

**EXTENT OF USE OF EMERGING TECHNOLOGIES FOR RESEARCH AND
DEVELOPMENT AMONG LECTURERS IN FEDERAL TERTIARY INSTITUTIONS
IN ANAMBRA STATE**

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Abstract

This study was conducted to determine the extent of utilization of emerging technologies for research and development among lecturers in federal tertiary institutions in Anambra state. The study adopted a descriptive survey research design. To guide the study, three research questions were formulated and two null hypotheses were tested at 0.05 level of significance. The population of the study comprised 1138 lecturers from two federal tertiary institutions used for the study. A sample size of 296 was determined using the Taro Yamane formula, while random proportionate sampling technique was used to select the respondents. A structured questionnaire developed by the researchers and validated by experts was used for collection of data. A face to face administration was used for the distribution and collection of the questionnaire. The data collected were analyzed using mean and standard deviation to answer the research questions, while t-test statistics were used to test the hypotheses. The results showed that while several emerging technologies enhance the research and development of lecturers, most of these technologies are not yet fully utilized. The study also identified several challenges impeding their effective utilization. The study concludes that lecturers are not maximizing the potential of emerging technologies, which are valuable tools for enhancing research and development in tertiary institutions. The study recommends, that tertiary institutions should collaborate with stakeholders such as TETFund, philanthropists, corporate organizations to provide the infrastructure required for the effective utilization of emerging technologies.

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Key Words: Emerging Technologies, Research, Development, Lecturers and Tertiary Institutions

Introduction

Research and development constitute fundamental responsibilities of lecturers in tertiary institutions. Beyond teaching, lecturers are expected to generate new knowledge through research activities that contribute to the advancement of their disciplines and the development of society. In higher education institutions, research productivity is often used as a key indicator for promotion, academic recognition, and institutional ranking. Consequently, lecturers are expected to remain current in their fields, develop new ideas, and contribute to scholarly discourse through publications, conferences, and collaborative research projects. Idika et al. (2022) maintain that research remains a crucial mechanism for generating new knowledge in a knowledge-driven society where innovation and intellectual advancement are essential for sustainable development.

Tertiary institutions play a critical role in national development through the generation and dissemination of knowledge. They include – universities, colleges of education, and polytechnics that serve as hubs for research and innovation where lecturers conduct investigations that address societal challenges and contribute to global scholarship. Research and development activities in tertiary institutions often involve literature review, data collection, statistical analysis, knowledge dissemination and collaboration with other scholars. However, the increasing complexity of research processes and the growth of digital knowledge systems have made the integration of technology increasingly necessary for effective research productivity. As technological innovation continue to evolve, new digital tools known as emerging technologies have become increasingly important in supporting research and academic productivity.

Emerging technologies refer to new or evolving technological innovations that have the potential to significantly influence industries, institutions, and societal practices. Miller et al. (2005) describe emerging technology as technologies that have not yet reached widespread maturity but possess the capacity to transform existing systems and practices. In this study, emerging technologies are operationalized as the use of digital tools such as Artificial Intelligence, Virtual and Augmented Reality, high-speed internet networks, and online data collection and analysis

platforms by lecturers to enhance literature search, data-collection, data analysis, collaboration, and dissemination of research outputs. In the context of tertiary education, these technologies include Artificial Intelligence (AI), Machine Learning, Virtual Reality (VR), Augmented Reality (AR), Google Form, the Internet of Things (IoT), and advanced communication networks like 5G. These technologies are increasingly transforming how lecturers conduct research, analyze data, access scholarly materials, and collaborate with other researchers across the globe.

Among these innovations, Artificial Intelligence has attracted considerable attention in academic research because of its ability to automate complex tasks such as literature searches, data analysis, and research writing support. Studies have shown that AI-driven tools can significantly improve research productivity by assisting scholars in organizing literature, analyzing large datasets, generating citations and visualizing research outputs (Glickman & Zhang, 2024 and Okon, 2021). Similarly, a study on university adoption of AI tools has shown that these technologies improve research efficiency, data processing, and overall scholarly productivity when properly integrated into academic work (Aderere et al., 2025).

In addition to artificial intelligence, other emerging technologies also contribute to research and academic activities. For instance Virtual Reality (VR), Augmented Reality (AR), and 3D technologies significantly enhance lecturers' research and development by improving visualization, enabling simulation-based experimentation, and facilitating interactive data analysis. AR supports contextual and real-time data interaction (Koumpouros, 2024), VR provides immersive environments for experimentation and virtual laboratories (Leung et al., 2018), while 3D technologies enhance modelling and interpretation of complex research data. These technologies allow lecturers from different disciplines to co-develop research ideas and engage in real-time interaction regardless of location. In addition, they can be useful for creating models or physical objects for enhanced presentation of research work thereby promoting deeper understanding, innovation and collaborative research practices (AIGerafi et al., 2023). Google Forms plays a significant role in enhancing lecturers' research and development by facilitating efficient and cost-effective data collection, real-time data management, and automatic organization of research data. The platform enables researchers to design and distribute online questionnaires

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access responses instantly, and collaborate with other researchers seamlessly. Its integration with spreadsheet tools reduces data entry errors and supports accurate data analysis. Consequently, Google Forms improves research productivity, data quality, and overall efficiency in the research process (Evans & Mathur, 2018). The internet of Things enables the collection and sharing of data through interconnected digital devices. Advanced internet technologies such as 5G networks further enhance the speed of information retrieval, enabling researchers to access vast digital databases, collaborate with scholars globally, and disseminate research findings efficiently. In this regard, emerging technologies have become essential tools for modern research practices in higher education.

The increasing integration of emerging technologies in higher education has significantly transformed research practices in universities and other tertiary institutions worldwide. Studies have shown that the use of emerging technologies in higher education has grown rapidly over the past two decades particularly with the expansion of artificial intelligence and digital research tools that support academic inquiry and innovation (Akhmadijeva et al., 2024). These technologies enable lecturers improved data analysis efficiency, speed and accuracy, better access to extensive information resources, and enhanced collaboration (Arifin & Sukmawidjaya, 2020; Mardiana, 2020; Siegle et al, 2021).

Despite these benefits, the effective utilization of emerging technologies for research activities among lecturers in developing countries remains uncertain. In many tertiary institutions, especially within developing contexts, challenges such as inadequate technological infrastructure, insufficient digital skills, high cost technological tools, and poor internet connectivity continue to limit the effective adoption of emerging technologies for research and development. Consequently, although emerging technologies possess significant potential for enhancing academic productivity, their utilization among lecturer in tertiary institutions may vary considerably. It is therefore necessary to examine the extent to which lecturers utilize emerging technologies for research and development in tertiary institutions. Understanding the level of technology utilization among lecturers will provide insight into existing gaps, challenges, and opportunities for improving research productivity in higher education. Against this background,

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this study investigates the extent of utilization of emerging technologies for research and development among lecturers in tertiary institutions in Anambra State.

Statement of Problem

In contemporary higher education, emerging technologies have become important tools for enhancing research and development among lecturers. (Eleje et al., 2019; Saad & Sankaran, 2020). Technologies such as artificial intelligence, digital research databases, and advance internet connectivity enable researchers to access scholarly information quickly, analyze data efficiently, collaborate with scholars globally, and disseminate research outputs within shorter time frames (Bates, 2011, Mardiana, 2020). Ideally, lecturers in tertiary institutions are expected to leverage these technologies to improve research productivity and meet the increasing demands for academic publications and knowledge generation.

However, in many tertiary institutions several lecturers particularly those in polytechnics and colleges of education still rely heavily on traditional research approaches such as physically visiting libraries to source for information, manually searching for research materials, and depending on limited printed resources. These traditional methods are often time consuming and may delay research processes, making it difficult for lecturers to meet research deadlines and publication requirements (Eleje et al., 2019). In addition, challenges such as poor internet connectivity, high cost of digital technologies, inadequate technological infrastructure and limited digital competencies further constrain the effective utilization of emerging technologies to research and development (Onasanya et al., 2010, Oyedele et al., 2021).

The persistence of these challenges may hinder lecturers' research productivity, limit access to global knowledge resources, and reduce the competitiveness of research outputs generated in tertiary institutions. Despite the growing importance of emerging technologies in academic research, there is limited empirical evidence on the extent to which lecturers in tertiary institutions in Anambra State utilize these technologies for research and development. It is against this background that this study was conducted.

Objectives of the study

The main objective of study was to determine the extent of use of emerging technologies for research and development among lecturers in tertiary institutions in Anambra State. Specifically the study determined the:

1. extent of usage of emerging technologies for research and development by lecturers in tertiary institutions in Anambra State,
2. extent different factors militate against the use of emerging technologies for research and development by lecturers in tertiary institutions in Anambra State,
3. suggest strategies for seamless use of emerging technologies for research and development by lecturers in tertiary institutions in Anambra State.

Research Questions

The following research questions guided the study:

1. What is the extent of usage of emerging technologies for research and development among lecturers in tertiary institutions in Anambra State?
2. At what extent do different factors militate against the use of emerging technologies for research and development among lecturers in tertiary institutions in Anambra State?
3. To what extent will certain strategies enhance seamless use of emerging technologies for research and development among lecturers in tertiary institutions in Anambra State?

Hypotheses

Ho₁: There is no significant difference in the mean ratings of lecturers in Federal College of Education (Technical), Umuze and Federal Polytechnic, Oko in Anambra State on the extent of their use of emerging technologies for research and development.

Ho₂: There is no significant difference in the mean ratings of lecturers Federal College of Education (Technical), Umunze and Federal Polytechnic, Oko in Anambra State on the extent to which various factors hinder their use of emerging technologies for research and development.

Methods

The study adopted a descriptive survey research design, as it facilitated the collection of data from a large group of respondents in order to describe existing conditions without manipulation of variables. The population of the study comprised 1,138 lecturers drawn from two tertiary institutions—Federal College of Education (Technical), Umunze and Federal Polytechnic, Oko in Anambra State, Nigeria. The selection of these institutions was informed by their similarity in performance appraisal indicators and their adoption of a comparable salary structure under the Consolidated Polytechnic and Colleges of Education Academic Staff Salary Structure (CONPCASS), thereby ensuring uniformity in key institutional characteristics relevant to the study.

Given the large population size, the Taro Yamane (1967) formula for sample size determination was employed, which yielded a sample size of 296 respondents. A proportionate stratified random sampling technique was used to ensure fair representation of lecturers from each institution in the sample. Data for the study were collected using a structured questionnaire developed by the researchers. The instrument was validated by four experts: two Chief Lecturers from Federal Polytechnic, Oko, and two Chief Lecturers in the Department of Education (Measurement and Evaluation) from the Federal College of Education (Technical), Umunze. Their inputs ensured the content and face validity of the instrument. The validated questionnaire comprised 18 items structured into three sections (A-C), with each section containing six items. Each section was designed to address one of the three research questions raised in the study. Respondents rated each item on a four-point Likert scale of High Extent (HE), Moderate Extent (ME), Low Extent (LE), and No Extent (NE), with corresponding weights of 4, 3, 2, and 1, respectively.

A pilot test was conducted using 30 lecturers from Federal Polytechnic, Nekede, Owerri, who were not included in the main study. The internal consistency of the instrument was determined using

Cronbach's alpha coefficient, which yielded a reliability coefficient of 0.79, indicating acceptable internal consistency. The instrument was administered through face-to-face contact with the respondents to ensure a high response rate. Out of the 296 questionnaires distributed, 290 were retrieved and used for analysis, representing a response rate of 98%.

Data collected were analyzed using arithmetic mean and standard deviation to answer the research questions and determine the variability in respondents' opinions. Inferential statistics, specifically the independent samples t-test, were used to test the hypotheses at a 0.05 level of significance.

The decision rule for the research questions was based on the criterion mean of 2.50. Items with mean scores of 2.50 and above were regarded as indicating high extent, while those with mean scores below 2.50 were considered low extent. Similarly, cluster mean scores of 2.50 and above were adjudged as high extent, whereas those below 2.50 were classified as low extent. For hypothesis testing, the null hypothesis was not rejected when the calculated p-value was greater than 0.05, but rejected when the p-value was less than or equal to 0.05.

Results

Research Question 1: What is the level of emerging technologies usage for research and development among lecturers in tertiary institutions in Anambra State?

Table 1: Respondents' Mean Ratings on the Extent of Use of Emerging Technologies for Research and Development Among Lecturers in Tertiary institutions in Anambra State

S/N	ITEMS	MEAN	SD	REMARKS
1	Lecturers use AI for concept clarification and in-depth knowledge.	2.78	0.82	HE
2	Lecturers use AR and VR for their work presentations.	1.21	0.43	LE
3	Lecturers use Google forms to gather data from respondents.	1.38	0.55	LE
4	Lecturers utilize high-speed internet networks (such as 5G) for speedy retrieval of information.	2.00	0.86	LE
5	Lecturers analyze their data using applications for statistical analysis like SPSS, E-view.	2.27	0.64	HE

6	Lecturers use the internet for most of their research work.	3.71	0.45	HE
	Cluster mean	2.23		LE

Table 1 shows that item 6 recorded the highest mean score (3.71) indicating that lecturers largely use the internet for research activities. Items 1 obtained a mean score of 2.78, suggesting moderate utilization of Artificial Intelligence for research purposes. However, items 2, 3, 4 and 5 recorded lower mean scores ranging from 1.35 to 2.27, indicating limited use of augmented and virtual reality tools, Google Forms, high-speed networks and statistical applications for research activities. This implies that the overall extent of usage of emerging technologies for research and development among lecturers is relatively low. It was also seen in the cluster mean score of 2.23 which indicates that lecturers in tertiary institutions in Anambra State use emerging technologies for research and development to a low extent. The standard deviation values ranging from 0.43 to 0.86 indicate relatively close responses among lecturers, suggesting a moderate level of agreement in their ratings.

Research Question 2: What are the factors militating against its usage for research and development among lecturers in tertiary institutions in Anambra State?

Table 2: Respondents' Mean Ratings on the Factors Militating Against the Use of Emerging Technologies for Research and Development by Lecturers in Tertiary Institutions in Anambra State

S/N	ITEMS	MEAN	SD	REMARKS
1	High costs of procuring emerging technologies deter lecturers from acquisition of these technologies.	3.61	0.73	HE
2	Poor network connectivity impedes the lecturers from its usage.	3.87	0.33	HE
3	Nonchalant attitude of lecturers.	2.13	0.53	LE
4	Epileptic power supply poses as challenge to its usage.	3.77	0.42	HE
5	Lecturers have insufficient knowledge on their usage.	3.70	0.65	HE
6	Unverified / Junk information from internet discourages lecturers from its use.	1.83	0.59	LE

Cluster mean	3.15	HE
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The data in table 2 indicate that high cost of procuring emerging technologies (M=3.61, SD = 0.73), poor network connectivity (M =3.87, SD = 0.33), epileptic power supply (M =3.77, SD = 0.42), and insufficient knowledge of usage (M = 3.70, SD = 0.65) were rated to a high extent as factors militating against the use of emerging technologies for research and development among lecturers. However, nonchalant attitude of lecturers (M = 2.13, SD 0.53) and concerns about unverified or junk information from the internet (M =1.83, SD = 0.59) were rated to a low extent as factors militating against their use. The relatively small standard deviation values suggest consistency in the responses of the lecturers regarding these factors.

Research Question 3: To what extent will certain strategies enhance seamless use of emerging technologies for research and development among lecturers in tertiary institutions in Anambra State?

Table 3: Respondents' Mean Ratings on the Strategies for Seamless Use of Emerging Technologies for Research and Development by Lecturers in Tertiary Institutions in Anambra State

S/N	ITEMS	MEAN	SD	REMARKS
1	Subsidization of emerging technologies for ease of accessibility and use.	3.84	0.37	HE
2	Provision of central Wi-Fi for ease of connection to internet.	3.85	0.36	HE
3	Lecturers must be curious for improvement as to remain relevant in their profession.	3.81	0.39	HE
4	Constant power supply should be made available.	3.79	0.41	HE
5	Training and retraining of lecturers on the effective use of emerging technologies.	3.84	0.37	HE
6	Credibility of the site for seeking of information must be ascertained.	3.22	0.53	HE
	Cluster mean	3.725		HE

Table 3 reveals that item 2 recorded the highest mean score (3.85), followed closely by items 1 and 5 mean scores of 3.84, while items 4 and 6 recorded mean scores of 3.79 and 3.22 respectively. This indicates that all the listed items were regarded as viable strategies for improving the utilization of emerging technologies for research and development among lecturers in tertiary institutions in Anambra State. Furthermore, the standard deviation values ranging from 0.35 to 0.53 indicate relative agreement among the lecturers in their responses.

Test of Hypotheses

Hypothesis 1

H_{01} : A significant difference does not exist between the mean ratings of lecturers in Federal College of Education (Tech) Umunze and Federal Polytechnic, Oko in Anambra state with respect to extent of use of emerging technologies for research and development.

Table 4: Summary of t-test Analysis of Federal College of Education (Technical), Umunze Lecturers' Responses and Their Counterparts from Federal Polytechnic, Oko on the Extent of Use of Emerging Technologies for Research and Development in Tertiary Institutions in Anambra State

	Name of Institution	N	Mean	Std. Deviation	df	p-value	Decision
Extent_Usage_Tech	FCET UMUNZE	115	2.2145	.35442	288	0.073	H_{01} not rejected
	FEDPOLY OKO	175	2.2295	.38347			

The result in Table 4 shows that there is no statistically significant difference in the mean rating of lecturers from Federal College of Education (Technical), Umunze ($M = 2.2145$, $SD = 0.35442$) and Federal Polytechnic, Oko ($M = 2.2295$, $SD = 0.38347$) regarding the extent of use of emerging technologies for research and development, since the p-value (0.073) is greater than the 0.05 level

of significance ($df = 288$). This implies that both group of lecturers share similar opinions, and the null hypothesis of no significant difference is not rejected.

Hypothesis 2

H_{02} : There is no significant difference between the mean ratings of lecturers in Federal College of Education (Tech) Umunze and Federal Polytechnic, Oko in Anambra state with respect to factors militating against use of emerging technologies utilization for research and development.

Table 5: Summary of t-test Analysis of Federal College of Education (Technical), Umunze Lecturers' Responses and Their Counterparts from Federal Polytechnic, Oko on the Factors Militating Against the Use of Emerging Technologies for Research and Development in Tertiary Institutions in Anambra State

	Name of Institution	N	Mean	Std. Deviation	df	p-value	t-value	Cohen d	Decision
Factors_Militating_Usage	FCET	115	3.2725	.35136	288	0.000	-4.32	0.50	H ₀₂ Rejected
	UMUNZE								
	FEDPOLY OKO	175	3.0724	.43237					

Table 5 shows that lecturers from Federal College of Education (Technical), Umunze ($M = 3.27$, $SD = 0.35$) reported higher mean scores on factors militating against the use of emerging technologies than their counterparts from Federal Polytechnic, Oko ($M = 3.07$, $SD = 0.43$). The difference was statistically significant ($t(288) = -4.32$, $p < 0.001$), leading to the rejection of the null hypothesis.

The effect size (Cohen's $d = 0.50$) indicates a moderate difference, suggesting that lecturers in FCET Umunze experience these challenges to a greater extent than those in Federal Polytechnic, Oko.

Discussion of Findings

The study examined the extent of utilization of emerging technologies for research and development among lecturers in tertiary institutions in Anambra State. The findings revealed that lecturers frequently utilize the internet, Artificial Intelligence for concept clarification, and statistical software such as SPSS for data analysis. However, the utilization of other emerging technologies such as augmented reality (AR), virtual reality (VR), and digital tools like Google Forms for data collection was found to be relatively low. This suggests that although some digital technologies are being used in research activities, the adoption of more advanced emerging technologies remains limited among lecturers. These findings are consistent with earlier submission of Choeda et al. (2016), Onasanya et al. (2021), and Ike and Uzodimma (2021), which reported a relatively low level of technology integration in tertiary institutions.

The study further identified several factors militating against the utilization of emerging technologies for research and development. These include the high cost of acquiring emerging technologies, poor network connectivity, epileptic power supply, and insufficient knowledge of their effective use. The cluster mean of 3.15 indicates that these factors were experienced to a high extent among lecturers. This implies that systemic, infrastructural, and capacity-related challenges significantly hinder lecturers' ability to fully integrate emerging technologies into their research activities. These findings corroborate previous studies by Choeda et al. (2016) and Oyedele et al. (2021), which similarly identified infrastructural deficits and skill gaps as major barriers to technology adoption in higher education.

In addition, the study identified several strategies that could enhance the seamless utilization of emerging technologies for research and development. These include subsidizing technological facilities to improve accessibility, providing central WI-FI connectivity encouraging lecturers to develop a culture of continuous learning, ensuring stable power supply, and organizing regular training and retraining programmes for lecturers on the effective use of emerging technologies. These findings align with the studies of Boyd (2014), Collie et al. (2018), Ike and Uzodimma

(2021), and Mardiana (2020), which emphasized the importance of training, institutional support, and infrastructural development for effective technology integration in higher education.

However, a statistically significant difference was observed in their perceptions of factors militating against the use of emerging technologies. Lecturers from Federal College of Education (Technical), Umunze reported higher mean scores compared to their counterparts from Federal Polytechnic, Oko. The effect size analysis (Cohen's $d \approx 0.50$) indicates a moderate difference between the two groups. This implies that although both groups generally experience similar categories of challenges—as established in the descriptive findings—the degree or intensity of these challenges differs meaningfully across institutions.

This variation may be attributed to disparities in institutional infrastructure, funding availability, access to digital resources, and levels of technical training and administrative support. Studies have shown that institutional context plays a critical role in shaping how technology-related challenges are experienced in higher education. For instance, Aldoghi et al. (2025) emphasize that the adoption and impact of digital technologies are strongly influenced by organizational structures, resources, and institutional practices rather than technology alone. Similarly, Ochogo et al. (2014) found that differences in institutional preparedness, access to infrastructure, and support systems significantly affect how lecturers perceive and cope with technological challenges.

Therefore, while the barriers to the utilization of emerging technologies are pervasive across tertiary institutions, their impact is more pronounced in some institutional contexts than others.

Conclusion

The study concluded that the utilization of emerging technologies for research and development among lecturers in tertiary institutions in Anambra State remains relatively low despite the availability of some digital tools. Although lecturers frequently use the internet and statistical software for research purposes, the adoption of other emerging technologies such as augmented and virtual reality tools remains limited. The study also identified major barriers to effective utilization, including high cost of technology, poor internet connectivity, unstable power supply,

and insufficient technical knowledge. Addressing these challenges through institutional support, infrastructure development, and capacity building will significantly enhance the effective integration of emerging technologies into research and development activities in tertiary institutions.

Recommendations

The following recommendations are made from the conclusion drawn:

- 1) Government and institutional authorities should invest in technological infrastructure, including stable internet connectivity and reliable power supply to facilitate the effective utilization of emerging technologies for research and development
- 2) Tertiary institutions should partner with stakeholders such as TETFund, philanthropists, and corporate organizations to provide modern technological facilities that support research activities.
- 3) Regular training and retraining programmes should be organized for lecturers to enhance their competence in the use of emerging technologies for research and development.
- 4) Institutions should promote digital literacy among lecturers, particularly in evaluating the credibility of online information sources to ensure the reliability of research outputs.

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