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BUILDING TECHNOLOGY EDUCATION AND INDUSTRY COLLABORATION FOR INNOVATION, ENTREPRENEURSHIP AND SUSTAINABLE DEVELOPMENT

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Abstract: *The study investigated the collaboration of Building Technology education and the Industry for innovation and sustainable Entrepreneurship development in Delta State. The study adopted a descriptive survey design. The population of 20 teachers and 40 students were randomly selected from four (4) out of the nine (9) public Technical colleges in Delta state. The questionnaire was made up of three parts according to the research questions and 24 items were generated with eight (8) items each for research questions one, two and three. The response options were strongly Agree, Agree, Disagree and strongly Disagree and with a criterion mean of 2.50 and above for selection of items. Three experts validated the questionnaire items, two from department of industrial Technology Education and one from the Department of measurement and evaluation, all from Delta State University Abraka. Reliability coefficient of 0.76 was obtained using Cronbach Alpha reliability method. Mean and standard deviation were used to answer the research questions. The result of data analysis revealed among others that there is a mismatch between technical training and work place environment. It was recommended among others that stronger collaboration should be fostered between technical colleges and industries to expose students to real- world industrial environment.*
Keyword: *Building Technology, Industry Collaboration, Innovation, Entrepreneurship and Sustainable Development*

Introduction

Technology education is fundamental to the development and industrialization of any country. Technology education is used in Nigeria more widely than vocational education and is sometimes used incorrectly to refer to secondary vocational education and prevocational programmes. Consequently, the Federal Republic of Nigeria (FRN,) stated that Technology Education is used as a comprehensive term referring to those aspects of the educational process involving in addition to general education, the study of technologies and related sciences and acquisition of practical skills, attitudes understanding and knowledge relating to occupation in various sectors of the economy and social life. According to United Nations Educational Scientific and Cultural Organisation (UNESCO) as cited in Ehimen and Asuai (2021), Technology education is a comprehensive term, referring to that involving in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, basic scientific knowledge and attitudes required as craftsman and technicians at professional level. Technology education is also understand to be an integral part of general education;

a) Integral part of general education;
b) A means of preparing for occupational fields and for effective participation in the world of work;
c) An aspect of lifelong learning and a preparation for responsible citizenship;
d) An instrument an instrument for promoting environmentally sound suitable development;
e) A method of alleviating poverty.

One of the goals of technology education is to develop skills, abilities, attitudes, work habit in preparation for self-reliance (Asuai, 2025). It serves as a medium through which national objectives and technological programmes are achieved. Adesina (2024), stated that in an ever-evolving world of technology and

learning, technology is becoming increasingly central to the educational experience. Without technological capability, Nigeria will continue to dream of becoming an industrialized nations.

Among the levels of technology institutions as listed in the national policy on education is technical colleges. Deebom & Obulor (2018) defined technical colleges as institutions where specific knowledge and practical skills require for specific trade, employment or professional craftsmen and master craftsmen or similar level in business and industry are imparted and taught. One of the aims establishing Technical Colleges is to produce technicians for industries through the acquisition of appropriate skills.

Building technology education is one of the educational programmes in technological institutions such as Polytechnics, Colleges of Education (Technical) and Technical Colleges. Building technology is a part of Technology education. This enable individuals to live well and contribute meaningfully to the development of the society (Amasuomo & Asuai, 2025). It is an integral part of national development. It provides entrepreneurial skills necessary for gainful self-employment and sustainable development. In recent years, the construction industry has undergone significant transformations driven by increasing demand for efficiency and safety. Building technology education refers to the advancement, tools equipment and methods used in construction industries to enhance efficiency, safety and sustainability. The main building technology trades has among others the following objectives; job creation, cultural heritage, productivity and self-employment for individuals (Haman & Gana, 2016). These objectives can be achieved through a curriculum that is relevant in the acquisition of skill that will provide gainful employment for future development. In technical colleges, individuals are provided with needed skills that will enable them become more proficient in both work place and private employment. By the virtue of curriculum offering, building technology, education provides its beneficiaries with technical and entrepreneurial skills with which an individual can start and manage his business. Ikorogba and Ahiakwo (2025) in OCCD/Kuroslai, 2018) opined that innovation is the new improved product that differs significantly from the previous products and been made available to potential user. The ultimate aim and goal of innovations to strengthen the bond between the activities of science and technology and improve outcomes through an alteration of practices.

With the rapid advancement of technology and digitalization of economies, the role of building technology education in the digital economy has become more important than even. Despite the contributions of building technology education in building a future ready work force, significant gaps remain between current training programs and the evolving practical demand of the building industries. Many technology institutions still rely on outdated syllabi that do not reflect current industry standards or technological advancement. Technical College students lack the practical skills and innovative competences required to succeed in the industry and entrepreneurship. It is still confronted with problem of lack of industry collaboration with training institution. Consequently, students graduate without mastering and acquiring proficient skills in the relevant area of study. According to Adeyemi (2019), many graduates lack employability skill and practical training that aligns with current industry demand, which can lead to unemployment, poverty and economic instability.

Industries are significant contributor to the economy, providing employment opportunities and infrastructural development. However, there is a skill gap between industries and training institutions, which hampers their performance and employability. Industries are concerned about recruiting the right type of personnel to carry out a variety of challenging and production job (Amasuomo & Asuai, 2025).

Without productivity growth, rising manufacturing employment alone cannot drive industrial transformation. For this, trend to reverse, policies must shift beyond job creation to focus on mechanization, skill development through entrepreneurship training and industrial innovation, thereby strengthening the sector's global competitiveness. The integration of digital technologies into education offers significant potential for expanding access to learning opportunities and enabling flexible personalized education that supports resilience at both the individual and community levels (World Bank, 2020). As automation is on the increase, artificial intelligence and digital technologies, continuous

education is essential for individual to remain competitive in the labour market. Lifelong learning programmes particularly in digital skills plays a crucial role in entrepreneurial development as it enables people to reskill and up skill throughout their career (Adebayo, 2024). The integration of these programmes is essential as it ensures that societies remain focused in the face of shifting labour market and technological advancement. Building technology education has the capacity to introduce new skills demand that impact on education and employment through entrepreneurial training and life – long learning.

The essence of building technology education is to develop skills that would enable its recipients to be gainfully employed and this form a section of entrepreneurship that exist in the fabric of building technology education. The implication of this is that entrepreneurship is one of the means to realize or achieve the aims and objectives of Building Technology education. Entrepreneurship is the ability of an individual or group of person to invest capital and other factors of production (land and labour), aimed at meeting needs and maximise profit. One of the objectives of entrepreneurship among others as outlined by Maduka et al., (2019) as in Osuala (2010), Akinola (2011), Maduka and Nzeako (2012) is to provides graduates with enough training that will make them creative, innovative in identifying new businesses thus, becoming self-reliant. Building technology provides the basis for entrepreneurship to develop and its hall mark is the task of harnessing human and natural resources to productive skill use. Sustainable development refers to the improvement in the wellbeing and quality of life of individuals, communities and nation to meet their present and future needs. Isaac et al., 2025) defined sustainable development as the development that meet the needs of the present without compromising the ability of future generations to meet their needs. Achieving sustainable development and maintaining it is important because of the rising wave of poverty and the problem of unemployment facing many countries of the world, especially Nigeria.

Effective sustainable development efforts contribute to resilient systems capable of withstanding social and economic pressures. Government, industries and individuals play a pivotal roles in driving sustainable development forward through policy – making, corporate responsibility, and sustainable lifestyle choices (Onwusa & Asuai, 2025). Building Technology Curriculum should be a functional one that will assist individuals to acquire marketable and practical skills in order to be self-reliant, without depending on others for survivals. Through involvement in entrepreneurship skill development scheme, students becomes creators of job and not dependents on white – collar jobs that are not readily available. Building technology education can produce entrepreneurs than can focus on skill demand and production in the building industry which will bring about growth in the building industries and sustainable national development.

Statement of the Problem

One of the goals of Technology education is to develop skills, abilities, attitudes, work habit in preparation for self-reliance. In today's digital economy, technology institutions are increasingly measured not only by academic excellence but by their ability to produce graduates equipped with practical skills, innovative and entrepreneurship capacity. Despite the increase awareness of the importance of Building technology education by stakeholders, significant gaps exist between the current training programs and their evolving practical demands of the building industries. Many technology institutions still rely on outdated syllabi that do not reflect current industry standards or technological entrepreneurial skills and innovative competencies required to succeed in the industries collaboration between educational providers and industry stakeholders and access to modern machinery remains limited. This problem is compounded by the fact that these graduates do not possess entrepreneurial skills that will enable them manage successfully businesses of their own and become self-employed. These gaps have contributed to persistent skill shortages, lower employment outcomes for graduates and delays in the adoption of cutting edge technologies International Labour Organisation (ILO, 2020).

Consequently, students graduate without mastering/acquiring proficient skills in the relevant area of study. Industries are significant contributor to the economy, providing employment opportunities and infrastructural development. Skill gaps between industries and training institutions hampers their performance and employability. Without collaboration, students may lack the motivation to pursue careers in building technology as they may not fully understand the potential of career growth and income prospects with the sector. Embedding practical skills and thoughtful innovation into the curriculum that could immediately be applied to real objects at work from strategy to user research and technical decisions bridges the gap between school and industry. It is based on these that this study sought to assess technology and industry collaboration for innovation, entrepreneurship and sustainable development among Building Technology students in Technical Colleges in Delta State.

Purpose of the Study

The main purpose of this study was to assess the level of collaboration between Building technology education and industries for innovations, entrepreneurship and sustainable development in Technical Colleges in Delta State. Specifically, the study sought to:

1. Examine the level of collaboration between Building Technology Education institutions and the construction industry in Delta State.
2. Determine the influence of industry collaboration on innovation among Building Technology students in Delta State.
3. Assess the influence of Building technology education and industry collaboration on entrepreneurial development in Delta State.

Research Questions

1. What is the level of collaboration between Building Technology education institutions and the construction industry in Delta State?
2. How does Building technology education industry collaboration enhance innovation among building technology students and graduates in Delta State?
3. What is the influence of Building technology education and industry collaboration on entrepreneurship of technical college students in Delta State?

Methodology

The study adopted a descriptive survey design. The population of 20 teachers and 40 students randomly selected from four (4) out of the nine (9) Public Technical Colleges in Delta State. The questionnaire was made up of three parts according to the research questions and 24 items were generated with eight items each for research questions one, two and three. The response options were Strongly Agree. Agree, Disagree and Strongly Disagree and rated on a 4-point Likert scale of 4, 3, 2 and 1 using a criterion mean of 2.50 and above for selection of items. Three experts validated the questionnaire items, two from Department of Industrial Technology and one from the Department of Measurement and evaluation, all from Delta State University, Abraka. Their corrections and suggestions were effected on the initial drafts to produce the final copy. Weighted mean and standard deviation were used to answer the questions. The mean of 2.50 or above was regarded as agree, while any item with a weighted mean less than 2.50 was regarded as disagree.

Results and Analysis

Research Question 1: What is the level of collaboration between building technology education institutions and the construction industry in Delta State?

Table 1: Mean responses on the level of collaboration between building technology education institutions and construction industry in Delta State.

S/N	Items	$\bar{x}$	S.D	Decision
1.	The school organize visit to construction sites for students.	1.70	0.83	Disagree

2.	Thy technical college collaborate with construction firms for students industrial training	2.70	0.55	Agree
3.	Construction firm provide opportunities for students to gain practical work experience.	1.95	0.93	Disagree
4.	Construction firm provide feedback that improves student practical skills.	1.75	0.88	Disagree
5.	Industry experts are invited to deliver lectures or practical demonstrations.	1.44	0.43	Disagree
6.	Building technology curriculum reflects current industry practices.	1.21	0.43	Disagree
7.	The school maintain a good working relationship with construction companies.	2.10	0.83	Disagree
8.	Construction firm provide feedback that help improve students' practical skill.	1.70	0.83	Disagree
	Grand Mean	**1.74**	**0.71**	**Disagree**

The result in Table 1 indicated that the school rarely organize visit to construction sites (1.70), the school collaborate with firms for students industrial training (2.70), construction firm rarely provide opportunities for students to gain practical work experience (1.95), no feedback from construction firm to improve students practical skills (1.75), industries experts are hardly invited to deliver lectures to students (1.44), the curriculum do not reflect current industry practices (1.21), there is not cordial relationship between the school and construction companies (2.11) and construction firm do not provide feedback that helps to improve students practical skills. From the foregoing, the grand mean score of 1.74 was less than the criterion score of 2.50 indicating that there is little or no effective collaboration between building technology education institutions and the construction industries in Delta State.

Research Question 2: How does building technology education – Industry collaboration enhance innovation among building technology students and graduates in Delta State?

Table 2: Mean response on how building technology education – Industry collaboration enhance innovation among building technology students and graduates in Delta State

S/N	Items	$\bar{x}$	S.D	Decision
9.	Industry collaboration exposes students to modern construction technologies.	3.62	0.52	Agree
10.	Practical training encourages students to develop innovative ideas.	3.79	0.49	Agree
11.	Working with industry professionals improves students' problem-solving skills.	3.71	0.41	Agree
12.	Industry collaboration enhances students' creativity in building projects.	3.70	0.46	Agree
13.	Exposure to real construction projects ability to use modern construction equipment.	3.70	0.45	Agree
14.	Industry collaboration improves students ability to use modern construction equipment.	3.52	0.44	Agree
15.	Practical experience enables students to develop innovative building solutions.	3.60	0.49	Agree
16.	Collaboration with industry increases students' confidence in applying new ideas.	3.54	0.51	Agree
	Grand Mean	**3.90**	**0.47**	**Agree**

Source 2026

Data presented in Table 2 showed that the mean responses of teachers and students in item 9 – 16 which ranged from 3.52-3.79 were above the criterion score of 2.50. This implied that the respondents agreed that collaboration between institution and industry influence innovation among building technology and graduates in Delta State.

Research Question 3: What is the influence of Building technology education and Industry collaboration on entrepreneurship of technical college student in Delta State?

Table 3: Mean responses on the influence of Building technology education and Industry collaboration on entrepreneurship.

S/N	Items	$\bar{x}$	S.D	Decision
17.	Industry collaboration equip students with skills for self-employment.	3.20	0.12	Agree
18.	Practical training increases students interest in starting construction – related businesses.	3.26	0.31	Agree
19.	Students acquire entrepreneurial skills during industrial attachment.	3.02	0.53	Agree
20.	Industry collaboration help students identify business opportunities in the construction sector.	3.08	0.18	Agree
21.	Industry exposure improves students' ability to manage construction projects independently.	3.00	0.81	Agree
22.	Building technology education encourages student to become employers rather than job seekers.	3.25	0.65	Agree
23.	Collaboration with industry develop students' business management skills.	2.94	0.43	Agree
24.	Collaboration experience prepares students to establish successful building enterprise after graduation.	2.78	0.31	Agree
	Grand Mean	**3.06**	**0.42**	**Agree**

The result in table 3, showed that the grand mean score of 3.06 was greater than the criterions score of 2.50. This indicates that building technology education and industry collaboration influence entrepreneurship among technical college and graduates in Delta State.

Discussion of Findings

In the area of collaboration between building technology education and the construction industry, the findings from research questions I revealed that little or no collaborations with a grand mean of 1.74. the findings of this study finds support in the study of Adeyemi (2019) which credence to the fact that many grates, lack of employability skills and fact and training, that aligns with the current industry demand, which can lead to employment, poverty and economy stability.

The results from research questions 2 revealed that industry collaboration enhance innovation among building technology students and graduates in Delta States. This is line with (Adebayo, 2024) who maintained is essential as if of digital technologies into education to ensures that society remain focused in the face of shifting labour market and technological advancement in addition, results from question 3 revealed that the grand mean score of 3.06 was greater that the criterion score of 2.50. this means that coloration between industry and building technology education influences entrepreneurship in technical colleges in Delta State. The nations technological development depend largely on the level of skill acquisition of our craftsmen and technicians.

Conclusion

The study has demonstrated that prospective Building Technology graduates from Technical Colleges in Delta State are not adequately equipped with innovative and entrepreneurial skills required to function in modern industrial environment for self-reliance. The presence of significant skill gaps across all assessed areas – especially in core competencies like Auto-Cad, modern machine operation suggests that the current training frameworks are outdated and not aligned with industry standards. Without deliberate and targeted reforms in curriculum content, teaching methodologies, equipment modernization and partnership with industries, the employability of building technology graduates will continue to decline. There is a critical need to shift from a theory – heavy instruction model to a practice oriented, industry relevant training system that prepares students not just for graduation but for productive industry engagement and self-reliance.

Recommendations

Based on the finding of this study, the following recommendations were made.

(1) Curriculum Review and Modernization: The National Board for Technical Education (NBTE) and policy makers should revise the Building Technology Curriculum to integrate modern tools, techniques, and technologies, especially Auto-Cad, Automation.

(2) Industry – Institutional Collaboration: Stronger collaboration should be fostered between technical colleges and industries through SIWES programmes, guest lectures, and apprenticeship arrangements to expose students to real world industrial environment. This will bridge the gap between classroom learning and real world application.

(3) Integration of digital competencies: Basic digital literacy and advanced Building Technology Software like ICT tools. Auto Cad should be incorporated into the training programmes. This will enhance precision, creativity and employability among graduates.

(4) Upgrading of Training equipment and workshops: Government and private stakeholder should invest in equipping workshops with modern machines and software that match these used in the industry.

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