Leveraging Sociotechnical Systems for Sustainable Business Education: Pathways to Youth Development

Abdullahi AbdulRafiu[1]*, Joshua Sule Mamman Ph.D[2], Semiu Olawale Makinde Ph.D[3], Sakariyyahu Shehu[1], Afeez Adebayo Fawale Ph.D[1]

[1]*Department of Business Education, Faculty of Education, AlHikmah University, Ilorin, Nigeria*
[2]*Department of Science Education, Faculty of Education, AlHikmah University, Ilorin, Nigeria*
[3]*Department of Business and Entrepreneurship Education, Faculty of Education, Kwara State University, Nigeria*

ABSTRACT

In today's rapidly evolving world, sustainable development depends on education systems that can truly evolve and prepare young people for the future. Sociotechnical systems which bridge the gap between human interaction and technology are essential in this journey, helping young researchers sharpen their skills while supporting the Sustainable Development Goals (SDGs) through inclusion and economic growth. To explore this, our study conducted a survey among 350 business educators from 17 universities across West Africa, using the SSSBEYDQ online questionnaire with a reliability index of 0.83. Through descriptive statistics, t-tests, and linear regression, the findings clearly show that these systems do more than just provide tools; they significantly boost students' critical thinking, digital literacy, and creative potential. This evidence suggests that integrating technology with human connection is vital for shaping graduates who can navigate today's unpredictable socio-economic landscape. To move forward, we must encourage stakeholders to prioritize better digital infrastructure, continuous professional development, and fair access for all. Ultimately, aligning business education with the SDGs is a strategic path toward building a more resilient and inclusive global economy.

ABSTRAK

Di dunia yang berkembang pesat saat ini, pembangunan berkelanjutan menuntut sistem pendidikan yang mampu menyesuaikan diri dengan strategi berorientasi masa depan untuk pengembangan generasi muda. Sistem sosioteknis, yang memadukan interaksi manusia dan teknologi, membantu peneliti muda memperluas kemampuan mereka dan mempersiapkan diri menghadapi tantangan dunia modern. Sistem ini selaras dengan Tujuan Pembangunan Berkelanjutan dengan mendorong inklusi dan pertumbuhan ekonomi berkelanjutan. Penelitian ini menggunakan desain survei deskriptif yang melibatkan 350 pendidik bisnis dari 17 universitas di kawasan Afrika Barat. Menggunakan desain survei deskriptif, penelitian ini melibatkan 350 pendidik bisnis dari 17 universitas di wilayah Afrika Barat. Data dikumpulkan melalui kuesioner daring (SSSBEYDQ) dengan indeks reliabilitas 0,83. Analisis data dilakukan menggunakan statistik deskriptif, t-test, dan regresi linear pada tingkat signifikansi 0,05. Hasil penelitian menunjukkan bahwa sistem sosioteknis secara signifikan meningkatkan berpikir kritis, kefasihan digital, dan kapasitas inovatif mahasiswa. Hasil ini menunjukkan bahwa integrasi sosioteknis sangat penting dalam mencetak lulusan yang siap menghadapi dinamika sosioal ekonomi dimasa depan. Penelitian ini menunjukkan bahwa memprioritaskan infrastruktur digital, pengembangan profesional, dan kebijakan akses yang adil merupakan prioritas bagi pemangku kepentingan. Penyelarasan pendidikan bisnis dengan SDGs adalah langkah strategis untuk membangun ekonomi global yang inklusif dan tangguh.

CONTACT
aabdulrafiu@alhikmah.edu.ng

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INTRODUCTION

Sustainable development depends greatly on education, which provides young African graduates with the skills needed to adapt to technological advancements and economic changes. In line with the United Nations Sustainable Development Goal 4, which emphasizes quality, inclusive, and lifelong learning, the responsibility to prepare young Africans for employment and meaningful economic participation is increasing rapidly. Competency-based education equips young Africans with the skills necessary to adapt, innovate, and achieve sustainable livelihoods. This approach enables young African graduates to play a significant role in fostering social inclusion and

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strengthening economic stability, while also creating pathways for decent work and long-term prosperity through a well-designed business education curriculum.

Business education, as a bridge program that closes the gap between theoretical learning and practical engagement, has the potential to produce employable and entrepreneurial graduates. For business education to meet local and global demands, it must be restructured to integrate sociotechnical systems that blend human interaction with technological processes. In addition, digital learning, collaborative problem-solving, and skills development offer opportunities that extend beyond the limits of traditional classroom interactions (Baxter & Sommerville, 2021). Integrating sociotechnical systems into business education not only supports digital learning spaces where human skills and technology complement each other, but also strengthens teamwork, critical thinking, and agile skill development beyond conventional classroom settings. This gives students the advantage of engaging with both theoretical content and collaborative tasks using technological tools, preparing them for complex and real-world economic environments. By adopting sociotechnical principles, business education can better prepare young people to navigate and innovate within dynamic, technology-driven economies (AbdulRafiu et al., 2025).

Sociotechnical systems refer to the interplay between people and technology as they work together to produce effective results in complex environments (Baxter & Sommerville, 2021). This underscores the need to integrate technology with teaching methods, teacher capacity, and students' diverse learning requirements. Such an approach promotes teamwork, effectively incorporates digital tools, and equips students with competencies relevant to real-world business contexts. Sociotechnical systems also emphasize values such as responsibility, trust, and respect, enhancing both productivity and well-being in educational settings. These principles help create adaptable and resilient systems that prepare learners to face complex challenges in business environments (Adebayo & Musa, 2023). Research has shown that digital platforms integrating learning management systems, simulations, and immediate feedback provide students with greater opportunities for active participation and deeper engagement in their learning experiences (García-Peñalvo, 2022).

These platforms do more than digitize traditional teaching; they also transform education by developing digital skills, encouraging critical thinking, and enabling collaborative knowledge building in technology-enhanced settings. Alghamdi (2023) postulated that the use of virtual business laboratories, case-based simulations, and collaborative project software fosters creativity, drives innovation, and equips learners with the competencies needed for professional readiness. Integrating digital technologies into business education, along with social and entrepreneurial competencies, equips graduates with a strong academic foundation and the flexibility required to succeed in today's fast-changing global digital economy. This combination enables young graduates to embrace change and seize emerging opportunities in the business world (Adebayo & Musa, 2023). Furthermore, this approach cultivates vital future-ready skills, including digital literacy, entrepreneurial innovation, and teamwork in problem-solving, which are essential for addressing Africa's economic challenges and supporting sustainable growth over time (Adu & Dube, 2022).

Sustainable development is increasingly recognized as a priority at both local and global stage, guiding societies toward economic progress while ensuring environmental preservation and promoting social inclusion. In Nigeria and other parts of sub-Saharan Africa, this urgency is heightened by rapid population growth, limited natural resources, and youth unemployment, necessitating innovative and adaptable approaches to equip young people for self-reliance (AbdulRafiu et al., 2025). This suggests that business education has the potential to drive sustainable transformation by helping youth understand that business objectives extend beyond profit to include social justice, environmental responsibility, and long-term value creation (Edeh & Ogu, 2023). Achieving these goals requires curriculum reforms that emphasize sustainable business practices, ethical entrepreneurship, and responsible leadership in alignment with the Sustainable Development Goals (SDGs). Integrating sociotechnical systems that incorporate sustainability into business education programs is crucial for fostering and supporting the development of young people.

To promote youth development, educational institutions must align with technological advancements and the needs of the labor market. The evolving demands of the twenty-first-century digital economy cannot be adequately addressed by traditional instructional approaches. There is an urgent need to integrate sociotechnical systems, which emphasize the interaction between social collaboration and technological tools, into teaching and learning processes. These systems create flexible and interactive learning environments where young people develop both technical and soft skills of problem-solving, creativity, and teamwork that are essential for graduate employability and entrepreneurial readiness (Alghamdi, 2023).

Despite the growing recognition of the value of integrating sociotechnical approaches into business education curricula in African universities, the rate of adoption of these innovations has been slow. Many institutions continue to rely on traditional methods of teaching that do not exploit the potential of technology to support

sustainable learning outcomes. These slow paces limit the potential of business education programs to fully prepare students for today's socio-economic realities, including entrepreneurship, online collaboration, and building sustainable business enterprises. Addressing this gap requires curriculum modernization, infrastructural development, and training of business educators in modern technology-enhanced methods that meet the evolving needs of the current workforce and economic ecosystem.

Statement of the Problem

The high rate of youth unemployment and the growing need to align curricula with the Sustainable Development Goals present two challenges for business education programs at African universities. Many African institutions still adopt traditional teaching techniques that place more emphasis on theoretical knowledge than on practical experience, despite the industry's potential to promote social and economic growth. Business educators often lack the necessary skills to excel in the fast-paced demands of modern markets due to a lack of technology integration and problem-solving techniques (Eze et al., 2021). Studies have shown that African youth are unprepared due to a disconnect between university education and labor demand, which has created a gap between the classroom knowledge acquired and the realities of contemporary labor markets, where digital competence, creativity, and adaptability are crucial. Universities must address this by introducing competency-based education that incorporates real-world experience, fortifies industry relationships, and integrates the development of digital and entrepreneurial skills into their curricula. The ongoing cycle of graduate unemployment, underemployment, and socioeconomic marginalization is likely to continue in the absence of these focused initiatives. Higher education institutions' capacity to significantly support the Sustainable Development Goals of the UN, especially SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth), will likewise be hampered by this neglect. To establish evidence-based solutions, it is crucial to examine how sociotechnical systems impact business education in order to develop strategies that can provide youth with the skills they need for employability and entrepreneurial engagement, and to offer useful guidance to policymakers, development experts, and business educators who wish to leverage business education as a catalyst for social advancement and equitable economic growth.

Purpose of the Study

The main objective of this study is to explore how sociotechnical systems can be incorporated into business education programs to advance sustainable youth development in African universities. Specifically, the study seeks to:

1. Examine the extent to which sociotechnical systems impact critical thinking of business education students.
2. Investigate the extent to which sociotechnical systems enhanced digital literacy of business education students.
3. Determine how business education students in African universities are inspired to be innovative through sociotechnical systems.

Research Questions

1. To what extent do sociotechnical systems enhance the critical thinking of business education students?
2. To what extent do sociotechnical systems enhance the digital literacy of students in business education?
3. How is business education students in African universities inspired to be innovative through sociotechnical systems?

Research Hypotheses

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

H_{01}: Sociotechnical systems have no significant impact on the development of critical thinking of business education students.

H_{02}: Sociotechnical systems do not significantly enhance digital literacy of business education students.

H_{03}: Sociotechnical systems do not significantly impact innovative skills of business education students in African universities.

METHODS

The study employed a descriptive survey research design, which was considered appropriate as it allows for the collection of data from a broad population. This approach facilitates the description of individuals, attitudes, and experiences related to sociotechnical systems in business education (Creswell & Creswell, 2023). The study population comprised 350 business education students drawn from 17 universities, representing a cross-section of public and private institutions offering business education programs. Due to the manageable size and accessibility

of the respondents, the researcher adopted a census sampling technique, which involves the inclusion of every respondent from the institutions. The data collection tool used for the study was a structured questionnaire titled The Sociotechnical Systems for Sustainable Business Education and Youth Development Questionnaire (SSSBEYDQ). The questionnaire was subjected to face and content validity by three specialists from the Department of Test Measurement, Science Education, and Business Education at Al-Hikmah University, Nigeria. A pilot study involving 30 respondents was conducted outside the sample universities, and the result of the instrument yielded a Cronbach's alpha reliability coefficient of 0.83, which exceeds the generally accepted benchmark of 0.70, indicating that the instrument possessed strong internal consistency for the main research (Taber, 2018).

The questionnaire was administered using Google Forms to ensure ease of distribution, low cost, effectiveness in gathering responses, and timely retrieval of data. The collected data were coded and analyzed using a combination of descriptive and inferential statistical techniques. Descriptive statistics, including mean, standard deviations, and frequency distribution, were utilized to summarize respondents' data and present it clearly. Inferential statistics, including independent t-tests and regression analysis, were employed to test the hypotheses at a 0.05 level of significance. A mean score of 2.50 and higher was accepted as Very High Engagement (VHE) and High Engagement (HE), while scores below 2.50 were regarded as Low Engagement (LE) and Very Low Engagement (VLE). These techniques were deemed appropriate because they enable comparison of group means and assist in establishing observed differences that are statistically significant.

RESULTS AND DISCUSSIONS

Hypotheses Testing

Hypothesis 1:

Sociotechnical systems have no significant impact on the development of critical thinking of Business education students.

Summary of Regression Analysis showing no significant impact of sociotechnical System on critical thinking of business education students

Table 1. Summary of Regression Analysis

Variable	X	SD	N	R	R Squared	Adjusted R Squared	F	Sig
Critical thinking	23.6	3.4	350	0.85	0.72	0.72	906.5	0.000
Sociotechnical system	31.05	6.8						

The regression analysis shows a strong positive relationship between sociotechnical systems and critical thinking of business education students, with a correlation coefficient (R) of .85. The coefficient of determination (R^2 = 0.72) indicates that approximately 72% of the variance in students' critical thinking is explained by sociotechnical systems, highlighting the substantial impact of these systems. The adjusted R^2 value of 0.72 confirms the robustness of the model and its good fit to the data. The F-value of 906.5, which is significant at $p < .05$ (Sig = .000), indicates that the overall regression model is statistically significant. These results lead to the rejection of the null hypothesis, suggesting that sociotechnical systems have a significant and positive impact on the development of critical thinking among business education students.

Hypothesis 2:

Sociotechnical systems do not significantly enhance digital literacy of business education students

Summary of linear regression analysis on the significant difference of sociotechnical System on students of business education digital literacy skills

Table 2. Summary of Linear Regression Analysis

Variable	X	SD	N	R	R Squared	Adjusted R Squared	F	Sig
Digital Literacy	20.7	3.2	350	0.80	0.64	0.64	618.6	0.000
Sociotechnical system	25.15	3.5						

The linear regression analysis examined whether the sociotechnical system significantly equipping business education students with digital literacy. The correlation coefficient of R = .80 shows a strong positive relationship

between the sociotechnical system and students' digital literacy. This indicates that improvements in sociotechnical practices are associated with higher levels of digital literacy among the students. The coefficient of determination $R^2 = .64$ reveals that the sociotechnical system accounts for about 64% of the variation in students' digital literacy. This means the model has a moderate to strong explanatory power. The adjusted R^2 value of .64 further confirms that the model fits the data well. The computed F-value of 618.6, which is significant at $p < .05$ (Sig = .000), shows that the regression model is statistically meaningful. This confirms that the sociotechnical system significantly enhance students' digital literacy levels. Based on this evidence, the null hypothesis that the sociotechnical system has no significant impact on digital literacy of business education students is therefore rejected. This revealed that, sociotechnical systems play a significant and positive role in equipping business education students with essential digital literacy needed to succeed in modern working eco-system.

Hypothesis 3:

Sociotechnical systems do not significantly inspire business education students in African universities to be innovative skills

Summary of linear regression analysis on the significant difference of sociotechnical System on students of business education innovative skills

Table 3. Summary of linear Regression Analysis

Variable	X	SD	N	R	R Squared	Adjusted R Squared	F	Sig
Innovative skills	22.1	4.3	350	0.83	0.69	0.69	775.3	0.000
Sociotechnical system	20.15	8.8						

The result of the regression analysis indicates a strong positive relationship between sociotechnical systems and the development of innovative skills among business education students in African universities, with a correlation coefficient (R) of .83. The coefficient of determination ($R^2 = .69$) suggests that about 69% of the variance in students' innovative skills can be explained by sociotechnical systems, showing that these systems have substantial explanatory power in promoting innovation. The adjusted R^2 value of .69 confirms that the model is robust and a good fit for the data. The F-value of 775.3, significant at $p < .05$ (Sig = .000), confirms that the overall regression model is statistically significant. Based on these findings, the null hypothesis, which posited that sociotechnical systems have no significant effect on innovative skills of business education students, is rejected. Therefore, it can be concluded that sociotechnical systems positively and significantly influence the development of innovative skills in business education students in African universities.

Discussion of Findings

The findings of the study in table 1 reveal that sociotechnical systems significantly impact the critical thinking of students' of business education program. The regression analysis also supported that sociotechnical systems accounted for 72% of the variance in developing critical thinking among business education students in Africa Universities. These underscore how sociotechnical systems are essential in teaching and learning process through fostering deeper engagement, problem-solving, and evaluative skills. Studies have confirmed that sociotechnical environments, which combine social and technical dimensions, provide a reach context for improving critical thinking through collaboration and reflective learning (Govers, 2023). Similarly, Meirbekov et al. (2022) found that critical thinking skills are essential in developing digital learning environments that encourage inquiry and analysis. The present finding therefore aligns with literature showing that sociotechnical approaches strengthen students' ability to critically question, evaluate, and synthesize knowledge.

The findings in research question two indicated that sociotechnical systems significantly influence the development of digital literacy skills, with 64% of the variance among the respondents. This demonstrates that the integration of sociotechnical systems into teaching and learning of business education program equips youth with essential digital competencies. Digital literacy requires not only technical ability but also social and contextual application of digital tools, which sociotechnical systems naturally foster. Martínez-Cerdá et al. (2020) noted that sociotechnical innovations in e-learning promote digital skills by promoting interaction, collaboration, and adaptability into the educational experience. Starke et al., (2025) further supported that innovation adoption in sociotechnical environments significantly impact students' digital competence. The finding from this study therefore supports the argument that sociotechnical systems play a vital role in preparing business education students with the digital literacy skills needed for modern academic and workplace demands.

The findings indicated that 69% of the variation among the respondents could be explained by sociotechnical systems, which significantly contributed to innovative talents. This suggests that sociotechnical systems foster African youth's creativity and invention in addition to offering digital information. This shown that Sociotechnical systems can establish a learning environment that fosters experimentation, problem-solving, and the generation of new ideas for African youth by fusing human contact with technological instruments. According to Pasmore (2019), sociotechnical design may promote innovation by combining human creativity with technical frameworks. According to Oosthuizen and Manzini (2022), sociotechnical perspectives also help students to accept learning that is founded on a systems thinking approach, which is crucial for promoting innovation. Thus, the results validate that sociotechnical systems are essential for fostering the innovative skills of African university students pursuing business education.

CONCLUSIONS

The impact of sociotechnical systems on sustainable business education and youth development in African institutions was examined in this study. The results indicated that these platforms are essential for helping African adolescents develop the critical thinking, digital fluency, and innovative skills needed to navigate the complex socioeconomic landscape of today's modern economy. The findings also showed that sociotechnical systems play a significant role in supporting business education graduates in achieving the Sustainable Development Goals, particularly those related to quality education (SDG 4) and the promotion of decent work and economic growth (SDG 8). This implies that, sociotechnical systems which integrate technology and human interaction can provide a framework for reimagining business education graduates in ways that are forward-thinking and focused on sustainability.

The study highlights that the integration of such systems is not merely a technological enhancement but a necessity for empowering young Africans to contribute meaningfully to socioeconomic development in the region. Leveraging sociotechnical systems within business education programs strengthens the link between academic training and real-world employability. As universities across Africa work to address youth unemployment and align with global development objectives, emphasizing sociotechnical integration in the curriculum is a timely and transformative strategy for equipping African youth.

Recommendations

1. University management should establish innovation labs and incubators where students can work on real-world problems and design creative solutions using sociotechnical tools. Interdisciplinary projects and hackathons should also be encouraged to promote a culture of innovation.
2. Business educators should utilize collaborative digital platforms, problem-based learning tasks, and simulations that actively engage students in analysis, evaluation, and decision-making. Training workshops should also be organized to enhance lecturers' capacity to design classroom activities that integrate social interaction with technology, thereby promoting deeper reasoning and reflection among African youth.
3. Stakeholders should prioritize digital infrastructure, professional development, and equitable access policies. Aligning business education with sustainable development goals is not only a necessity but also a strategic pathway to building a resilient and inclusive global economy.
4. Regular workshops and training sessions should be conducted to enhance the proficiency of business educators in digital tools and teaching technologies. Well-trained educators play a critical role in effectively utilizing sociotechnical systems, thereby improving both instructional quality and student learning outcomes.
5. To strengthen digital literacy, business education programs should integrate e-learning platforms, digital content creation tools, and online research projects that require students to actively apply digital skills. Additionally, periodic digital literacy training and certification programs should be provided for both students and staff to ensure all participants remain competent in emerging digital practices.

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