-year students from each selected department which resulted in the sample size of 560 respondents. The sample size was determined with the use of G*Power for a multiple linear regression including six predictors. As the medium effect size ($f^2 = .15$), a significance level of $\alpha = .05$, and power = .95 calculated the minimum required sample size to be 146 respondents. The final sample size of 560 participants is far higher than the required minimum. Therefore, the sample size is considered acceptable and provides adequate statistical power for reliable and stable parameter estimation.

Collection of Data

Data was collected through two well-structured adapted questionnaires. First, the Technology Proficiency Self-Assessment (TPSA C21) developed by Merino et al. (2024) was adapted. It was initially developed by Christensen and Knezek (2016) to assess the technology proficiency of teachers in a classroom setting and later modified by Fidan et al. (2020) in Turkish language. Therefore, updated version of the tool is relevant to use in formal academic settings to evaluate the technology proficiency of students. This adapted questionnaire comprised 34 items with six domains i.e., (1) E-mail, (2) WWW, (3) Integrated Applications, (4) Learning with Technologies, (5) Learning with Emerging Technologies, and (6) Emerging Technology Skills. The survey instrument was completed by 560 respondents. The reliability of the questionnaire was calculated which ranged from .79 (Emerging Technologies Skills) to .82 (Learning with Emerging Technologies) with overall reliability as .84.

The second tool was adapted from the Basic Employability Skills Model designed by Humburg and Velden (2017) and Miller and Konstantinou (2021). This questionnaire consisted of 47 items with 8 sub-dimensions in order to measure the employability skills of final-year undergraduates. The responses were measured with a Likert Scale. The reliability for the scale of Employability scale ranged from .78 (Interpersonal Skills) to .84 (Basic Literacy and Numeracy Skills), with overall reliability of .85. As both of the instrument tools were originally designed and validated for a different set of population, their construct and content validity were re-developed according to the present sample. For content validity, a panel of three subject experts from educational assessment and technology fields evaluated each item's relevance and clarity. After the revision of wording, the item-level content validity index $> .80$ was sustained for all items which showed that the items were suitable for the undergraduate respondents. Construct validity was determined with the help of exploratory factor analysis. It confirmed the TPSA-C-21 model's six factor structure and the employability model's eight factor structure with all items loading $> .40$ on their respective factors and Kaiser-Meyer-Olkin values were higher than .80.

The responses were measured with a Likert Scale consisting of 5 points which ranged from "Strongly Disagree", "Disagree", "Neutral", "Agree", to "Strongly Agree". These personal surveys were shared directly with the respondents. Prior to data collection, a pilot study was conducted on 50 undergraduates studying at the University of the Punjab, Lahore. The pilot test showed acceptable reliability, and it was not included in the final sample of the study. Thus, the survey instrument fulfilled the requirements to apply to a larger population by ensuring its accuracy.

Ethical Considerations

The Institutional Review Board of the Institute of Education and Research, University of the Punjab, issued the ethical approval of the study. The purpose of the study was revealed to the participants and a written informed consent was signed by every participant. Participants were informed of the voluntary nature of the participation and the right to withdraw at any stage. No personal information was recorded from the participants. All the responses were kept confidential and used solely for research purposes.

Materials and Methods

SPSS was used to run data in a three-step analytical arrangement. In the first step, Cronbach's Alpha was used to ensure the reliability of the variables. After assessing the level of each variable through descriptive statistics (Mean and Standard Deviation), the Pearson-r technique was adopted to evaluate the correlation between the variables, in the second step. Lastly, to measure the significant influence of technology proficiency on the employability skills without any mediator, Multiple Linear Regression analysis was conducted.

Table 2 Descriptive Statistics: Technology Proficiency (N=560). Measured with the adapted Technology Proficiency Self-Assessment Questionnaire for 21st Century Learning (TPSA-C-21; Christensen & Knezek, 2016).

Factors	M	SD
Email	18.47	2.353
WWW	18.57	3.278
Integrated Applications	16.32	2.742
Learning with Technology	18.76	2.811
Learning with Emerging Technologies	31.40	3.276
Emerging Technologies Skills	25.74	3.122
Overall	130.41	18.353

The respondents were requested to rate how confident they feel in operating technology. They rated it using six domains, which ranged from "Email" to "Emerging Technology Skills" on a Likert Scale. According to the results, undergraduates felt the highest level of confidence in "Learning with Emerging Technologies" (M=31.40, SD=3.276) and "Emerging Technologies Skills" (M = 25.74, 3.122). On the other hand, they felt least confident about using "Integrated Applications" in the classroom (M = 16.32, SD = 2.742). The results showed that participants had essential digital and communication skills in educational settings, but the general level of technology proficiency was moderate among them.

Table 3 Descriptive Statistics: Employability Skills (N=560). Measured with the adapted Basic Employability Skills instrument (Humburg & Velden, 2017; Miller & Konstantinou, 2021).

Factors	M	SD
Basic Literacy and Numeracy Skills	18.41	2.353
Critical Thinking Skills	22.68	3.555
Leadership Skills	18.44	3.242
Management Skills	14.66	2.415

Factors	M	SD
Interpersonal Skills	27.49	3.440
Information Technology Skills	28.32	2.878
Systems Thinking Skills	27.76	3.521
Work Ethics	22.44	3.340
Overall	161.76	15.496

The statistics showed that the participants had the highest competency level in three areas such as “Interpersonal Skills” (M = 27.49, SD = 3.440), “Information Technology Skills” (M = 28.32, 2.878), and “Systems Thinking Skills” (M = 27.76, SD = 3.521). These findings indicate that undergraduates agreed that they are able to collaborate, interact with technology, and solve problems in the classroom. On the other hand, “Management Skills” (M = 14.66, SD = 2.415) and “Leadership Skills” (M = 18.44, SD = 3.242) demonstrated the lowest scores which means there is a perceived gap in managerial and leadership skills of undergraduates. On the whole, the overall mean score (M = 161.76, SD = 15.496) showed an average employability skills level among undergraduates.

Table 4 Relationship between Technology Proficiency and Employability Skills (N=560).

Factors	1	2	3	4	5	6	7	8
Email	.52	.44	.54	.45	.42	.51	.49	.52
WWW	.45	.38	.61	.50	.53	.62	.51	.41
Integrated Applications	.51	.54	.50	.51	.45	.48	.49	.45
Learning with Technology	.52	.54	.59	.36	.44	.44	.46	.53
Learning with Emerging Technologies	.61	.46	.39	.38	.42	.46	.61	.51
Emerging Technologies Skills	.56	.50	.40	.41	.39	.38	.44	.43
Overall				.65				

P=.001

Note. 1 = Basic Literacy and Numeracy Skills; 2 = Critical Thinking Skills; 3 = Leadership Skills; 4 = Management Skills; 5 = Interpersonal Skills; 6 = Information Technology Skills; 7 = Systems Thinking Skills; 8 = Work Ethics. All correlations significant at $p = .001$.

According to the data, moderate relationship with a coefficient of 0.65 was recorded, which indicated that there is an overall high moderate positive relationship between technology proficiency and employability skills of final-year undergraduate students. This demonstrated that students with advanced levels of technology proficiency are more likely to possess improved employability skills. Moreover, the analysis revealed a diverse relationship which suggests that some domains of technology proficiency have a stronger impact on specific employability skills. For example, “Learning with Emerging Technologies” has a high moderate correlation with “Basic Literacy and Numeracy Skills”

(1) and “Systems Thinking Skills” (7) as .61. This indicated that targeted technology expertise may help in enhancing the basic and strategic work abilities of students. In contrast, “Learning with Emerging Technologies” demonstrated a weaker link with “Management Skills” (4th factor) as 0.36, which suggested that not all the factors of technology proficiency demonstrated high or moderate relationship with employability skills. Overall, moderate relationships were among the factors of these two constructs. This data showed that specific technology skills are aligned with only preferred employability competence.

Table 5 Regression Analysis.

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	65570.329	6	10,928.388	174.629	.000
Residual	23578.281	554	58.320		
Total	89148.610	560			

Note. Predictors (Constant), the six technology proficiency domains. Dependent variable: Employability Skills. $R = .662$, $R^2 = .44$, Adjusted $R^2 = .43$, SE of the estimate = 7.64. The MEAN Square for Regression is the Regression Sum of Squares (65570.329) divided by its degrees of freedom (6).

Multiple Linear Regression was conducted to measure the effect of technology proficiency on employability skills. Based on the analysis, all six factors of technology proficiency predicted a significant variance (.44) on the employability skills of final-year undergraduates. The finding suggested that with the F-statistic of 174.629 and a significance level of .000, technology proficiency explained 44% of the differences in overall employability skills. To sum up, technology proficiency significantly impacted the employability skills of undergraduates.

Results and Discussion

Students in the HEIs seem to struggle to get suitable jobs after graduation, which leads to low employability rates in Pakistan. In this case, technology integration in educational settings has helped improve their employability skills for a technology-driven workplace. The conceptual model of this study derives from (a) the call by Chaw and Tang (2023) to assess the technology proficiency of students with a valid instrument in educational background, and (b) the need to study its direct influence on employability skills to enhance the employability of 21st-century youth in developing countries like Pakistan. It has been observed that the technology proficiency of students is an emerging topic in HEIs, and it has not been assessed before using a separate effective scale for students. It has also been argued that it has the potential to be a crucial component to enhance students' employability skills by preparing them for a digital job market.

The findings proposed that final-year undergraduates agreed to have a higher level of technology integration in their classroom settings, and comparatively, had a low level of emerging technology skills for the future workplace. The findings also showed that they were least confident about using integrated applications like LMS for completing their educational tasks (Akaadom & Obibi, 2023). This variation between the high level of self-perceived learning with technology

integration, but poor display of technology skills and integrated applications in the professional environment suggested the gap between exposure to technology in the classroom and its application in real-life situations. Mostly, university students are well-informed of the digital tools by its frequent use in the classroom, but are unable to apply their combined knowledge of these tools into sustained goal-oriented practices in a professional setting. Therefore, the ease of use or availability of technological tools does not assure their perceived usefulness in workplace setting due to the depth and complexity of the task (Akaadom & Obibi, 2023; Lucas et al., 2022; Pumptow & Brahm, 2023). Studies by Chaw and Tang (2023), Davis (1989), and Alshammari and Alkhwalidi (2025) further strengthened these results by implying that technology proficiency and learning outcomes of students enhanced when students perceive technology as useful and relevant along with sufficient support from HEIs for its effective application.

Furthermore, students showed a moderate level of employability skills with strong IT and interpersonal skills while expressing limited expertise in particular domains of social and professional competence, such as low leadership and management skills (Fifani et al., 2025). A positive but moderate relationship was analyzed between technology proficiency and employability skills among students, which shows that students with a higher level of technology proficiency will have a positive impact on developing their employability skills for a suitable career (Habets et al., 2020; Pedregosa et al., 2025; Peng & Deng, 2022). However, this relationship was not uniformly strong among all domains, which indicates that the correlation was domain-specific. The social construct and TAM perspective collectively indicated that technology proficiency can be improved through teamwork, guided interactions associated with its ease, and perceived usefulness in complex and practical situations, which explained this domain-specific association between technology proficiency and employability skills (Davis, 1989; Hariyati et al., 2025; Vygotsky, 1978; Mustafa & Garcia, 2021). With respect to TAM, emerging technologies such as social networking interfaces, MOOCs, and digital learning applications on mobile were associated with highly perceived ease of use. Its immediate and beneficial usefulness was noticed to boost confidence in students, hence they were able to adopt and use these technologies effectively. On the other hand, integrated technologies like learning management systems (LMS), productivity software, and data-driven platforms were complicated to use and required deeper learning which displayed their less immediate and less user-friendly nature as extensive training was needed to get the most benefits. From a Social Constructivist point of view, emerging technologies were learned informally through collaboration and shared social interaction, which Vygotsky (1978) explained in the concept of socially mediated learning. In contrast, the organized use of integrated technologies is highly formal with minimal social interaction and depends solely on the guidance of mentors. As a result, the lack of guided social learning practice in these integrated applications highlighted a developmental gap within the student's proximal zone that cannot be addressed only by informal social learning. The combination of TAM and Social Constructivist Theory explained the uneven development of technology proficiency across various digital applications. This interpretation explained why different dimensions of technology proficiency contribute to various dimensions of employability skills in a different manner.

The findings further represented that individual factors of technology proficiency appeared to improve only particular dimensions of employability skills. In conclusion, this diverse interaction of technology proficiency with employability skills does not provide a comprehensive

overview, unlike argued in the literature review as their relationship has not been explored previously by combining Vygotsky's Social Constructivism Theory and TAM Model. To the best of researcher's knowledge, no prior studies reported this selective interaction. Hence, these findings are difficult to relate to any existing literature. Nevertheless, this unique finding will be valuable for researchers to further explore how specific technology proficiency factors selectively influence targeted domains of employability skills.

Conclusion

This study was designed to evaluate the impact of technology proficiency on employability skills of final-year undergraduates in the public universities of Lahore. Findings of this study showed that final-year undergraduates demonstrated moderated level of technology proficiency and employability skills, and they have a moderate positive association with each other ($r=.65$). The findings also confirmed that technology proficiency explained a variance of 44% in shaping the employability skills of final-year undergraduates. However, this influence was selective across all the domains rather than a uniform pattern. The findings highlighted that TPSA-C-21 is a useful low-cost diagnostic tool to identify specific proficiency gaps among students, which were related to integrated, work-related applications in a trained collaborative environment. It can be used to strengthen the career readiness of undergraduates in the advanced digital workplace.

Limitations and Recommendations

An advanced integrated curriculum should be designed that will help undergraduates to develop their technology skills and employability skills holistically while considering their individual, social, and emotional needs. This approach will maintain a balance between the overall development of technological and professional competencies among students. Higher education institutes (HEIs) should adopt TPSA-C-21 as a regular diagnostic tool to identify students' proficiency gaps in technology. Moreover, the lower levels of critical thinking, leadership, and management skills among students raise the need for policymakers to introduce interdisciplinary and professional initiatives for a real-life work experience in order to increase career preparedness among final-year students. HEIs should also redevelop the curriculum to combine emerging technology proficiency with management and leadership skills to overcome the weakest link. They should also introduce collaborative project-based training in emerging integrated applications to enhance their confidence.

This study cannot be generalized to a vast population. Therefore, the results are limited in their generalizability. Thus, this study can be expanded culturally in different educational institutes across the country and even compared in terms of gender between public and private settings. In addition, respondents' responses were already limited due to the closed-ended questions of a well-structured instrument. The researchers should assess this limitation by expanding it into semi-structured interviews of a qualitative approach. Finally, the presented conceptual framework could be tested on different constructs, such as technology adaptability. In the light of these limitations, gender-based analysis should be examined to study the difference in the proficiency levels of male and female undergraduates with respect to its relation to employability. This framework should be tested in private universities with a longitudinal study design to evaluate the actual employment outcomes over time predicted by technology proficiency.

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