

Digital Skills Acquisition and Employability Outcomes of University Graduates in Nigeria

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Abstract—Nigeria produces over 500,000 university graduates annually, yet youth unemployment persists above 33 per cent a paradox driven substantially by a widening mismatch between the digital competency's graduates possess and those that twenty-first-century employers' demand. This paper examines the relationship between digital skills acquisition and the employability outcomes of university graduates in Nigeria through a systematic empirical and conceptual review of literature published between 2015 and 2026. The review draws on peer-reviewed studies retrieved from Scopus, Web of Science, ERIC, Google Scholar, and African academic repositories, and is anchored on Human Capital Theory, Signalling Theory, and the European Digital Competence Framework for Citizens (DigComp 2.2). Findings reveal that Nigerian graduates consistently exit the university system with digital competencies at foundational levels insufficient for the intermediate and advanced proficiencies employers require in data management, digital communication, cloud-based workflows, and cybersecurity. Technology-enhanced learning environments are constrained by access inequities and teacher capacity deficits, while university credentials have progressively lost credibility as signals of practical digital competence to private-sector employers. Structured, modular, and practice-driven digital skills interventions produce statistically significant and practically large competence gains. The paper proposes the Digital Skills Employability Pathways Model (DSEPM) as a theoretically grounded account of how digital competence translates or fails to translate into labour market outcomes through three distinct causal pathways, each moderated by structural factors including gender, regional infrastructure, and socioeconomic background. The paper concludes that the digital skills deficit is tractable but requires coordinated institutional response, and recommends that the National Universities Commission integrate a verified digital competence benchmark into minimum academic standards across all disciplines, that universities embed practice-oriented digital skills

training into curricula, and that the National Information Technology Development Agency structurally align graduate digital skills programmes with university credit frameworks.

Index Terms—digital competence; digital skills; employability outcomes; graduate unemployment; university graduates

I. INTRODUCTION

1.1. Background to the Study

Nigeria confronts a graduate employment paradox of troubling proportions. The National Universities Commission (NUC, 2023) reports over 170 accredited universities producing more than 500,000 graduates annually, while the National Bureau of Statistics (NBS, 2024) places youth unemployment among those aged 18 to 35 at 33.3 per cent. This figure excludes the substantially larger cohort of underemployed graduates working in roles disconnected from their qualifications. The consequence is a growing skills-productivity gap — an economy investing in education without harvesting the productive returns that investment should generate.

The global labour market has been fundamentally restructured by digital technology. Automation, artificial intelligence, cloud computing, and data-driven decision-making have redefined what employers expect at the point of hiring. The World Economic Forum (2023) identifies digital skills among the top three fastest-growing workforce competency categories, while the McKinsey Global Institute (2023) projects that 375 million workers globally will need to acquire substantially new skills by 2030. Nigerian employers are not insulated from these expectations. Across finance, healthcare, logistics, public administration, and digital commerce,

employers increasingly require not merely the ability to use a computer, but competence in data analysis, digital communication platforms, cloud collaboration tools, cybersecurity protocols, and AI-assisted workflows.

Nigerian university graduates, however, arrive at this demanding labour market ill-equipped. The World Bank's (2023) Nigeria Digital Economy Assessment found that fewer than 25 per cent of Nigerian tertiary graduates demonstrate intermediate-level digital competence as measured against DigComp 2.2. Employer surveys consistently rate graduate digital readiness as inadequate. Ezech (2025) found that over 85 per cent of sampled graduates in Anambra State lacked adequate digital marketing competencies, and David, Rasheed, and Amoda (2024) found that business education graduates in Lagos State self-classified their digital skills predominantly as "basic" insufficient for the demands of a modern workplace.

1.2. Statement of the Problem

The core problem is a structural, widening mismatch between the digital competencies that Nigerian university curricula produce and those that twenty-first-century employers require. University curricula remain predominantly content-oriented rather than competency-driven; technology-enhanced learning environments are constrained by access inequities and teacher capacity deficits; and the digital credential signals that Nigerian universities emit are progressively distrusted by private-sector employers who cannot verify practical capability from institutional transcripts alone (Nwosu, 2023; Ohanu et al., 2024).

The consequences are not distributed equitably. Graduates from better-resourced institutions and households can supplement university training with privately acquired digital certifications. Those from lower-income backgrounds, rural institutions, and underserved regions face compounded disadvantage: constrained access to reliable internet and electricity infrastructure reduces both the quality of digital learning environments and the incentive to acquire costly external credentials (Nwosu, 2023; GSMA, 2023). Available infrastructure data indicate that internet penetration and electricity reliability are substantially lower in northern Nigerian states than in southern urban centres, suggesting that graduates from these regions are likely to exit universities with fewer

opportunities to develop or supplement digital competencies — though dedicated empirical studies in northern Nigerian higher education institutions remain, at present, absent from the literature and constitute a priority research gap. This makes the digital skills deficit simultaneously a productivity problem and an equity problem.

1.3. Justification and Objectives of the Study

Despite growing recognition of the challenge, the empirical literature on digital skills and graduate employability in Nigeria remains fragmented, geographically concentrated in southern states, and methodologically uneven. Most studies are cross-sectional, discipline-specific (predominantly business education), and imprecise in the definition and measurement of digital skills. A theoretically grounded, systematic, and empirically anchored review is needed to consolidate existing evidence, identify patterns and contradictions in the literature, and generate a research agenda that can guide future empirical and policy work.

A confirmatory search of Scopus and Google Scholar using the terms "systematic review digital skills employability Sub-Saharan Africa" and "scoping review graduate employability Nigeria" (conducted April 2026) returned no published systematic or scoping review applying a multi-theoretical framework to this intersection in the Nigerian higher education context. The present paper therefore addresses a substantive gap in the review literature, in addition to the empirical literature it synthesises.

This paper accordingly pursues three objectives: (i) to synthesise and critically evaluate existing conceptual and empirical literature on digital skills acquisition and graduate employability in Nigeria; (ii) to develop a theoretically coherent model of the causal pathways linking digital skills acquisition to graduate labour market outcomes; and (iii) to identify specific, evidence-based research gaps that future empirical inquiry must address. The review serves both scholarly and policy audiences: it is addressed to researchers designing future studies and to institutional actors — the NUC, NITDA, and university curriculum developers — responsible for the policy decisions that determine what Nigerian graduates know and can do when they leave university.

II. REVIEW OF RELATED LITERATURE

2.1. Conceptual Clarifications

2.1.1. *Digital Skills: From Literacy to Competence*

The term "digital skills" has been applied inconsistently in both the scholarly and policy literature, encompassing a range of abilities from basic device operation to advanced programming and data analytics. Gilster (1997) offered an early formulation equating digital skills with computer literacy understood as the ability to operate word-processing software and navigate the internet, a conception quickly overtaken by technological change. Subsequent frameworks broadened the definition: Eshet-Alkalai (2004) introduced digital literacy as a survival skill set encompassing critical evaluation, creative reproduction, and real-time thinking. The Partnership for 21st Century Skills (2009) embedded digital competence within a broader information, media, and technology skills framework. UNESCO (2018) proposed a global reference framework for digital literacy skills.

The most comprehensive and internationally adopted framework remains the *Digital Competence Framework for Citizens*, DigComp 2.2, published by the European Commission (Vuorikari et al., 2022). DigComp 2.2 organises digital competence into five domains: (1) Information and Data Literacy the capacity to identify, retrieve, store, organise, and critically evaluate digital data; (2) Communication and Collaboration interacting and sharing through digital environments; (3) Digital Content Creation producing and editing digital content in multiple formats; (4) Safety protecting devices, content, personal data, and digital wellbeing; and (5) Problem-Solving identifying needs and solving conceptual problems using digital tools creatively. Each domain is assessed across eight proficiency levels from foundational awareness (Level 1) to highly specialised innovation (Level 8). This tiered architecture displaces the binary digital-literate/digital-illiterate framing that has distorted assessment and policy in the Nigerian context. It is noted, however, that DigComp 2.2 was developed in a European policy context, and published studies validating its constructs and proficiency descriptors in Sub-Saharan African labour market settings remain unavailable in the literature — a gap that constitutes a methodological priority for future research (see Section 5.1, Gap 6).

For this review, digital skills are defined as the combination of technical, cognitive, and socio-communicative competencies that enable individuals to navigate, create, evaluate, and apply information and content in digital environments, and to translate these capabilities into productive professional and entrepreneurial outcomes (van Laar et al., 2020; OECD, 2019). A consequential distinction throughout this paper is between *digital exposure* access to and use of digital devices and platforms and *digital competence* the structured, purposeful, and transferable application of digital tools to solve real problems. Nigerian graduates frequently possess the former while lacking the latter.

2.1.2. *Graduate Employability: Definitions and Dimensions*

Graduate employability has similarly resisted a single authoritative definition. Hillage and Pollard (1998) defined employability as the capability to gain initial employment, maintain employment, and obtain new employment if required a formulation that located employability as an individual-level attribute. Yorke (2004) enriched this by defining it as a set of achievements, skills, understandings, and personal attributes that make graduates more likely to gain employment and be successful in their chosen occupations. Both formulations, however, are supply-side in orientation: they focus on what graduates possess, neglecting the structural conditions that determine whether those possessions are recognised and rewarded in practice.

Tomlinson (2017) offered the most substantive structural critique, arguing that employability is co-produced through the interaction between graduate attributes and labour market structures employer perceptions, hiring practices, network access, and credentialling systems. His graduate capital framework identifies five forms of capital (human, social, cultural, identity, and psychological) whose interaction shapes employability outcomes independently of individual skill levels. Holmes (2013) further argued that employability is enacted rather than possessed: it emerges through the graduate's active navigation of specific social and economic contexts. Both frameworks directly complement the structural moderation pathway of the DSEPM proposed in Section 2.3: they explain why identical skill levels produce divergent outcomes for

graduates situated differently within the labour market. These critical perspectives are particularly relevant in Nigeria, where structural barriers geographic concentration of formal employment, network-dependent hiring, and the dominance of informal sector work mean that individually held competencies alone are an insufficient predictor of employment outcomes (Sodeinde, 2023). This paper adopts an integrated employability conception that acknowledges both supply-side graduate attributes and demand-side structural conditions.

2.2. Theoretical Framework

2.2.1. Human Capital Theory

Human Capital Theory (HCT), foundationally articulated by Schultz (1961) and systematically developed by Becker (1964), treats education and skills training as productive investments: costs incurred in the present tuition, foregone earnings yield returns in the form of enhanced productive capacity, higher wages, and improved employment prospects. Becker's (1964) analytical distinction between general human capital — skills transferable across employers, such as digital competence and specific human capital skills of value only to particular employers is particularly germane here. Digital skills are largely general: valued across industries and organisations, making their acquisition theoretically rational and the expected returns broadly distributed across labour market entrants.

Mincer (1974) extended HCT by demonstrating that both formal education and on-the-job training contribute additively to earnings outcomes, providing an empirical framework for estimating the return to specific educational investments. Applied to the Nigerian context, HCT predicts that graduates who invest in certified digital skills programmes through Google Career Certificates, Microsoft Certifications, AWS Training, or similar internationally recognised credentials should command measurably better employment and earnings outcomes than those who rely solely on university-acquired digital exposure. Samuel, Akorede, and Karimu (2025) provide the strongest Nigerian-specific empirical support for this prediction, demonstrating large and significant competence gains from structured digital training.

HCT, however, assumes labour markets that are competitive, transparent, and meritocratic assumptions that hold imperfectly in Nigeria, where

network-based hiring, geographic employment concentration, and employer capacity constraints all limit the market mechanism through which skills translate into outcomes (Adeyemi & Ogunyemi, 2021). This limitation is partly addressed by segmented labour market theory (Doeringer & Piore, 1971), which argues that labour markets are not unified competitive arenas but are structurally divided into primary and secondary segments with different hiring criteria, wages, and mobility prospects. In the Nigerian context, formal sector employment concentrated in Lagos, Abuja, and Port Harcourt constitutes a primary segment to which access is shaped as much by geographic proximity, social networks, and credentialing signals as by productive skill level. Graduates from lower-income or rural backgrounds may possess HCT-relevant skills but be systematically excluded from the segment in which those skills are rewarded. Sen's (1999) capability approach reinforces this: the relevant question is not merely whether graduates have acquired digital skills, but whether structural conditions enable them to convert those skills into substantive employment outcomes. The DSEPM's structural moderation pathway (Section 2.3) operationalises this insight.

2.2.2. Signalling Theory

Spence's (1973) job market signalling model addresses the information asymmetry problem that HCT's productive efficiency framing does not resolve: employers cannot directly observe worker ability before hiring and so use educational credentials as signals heuristics that guide selection decisions. The signal's value depends on its positive correlation with ability and on the cost of acquisition being differentially lower for high-ability candidates. Stiglitz (1975) extended this to include screening: employers use credentials to sort applicants into ability tiers, regardless of whether the credential itself augments productivity.

In the Nigerian labour market, Signalling Theory helps explain a critical observed phenomenon: employers have progressively lost confidence in Nigerian university transcripts as signals of digital competence, and instead weight internationally recognised digital certifications more heavily in hiring decisions (Nwosu, 2023; Jimoh, 2022). This has two compounding effects. First, it disadvantages graduates who cannot afford the cost of external certifications,

creating an equity gap superimposed on the skills gap. Second, it creates a credentialing arms race that universities are currently losing graduates are being implicitly required to acquire two credential sets, institutional and professional, in order to compete effectively. This dynamic has not been theorised or empirically examined in the existing Nigerian literature.

2.2.3. The DigComp 2.2 Framework as an Analytical Tool

Beyond its definitional function, the DigComp 2.2 Framework (Vuorikari et al., 2022) serves as this review's primary diagnostic tool. Its five-domain, eight-level architecture provides a taxonomy precise

enough to identify where specific competence gaps lie within the graduate population and at what proficiency levels employer demand activates. This resolution is unavailable in studies that operationalise digital skills as a single composite self-report variable. It enables curriculum developers to move from the question "do graduates have digital skills?" to which the answer is invariably a qualified "yes" to the more policy-useful question: "at which domains and levels are graduates proficient, and where specifically do they fall short?" Table 1 Summarises the Integration of The Three Theoretical Frameworks, Mapping Each to Its Core Analytical Contribution and Principal Limitation in The Nigerian Graduate Employability Context.

Table 1: Theoretical Framework Integration — Analytical Contributions and Limitations in the Nigerian Context.

Framework	Core Contribution	Nigerian Application	Principal Limitation
Human Capital Theory (Becker, 1964; Schultz, 1961; Mincer, 1974)	Education and training are productive investments yielding wage and employment returns; general skills broadly transferable	Explains returns to structured digital skills training (Samuel et al., 2025); predicts certification premium	Assumes competitive, meritocratic labour markets; segmented labour market structure in Nigeria limits transferability
Signalling Theory (Spence, 1973; Stiglitz, 1975)	Credentials resolve information asymmetry between employers and applicants in hiring decisions	Explains employer preference for international digital certifications over university transcripts (Nwosu, 2023)	Credential cost creates access barriers for lower-income graduates; signals can be inefficient
DigComp 2.2 (Vuorikari et al., 2022)	Provides a five-domain, eight-level diagnostic framework for specifying digital competence with domain and proficiency precision	Identifies which competence domains are deficient in Nigerian graduates and at which proficiency levels employer demand activates	Developed in a European context; no published validation studies in Sub-Saharan African settings currently available
Supplementary: Segmented Labour Market Theory (Doeringer & Piore, 1971) and Capability Approach (Sen, 1999)	Labour markets are structurally segmented; individuals need enabling conditions to convert skills into outcomes	Explains why graduates with equivalent skills obtain divergent outcomes based on geography, networks, and structural position	Macro-structural; does not readily generate individual-level testable predictions without integration with HCT

Source: Author's synthesis, 2026.

2.3. Conceptual Model: The Digital Skills–Employability Pathways Model (DSEPM)

Drawing on the theoretical synthesis above, this paper proposes the Digital Skills–Employability Pathways Model (DSEPM), which identifies three causal pathways connecting digital skills acquisition to

graduate labour market outcomes. The model integrates HCT's investment-return logic, Signalling Theory's credential-as-signal mechanism, and the structural moderation insights of segmented labour market theory and the capability approach. It provides the organising analytical framework for interpreting the empirical evidence reviewed in Section 2.4.

The DSEPM makes three analytical contributions. First, it foregrounds the *structural moderation pathway* which prior Nigerian scholarship has largely treated as background noise as a first-class explanatory mechanism. This explains why identical skill levels produce markedly different outcomes for graduates in different gender, geographic, and socioeconomic positions: policy that treats the digital skills deficit as uniform will produce solutions that are unequally effective. Second, it introduces a *temporal dimension* distinguishing immediate employability from longer-term career development that is necessary for evaluating whether digital skills interventions produce durable or merely transient employment effects. Third, it provides a *falsifiable structure*: each pathway and each moderating variable generates testable empirical predictions, providing the architecture for a future programme of longitudinal, multi-site Nigerian research.

2.4. Empirical Review: Digital Skills and Graduate Employability in Nigeria

2.4.1. Evidence on Digital Skills Deficits

David, Rasheed, and Amoda (2024), studying business education graduates across Lagos State tertiary institutions, found a statistically significant positive relationship between digital skill acquisition and employability. Their critical finding, however, was that the majority of graduates self-assessed their digital skills as "basic" consistent with DigComp 2.2 Levels 1 and 2 (foundational) placing them below the threshold at which employer demand for digital skills meaningfully activates. This pattern of "digital presence but digital inadequacy" graduates who use digital technologies socially but cannot deploy them productively in work contexts recurs consistently across the literature.

Saidu (2025) provides the most methodologically rigorous Nigerian contribution, employing partial least squares structural equation modelling (PLS-SEM) with Heterotrait-Monotrait (HTMT) ratio analysis to examine a mediation model in which digital

competence mediates the relationship between digital skills development and employability outcomes. The mediation was confirmed and statistically significant. The implication is direct: exposure to digital skills training does not produce employability returns unless it translates into genuine, measurable competence. Programmes that provide access to digital tools without structured competence-building pathways will not move graduate employment outcomes.

Binuyo, Adefulu, Asikhia, and Odumosu (2020), in the most geographically representative study available, surveyed 533 National Youth Service Corps (NYSC) members across Nigeria's six geopolitical zones. Multiple linear regression analysis found that digital innovation significantly and positively predicted skill acquisition ($\beta = 0.264$, $t = 4.329$, $p = 0.001$), while entrepreneurship education was positive but not statistically significant ($\beta = 0.056$, $p = 0.312$). The geographic breadth of this study provides the closest available approximation to a nationally representative finding, and the consistency of results across zones strengthens confidence in the relationship between digital engagement and skills outcomes.

Awoniyi and Owolabi (2025) found a significant positive relationship between digital skills and entrepreneurial capability among graduates in Nigerian public universities a critical finding given the inability of formal sector employment creation to absorb annual graduate output. Abiodun (2025), using structural equation modelling on polytechnic students in Osun State, confirmed behaviour-mediation effects of digital skills on entrepreneurial intentions. Olanipekun, Sokefun, Eboigbe, and Tunde (2021) found positive effects of skills acquisition on graduates' ability to find employment within six months, underscoring the employability premium attached to practical skills investment.

2.4.2. Technology-Enhanced Learning and Digital Skill Development

Ohanu, Nwandu, and colleagues (2024), surveying 318 vocational and technical education teachers across six Nigerian tertiary institutions, found that access to technology-enhanced learning (TEL) tools mediated the relationship between teachers' utilisation intentions and their actual utilisation performance (Cronbach's alpha reliability: 0.81). This finding locates a fundamental constraint in the digital learning pipeline: teachers who are unable to effectively deploy

TEL tools cannot deliver the practice-intensive digital learning environments that competence development requires. The problem is not motivational teachers intend to use digital tools but infrastructural and capability-related. Imoyera (2023) reinforces this conclusion, identifying teacher digital skills acquisition as a prerequisite for any meaningful improvement in the digital competence of business education graduates.

Otitoju and Nwagwu (2023), studying 378 undergraduates in Ibadan, found that 77.8 per cent had used Massive Open Online Courses (MOOCs), with 72 per cent having enrolled and 60.8 per cent completing their enrolled courses. UTAUT variables performance expectancy, effort expectancy, social influence, and facilitating conditions significantly predicted MOOC use, while internet accessibility and availability did not. This counterintuitive finding suggests that motivational and social factors are more binding constraints on digital learning engagement than connectivity alone, at least in urban university environments — a distinction with practical implications for programme design.

Ayoola (2025) examined artificial intelligence tool integration in building technology education in Oyo State, finding that most students reported only moderate AI-assisted workflow proficiency and that institutional support for AI integration was largely absent. Samuel, Akorede, and Karimu (2025) provide the strongest intervention evidence: a modular digital skills training programme delivered to 1,028 unemployed and underemployed graduates in Ogun State produced statistically significant improvements across all four modules Google Workspace, LinkedIn Professional Development, Canva Creative Design, and CV Writing with Digital Tools with effect sizes of Cohen's $d = 2.88$ to 4.91 ($p < .001$), confirming that structured, practice-driven intervention produces substantial and practically significant competence gains.

2.4.3. Employer Perceptions and the Demand Side

Uzoamaka and Okpuzor (2025), surveying 164 employers across the public and private sectors in Delta State using a four-point rating scale, found that data analysis tools, digital communication platforms, spreadsheet management, and online collaboration software were rated "Very Highly Required" by

employers, while business education graduates were assessed as weakest precisely in these domains. The mismatch is symmetrical and practically consequential: employers most need what graduates least possess.

Ezeh (2025) found that over 85 per cent of business education graduates in Anambra State lacked adequate digital marketing competencies, while Iyoha and Nwagu (2025) found that Nigerian business education programmes broadly failed to equip graduates for global digital competitiveness. Sunday and Samuel (2022) identified digital analytical skills as a new frontier for youth employability in Osun State but found graduates systematically unprepared to enter it. Nwosu (2023), in a multi-stakeholder doctoral study triangulating graduate, lecturer, professional and statutory regulatory body, and employer perspectives, found systemic misalignments: employers prioritised applied task-specific capability; lecturers emphasised theoretical understanding; regulatory bodies focused on accreditation compliance; and graduates navigated these competing demands without institutional guidance. This multi-stakeholder misalignment constitutes a governance failure that exceeds the capacity of any single actor to resolve unilaterally.

2.4.4. Sectoral and Disciplinary Evidence

The preponderance of reviewed literature concentrates on business education graduates, but evidence from other disciplines points to a systemic rather than discipline-specific problem. Liman (2025) found significant digital skills gaps among graduate librarians, particularly in cybersecurity awareness and data management the DigComp Domain 4 (Safety) competence area. Ohanu et al. (2024) documented deficits in vocational and technical education. Ayoola (2025) found similar patterns in building technology. Keshi and Umorenweke (2024) found digital skills deficits among secretarial and office technology graduates in Imo State, particularly in cloud collaboration and document management software. The convergence of evidence across disciplines with distinct technical requirements suggests that the digital skills deficit is a systemic property of Nigerian higher education rather than a discipline-specific anomaly, requiring a system-level rather than programme-level response.

The emergence of alternative credentialling pathways — Google Career Certificates, Microsoft

Certifications, AWS Academy, Coursera for Campus adds a further dimension. These programmes offer employer-validated, competency-standardised credentials that employers increasingly weight above university transcripts as indicators of practical digital capability (Nwosu, 2023). This development structurally challenges the university's role as the primary certifier of labour market readiness in digital competence domains, and the Nigerian empirical literature has not yet examined this disruption.

III. METHODS AND MATERIALS

3.1. Review Design

This study adopts a systematic empirical and conceptual review methodology, consistent with the PRISMA 2020 framework (Page et al., 2021) adapted for literature reviews in education and social science contexts. The review aims to synthesise peer-reviewed and doctoral-level evidence on the relationship between digital skills acquisition and graduate employability in Nigeria, and to develop a theoretically grounded explanatory model from the synthesised evidence.

3.2. Search Strategy and Database Coverage

Literature was retrieved from five international databases Scopus, Web of Science, ERIC, Google Scholar, and ProQuest Dissertations and Theses and three African academic repositories: AJOL (African Journals Online), Nigeria Scholar, and the Anglia Ruskin University institutional repository (ARU Figshare). Searches were conducted during the period January to April 2026.

The following Boolean search strings were applied. Strings were adapted for database-specific field syntax (Title-Abstract-Keywords in Scopus and Web of Science; full-text search in Google Scholar and AJOL):

- ("digital skills" OR "digital competence" OR "digital literacy") AND ("graduate" OR "university graduate") AND ("employability" OR "employment outcomes") AND "Nigeria"
- ("digital skills") AND ("higher education" OR "university") AND ("youth unemployment") AND ("Nigeria" OR "Sub-Saharan Africa")

- ("technology-enhanced learning" OR "TEL") AND ("skills acquisition" OR "competence development") AND "Nigeria"
- ("DigComp" OR "digital competence framework") AND "Nigeria"
- ("digital skills training" OR "digital skills intervention") AND ("graduates" OR "youth") AND "Nigeria"
- ("entrepreneurial capability" OR "entrepreneurial intentions") AND "digital skills" AND "Nigeria"

No language or publication-type restriction was applied at the database search stage. Exclusions based on language were applied at the screening stage (see Section 3.3).

3.3. Inclusion and Exclusion Criteria

Inclusion criteria: (i) studies published between 2015 and 2026, with foundational theoretical works (Becker, 1964; Schultz, 1961; Spence, 1973; Mincer, 1974; Vuorikari et al., 2022) included regardless of date; (ii) peer-reviewed journal articles, conference proceedings, and doctoral dissertations; (iii) studies examining digital skills, digital competence, graduate employability, or the intersection of these constructs in ways relevant to higher education; (iv) studies conducted in Nigeria or where directly comparative in Sub-Saharan African contexts with similar higher education system characteristics; and (v) studies reporting sufficient methodological detail to permit quality appraisal.

Exclusion criteria: (i) studies published in languages other than English this exclusion is acknowledged as a limitation, as it precludes French-language research from Francophone West and Central African countries that may contain methodologically relevant evidence; (ii) opinion pieces, editorial commentaries, or practitioner reports without empirical grounding; and (iii) studies examining primary or secondary school digital skills without relevance to tertiary graduates or their labour market transitions.

3.4. Screening Procedure

The screening process followed four sequential stages. Stage 1 Database retrieval: searches returned a total of 847 records across all databases and repositories, after de-duplication using reference management software. Stage 2 Title and abstract screening: 847 records were screened against the inclusion and exclusion criteria;

793 were excluded at this stage (duplicates: 112; outside scope: 521; non-English: 73; no empirical grounding: 87). Stage 3 Full-text eligibility assessment: 54 full-text documents were retrieved and assessed for eligibility; 37 were excluded (insufficient methodological detail: 14; discipline outside scope: 9; geographic scope outside Nigeria/SSA: 7; published before 2015 without foundational theory status: 7). Stage 4 Final inclusion: 17 primary empirical studies met all inclusion criteria and are included in the synthesis. These are supplemented by 11 foundational theoretical and policy documents retained for their framework contribution regardless of temporal exclusion criteria. Figure 1 (PRISMA flow diagram) summarises the screening procedure.

Table 2 (PRISMA): Search Screening Summary.
Total records retrieved: 847. Final empirical studies included: 17.

Stage	Records (n)	Action / Outcome
Stage 1: Database retrieval	847	Total records retrieved; duplicates removed using reference management software
Stage 2: Title/abstract screening	793 excluded	Excluded: 112 duplicates; 521 out of scope; 73 non-English; 87 no empirical grounding
Stage 3: Full-text eligibility	54 assessed; 37 excluded	Excluded: 14 insufficient details; 9 disciplines out of scope; 7 geographic scopes; 7 pre-2015 non-foundational
Stage 4: Final inclusion	17 empirical + 11 theoretical	17 primary empirical studies included; 11 foundational theoretical/policy documents supplementary

Source: Author, 2026.

3.5. Quality Appraisal

All 17 included empirical studies were appraised for methodological quality using an adapted Mixed

Methods Appraisal Tool (MMAT; Hong et al., 2018) rubric, structured around five dimensions: (1) clarity and appropriateness of research objectives; (2) adequacy of sampling and participant representativeness; (3) validity and reliability of measurement instruments; (4) appropriateness of analytical methods; and (5) interpretive coherence between findings and data. Each study received a rating of High (H), Moderate (M), or Low (L) confidence. These ratings are incorporated in Table 3 (Section 4) and inform how findings are weighted in the synthesis: High-confidence studies receive primary interpretive weight; Moderate-confidence findings are treated as corroborative; Low-confidence findings are noted as indicative only.

The quality appraisal yields the following distribution: High confidence 3 studies (Saidu, 2025; Samuel et al., 2025; Binuyo et al., 2020); Moderate confidence 9 studies; Low confidence 5 studies. The predominance of Moderate and Low confidence ratings reflects the field's current reliance on single-institution, self-report, cross-sectional survey designs, and underscores the need for the research design improvements identified in Section 5.1.

3.6. Analytical Approach

The theoretical framework Human Capital Theory, Signalling Theory, DigComp 2.2, and supplementary structural theories was applied as an analytical lens to organise and interpret the reviewed evidence. The DSEPM was developed inductively from the synthesised empirical evidence and deductively refined against the theoretical framework. Narrative synthesis was used to integrate findings across studies, structured by the three patterns identified in the evidence: competence threshold effects, intervention efficacy, and demand-supply mismatch. Where multiple studies address the same construct, the quality-weighted evidence from higher-confidence studies takes precedence in interpretation.

IV. DATA PRESENTATION AND ANALYSIS

The systematic review identified 17 primary empirical studies meeting all inclusion criteria, supplemented by 11 foundational theoretical and policy documents. Table 3 provides a complete summary of all 17 empirical studies reviewed, organised by research focus, methodology, sample, principal finding, and

quality confidence rating. The earlier version of this table (prior to full reconciliation) reported 12 studies; the complete set of 17 is presented below, with five additional studies integrated from the full-text

eligibility stage that were confirmed as meeting all inclusion criteria: Keshi and Umorenweke (2024), Imoyera (2023), Liman (2025), Iyoha and Nwagu (2025), and Olanipekun et al. (2021).

Table 3: Complete Summary of 17 Empirical Studies Reviewed. Quality ratings: H = High confidence; M = Moderate confidence; L = Low confidence (see Section 3.5). Source: Author's systematic review, 2026.

Author(s) & Year	Focus	Method	Sample	Key Finding	Quality
Saidu (2025)	Digital skills & employability mediation	PLS-SEM; HTMT analysis	University graduates (Nigeria)	Digital competence significantly mediates skills–employability relationship; exposure $\neq$ competence	High
Samuel et al. (2025)	Digital skills training intervention	Quasi-experimental; pre/post-test	n=1,028 graduates (Ogun State)	Effect sizes $d=2.88-4.91$; significant gains across all 4 modules ($p<.001$)	High
Binuyo et al. (2020)	Digital innovation & skill acquisition	Cross-sectional survey; MLR	n=533, six geopolitical zones	Digital innovation $\beta=0.264$, $t=4.329$, $p=0.001$; significant predictor of skills acquisition	High
David et al. (2024)	Digitalisation & employability (business ed.)	Descriptive survey	Lagos State tertiary graduates	Higher digital skill levels predict better employability; majority at foundational level only	Mod.
Ohanu et al. (2024)	TEL tool utilisation	Descriptive survey	n=318 VTE teachers, 6 institutions	Access to TEL tools mediates utilisation–performance relationship ($\alpha=0.81$)	Mod.
Otitoju & Nwagwu (2023)	MOOC adoption for digital skills	Descriptive survey; UTAUT	n=378 undergraduates, Ibadan	77.8% used MOOCs; 60.8% completion; social influence stronger predictor than connectivity	Mod.
Nwosu (2023)	Digital literacy: stakeholder perspectives	Qualitative; multi-stakeholder	Graduates, lecturers, PSRBs, employers	Systemic multi-stakeholder misalignment in definition and assessment of digital literacy	Mod.
Awoniyi & Owolabi (2025)	Digital skills & entrepreneurial capability	Survey	Nigerian public university graduates	Significant positive relationship between digital skills and entrepreneurial capability	Mod.
Uzoamaka & Okpuzor (2025)	Employer-required digital skills	Employer survey; 4-point rating scale	n=164 employers, Delta State	Data analysis, spreadsheet management rated Very Highly Required; graduates weakest in these areas	Mod.

Ezeh (2025)	Digital marketing competencies & employability	Survey	Business ed. graduates, Anambra State	>85% of graduates lacked adequate digital marketing skills	Mod.
Ayoola (2025)	AI tool integration for skills acquisition	Survey	Building technology undergraduates, Oyo State	Moderate AI proficiency; institutional support for AI integration largely absents	Mod.
Sunday & Samuel (2022)	Digital analytical skills & youth employability	Survey; statistical analysis	Osun State youth	Significant relationship between digital analytical skills and employability	Low
Keshi & Umorenweke (2024)	Digital skills deficits in secretarial education	Descriptive survey	Secretarial studies graduates, Imo State	Significant gaps in cloud collaboration and document management software; domain convergent with business education findings	Low
Imoyera (2023)	Teacher digital skills & business education	Conceptual/survey	Business education lecturers, Nigeria	Teacher digital skills acquisition is a prerequisite for graduate digital competence development	Low
Liman (2025)	Digital technology skills for graduate librarians	Survey	Graduate librarians, Nigeria	Significant gaps in DigComp Domain 4 (Safety/cybersecurity) and Domain 1 (Data management)	Mod.
Iyoha & Nwagu (2025)	Business ed. & global digital competitiveness	Conceptual/survey	Business education programmes, Nigeria	Programmes broadly failed to equip graduates for global digital competitiveness	Low
Olanipekun et al. (2021)	Entrepreneurial skills acquisition & employability	Survey	OOU graduates (n=approx. 240)	Positive effects of skills acquisition on graduates' self-employability within six months	Low

The evidence in Table 3 reveals three consistent patterns constituting the analytical core of this review. First, digital skills at foundational levels the norm among Nigerian graduates do not produce meaningful employability returns; the mediation effect documented by Saidu (2025) activates at competence thresholds, not at exposure thresholds. Second, structured, practice-driven digital skills interventions produce statistically significant and practically large competence gains in compressed timeframes, as confirmed by Samuel et al. (2025) with the largest and most rigorous intervention study available (High

confidence). Third, the employer-graduate competency mismatch is symmetrical: employers most require precisely the competencies data analysis, digital collaboration, spreadsheet management, digital communication — that graduates are most deficient in (Uzoamaka & Okpuzor, 2025; Ezeh, 2025).

These patterns are reinforced by cross-disciplinary evidence spanning business education, library and information science, vocational and technical education, building technology, secretarial studies, and entrepreneurship (Section 2.4.4), confirming that the deficit is systemic rather than discipline-bound.

The quality appraisal (Section 3.5) indicates that the three highest-confidence studies (Saidu, 2025; Samuel et al., 2025; Binuyo et al., 2020) all support these core findings, strengthening confidence in their interpretation. The preponderance of Moderate and Low confidence studies reflects the field's methodological limitations rather than contradicts the core finding.

V. DISCUSSION OF FINDINGS

The findings of this review confirm and extend the growing body of evidence that digital skills acquisition is a significant and tractable determinant of graduate employability in Nigeria. The central finding that most Nigerian graduates exit the university system with digital competencies at foundational levels insufficient for labour market participation is consistent with the HCT prediction that underinvestment in productive skills generates measurable employment and wage penalties. The finding also carries a Signalling Theory dimension: because university credentials no longer credibly signal digital competence to employers, graduates who cannot afford externally certified credentials face a double disadvantage they lack the competence and they lack the signal.

The intervention evidence of Samuel et al. (2025) provides grounds for cautious optimism. Effect sizes of Cohen's $d = 2.88$ to 4.91 across a diverse sample of 1,028 graduates demonstrate that the digital skills gap is not intractable. Structured, modular, practice-driven programmes can produce substantial competence gains in short periods. This shifts the policy question from "can the gap be closed?" to which the answer is affirmatively yes to "what configurations of programme, delivery mechanism, and institutional support produce the most durable and broadly accessible competence gains?" The literature does not yet answer this second question, and this constitutes the most directly policy-actionable research gap identified by this review.

The demand-side evidence adds a structural layer. Uzoamaka and Okpuzor (2025) and Ezech (2025) demonstrate that the skills mismatch is not simply a matter of graduate deficiency but of institutional misalignment: universities are not producing what employers need, and employers have not found effective channels to communicate their needs to

universities. Nwosu's (2023) multi-stakeholder research reveals this to be a governance failure the four groups of actors who could collectively resolve it (graduates, universities, employers, and regulatory bodies) operate on incompatible conceptions of what digital competence means and who bears responsibility for developing it.

The DigComp 2.2 framework, applied as an analytical lens, clarifies why prior Nigerian studies have produced imprecise and sometimes contradictory findings: they have measured digital skills as a single, composite, self-reported variable, when in reality digital competence is multi-domain, multi-tiered, and only predictive of employment returns above specific proficiency thresholds. Until Nigerian research adopts validated, domain-specific, and proficiency-tiered measurement instruments, the field will continue to generate findings that confirm the existence of a gap without specifying its precise contours. The absence of published DigComp validation studies in Sub-Saharan African contexts, noted in Section 2.1.1, means that the precise proficiency level thresholds at which Nigerian employer demand activates remain empirically unconfirmed a methodologically consequential gap.

The geographic and disciplinary concentration of the reviewed evidence warrants explicit acknowledgement. All 17 included studies are drawn from southern Nigerian states Lagos, Anambra, Delta, Ogun, Osun, Oyo, Rivers, and Imo with only Binuyo et al. (2020) achieving near-national geographic coverage across all six geopolitical zones. No study was conducted in a northern Nigerian university. Given that northern states are characterised by lower internet penetration, lower electricity reliability, and lower female labour force participation, the digital skills deficit may be substantially more acute in these contexts than the reviewed literature reflects. Policy recommendations directed at the NUC and NITDA should be understood as nationally applicable in intent, but as presently evidenced predominantly from southern Nigerian data. Similarly, the preponderance of business education studies means that findings cannot be assumed to transfer without modification to engineering, health sciences, agriculture, or humanities graduates, whose digital skill profiles and employer expectations may differ significantly.

5.1. Identification of Research Gaps

The review identifies six critical research gaps:

Gap 1 — Absence of Longitudinal Graduate Tracking Data:

Every reviewed Nigerian study is cross-sectional, incapable of capturing the dynamic relationship between skills acquisition and career trajectory over time. Nigeria has no graduate tracking mechanism comparable to the United Kingdom's Graduate Outcomes Survey. Establishing one, coordinated through the NUC, is the single highest-priority research infrastructure investment the field requires — without it, the temporal dimension of the DSEPM cannot be empirically validated.

Gap 2 — Absence of Tier-Specific Competence Assessment:

No Nigerian study has applied the full DigComp 2.2 operationalisation five domains, eight proficiency levels to a graduate population using validated, performance-based assessment instruments. Self-report scales are insufficient for the precision that curriculum intervention design requires.

Gap 3 — Neglect of Gender and Socioeconomic Differentials:

Only one reviewed study (Samuel et al., 2025) reported gender-disaggregated data, and none tested gender as a moderating variable. Given that Nigerian women are 24 per cent less likely to have basic digital skills (GSMA, 2023), gender-neutral programmes will reproduce rather than reduce existing inequalities. Socioeconomic stratification of digital skills acquisition has received no dedicated empirical attention.

Gap 4 — Absence of AI Literacy Research:

Artificial intelligence literacy is rapidly becoming a consequential competence domain. The WEF (2023) identifies AI and big data skills among the three fastest-growing global workforce competencies. Nigerian empirical literature has not substantively engaged with this domain, and Nigerian universities appear unprepared for this frontier (Ayoola, 2025).

Gap 5 — Exclusion of Informal Economy Employability Outcomes:

Between 80 and 90 per cent of Nigerian employment is informal (ILO, 2022). The reviewed literature

focuses almost exclusively on formal sector employment outcomes. Research examining how digital skills affect livelihood outcomes across the full employment spectrum formal, informal, self-employed, and gig work — would produce substantially more policy-relevant intelligence.

Gap 6 — Absence of DigComp Validation in Nigerian/SSA Contexts:

The application of DigComp 2.2 as a diagnostic and assessment instrument in Nigeria presupposes that its constructs, proficiency descriptors, and domain boundaries are transferable from European to Nigerian higher education and labour market contexts. No published validation study confirms this transferability. A contextualisation and validation study using Nigerian graduate and employer data is required before DigComp-based assessment instruments can be deployed with full confidence in this setting.

VI. CONCLUSION

This paper has established, through a theoretically grounded and systematically conducted review of 17 empirical studies and 11 foundational documents, that digital skills acquisition is among the most significant and most tractable determinants of graduate employability outcomes in Nigeria. The evidence is consistent: graduates with stronger digital competencies obtain employment more readily, demonstrate greater entrepreneurial capability, and attract more favourable employer assessments. The equally consistent evidence that the majority of Nigerian graduates exit universities at foundational levels of digital competence, insufficient for the intermediate and advanced tasks that employers increasingly require — constitutes a structural failure of the higher education system at the precise moment when digital competence is becoming a non-negotiable precondition for labour market participation.

The Digital Skills–Employability Pathways Model proposed in this paper provides a theoretically coherent account of how digital skills acquisition translates or fails to translate into employment outcomes through three causal pathways, moderated by gender, geography, socioeconomic background, sector digital intensity, and institutional support. It

foregrounds the structural moderation pathway that prior Nigerian scholarship has largely ignored: the same skill level produces markedly different outcomes for graduates in different structural positions. Policy that treats the digital skills deficit as uniform will produce solutions that are unequally effective.

Six research gaps constitute a prioritised empirical agenda: longitudinal graduate tracking, tier-specific competence assessment using validated instruments, gender-disaggregated and socioeconomic-stratified analysis, AI literacy baseline establishment, informal economy employability research, and DigComp contextualisation for Sub-Saharan African settings. The field cannot generate the policy-relevant intelligence Nigeria needs until these gaps are addressed.

VII. RECOMMENDATIONS

1. National Universities Commission (NUC):

The NUC should revise its Benchmark Minimum Academic Standards to integrate DigComp 2.2 or a contextually validated Nigerian adaptation as a verified graduate competence benchmark, applicable across all degree disciplines. Digital competence should be mandated as a graduation outcome, not merely a curriculum component, with institutional accountability mechanisms for assessment and reporting. The NUC should additionally establish a national graduate digital competence tracking mechanism to generate longitudinal data on digital skills–employment outcome relationships, addressing Gap 1 identified in this review.

2. National Information Technology Development Agency (NITDA):

The digital skills programmes operating under Nigeria's National Digital Economy Policy and Strategy including the 3 million Technical Talent (3MTT) programme should be structurally integrated with university training systems through NUC-endorsed credit recognition frameworks. Targeted expansion of programme access in northern states, rural areas, and for female graduates should be prioritised to address the equity dimensions of the digital skills deficit documented in this review and the structural moderation effects identified in the DSEPM.

3. University Curriculum Developers and Academic Leaders:

Universities should restructure digital skills development from add-on modules to embedded, practice-oriented competency development pathways across all disciplines. In the near term without waiting for comprehensive curriculum reform universities should establish co-curricular digital skills bootcamp programmes, developed in partnership with technology employers, modelled on the modular approach validated by Samuel et al. (2025). Parallel investment in the digital upskilling of academic staff is essential: Ohanu et al. (2024) and Imoyera (2023) demonstrate that the pedagogical pipeline is presently constrained at the point of instruction.

4. Researchers:

Future empirical studies should move beyond cross-sectional, single-institution, self-report designs toward longitudinal tracking, validated performance-based competence assessment using DigComp 2.2 instrumentation (following contextualisation validation), gender-disaggregated and socioeconomic-stratified analyses, and research designs that capture informal sector and gig economy employability outcomes. Multi-stakeholder, interdisciplinary, and nationally representative studies with specific attention to northern Nigerian higher education institutions are particularly needed.

5. Employers:

Private and public-sector organisations should formalise their digital competence expectations and communicate these two universities through structured employer–university partnership mechanisms. Participating in curriculum advisory boards, providing practicum placements that develop applied digital skills, and recognising NUC-endorsed digital credentials alongside international certifications would reduce the credentialling equity gap documented in this review.

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