

Artificial Intelligence Integration and Entrepreneurial Skill Development among Business Education Students in Tertiary Institutions in Gombe State

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Abstract

The emergence of Artificial Intelligence (AI) has transformed educational systems, business operations, and entrepreneurial activities across the globe. In developing economies such as Nigeria, the integration of AI into business education is increasingly becoming essential for preparing students with relevant entrepreneurial competencies needed in the digital economy. This conceptual paper examines the integration of Artificial Intelligence and its influence on entrepreneurial skill development among business education students in tertiary institutions in Gombe State, Nigeria. The paper explores the concepts of AI and entrepreneurial skill development, discusses relevant theoretical foundations, and highlights the opportunities, challenges, and prospects of AI adoption in business education. The study argues that AI-driven educational practices can enhance creativity, innovation, critical thinking, digital marketing capabilities, decision-making skills, and business management competencies among students. However, inadequate infrastructure, poor internet connectivity, insufficient digital literacy, and limited funding remain major barriers to effective AI integration in Nigerian tertiary institutions. The paper concludes that integrating AI into business education can significantly improve entrepreneurial readiness and self-employment opportunities among graduates. It recommends increased government investment in digital infrastructure, curriculum redesign, lecturer capacity development, and institutional collaboration with technology firms to facilitate effective AI integration in tertiary institutions in Gombe State and Nigeria at large.

Keywords: Artificial Intelligence, Business Education, Entrepreneurial Skills, Tertiary Institutions, Digital Literacy

1. Introduction

The rapid advancement of digital technologies has reshaped modern educational systems and business practices globally. Among these technologies, Artificial Intelligence (AI) has emerged as one of the most transformative innovations influencing teaching, learning, entrepreneurship, and organizational performance (Luckin et al., 2016; Holmes et al., 2019). Artificial Intelligence refers to the simulation of human intelligence processes by machines, especially computer systems capable of learning, reasoning, problem-solving, and decision-making (Russell & Norvig, 2021). AI technologies such as machine learning, intelligent tutoring systems, chatbots, predictive analytics, and automation tools are increasingly being integrated into educational environments to improve learning outcomes and skill acquisition (Chen et al., 2020; Zawacki-Richter et al., 2019).

In Nigeria, the growing rate of unemployment among graduates has intensified the need for entrepreneurial education and digital competency development in tertiary institutions (Nwosu & Ohia, 2021). Business education as a discipline is expected to equip students with practical, vocational, managerial, and entrepreneurial skills necessary for self-reliance and economic productivity (Osuala, 2010). However, traditional teaching methods that rely heavily on theoretical instruction have been criticized for failing to adequately prepare graduates for the realities of the digital business environment (Audu et al., 2022). Consequently, the integration of AI into business education has become increasingly

important for enhancing entrepreneurial capabilities among students.

Entrepreneurial skill development involves the acquisition of competencies such as creativity, innovation, communication, risk-taking, leadership, financial management, problem-solving, opportunity identification, and digital marketing abilities required for successful business creation and management (Hisrich et al., 2020). AI technologies can support the development of these competencies by providing personalized learning experiences, virtual business simulations, intelligent decision-support systems, and access to global market information (Baporikar, 2021). Through AI-enabled platforms, students can learn modern entrepreneurial practices such as data-driven marketing, customer relationship management, e-commerce operations, and financial forecasting. Gombe State, located in Northeastern Nigeria, is gradually embracing digital transformation within its educational sector despite infrastructural and socio-economic challenges. Tertiary institutions in the state are increasingly recognizing the importance of technology-driven learning approaches to improve graduate employability and entrepreneurial readiness (Yakubu & Idris, 2023). Nevertheless, the adoption of AI technologies in business education remains relatively low due to inadequate technological infrastructure, poor electricity supply, limited internet accessibility, and insufficient lecturer preparedness (Amina & Sule, 2022). The increasing relevance of AI in business operations and entrepreneurship necessitates the restructuring of business education curricula to incorporate AI-based learning approaches. Integrating AI into business education could significantly contribute to entrepreneurial skill development among students by exposing them to modern business technologies and innovative problem-solving strategies (Dwivedi et al., 2021). This conceptual paper therefore examines the role of Artificial Intelligence integration in enhancing entrepreneurial skill development among business education students in tertiary institutions in Gombe State, Nigeria.

2, Concept of Artificial Intelligence

Artificial Intelligence is broadly defined as the ability of machines or computer systems to imitate human intelligence and perform tasks that normally require human cognition such as learning, reasoning, perception, and decision-making (McCarthy, 2007). AI systems are capable of processing large amounts of data, identifying patterns, making predictions, and automating tasks with minimal human intervention (Russell & Norvig, 2021). AI applications in education include intelligent tutoring systems, automated grading systems, adaptive learning platforms, virtual assistants, educational robotics, and predictive analytics (Holmes et al., 2019). These technologies enable personalized learning experiences, enhance student engagement, and improve academic performance. AI also supports collaborative learning and facilitates access to educational resources irrespective of geographical barriers (Chen et al., 2020). Within business education, AI technologies can be used to simulate real-world business environments, analyze market trends, support business planning, and improve entrepreneurial decision-making (Bessen, 2019). Students exposed to AI-driven learning environments are more likely to develop digital competencies and entrepreneurial mind-sets necessary for the modern economy.

3. Concept of Entrepreneurial Skill Development

Entrepreneurial skill development refers to the process of acquiring practical and cognitive abilities necessary for identifying business opportunities, creating enterprises, managing risks, and sustaining organizational growth (Hisrich et al., 2020). Entrepreneurship education aims to foster innovation, self-employment, creativity, and economic independence among learners (Kuratko, 2020). Entrepreneurial skills include communication skills, leadership abilities, innovation capacity, opportunity recognition, digital literacy, financial management, strategic planning, negotiation skills, and marketing competencies (Okoro, 2016). In the digital age, entrepreneurial success increasingly depends on technological competence and the ability to utilize emerging technologies such as AI, big data, and digital platforms

(Nambisan et al., 2019). AI integration in business education can enhance entrepreneurial skill acquisition through interactive simulations, virtual business models, predictive analytics, and real-time market intelligence systems. Such technologies provide experiential learning opportunities that bridge the gap between theory and practice (Baporikar, 2021).

4, Theoretical Framework

This study is anchored on the Technology Acceptance Model (TAM) developed by Davis (1989). The model explains how users accept and utilize technological innovations based on perceived usefulness and perceived ease of use. According to TAM, individuals are more likely to adopt technology if they believe it will improve their performance and is easy to operate. The relevance of TAM to this study lies in understanding how business education students and lecturers perceive AI technologies in tertiary institutions. When students perceive AI tools as beneficial for entrepreneurial learning and business skill acquisition, they are more likely to embrace and utilize such technologies effectively (Venkatesh & Davis, 2000). Similarly, lecturers' acceptance of AI-based instructional tools significantly influences successful implementation within educational settings. The study also draws insight from Human Capital Theory, which posits that investment in education and skill development enhances productivity and economic growth (Becker, 1993). AI integration in business education represents an investment in digital and entrepreneurial competencies capable of improving graduate employability and business innovation.

5, AI Integration and Entrepreneurial Skill Development

Artificial Intelligence offers enormous opportunities for enhancing entrepreneurial skill development among business education students. One major contribution of AI is personalized learning. AI-powered systems can analyze students' learning patterns and provide customized instructional content that matches individual learning needs (Zawacki-Richter et al., 2019). Personalized learning improves understanding and supports effective entrepreneurial knowledge acquisition. AI also enhances creativity and innovation among students. Through machine learning applications, virtual simulations, and business analytics platforms, students can experiment with business ideas, analyze customer behaviour, and develop innovative solutions to market problems (Dwivedi et al., 2021). Exposure to such technologies encourages critical thinking and entrepreneurial problem-solving skills. Furthermore, AI promotes digital marketing competencies among business education students. Modern entrepreneurship relies heavily on digital platforms, online branding, and data-driven marketing strategies (Chatterjee et al., 2021). AI tools such as chatbots, recommendation systems, and predictive analytics enable students to understand customer preferences and develop effective marketing campaigns. Another important contribution of AI is decision-making enhancement. AI-driven business intelligence systems provide real-time market analysis, financial forecasting, and consumer trend evaluation that assist entrepreneurs in making informed business decisions (Brynjolfsson & McAfee, 2017). Students trained with these technologies are likely to possess stronger analytical and strategic planning capabilities. AI integration also supports collaborative and experiential learning. Virtual entrepreneurship laboratories and business simulations expose students to practical business scenarios where they can develop negotiation, leadership, and management skills (Baporikar, 2021). Such experiential learning approaches strengthen entrepreneurial confidence and self-employment readiness.

6, Challenges of AI Integration in Tertiary Institutions in Gombe State

Despite the benefits associated with AI integration, several challenges hinder its effective implementation in tertiary institutions in Gombe State and Nigeria generally. One major challenge is inadequate

technological infrastructure. Many institutions lack sufficient computer laboratories, internet connectivity, smart classrooms, and digital learning resources necessary for AI-based instruction (Audu et al., 2022). Poor electricity supply also constitutes a major barrier to technology integration in Northeastern Nigeria. Frequent power outages limit the effective utilization of AI tools and digital learning platforms (Yakubu & Idris, 2023). This infrastructural deficiency negatively affects students' access to technology-enhanced entrepreneurial education. Another challenge is inadequate lecturer competence in AI applications. Many educators lack the technical skills and professional training required for integrating AI into classroom instruction (Amina & Sule, 2022). Resistance to technological change among some lecturers further affects implementation efforts. Financial constraints equally limit AI adoption in tertiary institutions. Procuring AI technologies, maintaining digital infrastructure, and training personnel require substantial financial investment, which many institutions cannot adequately provide (Nwosu & Ohia, 2021). Cybersecurity concerns, ethical issues, and data privacy challenges also present obstacles to AI implementation in educational settings (Holmes et al., 2019). Institutions must establish proper digital governance structures to ensure responsible and secure use of AI technologies.

7, Prospects of AI Integration in Business Education

The future of AI integration in business education in Nigeria appears promising. The increasing global shift toward digital economies and entrepreneurship highlights the importance of equipping students with AI-related competencies (World Economic Forum, 2023). AI-driven business education can contribute significantly to reducing graduate unemployment by promoting self-employment and innovation. Government initiatives promoting digital literacy and technological development can further support AI adoption in tertiary institutions (Federal Ministry of Communications and Digital Economy, 2022). Partnerships between educational institutions and technology companies can also facilitate access to AI tools, training programs, and digital resources. Moreover, AI integration can strengthen entrepreneurial ecosystems in Gombe State by enabling students to establish technology-driven enterprises capable of competing in national and global markets. Digital entrepreneurship powered by AI can stimulate economic growth, job creation, and sustainable development in the region.

8, Conclusion

Artificial Intelligence has become a transformative force in education and entrepreneurship globally. This conceptual paper examined the integration of AI and its influence on entrepreneurial skill development among business education students in tertiary institutions in Gombe State, Nigeria. The study established that AI technologies can significantly enhance entrepreneurial competencies such as innovation, digital marketing, critical thinking, decision-making, and business management skills. However, the effective integration of AI in business education is constrained by infrastructural deficiencies, inadequate digital literacy, financial limitations, and poor institutional preparedness. Addressing these challenges requires strategic investments, policy support, curriculum innovation, and continuous capacity development for educators and students. Integrating AI into business education can improve graduate employability, stimulate entrepreneurship, and contribute to economic transformation in Gombe State and Nigeria at large. Therefore, stakeholders in the education sector must prioritize technology-driven learning approaches capable of preparing students for the realities of the digital business environment.

9. Recommendations

1. Government should increase funding for digital infrastructure development in tertiary institutions.
2. Business education curricula should be redesigned to incorporate AI and digital entrepreneurship

- courses.
3. Lecturers should receive continuous professional training on AI applications in teaching and entrepreneurial development.
4. Institutions should establish partnerships with technology companies to facilitate access to AI tools and innovation hubs.
5. Reliable internet connectivity and electricity supply should be improved to support technology-enhanced learning.
6. Students should be encouraged to participate in AI-based entrepreneurial projects, digital innovation competitions, and start up incubation programs.

REFERENCES

- Amina, U., & Sule, Y. (2022). Digital transformation and higher education in Northeastern Nigeria. *African Journal of Educational Technology*, 8(2), 44–58.
- Audu, J., Ibrahim, M., & Hassan, A. (2022). Technology adoption in Nigerian tertiary institutions: Challenges and prospects. *Nigerian Journal of Educational Management*, 15(1), 77–91.
- Baporikar, N. (2021). Artificial intelligence and entrepreneurship education. *International Journal of Innovation Studies*, 5(3), 150–165.
- Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis with special reference to education* (3rd ed.). University of Chicago Press.
- Bessen, J. (2019). AI and jobs: The role of demand. *NBER Working Paper Series*, 24235, 1–30.
- Brynjolfsson, E., & McAfee, A. (2017). *Machine, platform, crowd: Harnessing our digital future*. W.W. Norton.
- Chatterjee, S., Rana, N., Tamilmani, K., & Sharma, A. (2021). The effect of AI-based CRM on customer engagement and business performance. *Journal of Business Research*, 129, 877–892.
- Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, 8, 75264–75278.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
- Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., & Williams, M. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges and opportunities. *International Journal of Information Management*, 57, 101994.
- Federal Ministry of Communications and Digital Economy. (2022). *National digital economy policy and strategy*. Government Press.
- Hisrich, R., Peters, M., & Shepherd, D. (2020). *Entrepreneurship* (11th ed.). McGraw-Hill.
- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.
- Kuratko, D. F. (2020). *Entrepreneurship: Theory, process, and practice* (11th ed.). Cengage Learning.
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson Education.

- McCarthy, J. (2007). What is artificial intelligence? *Stanford University AI Laboratory*, 1–15.
- Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship. *Research Policy*, 48(8), 103773.
- Nwosu, B., & Ohia, A. (2021). Graduate unemployment and entrepreneurship education in Nigeria. *Journal of Contemporary African Studies*, 39(4), 512–526.
- Okoro, J. (2016). Business education and entrepreneurial development in Nigeria. *International Journal of Vocational Education*, 4(2), 23–35.
- Osuala, E. C. (2010). *Principles and methods of business and computer education*. Cheston Agency Ltd.
- Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.
- Venkatesh, V., & Davis, F. (2000). A theoretical extension of the Technology Acceptance Model. *Management Science*, 46(2), 186–204.
- World Economic Forum. (2023). *The future of jobs report 2023*. World Economic Forum.
- Yakubu, A., & Idris, M. (2023). ICT infrastructure and educational development in Northern Nigeria. *Journal of African Educational Studies*, 12(1), 66–81.
- Zawacki-Richter, O., Marín, V., Bond, M., & Gouverneur, F. (2019). Systematic review of research on Artificial Intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(39), 1–27.