BUILDING STRONGER BUSINESS EDUCATION THROUGH THE INCORPORATION OF INDUSTRY 4.0 TECHNOLOGIES

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Abstract
This study examined building stronger business education through the incorporation of industry 4.0 technologies. The study employed survey research design. The population of study consisted of 200 business education lecturers in tertiary institutions in South East Nigeria. The study employed multi-stage sampling technique to select 100 Business Education lecturers. Structured questionnaire was used as the instrument of data collection. Mean rating was employed to analyze the data collected. T-test statistics was conducted to test the hypothesis at 0.05 level of significance. The findings of the study showed that Artificial Intelligence, Big Data analysis, IoT, virtual reality and cloud computing were the types of industry 4.0, technologies that could be incorporated in business education curriculum to prepare business education students for work in this age of high digital transformation. Also, the study found that industry 4.0 technologies have prospect of improving business education programme by fostering new skills like digital literacy, critical thinking and shifting towards interdisciplinary and experiential learning methods such as virtual/augmented reality and project-based learning and better prepare business education students for the rapid changing demands of the present-day industrial sectors by making the course more adaptive, data-driven and collaborative. Thus, the study concluded that there is mean difference between male and female teachers' opinions on the prospects of business education programme with the integration of industry 4.0, technologies in the classroom. Therefore, the study recommended among others that Government should provide adequate funds budget allocation to tertiary institutions for procurement of industry 4.0 infrastructures.

Keywords: Building Stronger, Business Education, Incorporation, Industry, 4.0 Technologies

Introduction

The emerging technology in the present day has transformed the society and development of nations across the globe. The transformation brought about by the digital technology has changed the economy, education and industrial sectors. Islam (2018) opined that digital technologies are becoming an integral part of society; educational development and learning are the vision of the current world with digitalization. Sreedharan and Unnikrishnan (2017), maintained that this digitalization is linked to the emergence of Industry 4.0 called Integrated Industry, Industrial Internet, Smart Factories, Smart Industry, and Advanced Manufacturing, among others. Corona, Ruelas, Rebolloso, Fuentes and Aguilera (2020) defined Industry 4.0 as the disruptive processes that applied technological changes in industry in the modern age. Industry 4.0 is a systemic change, bringing about extensive changes to the world of work. It is not about the introduction of *one* new technology, linked with an incremental adaptation of work systems, but about a multitude of new technologies and forms of application, with different degrees of technical maturity and systemic effects. Industry 4.0 is the next phase in the digitization of the manufacturing sector, which is driven by four disruptions, namely, astonishing increases in data volume, computational power, and connectivity, especially new low-power wide-area networks; the emergence of analytics and business-intelligence capabilities; new forms of human—machine interaction such as touch interfaces and augmented-reality systems; and improvements in transferring digital instructions to the physical world (Jamaludin, McKay & Ledger, 2020).

According to Islam (2018) the elements of Industry 4.0 have been established for the manufacturing settings which is not only indispensable to increase the production of units, but also to reduce the production costs. The new levels of automation and data-driven decision-making are made possible by these industry 4.0 technologies, increasing productivity and efficiency. To be competitive

in a market that is changing quickly, many businesses are making investments in Industry 4.0 technology and systems. Smart factories, which employ connected machinery and sensors to increase production, decrease downtime, and enable predictive maintenance, are being adopted by manufacturers at an increasing rate.

However, as the wind of technological transformation has affected different aspect of work and human lives in the society, business education is not left out. The Business Education is defined as the type of education needed in the 21st century, which has a built-in mechanism for developing skills in almost all disciplines viz accounting, investment, marketing, law and information communication and technology (ICT) in the learner (Koyosaki, 2013). The primary goal of business education is to provide individuals with the necessary knowledge and skills to succeed in business-related occupations (Oriola, 2016). The objectives of business education encompass several aspects. Firstly, it aims to prepare students for initial employment by equipping them with the skills and knowledge needed to enter the workplace. Secondly, it facilitates the upgrading and retraining of individuals in new and related business and office occupations. Additionally, business education provides opportunities for students to gain information about the business world, developing their understanding of various areas of work where they can earn a living (Association of Business Educators of Nigeria, 2017). It is a career oriented that aims at preparing students with skills necessary for gainful employment. Therefore, skill acquisition is one of the goals of a business education programme.

In other words, industry has undergone various industrial revolutions leading to major upheavals in all activities of human life, particularly in the field of businesses. Olaniyi (2015) opined that considering the need for Business Education to be repositioned and enhanced its comparative advantage to its recipient in this digitalized and global workforce, it is important for business education programme to draw inspiration from the new paradigm of the fourth industrial revolution (Industry 4.0), which consists of digitizing organizations and automating business processes in order to better meet the specific needs of each product or service.

Thus, to building stronger business education through Industry 4.0, integrating advanced technologies like AI, IoT, and Big Data into the curriculum is needed. This could foster new skills like digital literacy, critical thinking and shifting towards interdisciplinary and experiential learning methods such as virtual/augmented reality and project-based learning. Also, this could help to better prepare business education students for the rapid changing demands of the present-day industrial sectors by making the course more adaptive, data-driven and collaborative. The industry 4.0 could also, reshape business education by demanding a shift toward more practical, skills-based learning, including the use of technologies like AI, Big Data, and VR/AR. This could necessitate updating of business education curriculum to include interdisciplinary collaboration, emphasizing soft skills like creativity and critical thinking, and adopting continuous, lifelong learning models to prepare students for a rapidly evolving digital landscape.

Also, align business education with industry 4.0 could aid in update programs to include hands-on experience with technologies such as AI, big data analysis, cloud computing, augmented and virtual reality, and additive manufacturing. It can help in developing crucial soft skills that will remain in demand, including creativity, emotional intelligence, critical thinking, interpersonal communication as well as preparing students to be continuous learners, as the skills required in Industry 4.0 are constantly evolving. More also, it can help to utilize technology to meet the specific needs of each business education students and create more personalized educational experiences, align with students' expectations, develop new educational models, utilize different pedagogical tools, develop problem-solving skills, entrepreneurial mindset and adapt to teaching and learning methods. Hence, this study aimed at examining building stronger business education through the incorporation of industry 4.0 technologies.

Statement of the Problem

The latest Industry 4.0 paradigms place an emphasis on visualization technologies, especially virtual reality, as a means of sustainable business education. Jamaludin, Mckay and Ledger (2020) opined that in Nigeria, there is scarcity of studies on this area showing that our universities have not been incorporating Industry 4.0 infrastructures. Lukita, Suwandi, Harahap, Rahardja and Nas (2020) added that global competition on human resources require strong competencies in all areas, usually technology, but there are limited studies with few studies suggested that the prospects of Industry 4.0 incorporation in Business education in Nigeria prospect to be the twenty-eighth largest economy in the world by 2030 is challenging. Few studies conducted revealed that incorporating industry 4.0 into business education in Nigeria would have some challenges including poor infrastructure, availability of cheaper labour, and expensive installation of technologies, lack of government supports and lack of knowledge of industry 4.0 technology among business education teachers ((Islam, 2018). However, this showed that business education programme in Nigeria lags far behind developed countries and its curriculum has not been effectively implemented. The business students in Nigeria Universities have not been trained neither have acquired knowledge and skills on the operation of industry 4.0 technologies to overcome the challenges of the present-day world of work.

Purpose of Study

The purpose of the study was to examine the building stronger business education through the incorporation of industry 4.0 technologies among students of business education in Universities in South East, Nigeria. Specifically, the study sought to explore the:

1. the types of industry 4.0, technologies needed to be incorporated into business education curriculum.
2. the prospects of business education programme with the integration of industry 4.0, technologies in the classroom.

Research Questions

1. What are the types of industry 4.0, technologies needed to be incorporated into business education curriculum?
2. What are the prospects of business education programme with the integration of industry 4.0, technologies in the classroom?

Research Hypothesis

H_0. There is no mean difference between male and female teachers' opinions on the prospects of business education programme with the integration of industry 4.0, technologies in the classroom.

Methodology

This study employed survey research design to study a population of 200 business education lecturers in tertiary institutions in South East Nigeria. Multi-stage sampling technique was employed to select 100 Business Education lecturers as the sample for the study. The South East Nigeria consisted of five states made up of universities, colleges of education and polytechnics. In the first place, the five states were grouped in three tertiary institutions. Simple random sampling technique was employed to select 7 Business Education lecturers in each tertiary institution in each of the five states. Stratified sampling technique was employed to select 16 Business Education lecturers in each state tertiary institutions. Thus, giving a total sample of 100 Business Education lecturers. Structured questionnaire was used for data collection in the study. The questionnaire consisted of section A and B. Section A contained demographic data of the respondents. Section B contained information on the relevant research questions of the study. Five-point Likert scale was used to answer the research questions. Strongly disagreed (SD-1), disagree (D-2), Undecided (UN-3) agreed (A-4) and strongly agreed (SA-5). The instrument was validated by two experts. One expert from Technology and vocational education and one other expert from measurement and evaluation, all from Nnamdi Azikiwe University, Awka. A pilot study was carried out with the administration of 6 copies of the questionnaire to Business Education teachers in secondary schools in Awka Anambra state. The data collected was tested with SPSS tool. The result obtained was 0.82 which was reliable to carry out the study. The researcher administered the instrument with the aid of two research assistants. The

exercise took two weeks. Out of 100 copies of the questionnaire administered, 80 copied were retrieved and used for data analysis. The data collected was analyzed with mean rating. The point for accepting the mean was set at 2.5 and above or rejects the mean at less than 2.5. T-test was conducted to test the hypothesis at 0.05 level of significance.

Results and Discussion

1. What are the types of industry 4.0, technologies needed to be incorporated into business education curriculum?

Table 1: Mean responds on types of industry 4.0, technologies needed to be incorporated into business education curriculum.

S/N	Items	SD	D	UN	A	SA	X	Remarks
1	Artificial Intelligence (AI)	0	0	0	30	50	4.6	Agreed
2	Big Data analysis.	0	0	4	28	48	3,6	Agreed
3	IoT.	4	5	10	21	30	3.5	Agreed
4	virtual reality,	0	2	1	30	37	3.9	Agreed
5.	cloud computing,	0	3	4	27	46	4,5	Agreed
	Total						4.0	Agreed

Table 1 above analyzed data on the types of industry 4.0, technologies needed to be incorporated into business education curriculum. The computed mean is 4.0 which is greater than 2.5. Since, the computed mean is greater than 2.5, it is agreed that Artificial Intelligence, Big Data analysis, IoT, virtual reality and cloud computing are the types of industry 4.0, technologies needed to be included in business education curriculum for business preparing students for work in this age of high digital transformation.

2. What are the prospects of business education programme with the integration of industry 4.0, technologies in the classroom?

Table 2: Mean responds on the prospects of business education programme with the integration of industry 4.0, technologies in the classroom.

S/N	Items	SD	D	UN	A	SA	X	Remarks
1	Integrating industry 4.0, technologies like AI, IoT, and Big Data into business education curriculum	0	0	0	20	60	4.8	Agreed
2	Industry 4.0, technologies can help to better prepare business education students for the rapid changing demands of the present-day industrial sectors.	0	0	0	35	45	4.6	Agreed
3	Industry 4.0 can reshape business education by demanding a shift toward more practical, skills-based learning.	0	0	0	39	41	4.0	Agreed
4	It can help in the updating of business education curriculum to include interdisciplinary collaboration, emphasizing soft skills.	0	2	0	36	42	4.5	Agreed
5.	Industry 4.0 can help to utilize technology to meet the specific needs of each business education students	0	0	0	33	47	4.2	Agreed
	Total						5.3	Agreed

In table 2, the computed mean is 5.3 while the accepting is mean 2.5. Since the computed mean at 5.3 is greater than 2.5, it is agreed that incorporation of industry 4.0, technologies like AI, IoT, and

Big Data into business education curriculum can foster new skills like digital literacy, critical thinking and shifting towards interdisciplinary and experiential learning methods such as virtual/augmented reality and project-based learning and better prepare business education students for the rapid changing demands of the present day industrial sectors by making the course more adaptive, data-driven and collaborative. It will also, help in updating business education curriculum to include interdisciplinary collaboration, emphasizing soft skills like creativity and critical thinking, and adopting continuous, lifelong learning models to prepare students for a rapidly evolving digital landscape and help to utilize technology to meet the specific needs of each business education students and create more personalized educational experiences, align with students expectations, develop new educational models, utilize different pedagogical tools, develop problem-solving skills, entrepreneurial mindset and adapt to teaching and learning methods.

Test of Hypothesis

H_0. There is no mean difference between male and female teachers' opinions on the prospects of business education programme with the integration of industry 4.0, technologies in the classroom.

Table 3: **One-Sample Test**

	Test Value = 0					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Male	2.938	9	.017	23.50000	5.4082	41.5918
Female	2.952	9	.016	16.50000	3.8542	29.1458

In table 3 above t-test was conducted to find out whether there is no mean difference between male and female teachers' opinions on the prospects of business education programme with the integration of industry 4.0, technologies in the classroom. The test was conducted at 2-tailed. The result was at 2.938 and 2.952 respectively. The p-value is 0.01. The mean difference was 23.50 and 16.50. Hence, at 95% confidence interval of the difference, we concluded that there is mean difference between male and female teachers' opinions on the prospects of business education programme with the integration of industry 4.0, technologies in the classroom. This is true since 41.5918 is greater 29.1458 and the p-value at 0.05 is greater than 0.01.

Discussion

In this study, it was found that Artificial Intelligence, Big Data analysis, IoT, virtual reality and cloud computing are the types of industry 4.0, technologies needed to be included in business education curriculum for business preparing students for work in this age of high digital transformation. Also, the study found that industry 4.0 technologies can have prospects in fostering new skills like digital literacy, critical thinking and shifting towards interdisciplinary and experiential learning methods such as virtual/augmented reality and project-based learning and better prepare business education students for the rapid changing demands of the present-day industrial sectors by making the course more adaptive, data-driven and collaborative. It was also, found that industry 4.0 technologies can help in updating business education curriculum to include interdisciplinary collaboration, emphasizing soft skills like creativity and critical thinking, and adopting continuous, lifelong learning models to prepare students for a rapidly evolving digital landscape and help to utilize technology to meet the specific needs of each business education student and create more personalized educational experiences, align with students expectations, develop new educational models, utilize different pedagogical tools, develop problem-solving skills, entrepreneurial mindset and adapt to teaching and learning methods.

Conclusion

Having examined the role of incorporating industry 4.0 technologies in business education curriculum among students in business education in tertiary institutions in South East Nigeria, the following conclusions were drawn based on the finding that there is mean difference between male and female teachers' opinions on the prospects of business education programme with the integration of industry 4.0, technologies in the classroom. Technologies such as Artificial Intelligence, Big Data analysis, IoT, virtual reality and cloud computing were among industry 4.0 technologies needed in business education curriculum for preparing students for work in this age of high digital transformation.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Government should provide adequate funds budget allocation to tertiary institutions for procurement of industry 4.0 infrastructures.
2. Curriculum developers should redesign business education curriculum to include the concepts, element, principles and practical methods of teaching and learning industry 4.0 in business education programme.
3. Business education lecturers should be trained to acquire knowledge and skills of industry 4.0 in order to be able to implement it in the classroom.

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