

Digital Analytic and Marketing Competencies Needed By Business Education Students in the Fourth Industrial Revolution

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ABSTRACT

This study ascertained the digital analytic and marketing competencies needed by business education students in the fourth industrial revolution. Two research questions guided the study and two null hypotheses were tested at 0.05 level of significance. The study adopted a descriptive survey design and was carried out in public tertiary institutions in Anambra State. The population of the study comprised 116 business educators from universities and colleges of education in Anambra State. A structured questionnaire was used for data collection. Mean and standard deviation were used to analyze the research questions, while t-test was used to test the null hypotheses. Findings from the study revealed several digital analytic competencies and digital marketing competencies, that are needed by business education students for adaptation in the fourth industrial revolution. The study concluded that digital analytic and marketing competencies are indispensable to business education students in the fourth industrial revolution. Based on the findings of the study, it was recommended among others that Business Education curriculum planners should integrate practical instructions on digital marketing platforms such as Google Ads, Facebook Ads Manager, Search Engine Optimization (SEO) and Pay-per click advertising which could help the students to design, manage and evaluate marketing strategies in the dynamic digital environment.

Keywords: Business education Students, Digital Competencies, Fourth Industrial Revolution, Digital Analytic, Digital Marketing.

INTRODUCTION

Education is one of the tools for human and economic development. It provides individuals with the knowledge, skills and values necessary to contribute effectively to the society. Through education, people acquire the necessary competencies to think critically, solve problems and engage in productive activities that drive economic growth and social progress. Recognizing the vital role of education in addressing economic challenges, different programmes (including Business Education) were introduced and incorporated into the Nigerian educational curriculum. Business Education programme was introduced in order to bridge the gap between theoretical knowledge and practical skills to reduce unemployment, poverty and other socio-economic challenges faced by the country (Ayemhenre, Okoloe & Ogidan, 2023).

Business education students are individuals who enroll in a formal academic programme that focuses on developing the knowledge, skills, and attitude required for effective participation in business management and entrepreneurial activities (Shaibu & Mbaegbu, 2023). They are prepared through instructional processes that equip them for future roles as employees, employers, and entrepreneurs. The effective preparation of business education students largely depends on the competence, instructional strategies and professional expertise of business educators, who are responsible for the impartation of relevant competencies for adaptation in the fourth industry revolution.

The Fourth Industrial Revolution (4IR) refers to the era of technological advancement characterized by the fusion of digital, biological and physical systems (Okebiorun, 2022). It involves emerging innovations such as artificial intelligence, robotics, big data, the Internet of Things (IoT) and biotechnology which are transforming

industries, economies and the nature of work globally. Obidile, Obi and Ikpata (2023) described fourth industrial revolution as the era when individuals move between the digital domains and the offline reality with the use of connected technology to enable and manage their lives. In the context of the study, fourth industrial revolution is the era of technological advancement where digital technologies are highly used in human activities, resulting in the automation of processes and the development of smart systems for learning, working and solving problems. This revolution is reshaping industries by enhancing productivity, efficiency and innovation through the adoption of cyber-physical systems (Okebiyorun, 2022).

Currently in Anambra State, many jobs are being automated through technologies such as artificial intelligence (AI), the Internet of Things (IoT), cloud computing, 3D printing, bioengineering, machine learning, robotics, nanotechnology, genetics and biotechnology (Mbanugo & Okeke-Ezeanyanwu, 2025). Consequently, business education students seem to face significant challenges in adapting to the demands of the Fourth Industrial Revolution (4IR), which is characterized by rapid technological advancements, automation, and digitalization of workplaces. Many students lack adequate digital literacy and practical experience with modern tools, limiting their ability to fully participate in technology-driven tasks (Shaibu & Mbaegbu, 2023). Furthermore, limited access to up-to-date hardware, software and low-speed internet exacerbates this skills gap, particularly in developing regions (Okoro 2025). Similarly, students often struggle to integrate theoretical knowledge with practical applications, resulting in a mismatch between academic preparation and industry expectations (Adeyemi 2022). In addition, insufficient exposure to emerging technologies, inadequate training in critical thinking and problem-solving in digital contexts, and limited guidance from educators on navigating complex digital environments further hinder students' readiness to fully participate in technology-driven world (Amaonye, Anyikwa & Abang, 2025). In order to thrive, students need to develop the necessary digital competencies that could enable them to adapt effectively to 4IR demands.

Digital competency refers to the ability to confidently, responsibly and effectively use digital technologies, tools and platforms to access information, create content, communicate, solve problems and support learning in technology-driven environments (Okoro, 2025). Ayemhenre, Okoloe and Ogidan (2023), described digital competency as the specific digital abilities and skills required for effective learning, participation and performance in contemporary educational and technological environments. It could therefore be deduced from the above definitions that digital competencies are knowledge, skills abilities and attitude, required for effective engagement with digital systems to learn, work and solve problems confidently and responsibly. There are several areas of digital competence which include information and data literacy, digital content creation, problem solving, digital analytic and digital marketing (Chap, et al., 2022). In this study digital analytic and digital marketing competencies would be discussed.

Digital analytic competency refers to the ability to collect, process, and interpret data using digital tools and software such as Microsoft excel, Power point, SPSS, Tableau and Power BI. It involves analyzing datasets to generate insights, identify patterns and support data-driven decision-making in academic setting. According to Gupta, Leszkiewicz, Kumar, Bijmolt and Potapov (2020), digital analytic competency refers to the techniques, technologies, systems, practices, methodologies and applications used to analyze critical digital data to help individuals understand information and make timely, data-driven decisions. Adelaja (2018) defined digital analytic competency as the ability to collect, process and analyze data using appropriate digital tools and technologies to generate actionable insights and support decision-making. Digital analytic competency involves not only the technical ability to work with data, but also the ability to interpret and apply analytical findings effectively, to solve problems and make informed decisions in technology-driven environments. This competency enables students to generate actionable insights, identify patterns and make data-driven decisions, which are essential for effective problem-solving and strategic planning in contemporary business environments (Uzohuo 2022). Mastery of digital analytic tools could enhance students' preparedness for technology driven business environment and adaptation in the 4IR.

Digital marketing competency refers to the ability to plan, implement, manage and evaluate marketing activities using digital technologies and online platforms to engage customers and create value. According to Chinnapakjarusiri, Khotabut, Nakpleung, Kraiwanit and Moolngearn (2024), digital marketing competency involves the effective application of digital tools, channels and data to engage customers in online

environments. Similarly, Iankovets (2024) described digital marketing competency as the capacity to understand digital consumer behaviour and use digital platforms strategically to communicate, promote and deliver products and services. Digital marketing competencies enable students to apply digital tools and strategies to real-world marketing tasks (Nedum-Ogbede, 2023). Digital marketing competency comprises several interrelated components that support effective marketing performance in digital spaces. Shaibu and Mbaegbu (2023) identified some skills such as digital marketing planning, content creation, social media marketing and search engine optimization as essential skills for engaging online audience. Mastery of digital marketing competencies could enable the students to reach target audience, measure competitors' performance and adjust strategies for optimal outcome in a digitalized business environment.

Statement of the Problem

The rapid technological changes in the Fourth Industrial Revolution have transformed workplaces, requiring new digital skills for success. As a result, graduates seem to face reduced employability and difficulty adapting to the demands of modern businesses. According to Okoro (2025), students (future graduates) experience disparities in access to digital tools, knowledge, skills and training and these hinder students' readiness for technology-driven business environment. This gap limits their ability to effectively analyze data, develop software and create engaging digital contents in evolving business world.. Ascertaining the digital analytic and marketing competencies that business education students need for adaptation in the 4IR, is essential for designing effective training programs and ensuring that students are well-prepared to thrive in the present labour market as graduates.

Purpose of the Study

The main purpose of the study was to examine digital analytic and marketing competencies needed by business education students in the fourth industrial revolution in tertiary institutions in Anambra State. Specifically, the study ascertained;

1. Digital analytic competencies needed by business education students in the fourth industrial revolution.
2. Digital marketing competencies needed by business education students in the fourth industrial revolution.

Research Questions

The following research questions guided the study:

1. What are the digital analytic competencies needed by business education students in the fourth industrial revolution?
2. What are the digital marketing competencies needed by business education students in the fourth industrial revolution?

Null Hypotheses

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

1. There is no significant difference in the mean ratings of male and female business educators on the digital analytic competencies needed in the fourth industrial revolution.
2. There is no significant difference in the mean ratings of male and female business educators on the digital marketing competencies needed in the fourth industrial revolution.

METHOD

This study adopted a descriptive survey research design. The population comprised 116 business educators from universities and colleges of education offering business education programme in Anambra State (Nnamdi Azikiwe University Awka, Chukwuemeka Odumegwu Ojukwu University Igbariam, Federal College of

Education Umunze and Nwafor Orizu College of Education Nsugbe). The study employed census sampling as the entire population was studied. Data were collected using a structured questionnaire titled: Digital Competencies Needed by Business Education Students for Adaptation in the Fourth Industrial Revolution (DCNBESAFIR). The instrument has two sections A and B. Section A contained demographic information of the respondents while Section B had two clusters, B1 and B2 which contain 10 items respectively. The instrument was structured on a 4-point scale of Highly Needed (HN) = 4, Needed (N) = 3, Lowly Needed (LN) = 2 and Not Needed (NN) = 1. The instrument was validated by three experts, two experts from the Department of Business Education, Faculty of Technology and Vocational Education and one expert, from Measurement and Evaluation Unit in the Department of Educational Foundations, Faculty of Education; all from Nnamdi Azikiwe University Awka. Cronbach Alpha's method was used to ascertain the internal consistency of the instrument. The results indicated that B1 had a coefficient value of 0.87 and B2 had a coefficient value of 0.84. Out of 116 copies of the questionnaire distributed, 102 copies were retrieved and used for data analysis. Copies of the questionnaire were administered to the respondents, with the help of three research assistants who were briefed on the procedures for distribution and collection. The data collected were analyzed using the Statistical Package for Social Sciences (SPSS) version 26. Mean and standard deviation were used to answer the research questions while t-test was used to test the null hypotheses at 0.05 level of significance. The decision rule was that any item with a mean score of 2.50 and above would be regarded as having attracted a positive response; while any item with a mean score of less than 2.50 would be regarded as having attracted a negative response. For the hypotheses testing, when the p-value was less than or equal to 0.05, the null hypothesis was rejected but when otherwise the null hypothesis was not rejected.

RESULTS

Research Question One

What are the digital analytic competencies needed by business education students in the fourth industrial revolution?

Table 1: Mean ratings on digital analytic competencies needed by business education students in the fourth industrial revolution

SN	Digital analytic competencies	\bar{x}	SD	Remarks
1	Use of statistical software such as Microsoft excel and SPSS for data analysis.	3.97	0.65	Highly Needed
2	Use of analytical tools such as python for extracting and analyzing data.	3.70	0.67	Highly Needed
3	Use of digital platforms such as google forms for data collection.	3.60	0.70	Highly Needed
4	Ability to use SPSS to generate analytical reports and charts.	3.20	0.89	Needed
5	Ability to use Excel to interpret analytical scores.	3.31	0.70	Needed
6	Ability to use emerging digital analytical tools such as Tableau, Power BI and advanced excel.	3.73	0.64	Highly Needed
7	Ability to use spreadsheet applications for calculations, record keeping, budgeting, forecasting and graphical data presentation.	3.13	0.77	Needed
8	Ability to apply ethical principles when analyzing data using digital analytic tools.	3.18	0.78	Needed
9	Ability to store, retrieve, organize and analyze business information electronically.	3.01	0.85	Needed
10	Ability to ensure data privacy when handling datasets with digital analytic software.	3.64	0.65	Highly Needed

Data in Table 1 show the mean ratings on the digital analytic competencies needed by business education students for adaptation in the Fourth Industrial Revolution. The mean ratings range from 3.01 to 3.97 which indicate that all the items were rated as needed. Items 1, 2, 3, 6 and 10, with mean ratings between 3.60 and

3.97, were rated as highly needed, while Items 4, 5, 7, 8 and 9, with mean ratings ranging from 3.01 to 3.31, were rated as needed. This entails that digital analytic competencies are needed by business education students. The standard deviation which range from 0.64–0.88 indicate that the respondents were homogeneous in their ratings.

Research Question Two

What are the digital marketing competencies needed by business education students in the fourth industrial revolution?

Table 2: Mean ratings on digital marketing competencies needed by business education students in the fourth industrial revolution

SN	Digital Marketing competencies	\bar{x}	SD	Remarks
11	Use of platforms such Facebook Ads for digital marketing.	3.74	0.54	Highly Needed
12	Use of search engine optimization (SEO) techniques, such as content optimization, to improve website visibility.	3.63	0.57	Highly Needed
13	Use of Pay-Per Click (PPC) advertising techniques, to enhance marketing of products/services.	3.69	0.56	Highly Needed
14	Ability to create engaging marketing content for blogs and websites.	3.58	0.59	Highly Needed
15	Ability to create digital content social media channels.	3.43	0.66	Needed
16	Ability to use platforms like Google Analytic (GA4) to analyze marketing performance metrics.	3.71	0.55	Highly Needed
17	Ability to develop compelling advertising social media messages that attract and retain audience.	3.46	0.74	Needed
18	Use of digital market research techniques, like audience profiling.	3.48	0.61	Needed
19	Ability to oversee multiple digital marketing activities at the same time across various platforms.	3.42	0.50	Needed
20	Ability to apply new digital marketing, platforms as industry trends evolve.	3.63	0.68	Highly Needed

Data in Table 2 show the mean ratings on the digital marketing competencies needed by business education students for adaptation in the Fourth Industrial Revolution. The mean ratings range from 3.42 to 3.74, indicate that all the items were rated as needed by the respondents. Specifically, Items 11, 12, 13, 14, 16 and 20, with mean ratings ranging from 3.58 to 3.74, were rated as highly needed, while Items 15, 17, 18 and 19, with mean ratings ranging from 3.42 to 3.48, were rated as needed. This entails that digital marketing competencies are highly needed by business education students for adaptation in the Fourth Industrial Revolution. The standard deviation which range from 0.50–0.74 show that the respondents were homogeneous in their ratings.

Hypothesis One

There is no significant difference in the mean ratings of male and female business educators on the digital analytic competencies needed in the fourth industrial revolution.

Table 3: Summary of t-test analysis of male and female business educators on the digital analytic competencies needed in the fourth industrial revolution

Gender	N	Mean	SD	df	p-value	Decision
Male	21	3.55	0.323	100	0.542	Not Significant
Female	81	3.41	0.267			

Data in Table 3 present the summary of the independent t-test analysis of male and female business educators' ratings on the digital analytic competencies needed in the Fourth Industrial Revolution. With p-value of 0.542

at 100 df the p-value exceeds the 0.05 significance level, therefore, the null hypothesis was not rejected. This indicates no significant difference between the mean ratings of male and female business educators on the digital analytic competencies needed for adaptation in the Fourth Industrial Revolution.

Hypothesis Two

There is no significant difference in the mean ratings of male and female business educators on the digital marketing competencies needed in the fourth industrial revolution.

Table 4: Summary of t-test analysis on the mean ratings of male and female business educators on the digital marketing competencies needed in the fourth industrial revolution

Gender	N	Mean	SD	df	p-value	Decision
Male	21	3.63	0.254	100	0.358	Not Significant
Female	81	3.57	0.353			

Data in Table 4 present the summary of the independent t-test analysis of male and female business educators' ratings on the digital marketing competencies needed in the Fourth Industrial Revolution. The computed p-value of 0.358 at 100 df exceeds 0.05 level of significance. Therefore, the null hypothesis was not rejected which indicates no significant difference between the mean ratings of male and female business educators on the digital marketing competencies needed for adaptation in the Fourth Industrial Revolution.

DISCUSSION

The findings from research question one revealed that digital analytic competencies were needed by business education students for adaptation in the Fourth Industrial Revolution (4IR). Competencies such as: Ability to use of statistical software like Microsoft Excel and SPSS for data analysis, Use of analytical tools such as python for extracting and analyzing data, Use of digital platforms such as google form for data collection, Ability to use SPSS to generate analytical reports and charts, Ability to use Excel to interpret analytical scores, Ability to use emerging digital analytical tools such as Power BI and advanced excel. Others include: Ability to use spreadsheet applications for calculations, record keeping, budgeting, forecasting and graphical data presentation, Ability to apply ethical principles when analyzing data using digital analytic tools, Ability to store, retrieve, organize and analyze business information electronically and Ability to ensure data privacy when handling datasets with digital analytic software, are needed by business education students for adaptation in the Fourth Industrial Revolution (4IR). This is in line with the study of Okoro (2025), which revealed that digital skills including analytic tools and data-driven competencies are essential for business education students for self-reliance. These skills are essential as automation is gradually reshaping the employment and business landscape. Possession of digital analytic competencies could enable students to generate actionable insights, identify trends and make informed decisions in both academic and evolving business world. The test of hypothesis one revealed no significant difference in the mean ratings of male and female business educators on digital analytic competency needed by business education students.

Findings from research question two revealed that digital marketing competencies were needed among business education students for 4IR adaptation. Competencies such as: Use of platforms such Facebook Ads for digital marketing, Use of search engine optimization (SEO) techniques, such as content optimization to improve website visibility, Use of Pay-Per Click (PPC) advertising techniques to enhance marketing of products/services, Ability to create engaging marketing content for blogs and websites, Ability to create digital content social media channels, Ability to use platforms like Google Analytic (GA4) to analyze marketing performance metrics, Ability to develop compelling advertising social media messages that attract and retain audience. Others include: Use of digital market research techniques like audience profiling, Ability to oversee multiple digital marketing activities at the same time across various platforms and Ability to apply new digital marketing platforms as industry trends evolve, are needed by business education students for adaptation in the Fourth Industrial Revolution (4IR). These competencies are essential for students to promote products and services effectively in online environment. The test of hypothesis two revealed no significant difference in the

mean ratings of male and female business educators on digital marketing skills needed by students for adaptation in the fourth industrial revolution. This finding is in line with the findings of Uzoamaka and Okpuzor (2025), which revealed that gender did not influence educators perception of digital marketing competencies with regards to enhancing students' knowledge in promoting goods and services in online environment.

CONCLUSION

Digital analytic and marketing competencies are crucial for preparing business education students in tertiary institutions in Anambra State, for adaptation in the Fourth Industrial Revolution. These competencies could enhance students' ability to analyze data, create digital content, develop software applications and present information effectively, improving both academic engagement and employability readiness of students.

RECOMMENDATIONS

Based on the findings of the study, the following recommendation were made;

1. Administrators of tertiary institutions should provide structured training for business education students on digital analytic tools such as SPSS, Excel, Python, Tableau and Power BI, which could help the students to collect, process and interpret data effectively for academic and business decision-making.
2. Business Education curriculum planners should integrate practical instructions on digital marketing platforms such as Google Ads, Facebook Ads Manager, Search Engine Optimization (SEO) and Pay-per click advertising which could help the students to design, manage and evaluate marketing strategies in dynamic digital environment.

REFERENCES

1. Adelaja, T. (2018). Digital analytic competency in business education. Bridging the gap for the fourth industrial revolution. *Journal of Digital Skills and Education*, 4(1), 45–59.
2. Adeyemi, A. (2022). The impact of digital skills on employability in the digital economy: Perspectives from business education students. *Business Education Review*, 34(2), 121-137.
3. Amaonye, C. B., Anyikwa, N. E. & Abang, S. O. (2025). Digital competence as a predictor of applicability of artificial intelligence in managing higher learning institutions in Nigeria: Economic-educational outcomes. *UNIZIK Journal of Educational Laws and Leadership Studies*.
4. Ayemhenre, O. A., Okoloe, J. N. & Ogidan, O. O. (2023). Integrating digital competencies into tertiary education curricula for employability and productivity. *Journal of Business Education Research*, 6(2), 112–124.
5. Chaffey, D. & Ellis-Chadwick, F. (2019). *Digital marketing: Strategy, implementation and practice* (7th ed.). Pearson Education.
6. Chap, T. Y., Mitrovic, Z., Bjelica, D. & Borozan, T. (2022). Are future project managers ready for a digitalized world? DOI- 10.1007/978-3-031-18645-5_33
7. Chinnapakjarusiri, N., Khotabut, P., Nakpleung, P., Kraiwanit, T. & Moolngearn, P. (2024). Digital Marketing Skills in the Digital Economy: A Review Article. *Advance Knowledge for Executives* 3(3), No. 44
8. Gupta, S., Leszkiewicz, A., Kumar, V., Bijmolt, T. & Potapov, D. (2020). Digital Analytics: Modeling for Insights and New Methods. *Journal of Interactive Marketing*, 51(1), 1-17.
9. Iankovets, T. (2024). Digital Marketing Automation. *Scientia Fructuosa* 154(2),100-117. DOI: 10.31617/1.2024(154)06
10. Mbanugo, C. I. & Okeke-Ezeanyanwu, J. A. (2025). Extent of Implementation of Accounting Automation Techniques on Job Performance of Accounting Officers in Tertiary Institutions in Anambra State. *International Journal of Research and Innovation in Social Science (IJRISS)*, 9(4), 3330-3341. DOI: 10.47772/IJRISS

11. Nedum-Ogbede, P. O. (2023). Gauging the digital readiness of business education lecturers for students' skill acquisition for gainful employment. *Nigerian Journal of Business Education (NIGJBED)*, 10(1), 269-281.
12. Obidile, J. I., Obi, O. C. & Ikpat, N. H. (2023). Competencies Required for Adaptation in the Fourth Industrial Revolution: Business Educators' Perspectives. *Asian Journal of Managerial Science*, 12(1), 32-37.
13. Okebiorun, O. (2022). Fourth industrial revolution and digital literacy: The impact on business education students. *Journal of Educational Technology and Research*, 14(3), 89-102.
14. Okoro, C. E. (2025). Digital technology competencies and employability of postgraduate business education students in South-South Nigerian universities. *American Journal of Education and Social Science*, 12(2), 101–118.
15. Shaibu, O. G. & Mbaegbu, R. E. (2023). Relevant training skills needed by business education lecturers for effective teaching of business education courses in higher institutions in Imo State. *Nigerian Journal of Business Education (NIGJBED)*, 10(1), 338-346.
16. Uzoamaka, I. G. & Okpuzor, V. N. (2025). Digital skills required for business education graduates: Employer perceptions in Delta State, Nigeria. *African Journal of Management and Business Research*, 18(1), 318–328.
17. Uzohuo, O. N. (2022). Digital competencies required for business education graduates in a technology-driven economy. *Nigerian Journal of Business Education*, 9(2), 101–115.