

Digital Literacy of Business Education Students: Adaptability and Management Skills in Colleges of Education in North-East Nigeria

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ABSTRACT

The growing integration of digital technologies into higher education curricula necessitates a rigorous appraisal of students' digital competencies. This study examined the digital literacy of business education students, with specific focus on adaptability skills and management skills, in Colleges of Education in North-East Nigeria. The study adopted a descriptive survey research design, drawing on a sample of 540 business education students and 69 lecturers selected through stratified and purposive sampling techniques, respectively. A validated 4-point Likert-scale questionnaire served as the primary data collection instrument, with a reliability coefficient of 0.84 (Cronbach's alpha). Descriptive statistics, including mean and standard deviation, were employed to answer the research questions, whilst an independent-samples t-test was used to test the two null hypotheses at a 0.05 level of significance. Findings revealed that business education students in the sampled Colleges of Education possessed moderate-to-high levels of digital adaptability (Grand $\bar{X}$ = 3.36) and digital management skills (Grand $\bar{X}$ = 3.39). The t-test results indicated no statistically significant difference between the mean responses of students and lecturers on both dimensions. The study recommended curriculum enrichment with digital literacy modules, provision of adequate ICT infrastructure, and capacity-building workshops for business education lecturers across North-East Nigerian Colleges of Education.

1. INTRODUCTION

The twenty-first century knowledge economy is characterised by pervasive digitalisation, rendering digital literacy an indispensable competence for graduates across all professional fields. In the context of business education, digital literacy transcends mere familiarity with computers and the internet; it encompasses the capacity to locate, evaluate, utilise, and create information through digital means in ways that are meaningful, purposeful, and ethical (Porat et al., 2022). As digital technologies continue to reshape the nature of work and commerce, institutions charged with preparing future business professionals must ensure that their graduates are equipped with robust digital competencies that align with contemporary industry expectations. Nigeria's higher education landscape, encompassing its federal, state, and specialised Colleges of Education, has recognised the imperative of integrating digital literacy into its curriculum frameworks. The National Policy on Education (Federal Government of Nigeria, 2023) explicitly mandates the infusion of information and communication technology (ICT) competencies across all levels of the educational system. Yet, despite this policy directive, empirical evidence suggests that the actual digital competency levels of students in many Nigerian Colleges of Education remain uneven, particularly in the geographically and infrastructurally challenged North-East geopolitical zone (Abubakar & Usman, 2021; Musa et al., 2023). Protracted insecurity, poverty, and infrastructural deficits in this region have compounded the challenge of building the digital capacity of both students and lecturers.

Business education, as an academic discipline, is uniquely positioned at the intersection of vocational preparation and technological advancement. It equips learners with the knowledge, skills, and attitudes necessary to function effectively in corporate and entrepreneurial environments. Within this disciplinary context, digital literacy manifests in two particularly critical dimensions: adaptability skills and management skills. Adaptability skills denote the ability to respond flexibly and effectively to new, changing, or unexpected digital environments, tools, and tasks (Benejam et al., 2020), whilst management skills refer to the capacity to organise, coordinate, and oversee digital resources and workflows to achieve defined objectives (Claro et al., 2021). The importance of these two skill sets cannot be overstated in today's business environment. Employers increasingly seek graduates who can seamlessly transition between diverse digital platforms, troubleshoot technological disruptions, and manage complex digital projects collaboratively (World Economic Forum, 2023). However, there is a paucity of empirical data specifically investigating the digital adaptability and management skill levels of business education students in North-East Nigerian Colleges of Education. Most existing studies have focused on broader ICT integration or general student performance, without disaggregating digital literacy into these competency-specific dimensions.

This study therefore responds to a significant empirical gap in the literature. It investigated the digital literacy of business education students with respect to their adaptability and management skills in Colleges of Education in North-East Nigeria, and further examined whether lecturers and students differ significantly in their perceptions of these competencies. The findings are expected to inform curriculum development, institutional policy, and pedagogical strategies aimed at enhancing the digital preparedness of business education graduates in the region. However, despite the growing emphasis on digital literacy in Nigerian higher education policy, business education students in North-East Nigeria remain inadequately prepared for the digital demands of the

contemporary workplace. The region's persistent challenges including infrastructural deficits, limited access to digital devices, and insufficient digital skills instruction have created a widening competency gap between graduates and the expectations of modern employers (Yusuf et al., 2022). This study addresses the specific dimensions of digital adaptability and digital management skills, which have received limited empirical attention in the North-East Nigerian context, whilst also determining whether the perceptions of students and lecturers concerning these competencies differ significantly.

Research Objectives

The specific objectives of this study were to:

1. Determine the digital literacy of business education students' adaptability skills in Colleges of Education in North-East Nigeria.
2. Assess the digital literacy of business education students' management skills in Colleges of Education in North-East Nigeria.

Research Questions

The following research questions guided the study:

- RQ1.** What is the digital literacy of business education students' adaptability skills in Colleges of Education in North-East Nigeria?
- RQ2.** What is the digital literacy of business education students' management skills in Colleges of Education in North-East Nigeria?

Research Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

H01: There is no significant difference in the mean response of business education students and lecturers on the digital literacy of business education students' adaptability skills in Colleges of Education in North-East Nigeria.

H02: There is no significant difference in the mean response of business education students and lecturers on the digital literacy of business education students' management skills in Colleges of Education in North-East Nigeria.

2. LITERATURE REVIEW

The Concept of Digital Literacy

Digital literacy has evolved considerably since Gilster (1997) introduced the term, expanding far beyond the technical skill of operating computers. Contemporary scholars conceptualise digital literacy as a multidimensional competence encompassing technical proficiency, critical evaluation of digital content, online communication, collaborative knowledge construction, and digital identity management (Ng, 2022; Spante et al., 2018). The European Commission's DigComp 2.2 framework (Vuorikari et al., 2022) identifies five broad competence areas: information and data

literacy, communication and collaboration, digital content creation, safety, and problem-solving, each of which is relevant to the preparation of business education graduates. In the African context, and particularly in Nigeria, digital literacy has been increasingly recognised as a developmental priority. The National Information Technology Development Agency (NITDA, 2021) has identified digital skills gaps as a major impediment to national economic development, noting that graduates across multiple disciplines lack the competencies required for the digital economy. This challenge is particularly pronounced in the North-East geopolitical zone, where security challenges, poverty, and limited infrastructure have constrained access to digital resources (Musa et al., 2023). For business education specifically, Ndidi and Okafor (2022) argue that digital literacy must be understood as an integrative competence that encompasses not merely the ability to operate digital tools, but the capacity to leverage those tools strategically within business processes. This perspective aligns with the work of Claro et al. (2021), who contend that digital literacy in vocational and professional education settings must be assessed against the demands of specific occupational roles. From this standpoint, the adaptability and management dimensions of digital literacy acquire particular salience.

Digital Adaptability Skills

Digital adaptability skills refer to the cognitive and behavioural capacities that enable individuals to respond effectively to new, changing, or unexpected digital environments (Benejam et al., 2020). These skills include the ability to learn new software applications rapidly, to transfer digital skills across different platforms and contexts, to troubleshoot technological problems independently, and to maintain productivity in the face of technological disruption. Researchers have identified adaptability as a core twenty-first century competency, noting that the rapid pace of technological change renders the ability to learn and re-learn digital tools more valuable than mastery of any specific application (Binkley et al., 2021; Griffin & Care, 2021). In the context of higher education, digital adaptability encompasses students' ability to navigate diverse learning management systems, to engage effectively with varied digital pedagogies, and to transition fluidly between face-to-face, hybrid, and fully online learning environments (Porat et al., 2022). The COVID-19 pandemic significantly highlighted the importance of digital adaptability, as institutions worldwide were compelled to pivot rapidly to emergency remote teaching (Adeyemi & Okafor, 2021). Studies from Nigerian higher education contexts suggest that students in northern states demonstrated lower levels of digital adaptability compared to their southern counterparts, largely due to infrastructural and access disparities (Abubakar & Usman, 2021). Adaptability within digital environments also encompasses what Binkley et al. (2021) describe as 'learning to learn' the metacognitive capacity to self-regulate one's digital learning, to identify knowledge gaps, and to seek out appropriate resources. This dimension is especially relevant to business education students, who must continuously update their digital competencies as business software, platforms, and communication technologies evolve. Institutions that foster digital adaptability in their students are therefore investing in a form of future-proofing that transcends the specific technologies currently in use.

Digital Management Skills

Digital management skills encompass the competencies associated with organising, coordinating, and overseeing digital information, resources, and workflows (Claro et al., 2021). These skills include digital file and data management, the use of project management applications, the

coordination of collaborative digital workflows, the management of digital communication channels, and the capacity to evaluate and report on digital project outcomes. In business education, digital management skills are closely aligned with the professional competencies required for roles in office management, human resource management, financial management, and entrepreneurship. The literature consistently identifies digital management as a domain in which Nigerian business education graduates exhibit significant weaknesses. Yusuf et al. (2022) found that fewer than half of surveyed business education graduates in North-East Nigeria could competently use cloud-based collaboration tools such as Google Workspace or Microsoft 365, both of which are standard productivity suites in contemporary workplaces. Similarly, Danladi et al. (2023) reported that students' ability to manage and secure digital data an increasingly critical competency in an era of data-driven business was significantly below industry expectations. The digital management skills dimension also intersects with broader information literacy frameworks. As Limberg et al. (2020) note, effective digital management requires not only technical proficiency with specific tools but also the capacity to critically evaluate the relevance, accuracy, and provenance of digital information. In the business education context, this translates into competencies such as the ability to source, analyse, and present digital market data, to manage customer relationship management (CRM) systems, and to use enterprise resource planning (ERP) software capabilities that are increasingly expected of entry-level business professionals.

Figure 1: Conceptual Framework of Digital Literacy in Business Education

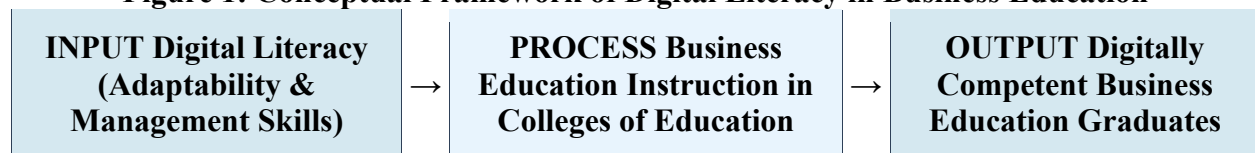


Figure 1: Conceptual Framework showing the input-process-output model of digital literacy in business education contexts (adapted from Claro et al., 2021).

Theoretical Framework

Technological Pedagogical Content Knowledge (TPACK) Framework

This study is underpinned theoretically by the Technological Pedagogical Content Knowledge (TPACK) framework, originally proposed by Mishra and Koehler (2006) and subsequently extended by multiple scholars (Angeli & Valanides, 2021; Schmid et al., 2021). TPACK posits that effective technology integration in education requires the simultaneous development of three interconnected knowledge domains: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). The intersections of these domains Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), and Technological Pedagogical Knowledge (TPK) culminate in TPACK, which represents the holistic competence required for effective digital teaching and learning. In the context of business education in Nigerian Colleges of Education, the TPACK framework offers a useful lens for understanding digital literacy development. Students' digital adaptability skills can be conceptualised as residing primarily within the TK and TPK domains, reflecting their capacity to work with diverse digital tools and to leverage those tools effectively in pedagogical contexts. Digital management skills, conversely, align more closely with the TCK and TPACK domains, involving the application of digital technologies to manage, organise, and communicate domain-specific business knowledge and processes (Schmid et al., 2021). Critically, the TPACK framework emphasises that digital

competency development is not an isolated, add-on process but one that must be deeply integrated into disciplinary knowledge and pedagogical practice. This has significant implications for business education curriculum design in North-East Nigerian Colleges of Education, suggesting that digital literacy instruction must be contextualised within authentic business scenarios rather than delivered as a standalone technical skills module (Angeli & Valanides, 2021).

Theory of Planned Behaviour (TPB)

A secondary theoretical lens employed in this study is Ajzen's (1991) Theory of Planned Behaviour (TPB), which has been widely applied in educational technology research (Teo, 2021; Huang et al., 2022). The TPB posits that behaviour is primarily determined by behavioural intention, which is in turn shaped by three antecedent factors: attitude towards the behaviour, subjective norms, and perceived behavioural control. In the context of digital literacy development, the TPB suggests that students' digital skill acquisition and usage are influenced by their positive or negative attitudes towards digital technologies, the social and institutional norms that govern digital practice in their academic environment, and their confidence in their own ability to perform digital tasks (Huang et al., 2022). This framework is particularly relevant to the North-East Nigerian context, where socio-cultural norms, institutional climates, and individual self-efficacy perceptions may significantly moderate students' digital skill development. Studies by Adeyemi and Okafor (2021) and Musa et al. (2023) suggest that students in underserved northern Nigerian institutions often exhibit lower digital self-efficacy, which, according to the TPB, would predict lower engagement with digital learning activities and, consequently, weaker digital skill development. The TPB thus provides a theoretical basis for interpreting the empirical findings of this study and for designing interventions targeted at enhancing both digital attitudes and digital self-efficacy.

Related Empirical Studies

Empirical research on digital literacy in Nigerian business education has grown substantially since 2019, though coverage of the North-East zone remains limited. Ndidi and Okafor (2022) conducted a survey of 487 business education students in South-East Nigerian universities, finding that whilst students demonstrated competent use of social media and basic internet functions, their proficiency in specialised business software including spreadsheet applications, accounting packages, and database management systems was significantly lower. The study highlighted a critical mismatch between the digital skills curricula in most business education programmes and the actual competency demands of contemporary Nigerian employers.

In a study more proximate to the current research context, Abubakar and Usman (2021) surveyed business education students in three Colleges of Education in the North-West geopolitical zone, finding that digital literacy levels were generally low, with particular deficits in adaptability and problem-solving dimensions. The authors attributed these deficits to inadequate ICT infrastructure, limited access to devices, and insufficient digital literacy instruction in the curriculum. Their findings are consonant with those of Musa et al. (2023), who reported that business education lecturers in North-East Nigeria themselves exhibited significant digital literacy gaps, which inevitably constrained the quality of digital instruction they could provide to students.

Danladi et al. (2023) examined the relationship between digital literacy and academic performance in business education in Adamawa State, one of the six states of the North-East zone. Using a

correlational research design, they found a statistically significant positive relationship between students' digital literacy levels and their academic performance across multiple business education subjects. This finding underscores the academic as well as professional significance of digital literacy development in business education, reinforcing the rationale for the current investigation.

Globally, research on digital adaptability skills has accelerated in the wake of the COVID-19 pandemic, which served as an unprecedented natural experiment in digital adaptability across educational systems (Adeyemi & Okafor, 2021). A large-scale study by Porat et al. (2022) across eight countries found that students who demonstrated high digital adaptability operationalised as the ability to rapidly learn and apply new digital tools, and to maintain task performance across shifting technological environments achieved significantly better academic and professional outcomes than their less adaptable peers. The study identified prior exposure to diverse digital environments as the most significant predictor of adaptability, suggesting that breadth of digital experience is more important than depth of proficiency with any single tool.

In the domain of digital management skills, Claro et al. (2021) conducted a multi-country study examining students' capacity to manage digital information and workflows in vocational education contexts. They identified four core sub-competencies: digital file management, collaborative digital project management, digital communication management, and digital data management. Across all four sub-competencies, students in low-income country contexts demonstrated significantly weaker performance than those in high-income contexts, a finding with clear implications for the Nigerian higher education context examined in the current study.

A systematic review by Spante et al. (2018), updated and extended by Ng (2022), mapped the conceptual landscape of digital literacy research, identifying adaptability and management as among the most consistently cited dimensions of digital competence across diverse educational contexts. Ng (2022) noted that these two dimensions are particularly challenging to assess in survey-based research, as self-report measures may be subject to social desirability bias and may not fully capture the complexity of real-world digital performance. This methodological concern is acknowledged in the current study and addressed through the use of a carefully validated instrument with triangulated response perspectives from both students and lecturers.

Gender has been consistently identified as a significant moderator of digital literacy in Nigerian educational contexts, though the direction and magnitude of gender effects have been disputed (Adeyemi & Okafor, 2021; Yusuf et al., 2022). Whilst earlier studies suggested a persistent digital gender gap favouring male students, more recent evidence points to a narrowing of this gap in urban higher education settings, even as significant disparities persist in rural and underserved contexts such as North-East Nigeria (Musa et al., 2023). The current study acknowledges gender as a demographic variable and presents disaggregated data accordingly, though gender-based comparisons were not among the primary objectives of the investigation.

Institutional factors including the availability of computer laboratories, quality of internet connectivity, lecturer digital competence, and institutional digital literacy policies have also been shown to significantly influence student digital literacy outcomes (Binkley et al., 2021; Danladi et al., 2023). In North-East Nigerian Colleges of Education, these institutional factors are often severely constrained, creating structural barriers to digital literacy development that individual student motivation and effort cannot fully overcome. Policy-level interventions targeting these

institutional constraints are therefore a necessary complement to curriculum-level digital literacy initiatives.

3. RESEARCH METHODOLOGY

This study adopted a descriptive survey research design, which is appropriate for studies that seek to describe the characteristics of a defined population at a particular point in time without the manipulation of variables (Creswell & Creswell, 2023). The descriptive survey design was selected because it facilitates the collection of data from large, geographically dispersed samples in an efficient and standardised manner, thereby enabling meaningful generalisations about the digital literacy status of business education students across the Colleges of Education in North-East Nigeria. The design is consistent with prior studies of digital literacy in Nigerian higher education (Abubakar & Usman, 2021; Ndidi & Okafor, 2022).

The target population comprised all regular business education students and business education lecturers in Colleges of Education in North-East Nigeria during the 2023/2024 academic session. Based on data obtained from the National Commission for Colleges of Education (NCCE, 2023), the total population consisted of 3,842 business education students and 187 business education lecturers distributed across six accredited Colleges of Education in the five states of Adamawa, Bauchi, Borno, Gombe, and Taraba.

A sample of 540 students was drawn using stratified random sampling, with each College of Education constituting a stratum to ensure proportionate representation. Within each stratum, students were randomly selected using a table of random numbers. The sample size for students was determined using Taro Yamane's formula at a 5% margin of error (Yamane, 1967), yielding a minimum required sample of 360 students; the final sample of 540 was adopted to enhance statistical power and account for potential non-response. All 69 lecturers who met the criterion of having taught a business education subject with a digital component in the preceding two academic sessions were selected using purposive sampling, reflecting the relatively small and specialised nature of this sub-population. Table 1 presents a summary of respondents' demographic characteristics.

Table 1: Summary of Respondents' Demographic Information

Category	Students (n)	%	Lecturers (n)	%
Gender: Male	312	57.8	38	55.1
Gender: Female	228	42.2	31	44.9
Level: 100–200	214	39.6	—	—
Level: 300–400	326	60.4	—	—
Experience: < 5 yrs	—	—	19	27.5
Experience: 5–10 yrs	—	—	28	40.6
Experience: > 10 yrs	—	—	22	31.9
TOTAL	540	100	69	100

Note: n = number of respondents; % = percentage of total within each group.

The primary data collection instrument was a researcher-developed questionnaire entitled 'Digital Literacy of Business Education Students Questionnaire (DLBESQ)'. The instrument comprised three sections: Section A elicited respondents' demographic information; Section B contained 14 structured items on digital adaptability skills (7 items); and Section C contained 14 items on digital management skills (7 items). All substantive items were presented on a 4-point Likert scale anchored at Strongly Agreed (4), Agreed (3), Disagreed (2), and Strongly Disagreed (1). The rationale for adopting a 4-point rather than a 5-point scale was to eliminate the neutral midpoint and thereby compel respondents to commit to either agreement or disagreement with each statement (Garland, 1991).

Table 2: Decision Criterion for Likert Scale Responses

Scale	Response	Mean Range	Decision
4	Strongly Agreed (SA)	3.50 – 4.00	Agreed
3	Agreed (A)	2.50 – 3.49	Agreed
2	Disagreed (D)	1.50 – 2.49	Disagreed
1	Strongly Disagreed (SD)	1.00 – 1.49	Disagreed

Note: A grand mean score of ≥ 2.50 indicates agreement with the item; a score of < 2.50 indicates disagreement.

Content and face validity of the DLBESQ were established through expert review by five specialists in business education and educational measurement from three universities in North-East Nigeria, who assessed the relevance, clarity, and appropriateness of each item. Ambiguous items were revised and three items were deleted from the initial pool of 24 items based on reviewers' feedback, yielding the final 14-item instrument. Construct validity was further supported by confirmatory factor analysis (CFA) conducted on pilot data, which confirmed the two-factor structure of the instrument (adaptability and management skills) with satisfactory fit indices (CFI = 0.94; RMSEA = 0.058).

Reliability was established through a pilot study involving 40 business education students and 10 lecturers from a College of Education not included in the main study. Cronbach's alpha reliability coefficient was computed at 0.84 for the entire instrument (0.82 for the adaptability subscale; 0.81 for the management subscale), exceeding the commonly accepted threshold of 0.70 (Nunnally & Bernstein, 1994). These reliability estimates indicate satisfactory internal consistency of the research instrument.

Data were collected over a six-week period during the second semester of the 2023/2024 academic session. The researcher and two trained research assistants administered the questionnaires directly to sampled students during designated class periods, following formal approval from the academic administrators of each participating College of Education. Lecturers were contacted individually and provided with self-addressed envelopes for the return of completed questionnaires. A response rate of 97.3% was achieved for students (527 of 540) and 100% for lecturers (69 of 69), resulting in a combined usable sample of N = 609.

Research questions were analysed using descriptive statistics, specifically arithmetic mean ($\bar{X}$) and standard deviation (SD). A grand mean cut-off score of 2.50 was adopted as the decision criterion

for item interpretation (Table 2). The null hypotheses were tested using an independent-samples t-test at the 0.05 level of significance with $df = N_1 + N_2 - 2 = 607$. A calculated t-value exceeding the critical t-value of 1.96 led to rejection of the null hypothesis; otherwise, the hypothesis was retained. All analyses were performed using SPSS Version 27.0 (IBM Corp., 2021).

4. RESULTS AND DISCUSSION

Research Question One: Digital Adaptability Skills

Research Question One sought to determine the level of digital adaptability skills among business education students in Colleges of Education in North-East Nigeria. The mean and standard deviation scores for students' and lecturers' responses to the seven adaptability skills items are presented in Table 3.

Table 3: Mean and Standard Deviation of Respondents on Digital Adaptability Skills Items

Item	Stu. $\bar{X}$	Stu. SD	Lec. $\bar{X}$	Lec. SD	Grand $\bar{X}$	Decision
AS1: Adapts quickly to new digital tools	3.61	0.74	3.55	0.71	3.58	Agreed
AS2: Adjusts learning strategies when technology changes	3.44	0.81	3.40	0.78	3.42	Agreed
AS3: Responds effectively to unexpected tech problems	3.29	0.89	3.22	0.83	3.26	Agreed
AS4: Transfers digital skills across software platforms	3.18	0.92	3.12	0.88	3.15	Agreed
AS5: Updates knowledge when new software is introduced	3.52	0.77	3.47	0.73	3.50	Agreed
AS6: Applies digital skills in varied business contexts	3.38	0.86	3.33	0.82	3.36	Agreed
AS7: Demonstrates resilience in digital task completion	3.27	0.91	3.20	0.87	3.24	Agreed
Grand Mean	3.38	0.84	3.33	0.80	3.36	Agreed

Note: $\bar{X}$ = Mean; SD = Standard Deviation; Stu. = Students ($n = 527$); Lec. = Lecturers ($n = 69$); Grand $\bar{X}$ = weighted grand mean of students and lecturers; Decision criterion: $\bar{X} \geq 2.50$ = Agreed; $\bar{X} < 2.50$ = Disagreed.

As shown in Table 3, all seven adaptability skills items yielded grand mean scores above the decision criterion of 2.50, with the overall grand mean of 3.36 (SD = 0.84 for students; SD = 0.80 for lecturers) indicating that respondents agreed that business education students in North-East Nigerian Colleges of Education possessed the assessed digital adaptability competencies. Item AS1 ('Adapts quickly to new digital tools') recorded the highest grand mean of 3.58, whilst item AS4 ('Transfers digital skills across software platforms') recorded the lowest grand mean of 3.15, though this remained above the decision threshold. These findings suggest that, overall, business

education students demonstrate a moderate-to-high level of digital adaptability. The relatively lower mean score for platform transferability (AS4, $\bar{X} = 3.15$) and digital resilience (AS7, $\bar{X} = 3.24$) indicates areas where student competency is comparatively weaker and where targeted instructional support may be most beneficial. Conversely, the relatively higher means for items relating to basic tool adoption (AS1) and knowledge updating (AS5, $\bar{X} = 3.50$) suggest that students are reasonably disposed towards learning new technologies, even if they face challenges applying those skills across diverse contexts.

Research Question Two: Digital Management Skills

Research Question Two sought to assess the level of digital management skills among business education students in Colleges of Education in North-East Nigeria. Table 4 presents the descriptive results.

Table 4: Mean and Standard Deviation of Respondents on Digital Management Skills Items

Item	Stu. $\bar{X}$	Stu. SD	Lec. $\bar{X}$	Lec. SD	Grand $\bar{X}$	Decision
MS1: Manages digital files and folders efficiently	3.55	0.76	3.49	0.73	3.52	Agreed
MS2: Uses digital calendars and scheduling tools	3.42	0.83	3.38	0.80	3.40	Agreed
MS3: Organises collaborative digital projects	3.31	0.90	3.25	0.85	3.28	Agreed
MS4: Applies data management skills in business tasks	3.20	0.94	3.16	0.90	3.18	Agreed
MS5: Uses cloud platforms to coordinate team work	3.48	0.79	3.43	0.76	3.46	Agreed
MS6: Monitors and evaluates digital project progress	3.35	0.88	3.30	0.84	3.33	Agreed
MS7: Manages digital communication professionally	3.57	0.72	3.52	0.70	3.55	Agreed
Grand Mean	3.41	0.83	3.36	0.80	3.39	Agreed

Note: $\bar{X}$ = Mean; SD = Standard Deviation; Stu. = Students ($n = 527$); Lec. = Lecturers ($n = 69$); Grand $\bar{X}$ = weighted grand mean; Decision criterion: $\bar{X} \geq 2.50$ = Agreed.

Table 4 reveals that all seven digital management skills items were agreed upon by respondents, with a grand mean of 3.39 (SD = 0.83 for students; SD = 0.80 for lecturers) slightly exceeding the adaptability skills grand mean of 3.36. Item MS7 ('Manages digital communication professionally', Grand $\bar{X} = 3.55$) and item MS1 ('Manages digital files and folders efficiently', Grand $\bar{X} = 3.52$) recorded the highest scores, indicating that students perceived themselves as relatively proficient in these foundational management competencies. Item MS4 ('Applies data management skills in business tasks', Grand $\bar{X} = 3.18$) recorded the lowest score, suggesting that higher-order data

management competencies remain an area of relative weakness. The overall pattern of findings for management skills is broadly consistent with those for adaptability skills, confirming that whilst business education students in North-East Nigeria have acquired a functional base of digital competencies, there are specific areas particularly cross-platform skill transfer and data management where further development is required. The marginally higher grand mean for management skills compared to adaptability skills may reflect the more task-specific and procedural nature of management competencies, which are more readily taught and assessed through conventional classroom instruction.

Test of Null Hypothesis One

Hypothesis One posited that there is no significant difference in the mean response of business education students and lecturers on the digital literacy of business education students' adaptability skills in Colleges of Education in North-East Nigeria. The results of the independent-samples t-test are presented in Table 5.

Table 5: Independent-Samples t-test for Hypothesis One: Digital Adaptability Skills

Group	N	$\bar{X}$	SD	df	t-calc	t-crit (0.05)	Decision
Students	540	3.38	0.84	607	0.87	1.96	Ho Retained
Lecturers	69	3.33	0.80				

Note: t-calc = calculated t-value; t-crit = critical t-value at $\alpha = 0.05$, two-tailed, $df = 607$; Ho = null hypothesis. Decision: $t\text{-calc} < t\text{-crit}$, therefore Ho is retained.

As shown in Table 5, the calculated t-value of 0.87 is less than the critical t-value of 1.96 at the 0.05 level of significance with 607 degrees of freedom. Consequently, the null hypothesis is retained. There is no statistically significant difference in the mean responses of business education students ($\bar{X} = 3.38$, $SD = 0.84$) and lecturers ($\bar{X} = 3.33$, $SD = 0.80$) on the digital adaptability skills of business education students in Colleges of Education in North-East Nigeria.

Test of Null Hypothesis Two

Hypothesis Two posited that there is no significant difference in the mean response of business education students and lecturers on the digital literacy of business education students' management skills in Colleges of Education in North-East Nigeria.

Table 6: Independent-Samples t-test for Hypothesis Two: Digital Management Skills

Group	N	$\bar{X}$	SD	df	t-calc	t-crit (0.05)	Decision
Students	540	3.41	0.83	607	0.73	1.96	Ho Retained
Lecturers	69	3.36	0.80				

Note: t-calc = calculated t-value; t-crit = critical t-value at $\alpha = 0.05$, two-tailed, $df = 607$; Ho = null hypothesis. Decision: $t\text{-calc} < t\text{-crit}$, therefore Ho is retained.

Table 6 shows that the calculated t-value of 0.73 falls below the critical t-value of 1.96, leading to the retention of the null hypothesis. There is therefore no statistically significant difference in the mean responses of students ($\bar{X} = 3.41$, $SD = 0.83$) and lecturers ($\bar{X} = 3.36$, $SD = 0.80$) regarding

the digital management skills of business education students. This congruence in perception between students and lecturers across both competency dimensions is a noteworthy finding with implications for assessment validity and stakeholder alignment in the development of digital literacy curricula.

5. DISCUSSION OF FINDINGS

The finding that business education students in North-East Nigerian Colleges of Education possess moderate-to-high digital adaptability skills (Grand $\bar{X} = 3.36$) is both encouraging and nuanced. On the one hand, it suggests that students have developed sufficient adaptability to navigate the basic digital demands of their educational environment. On the other hand, the below-3.50 grand mean for most items, and particularly the relatively low scores for platform transferability and digital resilience, indicate that adaptability levels have not yet reached the threshold required for confident professional performance in technology-intensive work environments. These findings are broadly consistent with those of Porat et al. (2022), who found that students in lower-resource educational contexts exhibited functional but not advanced digital adaptability. They also align with Abubakar and Usman (2021), who reported similar patterns in North-West Nigerian Colleges of Education. Importantly, the current findings suggest some improvement over the baseline established by earlier studies, which may reflect the catalytic effect of the COVID-19 pandemic in accelerating digital exposure and skill development even in underserved contexts (Adeyemi & Okafor, 2021).

The finding that digital management skills (Grand $\bar{X} = 3.39$) were marginally higher than adaptability skills resonates with the theoretical distinction between basic procedural competencies and higher-order adaptive competencies. Management skills, which include file organisation, digital communication, and collaborative project management, are more frequently practised in everyday academic life and are therefore more readily developed through informal usage, even in the absence of formal instruction. This is consistent with Claro et al.'s (2021) observation that lower-order digital management competencies are often acquired through experience, whilst higher-order competencies such as data analysis and digital project evaluation require deliberate, structured instruction. The data management item (MS4) recording the lowest grand mean (3.18) across both skill dimensions is particularly significant in the context of the data-driven economy. As Danladi et al. (2023) have noted, data literacy is rapidly emerging as a core competency for business professionals across all sectors, yet it remains one of the most underdeveloped areas in Nigerian business education curricula. This finding constitutes a clear call to action for curriculum developers and programme coordinators in North-East Nigerian Colleges of Education.

The retention of both null hypotheses indicating no significant difference in the perceptions of students and lecturers is a finding of considerable practical import. This convergence suggests that lecturers' assessments of students' digital competencies are reasonably aligned with students' self-assessments, providing a degree of inter-rater validation for the survey findings. It also implies that the challenges and strengths in digital literacy development identified by this study are recognised by both key stakeholder groups, which is a favourable condition for the development and implementation of remedial or enhancement programmes. This finding is consistent with Huang et al. (2022), who reported convergent assessments between teachers and students on digital literacy in Taiwanese higher education, and with Schmid et al. (2021), who similarly found alignment between TPACK-based self-assessments and observer ratings in European teacher education contexts. The convergence across North-East Nigerian Colleges of Education is

noteworthy given the significant contextual constraints under which both students and lecturers operate, and may reflect the shared experience of navigating the same institutional digital environment.

6. IMPLICATIONS OF THE STUDY

The findings of this study carry several significant implications for policy, practice, and research in business education and higher education more broadly in Nigeria.

For curriculum policy, the study's findings reinforce the urgent need for the National Commission for Colleges of Education (NCCE) to incorporate dedicated digital literacy competency standards including explicit coverage of digital adaptability and management skills within its accreditation frameworks and minimum standards for business education programmes. The current implicit treatment of digital literacy as an embedded competency is insufficient given the documented gaps.

For institutional practice, the relative weakness identified in platform transferability and data management skills points to the need for business education programmes to adopt a 'digital breadth' approach to instruction exposing students to a diverse range of digital tools and platforms rather than restricting instruction to a single application. Practical, project-based assignments that require students to manage and present digital data in realistic business scenarios would be particularly valuable.

For lecturers, the finding that both students and lecturers converge in their assessment of digital competency levels suggests a shared awareness of the challenges, but also the risk of a 'ceiling of expectation' set too low. Capacity-building workshops for lecturers, focused specifically on digital adaptability and data management, are essential for raising the standard of digital instruction and modelling the digital competencies that students are expected to develop.

For researchers, the study highlights the need for longitudinal and mixed-methods investigations that can track the development of digital competencies over time and provide richer insights into the processes by which students develop or fail to develop adaptability and management skills in the specific socio-cultural and institutional context of North-East Nigeria.

7. CONCLUSION AND RECOMMENDATIONS

This study investigated the digital literacy of business education students in Colleges of Education in North-East Nigeria, focusing on adaptability and management skill dimensions. The findings indicate that students possess moderate-to-high levels of both digital adaptability (Grand $\bar{X}$ = 3.36) and digital management skills (Grand $\bar{X}$ = 3.39), with no statistically significant difference between the perceptions of students and their lecturers. Specific areas of relative weakness notably platform transferability, digital resilience, and data management were identified, providing actionable direction for curriculum and instructional improvement. These findings contribute empirical evidence to an underdeveloped strand of the digital literacy literature specific to North-East Nigeria and Colleges of Education contexts.

Based on the findings of this study, the following recommendations are offered:

1. The NCCE should revise business education minimum academic standards to

explicitly incorporate digital adaptability and management skill competencies, with measurable indicators that can be used for programme review and accreditation purposes.

2. Colleges of Education in North-East Nigeria should prioritise investment in ICT infrastructure including reliable internet connectivity, adequately equipped computer laboratories, and licensed access to business software suites as a foundational prerequisite for meaningful digital literacy instruction.
3. Business education departments should redesign practicum and studio-based courses to include collaborative digital project work requiring students to demonstrate both adaptability (by working across multiple platforms) and management skills (by coordinating, documenting, and presenting project outcomes digitally).
4. Academic administrators should institute regular, structured digital professional development for business education lecturers, with particular emphasis on data literacy, cloud collaboration tools, and the pedagogical integration of diverse digital platforms.
5. Future research should employ longitudinal and experimental designs to investigate the causal effects of digital literacy interventions on students' competency development, and should extend coverage to include student performance-based assessments alongside self-report measures.

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