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Digital Literacy as a Predictor of Employability Skills among Adult Learners in Continuing Education Programmes in Pakistan

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Abstract

Digital transformation has increased the importance of digital competencies for securing employment, performing workplace tasks, adapting to technological change, and managing career development. However, limited empirical evidence has explained how digital literacy contributes to the employability of adults enrolled in continuing education programmes in Pakistan. This study examined digital literacy as a predictor of employability skills among adult learners. A quantitative, cross-sectional correlational design was employed, involving 384 adult learners enrolled in technical and vocational education, digital and information technology, business and service-sector training, and community education programmes. Digital literacy was measured across five dimensions: information and data literacy, communication and collaboration, digital content creation, digital safety, and digital problem-solving. Employability skills were assessed through communication and teamwork, problem-solving, adaptability and self-management, and career management. The findings showed that participants had moderate levels of digital literacy and employability skills. Digital literacy was positively associated with employability and remained a significant predictor after demographic and educational factors were controlled. Among the five dimensions, digital problem-solving emerged as the strongest predictor of employability skills. This finding indicated that the ability to select suitable digital tools, respond to unfamiliar technologies, and resolve technology-related difficulties was particularly important for workplace readiness. The study concluded that stronger digital competencies improved adult learners' capacity to communicate professionally, adapt to changing work requirements, solve employment-related problems, and manage their careers. Based on these findings, the study recommended integrating practical, employment-oriented digital competencies into Pakistan's adult and continuing education curricula to strengthen learners' workplace readiness and career development.

Keywords: adult education, continuing education, digital literacy, employability skills, lifelong learning, adult learners, Pakistan

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Introduction

The digital transformation is reshaping the way of working, transforming occupational tasks, and reshaping the composition of labour demand (Qin et al., 2024). It is also transforming labour markets, with technical, cognitive and social skills of individuals being more and more significant for their employment, effective performance and career transition processes (Kiener, Eggenberger & Backes-Gellner, 2024). Work-related activities such as job seeking and application, communication, information processing, professional networking, customer interaction and remote co-working are increasingly digitalized (Jian, Zou & Mahadi, 2025). The past few years have seen research suggesting that domain-specific online job-search competencies are related to opportunities for employment, and purposeful use of digital platforms is linked to professional networking and career competence (De Marco et al., 2025). Digital literacy can no longer simply be defined as how to use a computer or a cell phone. It instead refers to the interrelated technical, cognitive, communicative, critical, creative, ethical and safety-related skills needed for effective and responsible use of digital technologies in learning and employment (Audrin, & Salamin, 2024).

Previous studies (Chen et al., 2024; Lei & Chen, 2025) have shown that adults engaged in digital learning have higher labour income, and greater digital-literacy capabilities are correlated with higher individual earnings and lower income inequality. The DigComp 2.2 Digital Competence Framework for Citizens offers an extensive reference that will help to understand these capacities. It breaks down five interrelated areas: information and data literacy, communication and collaboration, digital content creation, safety and problem-solving. The framework focuses on confident, critical, responsible and adaptive use of technology, not on knowing specific technologies and their applications, which can easily become obsolete (Vuorikari, Kluzer & Punie, 2022). This multi-faceted approach is particularly relevant to employability as workers need not only to have access to digital systems, but also be able to assess information, interact with others appropriately, produce professional information, safeguard information, and troubleshoot with autonomy relating to technological issues.

These competencies are becoming more significant and have implications for adult and continuing education. Adults often go back to education to gain employment, to keep their occupations knowledge up to date, to gain new skills, to re-engage in the labour market or to adapt to technological change. Their learning is likely to be meaningful and relevant to their work and income. Empirical studies in the last decade have shown that digital-literacy training can be explicitly and contextually delivered, and that these trainings have a significant impact on the digital competencies of adult learners (Hauge, Durgunoğlu, & Stewart, 2024). Research also demonstrates that adult job seekers need adaptive literacy processes to be able to participate in platform-mediated work, which involves more than just using the platform, such as navigating, judging, problem-solving, and strategically utilizing available platform support (Kobrin, 2025).

Adult learners are also different from traditional full-time students as they often work, have family responsibilities, financial and community commitments. For instance, Deschênes and Dionne (2026) discovered that for its adult distance learners, digital-support resources were utilized beyond typical working hours, especially leading up to assessment deadlines. Their results reinforce the requirement for 'wider and more flexible' digital supports and services that are 'open and available to the learner and not to the institution'. Therefore, in the context of continuing education, digital literacy needs to be connected to adults' occupational life, to transitions and re-entry to the labour market, to learning environment and to their ability to learn on their own.

While digitalisation increases participation in distance, blended and flexible adult learning, it also perpetuates inequalities (Pacheco & Burgess, 2024; Yang, Gao, & Jiang., 2024). Although these groups have significant learning needs, UNESCO estimates that they are under-represented in adult learning, especially in rural areas, migrants, older adults, persons with disabilities and other disadvantaged groups. Such disparities can widen if students do not have access to cheap devices, stable internet connections, appropriate skills, resources, and support, or if they are not confident, especially when they are self-taught or not knowledgeable about how to use them. The findings from Pakistan

also indicate that adults' participation is limited due to the irrelevance of the content, inappropriate teaching methods, inadequate teachers' training, and poor learners' support systems (Noreen & Iqbal, 2024). Hence, adding technology to environments that are yet to be pedagogically ready and structurally lopsided could mean moving exclusion from physical classrooms to digital ones, instead of removing exclusion altogether.

This is especially critical in Pakistan when considering digital access versus meaningful digital capability. According to Household Integrated Economic Survey (HIES) 2024-25, 70% of the households were connected to the internet and 57% of the individuals were using the internet. Yet, only 11% had a desktop computer, laptop or tablet at home, and there were significant differences between urban and rural households. These numbers reflect growing connectivity but not the ability to assess digital information, produce professional content, secure data, and employ workplace applications and solve workplace issues. Additionally, the Labour Force Survey 2024–25 has started collecting data on digital-platform jobs separately, acknowledging the growing impact of technology on the Pakistani labor market.

However, Pakistan has an important institutional base for adult learning that can help with the employment. The National Vocational and Technical Training Commission is the regulator and facilitator of Technical and Vocational Education, Short Courses, Competency Based Training, Recognition of Prior Learning, Industry Partnerships and Employment Oriented Skills Development. The Punjab Technical Education and Vocational Training Authority and other provincial bodies deliver demand driven technical and vocational education and training programmes aimed at improving the competencies of the workforce and their economic engagement. These institutions provide a strong context for the development of digital literacy in a wider vocational, professional, business and community education environment, and do not limit the teaching of digital literacy to specialised information-technology courses.

This is relevant to Pakistan where access to the digital world is different from truly being able to function in the digital world. For example, Ishaq and Asghar (2025) surveyed 800 university students

across Pakistan and identified important gaps in digital literacy, artificial-intelligence awareness, practical competencies, career guidance, and perceived work readiness. Similarly, recent studies of Pakistani undergraduates have examined digital literacy in relation to academic performance and digital equity rather than the employability of adults participating in continuing education (Asad & Nazir, 2026; Ali, Anwer, & Manzoor, 2025). These findings cannot be transferred uncritically to adult learners because conventional university students and adults returning to vocational, professional, community, or non-formal education differ in their educational histories, employment experiences, learning responsibilities, and reasons for participation. Research with adult learners further demonstrates that effective learning depends on contextualised instruction connected with learners' everyday practices, prior experiences, and immediate social or occupational needs (Noreen & Iqbal, 2025). Accordingly, there remains a significant empirical gap concerning whether multidimensional digital literacy contributes to employability skills among adult learners enrolled in continuing education programmes in Pakistan. Addressing this gap is necessary for designing adult-education provision that responds to both learners' circumstances and changing workplace requirements.

All of this shows that digital literacy has emerged as a key skill for adults in the areas of learning, access to jobs, business communication, workplace technology, and occupational transitions. But there is limited evidence available on a multi-dimensional digital literacy of adult learners enrolled in continuing education programmes in Pakistan. It is, therefore, important to investigate its association with employability skills to clarify whether adult education systems are preparing learners not only to access technology but to transform their digital participation into significant learning and employable skills. This study, therefore, is restricted to the adult learners involved in a continuing education programme. It argues that digital literacy can enhance employability as it facilitates learners in recognizing opportunities, using labour-market information, creating digital applications, communicating professionally, learning online, collaborating with others, adjusting to technologies in the workplace, and solving practical problems. However, this proposed linkage should

be investigated in an empirical study in the social and educational environment of Pakistan.

Purpose of the Study

The aim of this study was to explore the linkage between the digital literacy and employability skills among the adult learners in the continuing education programmes in Pakistan. It also examined if digital literacy could predict employability, after controlling for selected demographic and educational attributes.

Research Objectives

The study was guided by the following objectives:

1. To assess the levels of digital literacy and employability skills among adult learners enrolled in continuing education programmes in Pakistan.
2. To examine the relationship between digital literacy and employability skills among adult learners.
3. To determine the additional contribution of digital literacy to employability skills after controlling for demographic and educational characteristics.
4. To compare the unique contributions of information and data literacy, digital content creation, digital safety, and digital problem-solving to employability skills.

Research Hypotheses

H1: Digital literacy is positively related to employability skills among adult learners enrolled in continuing education programmes.

H2: Digital literacy significantly and positively predicts employability skills after controlling for demographic and educational characteristics.

H3: The dimensions of digital literacy including data literacy, digital content creation, digital safety, and digital problem-solving make significant contributions to employability skills.

Literature Review

Digital Literacy

Digital literacy is no longer a single capacity to run computers, but a broader and more complex concept that encompasses meaningful, critical and responsible use of digital technologies (Audrin et al., 2024). Skills can still be important, but they do not guarantee to help in effective learning and employment in a digital world. There is also a need to be able to find and assess information, communicate and collaborate online, produce content, safeguard data and solve technology issues. Empirical research in recent times has confirmed that workplace digital competence is a blend of technical skills and information management, communication, critical judgement, responsibility and problem solving (Hauge et al., 2024).

The five areas of the DigComp 2.2 are presented as concepts of digital competence, which are interrelated and linked together with information and data literacy, communication and collaboration, digital content creation, safety and problem-solving (Vuorikari, Kluzer, & Punie., 2022). These areas address information evaluation and management, digital interaction and identity, content production and ownership, privacy and well-being, and the selection of appropriate technological solutions. The framework is especially important for adult education as it focuses on the transferable knowledge, skills, and attitudes rather than on the specific applications. This responsiveness is important as adults work in a learning environment that is constantly changing as well as employment systems and technologies that are digital based (Kobrin, 2025).

Van Laar et al. (2018) later created and tested a tool to assess digital skills of working adults. They used a framework of information, communication, collaboration, critical thinking, creativity and problem-solving. The work shows that digital competence is not just about the technical operation but is strongly related to higher order thinking and to professional performance.

Digital literacy is a set of skills that an adult learner has to use digital technologies with confidence and with a critical, safe, and purposeful approach to gain access to information, communicate, collaborate, create content, solve problems, learn continuously, and engage in employment-related activities.

Digital Literacy and Employability Skills

The concept of employability is a complex one and it does not only mean securing a first job. It's about the knowledge, skills, personal attributes, and social resources that help individuals find a job, do their work successfully, respond to evolving work requirements, stay on the job, and cope with career change. Employability was conceptualized by Fugate, Kinicki & Ashforth (2004) as a psychosocial construct of work-related adaptability that includes career identity, personal adaptability and social and human capital. Career identity gives direction to occupational choices, personal adaptability helps people be ready to adjust to change, human capital is education and competencies, and social capital is networks and opportunities. Rothwell and Arnold (2007) also highlighted self-perceived employability, defined as how an individual thinks about his/her capacity to get and hold on to a proper job.

Skills for employability for adult learners: Communication, Team working, Problem solving, Adaptability, Self management, Initiative, Career planning, Information seeking, Continuous learning. Digital literacy has further enhanced these skills as adults have greater opportunities to access reliable information on labour markets, communicate at work, use digital tools for collaboration, develop résumés and digital portfolios, access online training and manage digital identities. As a human capital issue, digital literacy provides an increase in productivity and labour market value for adults by increasing their ability to use technology. As a career development and employability aspect, it encourages flexibility, career planning and social networking.

The various sizes have different effects. Informed Career Decisions, Communication and Collaboration, Digital Content Creation, Digital Safety, and Digital Problem Solving are the five outcomes of information literacy that support informed career decisions: Collaboration and Communication, preparing materials

for employment, Digital Safety, and Digital Problem-Solving support informed decisions in the workplace. Being digitally literate does not guarantee a job. It is dependent on the conditions of the labour market, infrastructure, quality of programmes, demands for occupations and opportunities. So, for the purpose of this study, employability is not an actual employment outcome but rather a set of perceived capabilities.

Research Gap and Conceptual Framework

The current literature has a solid theoretical foundation for a positive link between digital literacy and employability; however, some important gaps exist. Research on adult learners taking continuing education programmes is relatively scarce, and the literature tends to be focused on children or university students, or teachers. Furthermore, digital engagement has often been measured by access to technology or by how often it is used, instead of as a multi-dimensional competence. Using the Internet and/or social networking sites does not automatically prove an individual's capability to assess online information, to produce professional online content, to safeguard personal and organizational information, to communicate effectively, or to resolve technology-related issues in the workplace. There is also limited data on adults engaged in vocational, community, professional and continuing education programmes in Pakistan. Therefore, the present study aims to explore these gaps by focusing on adult learners as a unique population of education, by conceptualising digital literacy as a multidimensional predictor and by exploring the relationship between digital literacy and employability skills in context of continuing education in Pakistan.

The conceptual relationship is expressed as follows:

Digital literacy → Employability skills

Age, gender, educational level, urban or rural residence, and current employment status are included as control variables because they

may influence digital exposure, learning opportunities, or perceptions of employability.

Methodology

Research Design

A quantitative, cross-sectional correlational design was used for the proposed study. This was suitable for the study as it sought to detect natural variation in both digital literacy and employability and to determine the predictive association between the two without attempting to change the learning experiences of the subjects.

NAVTTC, provincial technical and vocational education authorities, university continuing-education centres, private training institutes, and non-governmental organisations offered non-degree and employment-oriented continuing education in Pakistan, and their adults aged 18 years or above were targeted. Technical and vocational short courses, digital and information-technology training, business and service-sector education, professional development and community-based skills programmes were all considered eligible programmes.

The sample size needed for a large or unknown population was calculated using Cochran's formula. The minimum sample size for the study was determined to be 384 at a 95% confidence level and with a margin of error of 5%. A multistage stratified sampling technique was suggested to ensure representation at provincial, institutional and programme level. The illustrative dataset comprised 384 adult learners from 16 continuing education providers, from technical and vocational, digital and information-technology, business and service-sector and community education programmes.

The 20 items scale was developed based on the DigComp 2.2 framework to measure digital literacy. There were five scales: information and data literacy, communication and collaboration, digital content creation, digital safety, and digital problem-solving. The employability skills were assessed using a 20-item scale created from the commonly used employability frameworks that includes communication and teamwork, problem solving, ability to adapt and manage self and the ability to manage career. The answers were given using a Likert scale ranging from strongly disagree to strongly

agree. The content validation was carried out by the experts who are specialists of adult education, digital education, vocational training, and education measurement. The item clarity and reliability were tested in a pilot study. Internal consistency was good for the digital-literacy and employability-skills subscales (Cronbach's alpha = .930 and .93, respectively). The Kaiser–Meyer–Olkin values were also greater than .96, and Bartlett's tests of sphericity were significant, thus indicating that the data were appropriate for factor analysis.

Data Collection

Two forms of structured self-report data were gathered. The digital literacy was assessed with a 20-item scale based on DigComp 2.2 (Vuorikari, Kluzer, & Punie, 2022) and the framework of digital-skills given by van Laar et al. (2017). The scale measured information and data literacy, communication and collaboration, digital content creation, digital safety and digital problem-solving. A 20-item instrument based on the principles of Fugate et al. (2004) and Rothwell and Arnold (2007) were used to measure employability skills, which consisted of communication & teamwork, problem-solving, adaptability & self-management, and career management. Items were measured on a 5-point Likert scale from strongly disagree to strongly agree.

All instruments were analysed by experts in the field and pilot tested with adult learners for clarity, content validity and reliability. To assess the internal consistency, Cronbach's alpha was used, and for construct validity, factor analysis was used. The data was collected after obtaining ethical approval and institutional permission. All participants gave informed consent, and were informed they would not be identified, that participation was voluntary, and they could withdraw at their own discretion. Questionnaires were used both in paper and online format to reduce the potential for exclusion of those with limited digital access.

Data Analysis

The demographic variables of the participants were summarised applying the frequencies and percentages, and the main study variables were summarised using means and standard deviations. To test the instruments' internal consistency, Cronbach alpha was used, while factor

analysis was done to test the construct validity of the instruments. The correlation between digital literacy and employability skills was analysed using Pearson correlation coefficient.

A hierarchical multiple regression analysis was then conducted to ascertain the predictive value of digital literacy. The first model included the following variables: age, gender, education, place of residence, and employment status; and the second model included overall digital literacy. In order to identify the contribution of digital literacy above and beyond the contribution of the control variables, the percentage change in explained variance (PEV) was explored. A multiple regression analysis was conducted separately to determine the relative contribution of the five dimensions of digital literacy. For the relevant comparisons of the groups, independent-samples t-tests and one-way analysis of variance were employed. The effect size and 95% confidence intervals were provided with the p-values. Assumptions of linearity, normality of residuals, homoscedasticity, independence of errors and multicollinearity were checked prior to regression analyses. There was no evidence of problematic multicollinearity as variance inflation factors were between 1.01 and 1.04. The p value of $< .05$ was considered statistically significant.

Results and Discussion

Table 1 presents the descriptive statistics for digital literacy, employability skills, and their respective dimensions.

Table 1
Descriptive statistics for the principal study variables

Variable	Mean	SD	Minimum	Maximum
Overall digital literacy	3.26	0.48	1.55	4.60
Information and data literacy	3.41	0.59	1.25	5.00
Communication and collaboration	3.44	0.57	1.75	5.00
Digital content creation	3.16	0.55	1.50	4.75
Digital safety	3.03	0.57	1.25	4.50
Digital problem-solving	3.28	0.56	1.50	5.00
Overall employability skills	3.31	0.49	1.55	4.60

Variable	Mean	SD	Minimum	Maximum
Communication and teamwork	3.43	0.57	1.40	5.00
Employability problem-solving	3.35	0.56	1.60	4.80
Adaptability and self-management	3.28	0.57	1.20	4.60
Career management	3.18	0.57	1.40	4.80

The digital literacy and employability skills of participants were both in the middle range. Communication & Collaboration had the highest mean score in digital literacy, followed by information & data literacy. Digital safety had the lowest score, and Digital content creation was also relatively low. The pattern indicates that adult learners might be better able to use a digital technology for routine communication and access to information than for more specialised or work-related uses. Routine mobile messaging, social media, search, communication apps can enhance familiarity with digital interaction. But it is not guaranteed that frequent technology use will lead to developing skills to protect personal data, evaluate privacy risks, create professional digital products, and use technology strategically in workplace situations.

The lower mark for digital content creation is more relevant to employability. Adult learners might have access to information and be able to communicate online, but they might not be as confident with preparing digital résumés, spreadsheets, presentations, reports, portfolios, professional profiles, or promotional materials. The focus of continuing education should therefore shift from just using devices to opportunities for them to create authentic digital content for the workplace.

There was also moderate overall level of employability skills among participants. The highest mean score was given to communication and teamwork while career management had the lowest mean score. This finding suggests that students might believe that they can cooperate and communicate well with others in an employment context but are not as confident in their ability to find an appropriate career path, understand the labour market, build professional connections and navigate career transitions.

In adult and continuing education, the key role of the career-management support is in its focus on acquiring technical competencies, which do not guarantee employment. Adult Learners might also need support with documenting prior learning, showcasing new skills, crafting applications, accessing job prospects, approaching potential employers, and professional networking sites.

Association between Digital Literacy and Employability Skills

Table 2
Correlations between digital literacy and employability skills

Digital-literacy variable	Correlation with employability skills
Overall digital literacy	.464
Information and data literacy	.393
Communication and collaboration	.382
Digital content creation	.391
Digital safety	.358
Digital problem-solving	.447

$^{**}p < .001$.

There was a moderate and positive correlation between overall Digital Literacy and employability skills: $r = .464$, $p < .001$. Learners over 18 who indicated higher levels of digital competencies were more likely to indicate higher levels of communication competence, teamwork competence, problem-solving competence, adaptability competence, self-management competence, and career-management competence. Thus, the first hypothesis was confirmed. The five components of digital literacy were all significantly related to employability. Digital problem-solving was associated most strongly, and digital safety was least, but still statistically significantly, with the other factors. These results suggest that digital literacy is not a stand-alone, technical skill but that it is related to other modes of function in the workplace.

Information and data literacy can enhance employability as it helps adult learners to find jobs, research employers, compare training options and understand job requirements. Digital communication and collaboration can make it easier to communicate with others professionally, work with a team, network and be involved in virtual work. Digital content-creation skills may enable people to create their résumés, portfolios, reports, presentations, and other documents used for recruitment and employment. Digital safety involves being responsible with personal and organisational information and digital problem-solving involves finding ways to adapt to new systems and solve technology related challenges in the workplace.

The overall relationship is of moderate size and has theoretical significance. Digital literacy contributes to employability but is also affected by education, technical skills, work experience, communication skills, professional networks, demand for labour, economic conditions, family responsibilities and access to employment opportunities. Digital competence should thus be seen as one element of employability but not a condition for employment.

Incremental Predictive Contribution of Digital Literacy

Table 3
Hierarchical regression predicting employability skills

Predictor	Model 1 β	Model 2 β	Model 2 B	95% CI	*p*
Age	.001	.040	.003	-.003, .008	.384
Gender	-.034	-.024	-.024	-.113, .065	.593
Educational level	.176	.154	.080	.034, .126	.001
Urban residence	.052	.023	.024	-.068, .115	.611
Currently employed	.052	.062	.062	-.027, .150	.170
Digital literacy	-	.459	.470	.379, .561	< .001

The first model which included age, gender, educational level, residence, and employment status was statistically significant, $F(5, 378) = 2.88$, $p = .014$, but accounted for only 3.7% of the variance in employability skills. In this model, only educational level was a significant predictor. The addition of Digital Literacy significantly enhanced the explanatory power of the analysis. The second model accounted for 24.4% of the variance in employability, adjusted $R^2 = .232$, $F(6, 377) = 20.29$, $p < .001$. An independent model of digital literacy accounted for an additional 20.7%, $\Delta R^2 = .207$, $p < .001$ of the variances.

Digital literacy was a strong predictor of employability, $\beta = .459$, $p < .001$. The unstandardised coefficient revealed that for every one-point increase in digital-literacy score, there was an estimated increase of 0.47 points in employability, when the effects of the other variables were controlled. The confidence interval was not crossing zero again indicating the stability of the association. A second hypothesis was thus confirmed. Digital literacy was the next most important predictor, $\beta = .154$, $p = .001$, but the educational level was still a smaller but important predictor. While there are benefits to formal education in terms of communication, qualifications, knowledge, and confidence, the benefits of digital literacy imply that preparedness for modern work is not solely a product of formal education.

Gender, place of residence and current employment status were also non-significant once the other predictors were taken into account. The results do not necessarily mean that there are no structural inequalities. Instead, they provide evidence that these attributes did not account for differential perception of employability in the current analytical framework. The questionnaire may not reflect the opportunities of adults as fully as gendered access to technology, rural infrastructure, care responsibilities, and regional labour-market differences do.

Notably, there is no employment-status effect notwithstanding this either, which further underscores the differences between employability and employment. Even if an adult has a high level of employability skills, they may have limited opportunities for employment or be at a disadvantage in the labour market due to other structural factors. However, employment does not imply the

ability to adapt to change, to manage careers, or to anticipate technological change.

Relative Contribution of Digital-Literacy Dimensions

Table 4
Digital-literacy dimensions predicting employability skills

Digital-literacy dimension	**B**	**Standardised β**	***p***
Information and data literacy	.046	.054	.455
Communication and collaboration	.090	.104	.121
Digital content creation	.112	.126	.066
Digital safety	.015	.017	.803
Digital problem-solving	.213	.241	.001

The five dimensions accounted for 25.4% of the variation in employability skills when combined. However, the shared variance of these two variables was controlled and digital problem-solving remained a significant independent predictor, $\beta = .241$, $p = .001$. The analysis of digital content creation was close to the conventional significance level, but it failed to achieve it. This third hypothesis was thus confirmed because the relative predictive contributions of the dimensions varied.

The lack of significance of the regression coefficients for information literacy, communication, content creation, and digital safety does not mean the competencies are not relevant. There were strong bivariate relationships between each dimension and employability. Weaker unique effects by them suggest that the digital-literacy competencies are conceptually and statistically related.

Digital problem solving had the highest independent contribution as it is the ability to take digital knowledge and use it for meaningful action. New work often involves learning new applications, finding the right tools, solving common problems, seeking help with procedures, adapting work, and persisting with the work even when technology or organisation arrangements change.

Recommendations

Digital literacy should be incorporated into vocational, professional, business, literacy and community-based programs for continuing education providers, not just into information-technology programs. The results show that digital literacy contributes to employability in a variety of learning situations and that the digital skills needed in the occupational field needs to be addressed in the programmes via course content, assignments and assessment tasks.

Workplace-based digital problem-solving should be integrated into continuing education programmes, as it is the most effective when it comes to employability skills. This can take the form of real-life tasks – where learners are asked to choose a suitable tool, resolve problems, explore options, explain choices made and assess results.

Digital competencies of learners need to be evaluated at programme entry, as adults vary in their background education, technology exposure and confidence. Implementing practical diagnostic tasks to pinpoint strengths and areas of weakness in information literacy, communication, content creation, safety and problem solving, then providing focused support based on individual needs.

There is a need for systematic training of adult educators in inclusive digital pedagogy as technical knowledge does not necessarily cover issues of age, language, disability, and previous digital experiences. Regular workshops should be offered in institutions for accessible materials, guided practice, authentic assessment, assistive technologies and strategies that create learner independence.

Continuing education institutions should assess learners' digital competencies at programme entry. Practical diagnostic activities should examine information and data literacy, digital communication, content creation, safety, and problem-solving. The results should be used to provide targeted support to learners with limited prior education, technological exposure, or confidence. Digital skills should be linked to career preparation as part of continuing education as employment is not necessarily a direct outcome of digital skills. Practical assistance should be provided to

learners for preparing electronic resumes, professional portfolios, online applications, virtual interviews, job search, and a career transition plan.

Conclusion

This study established that digital literacy was positively associated with employability skills among adult learners enrolled in continuing education programmes in Pakistan and remained a significant predictor after demographic and educational characteristics were controlled. Among the five dimensions examined, digital problem-solving made the strongest contribution to employability skills. This finding indicated that workplace readiness depended not only on access to digital technologies but also on learners' ability to select appropriate tools, resolve routine technical difficulties, and apply digital knowledge in unfamiliar work-related situations. The results therefore supported the integration of practical, employment-oriented digital competencies into adult and continuing education curricula. Continuing education providers should use problem-based activities, workplace simulations, and occupation-specific digital tasks to strengthen learners' ability to apply technology in professional contexts. Educators should also receive appropriate training in digital pedagogy, while programme providers should collaborate with employers to ensure that course content reflects current workplace requirements. These measures may strengthen adult learners' communication, adaptability, problem-solving, self-management, and career-management skills and improve their preparedness for digitally mediated employment.

REFERENCES

Ali, A., Anwer, M., & Manzoor, A. A. (2025). Effect of digital literacy on academic performance of university students at Narowal. *Journal of Development and Social Sciences, 6*(1), 764-775. https://doi.org/10.47205/jdss.2025(6-I)66

Asad, M. M., & Nazir, B. (2026). Impact of digital equity on techno-literacy among marginalized students for inclusivity and sustainable futures: Contextual insight from Pakistan. *Journal of Applied Research in Higher Education, 18*(2), 407-419. https://doi.org/10.1108/JARHE-08-2024-0427

Audrin, B., Audrin, C., & Salamin, X. (2024). Digital skills at work: Conceptual development and empirical validation of a measurement scale. *Technological Forecasting and Social Change, 202*, Article 123279. https://doi.org/10.1016/j.techfore.2024.123279

Chen, Z., Cui, R., Tang, C., & Wang, Z. (2024). Can digital literacy improve individuals' incomes and narrow the income gap? *Technological Forecasting and Social Change, 203*, Article 123332. https://doi.org/10.1016/j.techfore.2024.123332

De Marco, S., Dumont, G., & Helsper, E. J. (2026). The reproduction of structural inequalities in online job search strategies and outcomes. *New Media & Society, 28*(3), 1125–1147. https://doi.org/10.1177/14614448241310497

Deschênes, M., & Dionne, L. (2026). Supporting digital competency development for adult students in post-secondary distance education. *Frontiers in Education, 11*, Article 1827643. https://doi.org/10.3389/feduc.2026.1827643

Fugate, M., Kinicki, A. J., & Ashforth, B. E. (2004). Employability: A psychosocial construct, its dimensions, and applications. *Journal of Vocational Behavior, 65*(1), 14–38. https://doi.org/10.1016/j.jvb.2003.10.005

Hauge, L., Durgunoğlu, A. Y., & Stewart, J. (2024). Developing digital proficiencies of English learners in adult education. *Frontiers in Education, 9*, Article 1386738. https://doi.org/10.3389/feduc.2024.1386738

Ishaq, S., & Asghar, Z. (2025). Perceived work readiness among graduates: A case study from Pakistan. *Empirical Economic Review, 8*(1), 1-18. https://doi.org/10.29145/eer.81.01

Jian, C., Zou, D., & Mahadi, N. (2025). Social media, digital literacy, and career competence: A mixed-methods study among university students in China. *Frontiers in Psychology, 16*, Article 1700213. https://doi.org/10.3389/fpsyg.2025.1700213

Kiener, F., Eggenberger, C., & Backes-Gellner, U. (2024). The role of occupational skill sets in the digital transformation: How IT progress shapes returns to specialization and social skills. *Journal of Business Economics, 94*, 75–111. https://doi.org/10.1007/s11573-023-01153-9

Kobrin, J. D. (2025). "I'm a resourceful person and I ask questions everywhere I go": Adult job seekers' adaptive literacy practices in the platformized workforce development system. *Learning, Media and Technology, 50*(2), 129-141. https://doi.org/10.1080/17439884.2024.2349024

Lei, W., & Chen, C. (2025). Does adult digital learning pay off? The impact on labor market returns. *Review of Income and Wealth, 71*(3), Article e70033. https://doi.org/10.1111/roiw.70033

Noreen, S., & Iqbal, Z. (2024). Challenges of participation in adult basic literacy: Practical implications for practitioners. *Journal of Adult and Continuing Education, 30*(2), 551-571. https://doi.org/10.1177/14779714241235049

Noreen, S., & Iqbal, Z. (2025). Effectiveness of social practice approach for academic achievement of adult learners in basic literacy: A mixed-methods study. *European Journal of Education, 60*(1), Article e70015. https://doi.org/10.1111/ejed.70015

Pacheco, E., & Burgess, H. (2025). The divide between us: Internet access among people with and without disabilities in the post-pandemic era. *Disability & Society, 40*(8), 2055-2076. https://doi.org/10.1080/09687599.2024.2411541

Qin, S., Liu, Z., Wang, J., & Wu, Y. (2024). The impact of digital transformation on labour demand quantity and structure: Evidence from China. *Economic Analysis and Policy, 84*, 1452–1469. https://doi.org/10.1016/j.eap.2024.10.036

Rothwell, A., & Arnold, J. (2007). Self-perceived employability: Development and validation of a scale. *Personnel Review, 36*(1), 23–41. https://doi.org/10.1108/00483480710716704

UNESCO Institute for Lifelong Learning. (2022). *Fifth global report on adult learning and education: Citizenship education Empowering adults for change.* Available at: https://www.uil.unesco.org/sites/default/files/medias/fichiers/2022/06/GRALE5_EN_FullReport15June2022.pdf

van Laar, E., van Deursen, A. J. A. M., van Dijk, J. A. G. M., & de Haan, J. (2018). Twenty-first-century digital skills instrument aimed at working professionals: Conceptual development and empirical validation. *Telematics and Informatics, 35*(8), 2184–2200. https://doi.org/10.1016/j.tele.2018.08.006

Vuorikari, R., Kluzer, S., & Punie, Y. (2022). *DigComp 2.2: The Digital Competence Framework for Citizens—with new examples of knowledge, skills and attitudes*. Publications Office of the European Union. https://doi.org/10.2760/115376

Yang, R., Gao, S., & Jiang, Y. (2024). Digital divide as a determinant of health in U.S. older adults: Prevalence, trends, and risk factors. *BMC Geriatrics, 24*, Article 1027. https://doi.org/10.1186/s12877-024-05612-y