IMPACT OF DIGITAL SKILLS DEVELOPMENT ON EMPLOYABILITY AMONG UNIVERSITY GRADUATES IN NIGERIA: THE MEDIATING ROLE OF DIGITAL COMPETENCE

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Abstract
In today's digital economy, employability increasingly depends on graduates' ability to acquire and apply digital skills effectively. Despite ongoing digital education initiatives, many Nigerian graduates still face challenges in translating digital training into practical workplace competence. This study therefore investigates the impact of digital skills development on employability among university graduates in Nigeria, with digital competence examined as a mediating variable. Guided by Human Capital Theory, the study posits that digital training enhances employability when it is transformed into applied competence that improves graduates' productivity and adaptability. A descriptive survey design and cross-sectional approach were employed in the study, with data collected from 352 graduates of Kaduna State University and Ahmadu Bello University. The data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). Results reveal that digital skills development significantly predicts digital competence, and digital competence strongly influences employability. Furthermore, digital competence mediates the relationship between digital skills development and employability. The study concludes that employability outcomes depend not only on acquiring digital skills but also on developing competence that enables effective application in work contexts. It recommends integrating practical digital learning into university curricula, enhancing academia–industry collaboration, and promoting continuous digital upskilling among graduates.

Keywords: Digital skills development, Digital competence, Employability, Human Capital Theory, Nigerian graduates

Introduction

Digitalisation has redefined the skills required for labour market participation, making digital skills a core determinant of graduate employability across the globe. These skills cover the ability to search, evaluate, and manage digital information, communicate and collaborate online, create content, and solve problems with technology ((Audrin, Audrin, & Salamin, 2024; Tee, Song, Ho, Wong, Lim, 2024). Universities are therefore under pressure to ensure that graduates are not only equipped with technical knowledge but also with digital readiness that enables them to function effectively in modern workplaces (Mejias-Acosta, D'Armas Regnault, Vargas Cano, Cardenas Cobo & Vidal Silva, 2024). Global studies highlight a mismatch between digital training in higher education and the competencies demanded by employers (Fan & Wang, 2022). Systematic reviews also show that many institutions provide surface-level digital instruction that fails to foster transferable workplace competence (López-Núñez et al., 2024). In Nigeria, similar challenges of outdated curricula and limited ICT infrastructure have been reported in recent study (Uzoamaka & Okpuzor, 2025), contributing to persistent graduate unemployment. As a result, many graduates struggle to apply the digital skills they claim to possess, leaving employers dissatisfied and contributing to rising graduate unemployment (Lopez-Nunez et al., 2024).

Moreover, the effectiveness of digital training depends not only on acquiring skills but also on building digital competence, defined as the confident and critical application of digital skills in real-world contexts (Tzafilkou, Perifanou & Economides, 2022). While digital skills and competence are related, competence reflects actual capability to perform tasks, adapt to technological change, and solve workplace challenges (Mejias-Acosta et al., 2024). This distinction is consistent with Human Capital Theory (Becker, 1964), which argues that investments in education and training enhance employability only when knowledge and skills are converted into productive capabilities. In this sense, digital competence represents the mechanism that links digital skills development to employability outcomes.

Despite these insights, graduate unemployment in Nigeria remains high, and employers frequently cite inadequate digital readiness as a reason for rejecting applicants (Akudolu & Onyeneke, 2022). Universities have introduced digital training initiatives, yet these have not consistently translated into employability gains, possibly because the competence dimension is overlooked (Akudolu & Onyeneke, 2022; Okojide & Onukwu, 2025). From a theoretical standpoint, Human Capital Theory suggests that training should improve employability through enhanced competence, but this mechanism remains empirically underexplored in the Nigerian context. This study therefore investigates the impact of digital skills development on employability among university graduates in Nigeria, with digital

competence as a mediating variable. The objective is to determine whether and to what extent competence explains the relationship between skills training and employability.

Literature Review and Hypotheses Development

Digital Skills Development

Digital skills development refers to deliberate processes such as formal instruction, workplace training, and structured informal learning that build an individual's ability to find, evaluate, create, and communicate information using digital technologies (Carretero, Vuorikari & Punie, 2017; van Laar, van Deursen, van Dijk & de Haan, 2017; Tzafilkou, et al., 2022; Karhapaa, Rikala, Poysa-Tarhonen & Hamalainen, 2024). Contemporary frameworks highlight its multi-dimensional nature, covering information literacy, technical operations, content creation, communication and collaboration, safety, and problem-solving, while stressing that measurement must capture both basic technical tasks and higher-order evaluative and ethical behaviors (Carretero, et al., 2017). Moreover, Empirical studies show that 21st-century capabilities overlap with digital skills but extend beyond mere tool use to include creativity, critical thinking and adaptability; hence training programmes that target only technical tasks often fail to produce the broader work-ready competencies employers demand (Van Laar, et al., 2017).

Research on how to develop digital skills highlights three consistent lessons. First, effective development combines conceptual instruction with authentic practice: learners must use tools in realistic tasks to transfer classroom learning to workplace performance (Carretero et al., 2017; van Laar et al., 2017). Second, access and inequality matter: digital training outcomes are constrained by unequal access to devices, connectivity and educator capacity, so interventions must address infrastructure and pedagogical quality as well as content (Helsper & Reisdorf, 2017; van Dijk & van Deursen, 2014). Third, recent validation and review studies recommend treating digital competence (the confident, contextually appropriate application of digital skills) as a distinct outcome of development programmes and as the proximal predictor of employability and performance (Tzafilkou, et al., 2022; Carretero et al., 2017). Together, these findings imply that policy and curriculum design should prioritise practice-based, contextually relevant training and rigorous assessment of competence rather than only counting contact hours or course offerings.

Employability

Employability is commonly defined as a person's capability to gain and maintain employment and to move between jobs if necessary, and contemporary research frames it as a multi-dimensional construct that combines individual attributes, career adaptability, and contextual opportunities (Fugate, Kinicki & Ashforth, 2007; Kwon, 2019).

Psychological and competency approaches emphasize personal resources such as adaptability, career self-management, and transferable skills, arguing that these resources increase an individual's capacity to obtain and sustain work (Fugate, et al., 2007). Complementary competence-based models treat employability as a set of specific skills and capacities including occupational expertise, social and communication skills, and metacognitive abilities that can be measured and developed through education and training (Van der Heijde & Van der Heijden, 2006). These perspectives together imply that employability is not a static trait, but a dynamic outcome shaped by both individual development and labour-market conditions. Studies on graduate employability highlight two policy-relevant findings. First, universities must move beyond narrow skills checklists and foster broader career attributes critical thinking, adaptability, and self-directed learning because employers value these transferable capabilities alongside technical knowledge (Tomlinson, 2007; Bridgstock, 2009). Second, practical models used in higher education link curricular design to employability outcomes by specifying how knowledge, skills, reflective practice, and career development activities interact to produce work readiness; such models inform assessment and curriculum redesign aimed at demonstrable employment outcomes (Dacre Pool & Sewell, 2007). Taken together, the literature indicates that improving employability requires coordinated efforts to develop measurable competencies, support career adaptability, and align training with real workplace tasks and expectations.

Digital Competence

Digital competence refers to the set of skills, knowledge and attitudes required to use digital technologies effectively, critically and ethically in varied contexts (Carretero, et al., 2017; Spante, Hashemi, Lundin, & Algers, 2018). Contemporary scholarship treats digital competence as multi-dimensional, encompassing information and media literacy, technical operation and tool use, communication and collaboration, content creation, safety and problem-solving, and a metacognitive capacity to apply these in context (Van Laar, et al., 2017; Tzafilkou, et al., 2022). Frameworks and systematic reviews emphasize that competence is more than technical skill: it includes critical evaluation of sources, ethical awareness, and the ability to transfer digital practices to new tasks, which distinguishes mere tool familiarity from applied competence (Ilomaki, Paavola, Lakkala, & Kantosalo, 2016; Spante et al., 2018). Empirical scale-development studies reinforce this distinction by validating instruments that separate technical actions from higher-order evaluative and adaptive behaviours. (Van Laar, et al., 2017 ; Spante, et al., 2018 ; Tzafilkou, et al., 2022). Research on measurement and development highlights two practical implications. First, teaching and training that combine conceptual instruction with authentic, practice-based tasks produce stronger competence gains than instruction limited to demonstrations or lists of

tools; assessment should therefore measure applied performance and adaptive use, not only self-reported familiarity. Second, inequalities in access, pedagogy and infrastructure constrain competence development: students with limited device access or exposure to authentic tasks often report skills that do not translate into workplace readiness. These findings underpin calls for curricula and policy that prioritise contextualised, practice-oriented learning and validated competence assessments if digital training is to improve outcomes such as employability and job performance. (Tzafilkou et al., 2022; Van Laar et al., 2017; Helsper & Reisdorf, 2017).

Digital Skills Development and Digital Competence

Scholars generally distinguish between digital skills development, the structured acquisition of task-oriented abilities through education, workplace training, or informal learning and digital competence, which represents a broader integration of technical, cognitive, and ethical capacities in digital contexts (Carretero, et al., 2017; Van Laar et al., 2017). Empirical studies show that digital skills development acts as a precursor to competence formation. For instance, Ilomaki et al. (2016) argue that while skills training enhances tool use and operational efficiency, competence emerges when these skills are combined with critical thinking, problem-solving, and ethical awareness. Similarly, Spante et al. (2018) found that competence requires not only mastery of digital tools but also the ability to adapt them across tasks, evaluate information critically, and collaborate effectively online. These findings underscore that skill development contributes to competence, but competence itself reflects a deeper, contextualized ability that transcends basic technical functions. The relationship between the two concepts is often framed within Human Capital Theory, which posits that investments in skills yield productivity gains and employability outcomes (Becker, 1993). Studies suggest that individuals who undergo structured digital skills training are more likely to convert these inputs into broader competencies that enhance labor market adaptability and lifelong learning. For example, Van Dijk and van Deursen (2014) show that technical skill acquisition predicts higher levels of information literacy and strategic competence, which in turn improve employment opportunities. The study of Tzafilkou et al. (2022) further emphasize that the return on investment in digital training is maximized when programs integrate critical, creative, and ethical dimensions, transforming skill acquisition into competence. Thus, digital skills development and digital competence are interdependent, with Human Capital Theory providing a useful lens to explain how initial training investments translate into broader capacities that drive individual and organizational performance. Based on the above, the relationship is hypothesized as follows.

H01: Digital skills development has no significant effect on digital competence.

Digital Competence and Employability

Scholarly debates consistently emphasize digital competence as a decisive factor shaping graduates' employability in today's technology-driven labor markets. Empirical studies show that graduates with higher levels of digital competence demonstrate stronger labor market outcomes, including increased job opportunities and career mobility (van Laar et al., 2017; Ilomaki et al., 2016). For instance, the study of Tzafilkou, et al. (2022) indicated that employers increasingly prioritize not just technical expertise but also digital collaboration, problem-solving, and ethical awareness when assessing graduate employability. These findings reflect the multidimensional view of employability as involving both individual skills and contextual opportunities, in which digital competence functions as a bridge between academic training and workplace readiness.

The relationship between digital competence and employability can be better understood through the lens of Human Capital Theory, which posits that investments in education and skill development improve productivity and labor market outcomes (Becker, 1993). Digital competence embodies such an investment, as it combines knowledge, skills, and attitudes that increase graduates' economic value to employers. Studies demonstrate that digitally competent graduates are more adaptable to new technologies, better prepared for dynamic job roles, and more competitive in globalized markets (Carretero et al., 2017; Van Dijk & Van Deursen, 2014). By extending beyond technical skills to include critical evaluation and responsible use of digital tools, digital competence enhances both individual employability and organizational performance. This suggests that fostering digital competence is not merely an educational goal but also a strategic response to the employability crisis, validating the central claim of Human Capital Theory that competence-based development yields measurable labor market benefits. Based on the above, the relationship is hypothesized as follows.

H02: Digital competence has no significant effect on employability.

Mediating role of Digital Competence on the Relationship between Digital Skills Development and Employability

While digital skills development equips individuals with the technical abilities to operate tools and platforms, these skills alone do not automatically lead to employability; they must be integrated with broader competencies such as critical evaluation, collaboration, problem-solving, and ethical awareness (Ilomaki et al., 2016; Carretero et al., 2017). Tzafilkou, et al. (2022) similarly argue that competence extends beyond skill acquisition to include confidence and adaptability essential qualities for transferring skills into diverse job contexts. Empirical studies on graduate employability consistently show that digital skills alone are insufficient. Instead, the consolidation of these skills into digital competence is a stronger driver of employability outcomes. For instance, Van Dijk and Van Deursen

(2014) found that while basic digital literacy is necessary, higher-order competence in information management and problem-solving is a stronger predictor of job readiness. Collectively, these findings stress that employability is shaped not only by acquiring skills but by transforming them into competencies that reflect adaptability, critical thinking, and practical application.

Building on this evidence, studies suggest that digital competence functions as an intermediary mechanism, linking digital skill acquisition to employment opportunities. Graduates who translate their training into competence are more capable of securing jobs, integrating into digital workplaces, and sustaining long-term career mobility (Ilomaki et al., 2016; van Laar et al., 2017).

This suggests that the relationship between digital skills development and employability is not direct but mediated by competence, which operationalizes learned skills into productive outcomes. Accordingly, the following hypothesis is proposed:

H03: Digital competence does not mediate the relationship between digital skill development and employability.

Conceptual and Theoretical Framework

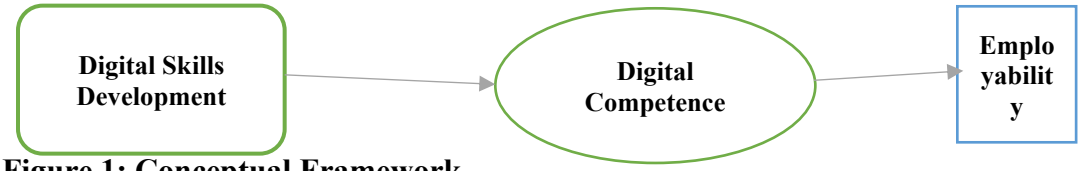

Figure 1: Conceptual Framework

Human Capital Theory (HCT) developed by Becker (1964) explains the mediating role of digital competence in the relationship between digital skills development and employability. The theory views education and training as investments that enhance productivity but emphasizes that their value is realized only when skills are effectively applied. In this context, digital skills development equips graduates with technical abilities, while digital competence converts these abilities into transferable outcomes that improve labor market performance. Competence extends beyond technical know-how to include critical evaluation, ethical awareness, and adaptability, enabling graduates to meet evolving workplace demands (Ilomaki et al., 2016; van Laar et al., 2017). Without this competence, digital skills remain underutilized, limiting their contribution to employability. Thus, digital competence mediates the relationship by ensuring that investments in digital skills translate into practical capabilities, aligning with HCT's emphasis on the productive application of human capital for career outcomes.

Methodology

This study adopted a descriptive survey design with a cross-sectional approach. Data were collected in September 2025 from Nigerian university graduates who

had completed their studies within the last three years. Graduates were selected because employability outcomes are best assessed among individuals already exposed to labor market realities, unlike undergraduates who can only report perceived employability (Okay-Somerville & Scholarios, 2017; Jackson & Tomlinson, 2020). Kaduna State University (state-owned) and Ahmadu Bello University (federal) were purposively selected to capture perspectives across different governance structures. Both institutions produce large numbers of graduates, offer diverse faculties, and maintain alumni and NYSC linkages that facilitate access to respondents. Collaboration with alumni offices and NYSC state secretariats enabled questionnaire distribution via Google Forms.

The study population was approximately 15,500 graduates. Based on Krejcie and Morgan's (1967) statistical table, a minimum sample size of 375 was determined and increased by 10% to 413 to minimize non-response bias. Proportionate stratified random sampling was used to categorize the population, while simple random sampling was employed to select participants. A total of 352 questionnaires were returned, representing a response rate of 85.3%. Data was analyzed with Partial Least Squares Structural Equation Modelling (PLS-SEM) using SmartPLS version 4.1.1.4.

Instruments and Measurement

The study employed three main constructs: digital skills development (DSD), digital competence (DC), and employability (EM). Digital skills development, the independent variable, was measured using 10 items adapted from Fan and Wang (2022). Digital competence, serving as the mediating variable, was assessed with 12 items adapted from Tzafilkou, et al. (2022). Employability, the dependent variable, was measured with 7 items adapted from Llinares-Insa, Gonzalez-Navarro, Zacares-Gonzalez, and Cordoba-Inesta (2018). All items were rated on a five-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5).

Presentation and Discussion of Results

In this study, the analysis was conducted in two phases: the measurement model and the structural model. The measurement model was first assessed to establish internal consistency reliability, convergent validity and discriminant validity of the constructs, as presented in Figure 1. In the second phase, the structural model was examined to evaluate the level of R-square value, determine the effect size (f2) and the significance of the hypothesized relationships.

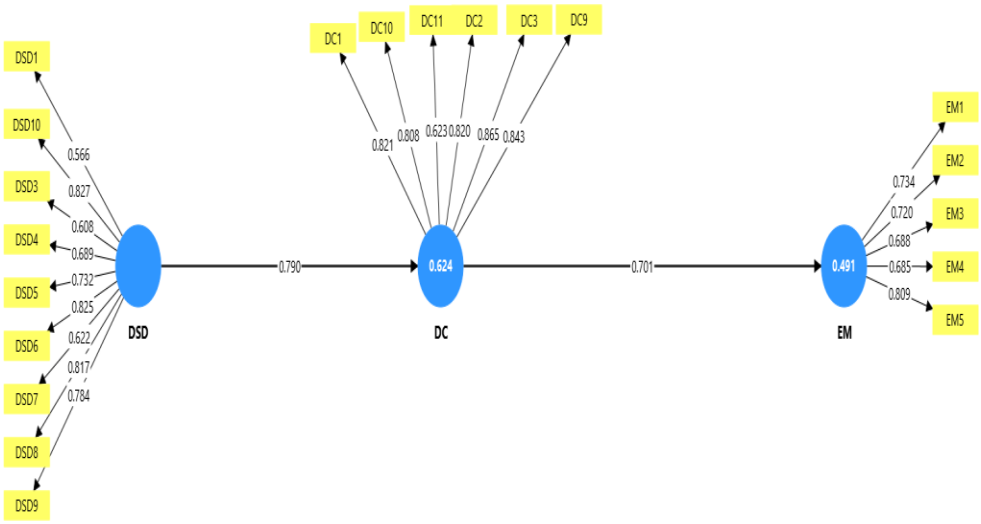

Figure 1. Measurement Model

Table 1: *Item loading, Cronbach Alfa (CA), Composite Reliability (CR) and Average Variance Extracted (AVE)*

Construct	Items	Loading	CA	CR
AVE				
Digital Competence	DC1	0.821	0.885	0.893
0.641				
	DC10	0.808		
	DC11	0.623		
	DC2	0.820		
	DC3	0.865		
	DC9	0.843		
Digital Skills Development	DSD1	0.566	0.884	0.895
0.526				
	DSD10	0.827		
	DSD3	0.608		
	DSD4	0.689		
	DSD5	0.732		
	DSD6	0.825		
	DSD7	0.622		
	DSD8	0.817		
	DSD9	0.784		
Employability	EM1	0.734	0.777	0.777
0.531				
	EM2	0.720		

EM3	0.688
EM4	0.685
EM5	0.809

Table 1 presents the results of the measurement model, which assessed the indicator reliability, internal consistency, and convergent validity of the constructs: Digital Competence (DC), Digital Skills Development (DSD), and Employability (EM). In the analysis, items with outer loadings below the recommended threshold of 0.60 were examined. Consequently, EM6 and EM7, DC4, DC5, DC6, DC7, DC8, DC12, and DSD2 were removed due to their low loadings. However, other indicators with marginally lower loadings were retained, as their exclusion did not affect the constructs' overall reliability. The remaining indicators demonstrated satisfactory loadings across constructs: Digital Competence (0.623–0.865), Digital Skills Development (0.566–0.827), and Employability (0.685–0.809). The CA values ranged from 0.777 to 0.885, exceeding the minimum acceptable level of 0.70, while CR values ranged from 0.777 to 0.895, confirming strong internal consistency. Similarly, the AVE values for all constructs exceeded the 0.50 benchmark, with DC = 0.641, DSD = 0.526, and EM = 0.531, thereby establishing convergent validity. Overall, these results confirm that the measurement model achieved acceptable reliability and validity, justifying its suitability for subsequent structural model analysis.

Moreover, one of the indicators for assessing the model discriminant validity is Heterotrait–Monotrait ratio of correlations (HTMT). According to Hair, Hult, Ringle, Sarstedt, Danks and Ray (2021), HTMT assesses discriminant validity by comparing the average correlations between indicators of different constructs to the average correlations within the same construct. A threshold value of 0.90 is appropriate for conceptually related constructs, while a more conservative cutoff of 0.85 is recommended for distinct constructs (Henseler et al., 2015; Hair et al., 2021). In this study, the results presented in Table 2 demonstrate that all HTMT values fall below the recommended threshold of 0.90, thereby confirming acceptable discriminant validity among the constructs. The HTMT value between Digital Competence and Digital Skills Development DSD is 0.884, which slightly exceeds the stricter 0.85 cutoff; however, this is justifiable given the conceptual proximity of both constructs, as digital competence often emerges from sustained digital skills development. The remaining correlations, DC and Employability (0.841) and DSD and Employability (0.779) are comfortably below the threshold, further affirming that each construct is empirically distinct and measures a separate but related aspect of the research model (Henseler, Ringle & Sarstedt, 2015; Hair, et al., 2021).

Table 2:
Discriminant Validity using Heterotrait-Monotrait Ratio (HTMT)

Variables	DC	DSD	EM
Digital Competence			
Digital Skills Development	0.884		
Employability	0.841	0.779	

Figure 2 presents the structural model of the study. The model was used to assess the hypothesized relationships through the examination of path coefficients, effect size (f^2), and the coefficient of determination (R^2). A bootstrapping procedure with 5,000 resamples was employed to determine the significance levels of the path coefficients and evaluate the strength of the relationships among the constructs.

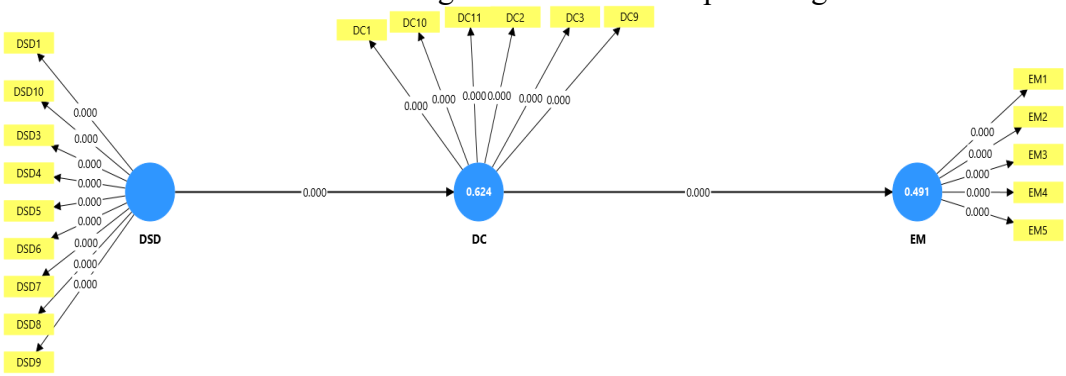

Figure 2. Structural Model

Table 3:
Path coefficient for Direct and Mediating Relationship

Hyp	Relationship	Beta	Std. Deviation	T statistics	Pvalues	Decision
H1	DC -> EM	0.701	0.025	27.881	0.000	Rejected
H2	DSD -> DC	0.790	0.019	41.431	0.000	Rejected
H3	DSD -> DC -> EM	0.553	0.025	21.869	0.000	Rejected

Table 3 presents the path coefficients for both direct and mediating relationships among the study variables. The results indicate that Digital Competence (DC) significantly influences Employability (EM) ($\beta = 0.701$, $t = 27.881$, $p < 0.001$), suggesting that higher levels of digital competence strongly enhance graduates'

employability. Similarly, Digital Skills Development (DSD) has a significant positive effect on Digital Competence ($\beta = 0.790$, $t = 41.431$, $p < 0.001$), indicating that skill acquisition substantially improves individuals' competence in applying digital technologies. Furthermore, the mediating effect of Digital Competence on the relationship between Digital Skills Development and Employability is also significant ($\beta = 0.553$, $t = 21.869$, $p < 0.001$). This implies that digital competence serves as a critical mechanism through which digital skills development translates into employability outcomes. Since all relationships are statistically significant at $p < 0.001$, the null hypotheses are rejected, confirming that digital skills development indirectly enhances employability through the mediating role of digital competence.

Table 4:

R Square (R^2) and Effect Size (f^2)

Indicators	R Square	
DC	0.624	
EM	0.491	
Indicators	f^2	Effect Size
DC -> EM	0.964	Large
DSD -> DC	1.659	Large

Table 4 presents the results for the coefficient of determination (R^2) and effect size (f^2), which assess the explanatory power and relative influence of the predictor variables in the model. The R^2 values indicate that Digital Skills Development (DSD) explains 62.4% of the variance in Digital Competence (DC), while Digital Competence and Digital Skills Development together account for 49.1% of the variance in Employability (EM). Following the guidelines of Hair, Hult, Ringle, Sarstedt, Danks, & Ray (2021), these R^2 values can be interpreted as substantial, indicating that the model possesses strong explanatory power.

The effect size (f^2) further reveals the magnitude of each predictor's contribution to the endogenous variables. The effect of DSD on DC ($f^2 = 1.659$) and DC on EM ($f^2 = 0.964$) both exceed the threshold of 0.35, which represents a large effect size (Cohen, 1988). This implies that digital skills development exerts a strong influence on digital competence, and in turn, digital competence has a substantial impact on employability.

Conclusion

The findings of this study provide strong empirical evidence on the pivotal role of Digital Competence (DC) and Digital Skills Development (DSD) in enhancing graduate employability (EM). The structural model results revealed that DSD significantly predicts DC, and DC, in turn, strongly influences employability outcomes. Furthermore, the mediation analysis established that DC serves as a

crucial conduit through which DSD translates into improved employability, highlighting the central role of digital competence in today's technology-driven labour market. Moreover, the study affirms that developing digital skills is not only essential for improving technical proficiency but also for enhancing employability prospects through strengthened digital competence. Graduates who acquire and effectively apply digital skills are more adaptable, innovative, and better positioned to meet the evolving demands of contemporary workplaces.

Recommendations

1. Therefore, to enhance graduate employability in the digital era, universities should integrate practical digital skills training into their curricula, ensuring that students acquire both technical proficiency and applied competence before entering the labour market. This institutional effort should be complemented by policy interventions that promote digital education through targeted funding, modern infrastructure, and national upskilling initiatives aimed at bridging the digital divide.
2. Collaboration between academia and industry is equally essential, as it ensures that training programmes are aligned with evolving workplace demands and that students gain hands-on experience through internships and digital innovation projects. In addition, employers should invest in continuous digital training to sustain workforce competence and adaptability in dynamic technological environments.
3. Finally, graduates must take personal responsibility for improving their digital competence by engaging in self-directed learning, online certifications, and emerging digital tools, thereby reinforcing institutional and policy efforts toward a more digitally competent and employable workforce.

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