

Digital Transformation, Skills Development, and Entrepreneurial Sustainability in Nigerian Higher Education and Small and Medium Enterprises: An Integrative Review and Framework for Sustainable Development

Abdulmutallib Umar Baraya, Agatha Samson and Joy Chinelo Chukwudolue

Received: 14 July 2026/Accepted: 10 October 2026/Published: 24 October 2026

Abstract: Digital technologies increasingly mediate teaching, entrepreneurship training, market information, and enterprise operations in Nigeria. Yet the connections between institutional digital transformation, learning-based competence formation, and sustainable small and medium enterprise (SME) performance remain fragmented across education, entrepreneurship, and fisheries/agricultural enterprise literatures. This integrative review develops a cross-sector interpretation of digital transformation and skills development, distinguishing learning and adoption outcomes from observed entrepreneurial performance. A purposive, transparent integration of 51 previously assembled publications, including supplied full-text papers by Agatha Samson and publications by Samuel Awolunate, was undertaken. Publisher-linked research and comparative reviews were used for interpretation. Sources were organized through structured charting and critical thematic comparison; this is not a systematic or exhaustive search. Findings: Four connected domains recur: digital instructional capacity; entrepreneurial and technical competencies; organizational adoption and institutional support; and enterprise resilience. The literature supports plausible relationships between these domains, but empirical designs are heterogeneous, commonly cross-sectional, and often reliant on intentions or perceptions. Direct evidence linking educational interventions to long-term SME survival or to measured graduate employment is limited. A Digital Learning–Enterprise Sustainability (DLES) framework is proposed to guide future multi-level research and practice. Effective digital transformation requires more than access

to technology; instructional design, skill application, financial and institutional support, and measurable enterprise outcomes should be evaluated as distinct yet interacting stages.

Keywords: digital transformation; entrepreneurship education; SMEs; open and distance learning; digital skills; Nigeria; enterprise resilience; integrative review

Abdulmutallib Umar Baraya

Abubakar Tafawa Balewa University Bauchi
Faculty of Technology Education,
Department of Vocational Education.

Email: fadilau4@gmail.com

<https://orcid.org/0009-0005-8447-0628>

Agatha Samson

Faculty of Education, Department of Arts and
Social Sciences Education, National Open
University of Nigeria Abuja Headquarters.

Email: asamson@noun.edu.ng

<https://orcid.org/0009-0001-4560-6810>

Joy Chinelo Chukwudolue

National Open University of Nigeria Abuja,
Faculty of Education
Department of Arts and Social Sciences
Education

Email: jchukwudolue@noun.edu.ng

<https://orcid.org/0009-0005-3612-8254>

1.0 Introduction

Digital transformation is not simply the acquisition of devices or software. In education, it involves changes to pedagogy, assessment, learner support, educator competence and institutional decision-making; in enterprises, it also involves market coordination, communication, operations and the capacity to respond to disruption. Treating technology adoption as equivalent to improved performance obscures the intervening requirements for skills, incentives, infrastructure and management.

Nigeria provides a pertinent setting in which universities, open and distance learning institutions and small firms face overlapping constraints involving finance, connectivity, training and institutional capacity.

Research on Nigerian higher education has examined computer-assisted instruction (Inuwa & Samson, 2025), interactive open and distance learning (Samson et al., 2024), and management of institutional digital transformation (Samson et al., 2025). Related studies address entrepreneurs' perceptions of online learning (Chukwudolue et al., 2025), venture creation skills (Okeke et al., 2025), and the survival of medium-scaled enterprises using ICT platforms (Samson & Jibrin, 2025). The aquaculture literature provides a complementary lens on digital communication, technology usability and resilience among agricultural entrepreneurs (Awolumate, 2018; Awolumate et al., 2025; Mundi et al., 2024).

These strands tend to examine different populations, levels of analysis and outcome measures. A student's intention to use software is not an observed teaching intervention; an SME operator's favourable perception of online learning is not demonstrable business growth; and an association between ICT and firm survival does not by itself establish a causal pathway. This review therefore integrates the literatures while making their conceptual and methodological boundaries explicit. Its purpose is to develop an analytical explanation of how digitally supported learning may contribute to entrepreneurial sustainability, rather than assume such contributions have already been empirically demonstrated.

The objective is to synthesize evidence on the mechanisms linking digital transformation, skills development and entrepreneurial sustainability in Nigerian tertiary education and SME contexts, and to develop a usable framework for institutional policy and future research.

The review was guided by five research questions designed to examine the relationships between digital transformation, skills development and entrepreneurial sustainability

in Nigerian higher education and SME contexts, as presented in Table 1.

This study is significant because it provides an integrated understanding of the relationships between digital transformation, skills development and entrepreneurial sustainability within Nigerian higher education and small and medium enterprises (SMEs). By bringing together evidence from educational technology, entrepreneurship education, digital competencies and enterprise development, the study addresses the fragmentation of existing research and provides a broader perspective on how digitally supported learning can contribute to sustainable entrepreneurial activities.

For higher education institutions, the study highlights the importance of integrating digital technologies with practical, competency-based entrepreneurship education. It provides insights into strengthening curriculum development, instructional delivery, educator capacity and institutional support systems to equip graduates with relevant digital, managerial and entrepreneurial skills. For policymakers, the proposed Digital Learning–Enterprise Sustainability (DLES) framework offers an analytical basis for developing policies that connect digital education initiatives, skills development programmes and SME support interventions. It also emphasizes the need to address infrastructural, financial and institutional constraints that may limit the effective application of digital competencies.

Table 1: Guiding Research Questions for the Integrative Review

Code	Guiding question
GQ1	What forms of digital teaching, learning and institutional transformation are documented in Nigerian higher education?
GQ2	Which digital, entrepreneurial and managerial competencies are emphasized, and how are they measured?
GQ3	What factors facilitate or constrain the application of digital technologies by SMEs and vocational entrepreneurs?



GQ4	What evidence links education and technology adoption with enterprise resilience, sustainability or employability?
GQ5	Which theoretical and methodological gaps should shape future evaluations?

The study is equally relevant to entrepreneurs and SME development agencies because it identifies the importance of translating acquired digital and entrepreneurial competencies into practical business activities, including digital marketing, financial management, customer engagement and operational efficiency. Furthermore, it contributes to academic knowledge by distinguishing technology access, adoption intentions, actual usage, competence formation and measurable enterprise sustainability outcomes as related but distinct dimensions. The proposed framework provides a foundation for future empirical investigations, particularly longitudinal and multi-level studies examining the extent to which digital learning and skills development translate into enterprise resilience, productivity, employment generation, and long-term business survival.

3.0 Review approach and analytical procedure

3.1 Design and sources

An integrative review approach was used to combine empirical studies, contextual reports, conceptual treatments and prior reviews across education and enterprise research. The corpus consisted of 51 named references assembled in the earlier review workflow (25 wider academic references, 17 cited publications from Agatha Samson's profile, and nine selected Samuel Awolumate publications). Uploaded full texts were used when available; other bibliographic records were retained as supporting literature where author, title and source could be established. The corpus is purposive and not an exhaustive representation of publications in Nigeria. No claim is made that all 51 works are indexed in Scopus or that all were subjected to identical full-text appraisal.



3.2 Selection and relevance appraisal

Sources were provisionally mapped to (a) digital teaching and higher education transformation, (b) competency and entrepreneurship education, (c) SME adoption and performance, or (d) comparative/theoretical or methodological background. Relevance was based on contribution to the guiding questions, not author identity. Studies outside higher education (e.g., aquaculture field communication, farming and secondary school education) are used solely to illuminate transferability and boundary conditions. Reviews and data articles were not treated as independent outcome trials. Because this is an integrative review, formal PRISMA identification counts, effect pooling and comprehensive database coverage are not claimed.

3.3 Extraction and critical comparison

For accessible primary studies, the synthesis distinguishes setting, population, design, intervention/exposure, measure and reported conclusion. Interpretation explicitly differentiates: (i) technology access, (ii) intentions or attitudes, (iii) actual use, (iv) competencies, and (v) economic outcomes. Cross-sectional associations are interpreted descriptively and not as causal estimates. All bibliographic records were checked against publisher or registry metadata; sources without a DOI were confirmed through citing literature.

4.0 Conceptual and theoretical foundations

4.1 Constructivist and experiential learning

Activity-based learning foregrounds learning by participation, problem solving and practical application rather than passive reception. Samson (2014) conceptualized activity-based learning as a model for business education, while Adubasim and Samson (2026) reported positive associations of its engagement and collaboration dimensions with undergraduate academic performance. The broader comparative literature likewise considers cases, simulations and other active methods as pedagogical alternatives



(Farashahi & Tajeddin, 2018; van Ewijk et al., 2020). Digital platforms contribute educational value when they enable meaningful tasks and feedback, not merely because content is delivered electronically.

4.2 Technology adoption and institutional readiness

Models of perceived usefulness, ease of use and self-efficacy help explain instructional technology acceptance. Inuwa and Samson (2025) reported these constructs as relevant to lecturers' adoption intentions for computer-assisted instruction. Isiyaku et al. (2018) examined antecedents of teachers' perceived ICT usefulness for business education. These measures are informative about readiness but cannot substitute for observation of actual use or instructional quality. At institutional level, Samson et al. (2025) situated digital transformation within strategic management, collaboration and sustainability concerns; Ofulue et al. (2024) proposed a wider research agenda for innovation and resilience in open and distance e-learning.

4.3 Competency development and sustainable entrepreneurship

Skills-based perspectives connect opportunities to apply knowledge with competencies such as financial management, innovation, communication and opportunity recognition. Okeke et al. (2025) reported SME managers' perceptions of the importance of venture creation competencies; Jacob et al. (2023) identified office technology and interpersonal competencies considered necessary for self-reliance. Entrepreneurial education research discusses the role of curriculum, training quality, support and intentions (Igwe et al., 2021; Iwu et al., 2021; Okolie et al., 2021; Otache et al., 2024). Intentions and perceived competencies are intermediate outcomes, not direct measures of enterprise survival or job creation. Baraya et al. (2025) similarly relate entrepreneurship education curriculum content to undergraduate students' entrepreneurial self-efficacy for self-

reliance, again an intermediate rather than enterprise-level outcome.

5.0 Findings: digital transformation in higher education

5.1 Digital instructional practice

The education papers converge on the need to move from access-focused ICT discourse to interaction and use. Samson et al. (2024) examined interaction and effectiveness within the National Open University of Nigeria's open and distance learning environment. Inuwa and Samson (2025) studied lecturers' intentions to use computer-assisted instruction, drawing attention to perceived usefulness, ease of use and computer self-efficacy. The former addresses the quality of participation in an instructional environment; the latter addresses readiness to employ a delivery technique. Neither result alone is equivalent to a measured learning gain caused by a specified digital intervention. Okon et al. (2025) similarly examine the application of e-learning resources to business education content delivery in Nigerian federal universities, which again concerns delivery conditions rather than measured learning gains.

Digital education can also support learning continuity under constrained conditions. Awolumate et al. (2025) examined digital learning resilience and financial access among aquaculture learners in climate-affected communities, extending attention beyond standard university classrooms. Ofulue et al. (2024) situate resilience within the broader organizational requirements of open and distance learning. Such work suggests a need to study technology maintenance, accessibility, costs and learning support as components of pedagogical implementation rather than confounders to be ignored. An earlier argument by Mundi and Awolumate (2013) that suitable ICTs within open and distance learning can widen access for orphaned and vulnerable children points to the same concern with inclusion.



5.2 Institutional transformation and educator development

Samson et al. (2025) investigated management of digital transformation for sustainable development in Bauchi State higher education institutions, emphasizing strategy, leadership and stakeholder collaboration. Liadi and Samson (2025) focused on professionalism and staff development in business education programme management. Samson and Yaduma (2021) examined manpower and physical facilities for undergraduate business education implementation, and Samson et al. (2021) reviewed its philosophy and objectives. Taken together, these studies reinforce a distinction between institutional capacity and individual teacher willingness: sustainable implementation involves curriculum coherence, staff development, infrastructure and governance. Okon, Agbor, et al. (2026) examine academic staff instructional competence in relation to business education delivery in public universities; Ibrahim et al. (2023) discuss teaching problems in accounting, business and management; and Udo et al. (2016) report students' perceptions of lecturers' good and caring teaching behaviours. These studies indicate that educator development involves pedagogical and relational practice as well as technical skill.

The broader literature on ICT in Nigerian business education (Isiyaku et al., 2018; Ohanu et al., 2025) indicates why technical competence and institutional conditions should be examined jointly. System-wide accounts of university entrepreneurship and innovation (Oyinlola et al., 2024) widen the frame to institutional incentives and ecosystems; however, conceptual similarity should not be mistaken for effect-size comparability.

6.0 Findings: competence formation and employability

6.1 Entrepreneurial and technical skills

An employability perspective requires at least three outcome layers: demonstrated learning, workplace-relevant competencies and

subsequent employment or business performance. Okeke et al. (2025) focus on opportunity identification and financial management skills deemed important for SME operations; Jacob et al. (2023) focus on word-processing, communication and interpersonal competencies for office technology students. In related studies, entrepreneurship training, centres and curriculum have been linked to student intention, preparedness or competencies (Ben-Caleb et al., 2025; Ogbari et al., 2018; Olokundun et al., 2018; Salisu, 2020). The relationship between these proxies and durable business outcomes warrants separate evaluation. Prior syntheses offer methodological context rather than additional Nigerian primary observations: Martínez-Gregorio et al. (2021) assessed entrepreneurship education outcomes through meta-analysis; Carpenter and Wilson (2022), Anubhav et al. (2024), Branca et al. (2025), and Hägg and Gabrielsson (2020) considered effects, tools or pedagogical evolution. These studies help define distinctions among entrepreneurship knowledge, intention and competence. Findings from students outside Nigeria (e.g., Effah et al., 2026) are included only as comparative perspectives.

6.2 Skills-to-outcomes translation

Curriculum and training effectiveness depend on opportunities to practise skills under realistic conditions. Entrepreneurship programmes may include applied projects, financial planning, digital marketing exercises and employer feedback. Yet evidence assembled here more commonly measures skills perceived as necessary than actual placement, earnings, business survival or firm productivity. The mismatch is particularly evident when vocational programmes are described as employability enhancing without longitudinal follow-up. Ndibalema (2026) highlights regional employability-curriculum gaps, while Okpara et al. (2026) addresses transition readiness. Neither should be conflated with verified downstream labour-market change in the Nigerian business education studies. Okon, Okpo, et al. (2026)



report that practical components in accounting, entrepreneurship, and marketing and distributive education were associated with final-year students' perceived global competitiveness in Cross River State, whereas office management practicals showed no significant influence. Kolajo et al. (2026) propose a transformative entrepreneurship curriculum model for bridging education and employability, although their secondary-school focus places the work outside the tertiary population.

7.0 Findings: SME adoption, resilience and sustainability

7.1 Online learning among enterprise operators

Chukwudolue et al. (2025) surveyed SME operators concerning online learning as an avenue for development and achievement. The paper reports generally favourable perceptions while identifying financial barriers to participation. This evidence relates most directly to demand for lifelong learning and perceived accessibility, not to a causal effect of online training on profitability. It nevertheless supports designing training models around adults' time and financial constraints.

7.2 ICT platforms and firm survival

Samson and Jibrin (2025) examined ICT platforms and medium-scaled enterprise survival in Bauchi Metropolis. The paper's focus on adoption, firm survival and infrastructure is closer to enterprise-level outcomes than studies of academic intentions. However, observational self-report data remain vulnerable to omitted-variable explanations, such as management quality, firm age, finance and market conditions. Consequently, the relationship is best interpreted as an association warranting stronger longitudinal or quasi-experimental study. Samson and Baraya (2024) report a related enterprise-level analysis of digital technology transformation as a determinant of entrepreneurial performance in Zuba International Fruits Market, Abuja; the same caution about self-reported performance applies.

7.3 Cross-sector evidence from aquaculture

Awolumate (2018) investigated ICT adaptability and friendliness in fish farming; Mundi et al. (2024) examined mobile technology and digital platforms for aquaculture communication in Kogi State. These studies illuminate usability, information access and sector-specific digital communication mechanisms. Agbo et al. (2026) examined innovation skills and institutional support among open and distance learning students engaged in aquaculture startup development, linking education to entrepreneurial practice more directly. Samson and Baraya (2026) add agripreneurship practices, food security and economic transformation as relevant economic context. Together the studies argue for sector-sensitive skills designs, but findings from fish farms should not be generalized automatically to all Nigerian SMEs. Within the same value chain, Awolumate et al. (2022) examine determinants of profitability and challenges among smoked and dried fish marketers in Lagos State, Awolumate and Muiyiwa (2025) analyse financial constraints on the profitability of small-scale roadside fish processors, and Awolumate and Ashiedu (2026) assess productivity and profitability responses to cooperative-based institutional support in aquaculture. These studies bring finance and institutional support, the enabling conditions in Stage 1 of the framework below, directly into view.

8.0 Proposed Digital Learning–Enterprise Sustainability (DLES) framework

The framework treats digital transformation as a staged, contingent process rather than a single intervention. Institutional support and contextual conditions influence whether people can access technologies, engage in quality learning and transfer competencies to enterprise routines. The model makes empirically testable distinctions among the mechanisms.

The proposed DLES framework conceptualizes the relationship between digital transformation, learning experiences, competency development and entrepreneurial sustainability as a five-stage



process, with corresponding constructs and measurable indicators, as presented in Table 2

Table 2: Stages, Key Constructs and Observable Indicators of the Digital Learning–Enterprise Sustainability (DLES) Framework

Stage	Key constructs	Observable indicators
1. Enabling conditions	Connectivity, devices, time, financing, educator competence, institutional strategy	Access logs; affordability ; training availability; staff preparation
2. Learning experience	Interactive ODL, activity-based tasks, CAI, mentoring, applied projects	Platform participation ; task completion; observed instruction
3. Competence formation	Digital, managerial, opportunity-recognition, financial and communication skills	Performance assessments ; validated skills measures
4. Enterprise application	Digital marketing, records, supply-chain information, customer communication	Verified business processes; frequency of tool use
5. Sustainability outcomes	Survival, productivity, sales, income, adaptive capacity, employment	Longitudinal business records; employment outcomes

Feedback loops are expected: firms may shape curricula through industry partnerships and

graduates may return to lifelong learning. Contextual moderators include firm sector, location, gender, funding, network reliability and market volatility. Three propositions follow: P1, pedagogical interactivity mediates the relationship between technology access and assessed competence; P2, institutional and financial support moderate the translation of competence into regular enterprise use; P3, observed enterprise use, rather than technology intention alone, is more directly associated with sustained performance. These are research propositions, not established effects.

9.0 Critical discussion and implications

9.1 Avoiding the digital-solutionism trap

The reviewed literature illustrates the attraction of technology as a solution to educational and commercial challenges. Yet a digital tool can be adopted without being used well, and a course can be completed without an economically productive application. Frameworks that collapse access, adoption, learning and enterprise growth into a single success measure risk overestimating effectiveness. Policy should therefore require evidence at each stage and make unintended burdens such as connectivity costs and exclusion visible.

9.2 Higher education policy and curriculum

Universities and open-distance learning institutions should align course designs with demonstrable competencies. Practical assessment can incorporate market research, budgeting, bookkeeping, digital customer engagement and team-based problem solving. Continuing staff development, curriculum maintenance and accessible technology support should be budgeted as recurring institutional responsibilities. Programme evaluation should distinguish learner satisfaction from assessed skill and post-training outcomes.

9.3 SME support and sector customization

SME capacity-building programmes should link short, accessible learning modules to real enterprise tasks, coaching and affordable digital infrastructure. Agricultural enterprise programmes may prioritize extension



communication and market information, whereas service firms may require digital payments and customer relationship practices. Such customization acknowledges that findings from aquaculture communications (Awolumate, 2018; Mundi et al., 2024) have transferable mechanisms but not universally transferable effect estimates.

9.4 Research design priorities

Future research should specify measurable interventions and comparators, establish baseline skills and enterprise conditions, use follow-up intervals sufficient for sustainability outcomes, and incorporate objective indicators when possible. Mixed-method studies could explain why tools are adopted but not sustained. Longitudinal designs and carefully evaluated training pilots would help clarify whether observed associations are explained by pre-existing managerial capability or resources.

10. Limitations and research integrity

This paper is a purposive integrative review of a previously assembled 51-reference library rather than a comprehensive systematic review. The initial corpus was selected through earlier consultation and supplied files, not an exhaustive reproducible database search. Some citations originated in incomplete bibliographic records; these were completed from publisher, registry or citing-literature records. The included studies span business education, university systems, agriculture, aquaculture and SME operations; they differ in population, design and outcome definition. No common effect sizes were pooled and no claim of representative national coverage is made. Review-author interests and prior source selection can introduce availability and selection bias; the manuscript therefore separates direct educational evidence, sectoral context and conceptual claims.

11.0 Conclusion

Nigerian higher education and SMEs share a need for usable digital competence, but the mechanisms of educational improvement and enterprise sustainability should not be conflated. The assembled literature highlights interactive

learning, lecturer readiness, institutional digital strategy, entrepreneurial skills, online learning access and ICT-enabled enterprise processes. Its stronger inference is that these dimensions constitute connected implementation challenges, not that digitalization alone causes employability or sustainable enterprise growth. The DLES framework offers a practical structure for teaching design, SME training and future evaluation by tracking the progression from access to instruction, competence, applied use and measurable outcomes. The next generation of studies should verify that progression through stronger longitudinal and comparative evidence.

12.0 References

- Adubasim, E. I., & Samson, A. (2026). The influence of activity-based learning strategies on academic performance among undergraduate students in Nigerian universities. *International Journal of Business & Entrepreneurship Research*, 15(1), 30–43. <https://doi.org/10.5281/zenodo.18641350>
- Agbo, A. N., Awolumate, S., Okhogbe, A. J., & Olakulehin, F. K. (2026). Innovation skills and institutional support in sustainable aquaculture start-up development among open and distance learning students in Nigeria. *Journal of Science and Information Technology*, 20(1), 112–121.
- Anubhav, K., Dwivedi, A. K., & Aashish, K. (2024). Entrepreneurship education in higher education (2002–2022): A technology-empowered systematic literature review. *The International Journal of Management Education*, 22(3), Article 100993. <https://doi.org/10.1016/j.ijme.2024.100993>
- Awolumate, S. (2018). Adaptability, friendliness, and status of information and communication technologies (ICTs) in fish farming in Lagos State, Nigeria. *West African Journal of Open and Flexible Learning*, 7(1), 143–162. <https://>



- wajofel.org/index.php/wajofel/article/view/25
- Awolumate, S., Agbo, A. N., Alabi, J. A., & Akure, O. C. (2025). Digital learning resilience and financial access among aquaculture learners in climate-affected communities in Southwest Nigeria. *West African Journal of Open and Flexible Learning*, 14(1A), 195–218. <https://wajofel.org/index.php/wajofel/article/view/413>
- Awolumate, S., & Ashiedu, J. C. (2026). Empirical assessment of productivity and profitability responses to cooperative-based institutional support in aquaculture production systems in Lagos State, Nigeria. *Communication in Physical Sciences*, 13(1), 17–24. <https://doi.org/10.4314/cps.v13i1.2>
- Awolumate, S., & Muyiwa, L. H. (2025). Impact of financial constraints on profitability of small-scale roadside fish processors in Lagos State, Nigeria: A multivariate regression approach. *Agriculture, Food and Natural Resources Journal*, 4(1), 27–34. <https://doi.org/10.5281/zenodo.15105560>
- Awolumate, S., Okwukenye, G. F., Agbo, A. N., & Akinbani, D. M. (2022). Determinants of profitability and challenges of smoked and dried fish marketers in Lagos State Nigeria. *Nigerian Journal of Agriculture and Agricultural Technology*, 2(2), 1–11. <https://doi.org/10.59331/njaat.v2i2.96>
- Baraya, A. U., Samson, A., Chadi, A. M., Umar, Y. B., & Jirgi, J. M. (2025). Relationship between entrepreneurship education curriculum content and undergraduate students' entrepreneurial self-efficacy development for self-reliant. *Gusau Journal of Business Administration*, 4(2), 235–244. <https://doi.org/10.57233/gujoba.v4i2.32>
- Ben-Caleb, J. O., Ben-Caleb, E., Peter, F. O., Eze, S., & Ayomide, I. A. (2025). The interplay between entrepreneurship centre, innovative ideas and startup intention to effective entrepreneurship education: Evidence from *Nigeria*. *Social Sciences & Humanities Open*, 12, Article 101859. <https://doi.org/10.1016/j.ssaho.2025.101859>
- Branca, E., Vanderstraeten, J., Slabbinck, H., & Maes, I. M. R. (2025). The impact of entrepreneurial education on key entrepreneurial competencies: A systematic review of learning strategies and tools. *The International Journal of Management Education*, 23(2), Article 101144. <https://doi.org/10.1016/j.ijme.2025.101144>
- Carpenter, A., & Wilson, R. (2022). A systematic review looking at the effect of entrepreneurship education on higher education student. *The International Journal of Management Education*, 20(2), Article 100541. <https://doi.org/10.1016/j.ijme.2021.100541>
- Chukwudolue, J. C., Eya, G. M., Samson, A., & Okeke, A. U. (2025). Perception of small and medium scale enterprises' operators on online learning as an avenue for self-development and achievement. *African Journal of Educational Management, Teaching and Entrepreneurship Studies*, 14(2), 168–182.
- Effah, E. D., Kwarteng, J. T., & Brown, M. (2026). Evaluating business students' technical competence and professional skills development in business education. *Discover Education*, 5, Article 927. <https://doi.org/10.1007/s44217-026-01917-9>
- Farashahi, M., & Tajeddin, M. (2018). Effectiveness of teaching methods in business education: A comparison study on the learning outcomes of lectures, case studies and simulations. *The International Journal of Management Education*, 16(1), 131–142. <https://doi.org/10.1016/j.ijme.2018.01.003>



- Hägg, G., & Gabrielsson, J. (2020). A systematic literature review of the evolution of pedagogy in entrepreneurial education research. *International Journal of Entrepreneurial Behavior & Research*, 26(5), 829–861. <https://doi.org/10.1108/IJEBR-04-2018-0272>
- Ibrahim, A., Yaduma, P. S., & Samson, A. (2023). *Problems of teaching accounting, business and management*. In P. S. Yaduma (Ed.), *Problems of teaching technology, vocational education and training (TVET)* (pp. 307–328). Golden Business Ventures.
- Igwe, P. A., Okolie, U. C., & Nwokoro, C. V. (2021). Towards a responsible entrepreneurship education and the future of the workforce. *The International Journal of Management Education*, 19(1), Article 100300. <https://doi.org/10.1016/j.ijme.2019.05.001>
- Inuwa, U., & Samson, A. (2025). Adoption of computer assisted instruction in teaching business education courses at tertiary institutions in North-East Nigeria. *International Journal of Teacher Education and Teaching*, 5(1), 38–49.
- Isiyaku, D. D., Ayub, A. F. M., & AbdulKadir, S. (2018). Antecedents to teachers' perceptions of the usefulness of ICTs for business education classroom instructions in Nigerian tertiary institutions. *Asia Pacific Education Review*, 19(3), 337–352. <https://doi.org/10.1007/s12564-018-9525-x>
- Iwu, C. G., Opute, P. A., Nchu, R., Eresia-Eke, C., Tengeh, R. K., Jaiyeoba, O., & Aliyu, O. A. (2021). Entrepreneurship education, curriculum and lecturer-competency as antecedents of student entrepreneurial intention. *The International Journal of Management Education*, 19(1), Article 100295. <https://doi.org/10.1016/j.ijme.2019.03.007>
- Jacob, T., Inuwa, U., & Samson, A. (2023). Assessment of competencies required for self-reliance by office technology and management students in colleges of education in North East Nigeria. *Al-Hikmah Journal of Business Education*, 3(2), 61–68.
- Kolajo, B. F., Laosebikan, J. O., & Smith, R. F. (2026). Bridging the gap between education and employability: A transformative entrepreneurship curriculum model for Nigerian secondary schools. *Scientific African*, 32, Article e03353. <https://doi.org/10.1016/j.sciaf.2026.e03353>
- Liadi, H. O., & Samson, A. (2025). Professionalism and staff development in managing business education programme in South-South Nigerian public universities: A comparative relationship. *NIU Journal of Educational Research*, 11(2), 23–31.
- Martínez-Gregorio, S., Badenes-Ribera, L., & Oliver, A. (2021). Effect of entrepreneurship education on entrepreneurship intention and related outcomes in educational contexts: A meta-analysis. *The International Journal of Management Education*, 19(3), Article 100545. <https://doi.org/10.1016/j.ijme.2021.100545>
- Mundi, N. E., & Awolumate, S. (2013, December 2–6). *Enhancement of learning for orphaned and vulnerable children through information and communication technologies in open and distance learning [Paper presentation]*. Seventh Pan-Commonwealth Forum on Open Learning (PCF7), Abuja, Nigeria. <https://oasis.col.org/entities/publication/1f88cb9d-6172-4655-8029-913d8442c7f2>
- Mundi, N. E., Awolumate, S., & Ambassador-Brikins, H. O. C. (2024). Digital platforms and mobile technology in aquaculture communication among fish farmers in Kogi State, Nigeria. *Nigerian Journal of Fisheries and Aquaculture*, 12(2), 1–9.



- Ndibalema, P. (2026). Employability-related curriculum gaps among graduates in Sub-Saharan Africa: A systematic literature review. *Cogent Education*, 13(1), Article 2732535. <https://doi.org/10.1080/2331186X.2026.2732535>
- Ofulue, C., Opataye, J., Awolumate, S., Olakulehin, F. K., Adesina, A., Yabo, A. M., Ugoala, B., Oluyide, O., & Ojediji, S. (2024). Developing a research agenda for resilient systems and innovative practices in ODeL: Findings from a national study. *Journal of Learning for Development*, 11(2), 323–348. <https://doi.org/10.56059/j14d.v11i2.1045>
- Ogbari, M. E., Olokundun, M. A., Uzuegbunam, J., Isiafwe, D. T., Ilogho, J. E., Obi, J. N., & Moses, C. L. (2018). Data on entrepreneurship education and entrepreneurial performance of aspiring entrepreneurs in selected Nigerian universities. *Data in Brief*, 20, 108–112. <https://doi.org/10.1016/j.dib.2018.07.044>
- Ohanu, I. B., Nwandu, L. O., Okadi, A. O., Orji, C. T., Ejiofor, T. E., Chukwuone, C. A., Ibezim, N. E., & Osinem, E. C. (2025). Utilization of technology-enhanced learning tools for sustainable skills acquisition and graduate employability in tertiary institutions in Nigeria. *Journal of Applied Research in Higher Education*, 17(6), 2283–2292. <https://doi.org/10.1108/JARHE-02-2024-0099>
- Okeke, A. U., Chukwudolue, J. C., Eya, G. M., Samson, A., Ohadiugha, M. N., Areji, J. N., & Ugwuonwoti, E. P. (2025). Venture creation skills for business education students: An empirical examination of opportunity identification and financial management skills for successful business operations in SMEs. *International Journal of Research*, 12(2), 517–531. <https://doi.org/10.5281/zenodo.14904981>
- Okolie, U. C., Igwe, P. A., Ayoola, A. A., Nwosu, H. E., Kanu, C., & Mong, I. K. (2021). Entrepreneurial competencies of undergraduate students: The case of universities in Nigeria. *The International Journal of Management Education*, 19(1), Article 100452. <https://doi.org/10.1016/j.ijme.2021.100452>
- Okon, E. E., Agbor, G. E., Onabe, M. B., Olom, P. A., Oche, P. E., Ereh, C. O., Ushie, P. U., Elogbo, E. E., Umoren, C. O., Bishie-Unung, S. S., Dijeh, A. E., Ingwe, M. O., Ateb, T. A., Ashi, L. A., Nyiam, P. A., Ekong, E. N., Bekomson, M., Effiong, K. O., & Nwaiwu, K. N. C. (2026). Influence of academic staff instructional competence on the delivery of business education in public universities. *Discover Education*, 5, Article 351. <https://doi.org/10.1007/s44217-026-01288-1>
- Okon, E. E., Odo, O. J., & Olom, P. A. (2025). Application of e-learning resources and business education content delivery in federal universities. *Social Sciences & Humanities Open*, 12, Article 102183. <https://doi.org/10.1016/j.ssaho.2025.102183>
- Okon, E. E., Okpo, A. A., Ushie, P. U., Bishie-Unung, S. S., Olom, P. A., Eleng, S. N., Oche, P. E., Michael, O., Ingwe, M. O., Agbor, G. E., Udida, F. U., Ushie, G. B., Odey, A. M., Ateb, T. A., Ashi, L. A., Nyiam, P. A., Elogbo, E. E., Egbe, J. E., & Kolo, I. (2026). Practical business education components and production of graduates for the global workforce in public universities in Cross River State. *Discover Education*, 5, Article 1150. <https://doi.org/10.1007/s44217-026-01935-7>
- Okpara, C. M., Okonkwo, C. C., Igu, O. F., Mong, I. K., Ojemuyide, C. C., & Onwumere, M. (2026). Perceived university career guidance, career adaptability, and school-to-work transition readiness among vocational and technical education students in South-East Nigeria. *Discover Psychology*. Advance online



- publication. <https://doi.org/10.1007/s44202-026-00917-y>
- Olokundun, M., Iyiola, O., Ibidunni, S., Ogbari, M., Falola, H., Salau, O., Peter, F., & Borishade, T. (2018). Data article on the effectiveness of entrepreneurship curriculum contents on entrepreneurial interest and knowledge of Nigerian university students. *Data in Brief*, 18, 60–65. <https://doi.org/10.1016/j.dib.2018.03.011>
- Otache, I., Edopkolor, J. E., Sani, I. A., & Umar, K. (2024). Entrepreneurship education and entrepreneurial intentions: Do entrepreneurial self-efficacy, alertness and opportunity recognition matter? *The International Journal of Management Education*, 22(1), Article 100917. <https://doi.org/10.1016/j.ijme.2023.100917>
- Oyinlola, M., Kolade, O., Okoya, S. A., Ajala, O., Adefila, A., Adediji, A., Babaremu, K., Tijani, B., Adejuwon, J., Wambui, F., & Akinlabi, E. T. (2024). Entrepreneurship and innovation in Nigerian universities: Trends, challenges and opportunities. *Heliyon*, 10(9), Article e29940. <https://doi.org/10.1016/j.heliyon.2024.e29940>
- Salisu, J. B. (2020). Entrepreneurial training effectiveness, government entrepreneurial supports and venturing of TVET students into IT related entrepreneurship: An indirect-path effects analysis. *Heliyon*, 6(11), Article e05504. <https://doi.org/10.1016/j.heliyon.2020.e05504>
- Samson, A. (2014). Activity based learning: A successful model for business education. *Journal of Research in Education and Society*, 5(2), 32–38.
- Samson, A., & Baraya, A. U. (2024). Digital technology transformation as determinant for entrepreneurial performance in Zuba International Fruits Market, FCT-Abuja, Nigeria. *Bauchi Multidisciplinary Journal of Research and Development*, 2(1), 172–178.
- Samson, A., & Baraya, A. U. (2026). Impact of agripreneurship practices on food security and economic transformation among small and medium scale farmers in Bauchi Metropolis, Bauchi State, Nigeria. *Journal of Agricultural Education Teachers Association of Nigeria*, 10(1), 1–11.
- Samson, A., & Jibrin, I. Y. (2025). The impact of ICT platforms on the survival of medium-sized enterprises in Bauchi Metropolis. *Jos Journal of Social Sciences*, 2(1), 159–176.
- Samson, A., & Yaduma, P. S. (2021). Evaluation of manpower and physical facilities for implementation of undergraduate business education programme in Nigerian universities. *Lapai International Journal of Administration*, 3(4), 287–302.
- Samson, A., Chukwudolue, J. C., & Jibrin, I. Y. (2025). Managing digital transformation for sustainable development in higher education institutions in Bauchi State. *NOUN Journal of Education*, Special Edition, 10–27.
- Samson, A., Jibrin, I. Y., & Chukwudolue, J. C. (2024). Assessing the impact of interaction on the effectiveness of open distance learning in the National Open University of Nigeria. *CEDS Journal of Entrepreneurship and Innovation Research*, 3(2), 15–30.
- Samson, A., Yaduma, P. S., & Aliyu, M. M. (2021). Evaluation of philosophy and objectives of undergraduate business education programme in Nigerian universities. *International Journal of Intellectual Discourse*, 4(2), 176–189. <https://ijidjournal.org/index.php/ijid/article/view/115>
- Udo, M. P., Samson, A., & Baraya, A. U. (2016). Good and caring teaching behaviours as perceived by business education students in tertiary institutions in the North Eastern Nigeria. *World Journal of Education*, 6(4),



- 14–21. <https://doi.org/10.5430/wje.v6n4p14>
- van Ewijk, A. R., Oikkonen, E., & Belghiti-Mahut, S. (2020). Linking methods to outcomes: A multi-course mixed-method study of the effects of active and passive pedagogy on entrepreneurial intentions. *The International Journal of Management Education*, 18(3), Article 100420. <https://doi.org/10.1016/j.ijme.2020.100420>

Declarations**Consent for publication**

Not Applicable

Data Availability Statement:

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of Interest

The authors have no competing interests to declare that are relevant to the content of this article.

Ethical Considerations

Not applicable

Funding

The authors declared no external source of funding

Authors' Contributions

Abdulmutallib Umar Baraya contributed to the conceptualization, literature review, data collection, synthesis and interpretation of findings, and development of the Digital Learning–Enterprise Sustainability (DLES) framework. Agatha Samson contributed to the study design, literature appraisal, critical analysis, interpretation of findings and manuscript revision. Joy Chinelo Chukwudolue contributed to literature identification, thematic synthesis, validation of the review findings and manuscript editing. All authors participated in reviewing and approving the final manuscript.

