

## **CHALLENGES AND PROSPECTS OF INTEGRATING ROBOTICS IN BUSINESS EDUCATION PROGRAMMES IN TERTIARY INSTITUTIONS IN DELTA STATE**

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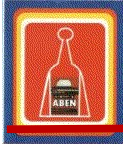
### **Abstract**

The main purpose of the study was to investigate the challenges and prospects of integrating robotics in tertiary institutions in Delta State. Two research questions guided the study and two hypotheses were tested at 0.05 level of significance. The study adopted the descriptive survey research design. The population of the study comprised 157 business educators in tertiary institutions in Delta State. The instrument of data collection was a structured validated questionnaire developed by the researchers. The test of reliability of the instrument using Cronbach Alpha yielded reliability co-efficient of 0.83 and 0.89 for clusters, 1 and 2 with a general reliability co-efficient of 0.85. Mean, standard deviation and t-test were used to analyse data for the study. The finding of the study revealed that the challenges of integrating robotics in business education programmes in tertiary institutions in Delta State are lack of infrastructure to support the integration of robotics and lack of experts to facilitate the integration of robotics in business education programmes in tertiary institutions among others. Findings further revealed that robotics can help business education programmes in tertiary institutions promote hands-on learning experiences that stimulate critical thinking, problem-solving, and creativity among students, assists business education programmes in tertiary institutions to align academic curricula with the needs of industries that rely on automation and robotics technologies and encourages entrepreneurship by empowering students to develop innovative solutions and products. Furthermore, findings revealed no significant difference in the mean ratings of lecturers in Federal owned tertiary institutions and State owned tertiary institutions. The researchers therefore recommended among others that the Federal and State governments in collaboration with university authorities should prioritize investment in infrastructure to support the integration of robotics.

**Keywords:** Integrating, Robotics, Challenges, Prospects, Business Education

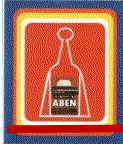
### **Introduction**

Business education is a vocational discipline aimed at enhancing workplace competence, career readiness, and adaptability to change. It involves the acquisition of specialised skills in commercial subjects. Ajie-Uche et al. (2018) defined business education as a programme that equips individuals with functional and sustainable skills, knowledge, attitudes, and values necessary for effective operation within their environments. Otamiri and Otomiewo (2022) defined



business education as a type of occupational training that aims to make students productive in the classroom, in paid jobs, and in their businesses. Beneficiaries of education are better prepared for lucrative jobs and enduring subsistence. It is typically viewed as business education. Obi and Arhueremu (2020) defined business educators as specialised instructors possessing professional training and pedagogical expertise to teach business-related courses in schools. Okoye and Udegbonam (2019) saw business education as a crucial academic programme in Nigerian tertiary institutions, enabling individuals to compete on a global scale and contribute to national development. Umezulike (2021) defined a business education programmes as a broad and comprehensive discipline whose instructional programmes encompasses knowledge, skills, vocation and aptitude needed by all citizens to effectively manage their businesses and also function in the economic system. Business education students are expected to possess relevant skills, competencies and knowledge in major aspects of business. Edokpolor and Egberi (2017) saw the business education programme as a unique academic programme that equips its recipients with skills to function independently as self-employed and employers of labour. Business education, therefore, is an academic field focused on the study and research of business practices. At the tertiary level, business education aims to equip students with the ability to apply their acquired knowledge in their future careers in business or related sectors. Graduates of business education often find employment in firms or government organisations as supervisors and managers, or they pursue entrepreneurship. Traditional business courses typically include accounting, business law, economics, entrepreneurship, finance, human resources, international business, management, marketing, organisationalbehaviour, organisational development, and technology management. However, recent developments and changes in the global labour market have placed increased emphasis on the integration of artificial intelligent technologies like robotics.

Robotics is a branch of Artificial Intelligence (AI) focused on designing, developing, and implementing physical devices known as robots. These robots comprise sensors, actuators, and computer systems, enabling them to interact with the physical world and perform tasks autonomously or with human guidance (Sophokleous et al., 2021). In university education, robotics is a growing field where robots teach students various subjects, engaging with them through human-like facial features and emotion-perceiving technology. Robotics is becoming increasingly common in tertiary education, offering students valuable hands-on experience and the chance to explore the subject of robotics and its applications (Shoikova et al., 2017). Many tertiary institutions offer academic programmes in robotics or related fields such as mechatronics or electrical engineering (Sophokleous et al., 2021). These courses provide students with a comprehensive understanding of robotics principles, technology, and applications. Students learn about topics such as robot design, control systems, computer vision, machine learning, and human-robot interaction (Goswami et al., 2020). Business education programmes in tertiary institutions in developed countries often conduct advanced robotics research, and students can participate in research projects (Shoikova et al., 2017). Through these research programmes, students work closely with faculty members and industry partners to explore new technologies, develop innovative solutions and contribute to the advancement of robotics (Amanatiadi et al., 2017). This hands-on experience enhances their critical thinking, problem-solving, and communication skills. University robotics laboratories are typically equipped with state-of-the-art equipment and software (Sophokleous et al., 2021). These labs provide interactive learning environments where students can build and program robots, conduct experiments, and test algorithms (Shoikova et al., 2017). Goswami et al. (2020) noted that working in these labs helps



university students improve their creative and technical abilities while gaining practical robotics skills and understanding the challenges of real-world implementations.

Integrating robotics in business education programme has the potential to act as effective educational aids (Alnajjar et al., 2021). Studies suggest that robots can assume roles such as tutors, peers, or facilitators in learning environments. Educational robotics (ER) has become a popular method for teaching STEM subjects to students across all educational levels, from primary school to university (Souza et al., 2018; Zhong & Xia, 2020). This method introduces engaging and hands-on activities, which can make the learning experience more enjoyable (Afari & Khine, 2017; Alnajjar et al., 2021). By fostering an interactive atmosphere, ER can capture students' attention and spark their curiosity (Anwar et al., 2019). Additionally, ER offers a substantial educational benefit by boosting students' interest and motivation to learn (Alnajjar et al., 2021). Leoste et al. (2021) highlighted that the integration of android robots with sophisticated AI has the potential to create machines that are perceived as human-like entities, influencing various aspects of human existence. However, the author also noted that the growing presence of such machines might result in the development of new communication patterns that better facilitate interaction between humans and AI-enhanced robots. On the other hand, it could also lead people to adopt familiar communication patterns when interacting with robots, thereby expanding our understanding and interaction with machines. On the other hand, these changes challenge traditional teaching methods. Robotics offer educational institutions both an opportunity and a responsibility to modernize their curricula and develop suitable pedagogical approaches that embrace new methods and policies for teaching and learning (Niederhauser et al., 2018). Even when some 21st century skills have already been integrated into curricula, there is still a need to create systematic approaches, supported by effective pedagogies and assessment methods (Grimus, 2020). This process can often be hindered by teachers' reluctance, which may stem from various factors. The use of technology in business education programmes in tertiary institutions is greatly shaped by individual preferences, which are in turn influenced by various factors such as cultural and ethical background, level of education, and technological expertise. For example, individuals with strong technical knowledge are more inclined to adopt and apply new technologies in their designs compared to those with less experience. Similarly, those from traditional cultural backgrounds may be less inclined to use new technologies or may prefer to apply them in a more conventional manner (Akande, 2023). Highly educated individuals may be more open to exploring and learning about new technologies, while those with less education may be more likely to adhere to perceived simpler concepts. Also, cost could be a major challenges in successful integration of robotics in university education. The procurement and integration of technology, including hardware and software, can be costly, especially for institutions with limited budgets (Ghobakhloo & Ching, 2019). Nyako et al. (2023) opined that some of the drawback in the integration of emerging technologies include negative attitude, a lack of computers, technical difficulties, poor funding, resistance to change, poor administrative support, low levels of computer literacy and technical skills, technology misaligned with the curriculum, lack of incentives, poor training opportunities, a lack of vision for integrating technology into learning processes, a lack of required IT skills, and feelings of discomfort. Despite these views, the existing gap in literature shows that studies have not been conducted to determine the challenges and prospects of integrating emerging technologies with specific reference to robotics in in the business education programme in tertiary institutions in Delta State. Based on this background, the researcher investigated the challenges and prospects of integrating robotics in business education programme in tertiary institutions in Delta state.



### **Statement of the Problem**

Business education programs play a crucial role in preparing students for the business world by equipping them with essential skills, knowledge, and competencies. The business education programme in tertiary institutions is meant to be pacesetters in the integration of novel initiatives and innovations in the business and academic environment. However, in Delta State, business education programs are struggling to keep pace with the rapid technological advancements seen in developed countries. The integration of robotics and other emerging technologies in teaching and learning is transforming business education globally. Sadly, the business education programmes in tertiary institutions in Delta State have not fully embraced these innovations. This gap raises concerns about the effectiveness of graduates from these programs in a competitive global business environment. The failure to adapt to these technological trends could negatively impact the quality of business education graduates, limiting their ability to function effectively in the increasingly digital and automated business world. The researcher expresses a significant worry that the inadequacies in the current business education framework may hinder students' preparedness for real-world challenges, ultimately affecting their employability and contribution to the economy.

### **Research Questions**

The following research questions guided the study:

1. What are the challenges of integrating robotics in business education programme in tertiary institutions in Delta state?
2. What are the prospects of integrating robotics in business education programme in tertiary institutions in Delta state?

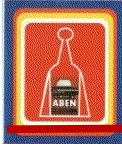
### **Hypotheses**

The following hypotheses were tested at 0.05 level of significance:

1. There is no significant difference in the mean ratings of lecturers in federal owned tertiary institutions and state owned tertiary institutions on the challenges of integrating robotics in business education programme in tertiary institutions in Delta State.
2. There is no significant difference in the mean ratings of lecturers in federal owned tertiary institutions and state owned tertiary institutions on the prospects of integrating robotics in business education programme in tertiary institutions in Delta State.

### **Methods**

The descriptive survey research design was adopted for the study, which was carried out in Delta State. The population comprised 157 business education lecturers in public tertiary institutions in Delta State. The instrument for data collection was a researcher-developed questionnaire titled "Questionnaire on Challenges and Prospects of Integrating Robotics in Business Education Programmes in Tertiary Institutions (QCPIRBEPTI)". The instrument consisted of 23 items organized into two sections: Section A collected demographic information, particularly the ownership status of institutions (federal or state), while Section B was divided into two clusters—B1 (11 items) on challenges and B2 (12 items) on prospects of robotics integration. The items were structured on a 4-point Likert scale: Strongly Agree, Agree, Disagree, and Strongly Disagree. The instrument underwent face and content validation by three experts in Business Education at the Federal College of Education (Technical), Asaba. A pilot test was conducted using 10 business educators from the University of Benin, Edo State, selected for accessibility and professional equivalence. Reliability was established using the Cronbach Alpha method, yielding coefficients of 0.83 for B1, 0.89 for B2, and an overall reliability index of 0.85. The questionnaire was administered both electronically (via email and WhatsApp) and



physically where necessary. Of the 157 copies distributed, 132 were returned in usable condition, representing an 84% response rate. Data collected were analyzed using mean and standard deviation to answer the research questions. Items with a mean score of 2.50 and above were considered "Agree," while scores below 2.50 were considered "Disagree." To test the null hypotheses, independent samples t-tests were conducted at a 0.05 level of significance. A p-value greater than 0.05 indicated no significant difference (hypothesis accepted), while a p-value less than or equal to 0.05 indicated a significant difference (hypothesis rejected).

**Results**

**Research Question 1:** What are the challenges of integrating robotics in business education programme in tertiary institutions in Delta state?

**Table 1: Respondents Mean Ratings on the Challenges of Integrating Robotics in Business education programmes in tertiary institutions (N=132)**

S/No.	Item Statements	Mean	SD	Remarks
1.	Lack of infrastructure to support the integration of robotics	3.67	0.85	Agree
2.	Lack of expertise to handle technical issues related to robotics integration in business education programmes in tertiary institutions	3.43	0.85	Agree
3.	Lack of funds for integration of robotics	3.79	0.93	Agree
4.	High cost of materials and tools for integrating robotics in business education programmes in tertiary institutions	3.71	0.89	Agree
5.	Poor institutional commitment to integrating robotics in business education programmes in tertiary institutions	3.66	0.78	Agree
6.	Poor attitude of lecturers towards the integration of robotics in business education programmes in tertiary institutions	3.65	0.87	Agree
7.	Lack of training for lecturers on current trends in robotics integration in university education system	3.63	0.74	Agree
8.	Non-alignment with existing curriculum in some business education programmes in tertiary institutions	3.61	0.83	Agree
9.	Challenges in facilitating collaboration with industry for practical training opportunities.	3.55	0.82	Agree
10.	Resistance to change towards the integration of robotics among lecturers	3.09	0.71	Agree
11.	Cultural barriers	3.22	0.76	Agree
<b>Cluster Mean</b>		<b>3.55</b>		<b>Agree</b>

**Source: Field Study (2024)**

Data in Table 1 show that the respondents rated items, 1-11 as the challenges of integrating in business education programmes in tertiary institutions in Delta State with mean rating ranging between 3.09 and 3.79. The standard deviation scores ranging between 0.71 and 0.93 showed



that the respondents' opinions were related. the cluster mean of 3.55 indicated that the challenges of integrating robotics in business education programmes in tertiary institutions in Delta State are lack of infrastructure to support the integration of robotics, lack of experts to facilitate the integration of robotics in business education programmes in tertiary institutions, lack of funding, challenges in facilitating collaboration with industry for practical training opportunities and poor institutional commitment to integrating robotics in business education programmes in tertiary institutions among others.

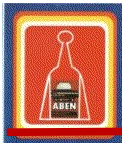
**Research Question 2:** What are the prospects of integrating robotics in business education programme in tertiary institutions in Delta state?

**Table 2: Respondents Mean Ratings on the Prospects of Integrating Robotics in Business education programmes in tertiary institutions in Nigeria (N=132)**

S/No.	Item Statements	Mean	SD	Remarks
12.	Provides engaging and functional exercises to make learning more joyful	3.48	0.86	Agree
13.	Helps students to participate in research projects.	3.30	0.76	Agree
14.	Educational robots may function as facilitators in learning activities	3.21	0.85	Agree
15.	Robotics increases students' interest and drive to study	3.18	0.73	Agree
16.	Facilitates personalised learning experiences aimed at improving specific needs of students	3.44	0.78	Agree
17.	Fosters the development of technical skills necessary for today's job needs.	3.58	0.84	Agree
18.	Fosters the development of digital skills necessary for today's job needs.	3.56	0.70	Agree
19.	Foster interdisciplinary learning among students across various faculties in business education programmes in tertiary institutions	3.67	0.92	Agree
20.	Facilitates the implementation of blended learning models that combine traditional face-to-face instruction with online learning activities.	3.74	0.74	Agree
21.	Encourages entrepreneurship by empowering students to develop innovative solutions and product	3.61	0.88	Agree
22.	Robotics can help business education programmes in tertiary institutions promote hands-on learning experiences that stimulate critical thinking, problem-solving, and creativity among students	3.77	0.82	Agree
23.	Assists business education programmes in tertiary institutions to align academic curricula with the needs of industries that rely on automation and robotics technologies	3.89	0.78	Agree
<b>Cluster Mean</b>		<b>3.54</b>		<b>Agree</b>

**Source: Field Study (2024)**

Data in Table 2 show that the respondents rated items, 12-23 as the prospects of integrating robotics in business education programmes in tertiary institutions in Delta State with mean rating ranging between 3.18 and 3.89. The standard deviation scores ranging between 0.70 and 0.92



showed that the respondents' opinions were related. The cluster mean of 3.54 indicated that the prospects of integrating robotics as an emerging technology in business education programmes in tertiary institutions in Delta State are that robotics assists business education programmes in tertiary institutions to align academic curricula with the needs of industries that rely on automation and robotics technologies; help business education programmes in tertiary institutions promote hands-on learning experiences that stimulate critical thinking, problem-solving, and creativity among students; facilitates the implementation of blended learning models that combine traditional face-to-face instruction with online learning activities; fosters the development of technical skills necessary for today's job needs and foster interdisciplinary learning among students across various faculties in business education programmes in tertiary institutions among others.

**Hypothesis 1:** There is no significant difference in the mean ratings of lecturers in federal owned tertiary institutions and state owned tertiary institutions on the challenges of integrating robotics in business education programmes in tertiary institutions in Delta State.

**Table 3: Summary of t-test Analysis on the Challenges of Integrating Robotics in Business education programmes in tertiary institutions in Delta State Based on Ownership**

Variable	N	SD	df	t	p-value	Decision
Federal Owned Tertiary institutions	51	3.600	81	130.05	.60	Not Significant
State Owned Tertiary institutions	81	3.530	76			

**Source: Field Study (2024)**

Data in Table 3 showed that the p-value of .60 is greater than the .05 alpha level of significance. This means that there is no statistically significant difference in the mean ratings of lecturers in federal owned tertiary institutions and state owned tertiary institutions on the challenges of integrating robotics as an emerging technology in tertiary institutions in Delta State. The hypothesis was therefore accepted.

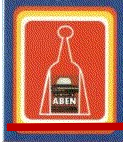
**Hypothesis 2:** There is no significant difference in the mean ratings of lecturers in federal owned tertiary institutions and state owned in tertiary institutions on the prospects of integrating robotics in business education programmes in tertiary institutions in Delta State.

**Table 4: Summary of t-test Analysis on the Prospects of Integrating Robotics in Business education programmes in tertiary institutions in Delta State Based on Ownership**

Variable	N	SD	df	t	p-value	Decision
Federal Owned Tertiary institutions	51	3.580	85	130.05	.67	Not Significant
State Owned Tertiary institutions	81	3.520	88			

**Source: Field Study (2024)**

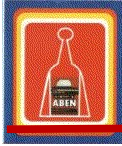
Data in Table 4 showed that the p-value of .67 is greater than the .05 alpha level of significance. This means that there is no statistically significant difference in the mean ratings of lecturers in federal owned tertiary institutions and state owned tertiary institutions on the prospects of integrating robotics in business education programmes in tertiary institutions in Delta State. The hypothesis was therefore accepted.



### **Discussion**

The finding of the study revealed that the challenges of integrating robotics in tertiary institutions in Delta State are lack of infrastructure to support the integration of robotics, lack of experts to facilitate the integration of robotics in business education programmes in tertiary institutions, lack of funding, challenges in facilitating collaboration with industry for practical training opportunities and poor institutional commitment to integrating robotics in business education programmes in tertiary institutions among others. This finding is in agreement with Nyako et al. (2023) revealed that some of the drawback in the integration of emerging technologies include negative attitude, a lack of computers, technical difficulties, poor funding, resistance to change, poor administrative support, low levels of computer literacy and technical skills, technology misaligned with the curriculum, lack of incentives, poor training opportunities, a lack of vision for integrating technology into learning processes, a lack of required IT skills, and feelings of discomfort. Ghobakhloo and Ching (2019) stated that the procurement and integration of technology, including hardware and software, can be costly, especially for institutions with limited budgets. Furthermore, findings of the study revealed no statistically significant difference in the mean ratings of lecturers in federal owned business education programmes in tertiary institutions and state owned business education programmes in tertiary institutions on the challenges of integrating robotics as an emerging technology in business education programmes in tertiary institutions in Delta State. This is in consonance of Akande (2023) who reported that the use of technology in business education programmes in tertiary institutions is could be influenced by cost, cultural and ethical background, level of education, and technological expertise.

The finding of the study revealed that the prospects of integrating robotics in tertiary institutions in Delta State are that robotics assists tertiary institutions to align academic curricula with the needs of industries that rely on automation and robotics technologies; help business education programmes in tertiary institutions promote hands-on learning experiences that stimulate critical thinking, problem-solving, and creativity among students; facilitates the implementation of blended learning models that combine traditional face-to-face instruction with online learning activities; fosters the development of technical skills necessary for today's job needs and foster interdisciplinary learning among students across various faculties in business education programmes in tertiary institutions among others. This finding is in line with Alnajjar et al. (2021) who revealed that robotics have the potential to be effective instructional aides. Zhong and Xia (2020) stated that robots may function as tutors, peers, or facilitators in learning activities. Afari and Khine (2017) asserted that educational robotics provides engaging and functional exercises to make learning more joyful. Furthermore, the findings of the study revealed no statistically significant difference in the mean ratings of lecturers in federal owned business education programmes in tertiary institutions and state owned business education programmes in tertiary institutions on the prospects of integrating robotics as an emerging technology in business education programmes in tertiary institutions in Delta State. This finding highlights the prospects of robotics in facilitating effective administration and instruction in business education programmes in tertiary institutions in Delta State. This is in agreement with Anwar et al. (2019) who noted that robotics in education increases students' attention and curiosity. Alnajjar et al. (2021) stated that integrating robotics in education also provides a major learning advantage by increasing students' interest and drive to study.



## Conclusion

Based on the findings of the study, the researcher concludes that integration of robotics in business education programmes in tertiary institutions presents both challenges and prospects in Delta State. The potential prospects include enhanced learning experiences, personalized education, and practical skill development for students. Robotics also offers opportunities for research and innovation, interdisciplinary learning, and improved administrative efficiency. However, challenges remain in the form of high costs, lack of expertise, and infrastructure limitations. Resistance to change, inadequate training and curriculum misalignment among others issues can also hinder the successful integration of robotics. To fully capitalise on the benefits of integrating robotics, business education programmes in tertiary institutions in Delta State must address these challenges by adopting remediating measures to ease the integration processes.

## Recommendations

The following recommendations were made based on the findings of the study:

1. Administrators of business education programmes in tertiary institutions in Delta State in collaboration with curriculum planners in all courses in the business education programmes in tertiary institutions should revise existing curricula to include robotics in a way that meets current industrial demands. The curriculum planners should create interdisciplinary programmes that combine robotics with other disciplines including engineering, computer science, and business.
2. Federal and state government in conjunction with administrators of tertiary institutions should go into collaborative initiatives with industry stakeholders and technology companies in for the provision of financial resources, infrastructural resources and expertise in tertiary institutions for successful integration of robotics in tertiary institutions.

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