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Impact of Brain Drain on Capacity Building of Electronic Technology in Universities in Rivers State, Nigeria.

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Abstract
*In today's world, electronic technology forms the foundation of modern civilization, powering innovations in every facet of life. Just like in many developed nations, electronic technology professionis expected to grow in capacity. However, Nigeria's capacity building efforts on electronic technology profession is highly threatened. This gap is what the study intends to fill. The study is aimed at investigating the impact of brain drain on capacity building of electronic technologyin universities in Rivers State. The study adopted 2 objectives, research questions and hypotheses to guide the study. Descriptive survey research design method was used for the study. The population size of the study was 65, which consist of 38 academic staff and 27 senior administrators from universities in Rivers State running technical education programmes. Stratified random sampling technique was used to determine the sample size of 30 academic staff and 20 senior administrators. The **q**uestionnaire was used as instrument for the study, which wasstructured on five-point Likert rating scale of Very High Extent (VHE=5), High Extent (HE=4), Moderate Extent (ME=3), Low Extent (LE=2) and Very Low Extent (VLE=1). The research instrument was subjected to face and content validity through expert review by specialists in educational research and electronic technology department. The reliability of the instrument was determined using the Cronbach's Alpha coefficient, with a threshold of 0.85 as acceptable. Data collected for the study were analysed using mean to answer the research questions and standard deviation to determine the homogeneity of the respondents' views. Z-test was used to test the null hypotheses at 0.05 level of significance. The findings of the study revealed that brain drain impacts negatively on the capacity building of electronic technology programmesin universities in Rivers State, by drastically reducing the availability of qualified academic staff and students' acquisition of practical skills.Owners of universities should improve the remuneration and welfare of academic staff to discourage migration; and that recruitment processes should be strengthened to ensure timely replacement of staff who left, thereby reducing workload on the remaining staff.*
***Keyword**: Impact, Brain drain, Capacity Building, Electronic Technology and University.*

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I. Introduction

Technical education in Nigeria is a vital component of the national education system. It is specifically designed to provide individuals with the practical skills, applied knowledge, and technological competencies required for economic development, industrial growth, and self-reliance. Unlike general education, which is often theory-driven, technical education emphasizes hands-on training, problem-solving, and innovation**.**In Nigeria, the need for technical education is anchored on the government's recognition that no nation can achieve sustainable development without a strong base of skilled manpower in science, technology, and industry (Omoniyi & Oyetade, 2024). Technical education in Nigeria remains a cornerstone for economic growth, industrialization, and national development. While challenges such as underfunding, poor perception, and inadequate facilities persist, strategic reforms and investments can reposition technical education as a driver of innovation, employment generation, and global competitiveness (Offiong, Utuk & Essien, 2024). One of the key objectives of technical education is to promote national development through innovation and the application of technology, which is expected to make technical education programme strong.A strong technical education programme will enable Nigeria to reduce unemployment, develop indigenous technology, and achieve its aspirations of becoming a fully industrialized nation. This form of education is offered at multiple levels, including technical colleges, polytechnics, colleges of education (technical), and universities.

University in Nigeria is the apex of the formal education system. It plays a crucial role in training highly skilled manpower, promoting research, and fostering socio-economic and technological development. It is regulated by the National Universities Commission (NUC)**,** which oversees accreditation, quality assurance, and standardization.As enshrined in the National Policy on Education (2013)**,** university education is expected to contribute to national development through high-level manpower training, research, and community service.

In essence, it is not only about acquiring degrees but also about building the intellectual, professional, and moral capacity of individuals to solve problems and advance society.University education is broad and multidisciplinary, offeringundergraduate programmes, postgraduate programmes, professional training and research opportunities**.** The system is designed to produce graduates who are globally competitive, adaptable, and capable of contributing to sustainable development. University education in Nigeria is a powerful tool for national development, providing manpower, research, and leadership for societal progress (Okeke & Isunueo, 2024**)**. However, challenges such as underfunding, brain drain, and curriculum gaps threaten its effectiveness. With sustained reforms, adequate funding, and a shift towards innovation-driven education, Nigerian universities can fulfil their mandate of producing globally competitive graduates and advancing the nation's economic, social development and technological areas like electronic technology.

Electronic technology is a branch of applied science and engineering that deals with the design, development, and application of devices, systems, and equipment that operate using the flow and control of electrons. It is a field of study that encompasses the principles of physics, materials science, and computer engineering, focusing on how electrical energy is converted, transmitted, and utilized for communication, computation, automation, and control (Onwusa, Okotubu & Okoye, 2025).In today's world, electronic technology forms the foundation of modern civilization, powering innovations in information and communication technology (ICT), medicine, aerospace, energy systems, and industrial automation.Electronic technology can be broadly described as the study and application of circuits, systems, and devices that control and manipulate electrical signals. Its main characteristics includesignal processing, miniaturization, automation and control, connectivity and innovation driven. Electronic technology is a cornerstone of modern society, enabling progress in communication, healthcare, energy, industry, and education. Globally, it continues to shape the way humans interact, learn, and innovate (Robinson, 2017). In Nigeria, while significant strides have been encouraged in the field of electronic technology, but much still needs to be done in terms of infrastructure development, local manufacturing, research investment, and human capital development.This implies that in Nigeria, there is need for a consistent and adequate capacity building of electronic technology in our universities. With appropriate policy direction and commitment to capacity building, electronic technology can become a key driver of Nigeria's industrialization and sustainable development (Onwusa, Okotubu & Okoye, 2025).

Capacity building is a broad concept that refers to the process of developing and strengthening the skills, competencies, institutions, and resources that individuals, organizations, and societies need to survive, adapt, and thrive in a fast-changing world. It is not just about training people, but also about improving systems, institutions, and the enabling environment in which they operate (Ogbebor & Oviawe, 2025). Globally, capacity building has become a central focus of sustainable development, as countries recognize that without adequate human and institutional capacity, investments in technology, infrastructure, and governance may not yield the desired outcomes (Akindele & Kehinde, 2023). Capacity building is the foundation of sustainable development, enabling individuals, institutions, and nations to maximize their potential and adapt to global challenges. For Nigeria, building capacity in education, technology, and governance is vital for addressing unemployment, reducing dependency on foreign expertise, and achieving industrialization. By investing in human capital, strengthening institutions, and fostering innovation, Nigeria can position itself as a competitive player in the global knowledge economy (Offor & Nwaru, 2024).In Nigeria, capacity building is a crucial strategy for addressing underdevelopment, unemployment, and weak academic professions like electronic technology. In essence, for electronic technology to thrivein our universities, capacity building must be adapted to meet emerging global challenges such as climate change, technological innovation, and globalization.However, Nigeria's capacity building efforts are hampered by many factors including brain drain.

Brain drain, also referred to as human capital flight, is the large-scale migration of highly skilled and educated individuals from one country (usually developing) to another (usually developed) in search of better economic, professional, and social opportunities. It involves the movement of doctors, engineers, scientists, lecturers, IT professionals, and other experts whose skills are critical for national development (Joshua, Olanrewaju & Ebiri, 2014).In the Nigerian context, brain drain has become a recurring challenge, particularly in the health, academic, and technology sectors, where professionals migrate due to poor working conditions, limited research opportunities, low remuneration, and political instability. Nigeria has witnessed massive brain drain since the 1980s, with professionals migrating to Europe, North America, the Middle East, and Asia. Brain drain is a double-edged phenomenon that has weakened the human capital base of developing nations like Nigeria. While it provides remittances and global exposure, its negative effects, such as weakened education systems, reduced research capacity, and loss of skilled manpower far outweigh the benefits.Brain drain has become one of the major challenges confronting developing countries, including Nigeria (Akporehe, 2022). Over the past few decades, Nigeria has witnessed a steady outflow of educated and experienced professionals, particularly in the fields of science, engineering, and technology, in search of better opportunities abroad. This

phenomenon has created a gap in human capital development, which directly affects the capacity of institutions to build and sustain advanced technological skills.

In the area of electronic technology, Nigerian universities especially those located in Rivers State, play a critical role in training the next generation of engineers, researchers, and innovators who are expected to drive industrial and digital transformation. However, the exodus of lecturers, researchers, and skilled technologists due to poor working conditions, limited research funding, inadequate infrastructure, and political instability has significantly reduced the capacity of universities to deliver quality education in this field of electronic technology. The loss of these professionals often results in a shortage of qualified instructors, low research productivity, weak mentorship systems, and limited exposure of students to emerging technologies. Furthermore, electronic technology is a fast-evolving discipline that requires continuous upgrading of knowledge and skills to remain relevant globally. When skilled academics and professionals migrate, they leave behind a vacuum that is often difficult to fill due to the slow pace of staff replacement and limited investment in capacity building. This undermines the ability of Nigerian universities to compete with their global counterparts and hampers the development of indigenous technological solutions to national challenges.

Therefore, understanding the impact of brain drain on the capacity building of electronic technology in Nigerian universities, using Rivers State as a case study is crucial. Rivers State, located in the Niger Delta region of Nigeria, is an oil-rich state with significant industrial growth, urbanization, manufacturing, renewable energy initiatives and commercial activities. Such an inquiry will provide insights into how the phenomenon affects human capital development, research output, and institutional growth. It will also highlight areas where policy interventions, improved welfare packages, and international collaborations can help to mitigate the negative effects of brain drain and strengthen the technological capacity of Nigerian universities.

II. Statement of the Problem

The development of electronic technology in any nation depends largely on the availability of skilled manpower, quality research, and institutional capacity building within universities. In Nigeria, universities are expected to serve as hubs for innovation, knowledge transfer, and the training of professionals who will drive technological advancement. However, this expectation is increasingly threatened by the persistent challenge of brain drain**.**In recent decades, Nigerian universities have witnessed the mass exodus of qualified lecturers, researchers, and technologists to countries where better remuneration, conducive working environments, and improved research facilities are provided (Agbeyangi, Makinde & Odun-Ayo, 2024). This outflow of skilled personnel has created a shortage of competent educators in electronic technology field of study, thereby weakening the teaching and learning process. As a result, students often graduate without adequate practical knowledge and exposure to emerging global trends in electronic technology (Robinson, 2017).

Despite government's policies and interventions, the rate of brain drain among professionals in science and technology continues to rise, raising concerns about the sustainability of capacity building in electronic technology. The critical question that arises, therefore, is: to what extent has brain drain affected the capacity of Nigerian universities to build, sustain, and advance electronic technology for national development?This unresolved challenge underscores the need to investigate the impact of brain drain on capacity building in electronic technology within Nigerian universities, using Rivers State as a case study, with a view to identifying its consequences and proposing actionable solutions.

Aim and Objectives of the Study

The aim of this study is to investigate the impact of brain drain on the capacity building of electronic technology in universities in Rivers State. Specifically, the study determined:

1. the extent to which brain drain impacts on the availability of qualified academic staff in electronic technology in universities in Rivers State.
2. the extent to which brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State.

Research Questions

The following research question guided the study:

1. to what extent does brain drain impacts on the availability of qualified academic staff in electronic technology in universities in Rivers State?
2. to what extent does brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State?

Hypotheses

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

1. there is no significant difference between the mean responses of academic staff and senior administrators on the extent to which brain drain impacts on the availability of qualified academic staff in electronic technology in universities in Rivers State.
2. there is no significant difference between the mean responses of academic staff and senior administrators on the extent to which brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State.

III. Research Methodology

The study adopted a descriptive survey research design. The descriptive survey research method is appropriate because it enables the researchers to collect data from many respondents to examine the impact of brain drain on capacity building of electronic technology in universities in Rivers State. The population of this study consist of academic staff in the departments of Electrical/ElectronicTechnology disciplines, and senior administrators in charge of academic planning and research& development in universities running technical education programmes in Rivers State. These universities are Rivers State University (RSU) and Ignatius Ajuru University of Education (IAUE). RSU consist of 14 academic staff and 16 senior administrators, while IAUE consist of 24 academic staff and 11 senior administrators. Hence, the population size was 65, which consist of 38 academic staff and 27 senior administrators.The study used stratified random sampling technique to ensure that academic staff and senior administrators are proportionately represented. The sample size was 30 academic staff and 20 senior administrators.Data was collected using structured questionnaire as instrument, administered to academic staff and senior administrators.The questionnaire was structured on five-point scale of Very High Extent (VHE=5), High Extent (HE=4), Moderate Extent (ME=3), Low Extent (LE=2) and Very Low Extent (VLE=1).

The research instrument was subjected to face and contentvalidity through expert review by specialists in educational research and electronic technology departments. A pilot test was carried out in Niger Delta University (NDU) Amassoma, Bayelsa State, which was not included in the main study. The reliability of the instrument was determined using the Cronbach's Alpha coefficient, with a threshold of 0.85 as acceptable.Data collected for the study were analyzed using mean to answer the research questions and standard deviation to determine the homogeneity or otherwise of the respondents' views. Z-test was used to test the null hypotheses at 0.05 level of significance. Where the p-value is less than or equal to 0.05, the null hypotheses is rejected, but if the p-value is greater than 0.05, the null hypotheses is accepted.

IV. Results

The findings of the study were obtained based on the results of the data analyzed below.

Research Question 1: To **w**hat extent does brain drain impacts on the availability of qualified academic staff in electronic technology in universities in Rivers State?

Table 1: Mean and Standard Deviation on the extent to which brain drain impacts on the availability of qualified academic staff in electronic technology programmes in universities in Rivers State.

		Academic Staff			Senior Admins		
S/NO	**ITEMS**	**X**	**SD**	**RMK**	**X**	**SD**	**RMK**
1	Brain drain has reduced the number of qualified lecturers in electronic technology departments.	3.57	.692	HE	3.81	1.039	HE
2	It is difficult to replace skilled staff who left universities in Rivers State.	3.56	.732	HE	4.11	.859	VHE
3	The shortage of experts due to brain drain has increased the workload on the remaining staff.	4.28	.750	VHE	4.35	.719	VHE
4	Brain drain has reduced mentorship opportunities for junior staff and students.	4.93	1.004	VHE	3.95	.932	HE
5	My department has a reduced number of daily lectures due to brain drain.	4.16	.941	VHE	4.42	.844	VHE
	Grand Mean	**4.10**	**0.82**	**VHE**	**4.13**	**0.88**	**VHE**

Data from Table 1 revealed that Academic Staff had a grand mean of 4.10 which indicates a Very High Extent, and a standard deviation of 0.82. Similarly, from same table 1, Senior Administrators had a grand mean of 4.13 which also indicates a Very High Extent, and standard deviation of 0,88. This implies that, both academic staff and senior administrators are of the opinion that there is a Very High Extent of brain drain impacts on the availability of qualified academic staff in electronic technology in universities in Rivers State. However, the standard deviation shows the homogeneity of the respondents.

Research Question 2: To what extent does brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State?

Table 2: Mean and Standard Deviation on theextent to which brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State.

		Academic Staff			Senior Admins		
S/NO	**ITEMS**	**X**	**SD**	**RMK**	**X**	**SD**	**RMK**
1	Brain drain has reduced opportunities for students to acquire hands-on skills in electronic technology.	4.23	.834	VHE	4.07	.838	VHE
2	There is a lack of skilled supervisors for students' practical and project work	4.40	.821	VHE	4.09	.808	VHE
3	Brain drain has weakened students' exposure to new technologies and practices.	4.09	.722	VHE	4.04	.947	VHE
4	Graduates of electronic technology in Nigerian universities are not adequately skilled for industry needs.	4.18	.658	VHE	4.19	.766	VHE
5	Brain drain has significant effect on the practical training of students.	4.05	.924	VHE	4.12	.982	VHE
	Grand Mean	**4.19**	**0.79**	**VHE**	**4.10**	**0.87**	**VHE**

Data from Table 2 revealed that Academic Staff had a grand mean of 4.19 which indicates a Very High Extent, and a standard deviation of 0.79. Similarly, from same table 2, Senior Administrators had a grand mean of 4.10 which also indicates a Very High Extent, and standard deviation of 0.88. This implies that, both academic staff and senior administrators are of the opinion that there is a Very High Extent of brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State. However, the standard deviation shows the homogeneity of the respondents.

Hypothesis 1 (Ho_1): There is no significant difference between the mean responses of academic staff and senior administrators on the extent to which brain drain impacts on the availability of qualified academic staff in electronic technology in universities in Rivers State.

Table 3: Z-test analysis on the extent to which brain drain impacts on the availability of qualified academic staff in electronic technology in universities in Rivers State.

Respondents		**N**	$\overline{X}$	**SD**	**α**	**DF**	**Z-Cal**	**Z-Crit**	**RMK**
Academic Staff	30	4.31	0.88						
0.05	48	1.22	1.96	Not Sig					
Senior Admins	20	4.19	0.83						

Result from Table 3 revealed that Z-cal. (1.22) is less than Z-crit (1.96) which indicates that the hypothesis stated was accepted. Therefore,there is no significant difference between the mean responses of academic staff and senior administrators on the extent to which brain drain impacts on the availability of qualified academic staff in electronic technology in universities in Rivers State.

Hypothesis 2 (Ho_2): There is no significant difference between the mean responses of academic staff and senior administrators on the extent to which brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State.

Table 4: Z-test analysis on the extent to which brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State.

Respondents		**N**	$\overline{X}$	**SD**	**α**	**DF**	**Z-Cal**	**Z-Crit**	**RMK**
Academic Staff	30	4.12	0.85						
0.05	48	1.23	1.69	Not Sig					
Senior Admins	20	4.19	0.83						

Result from Table 4 revealed that Z-cal. (1.32) is less than Z-crit (1.69) which indicates that the hypothesis stated was accepted. Therefore,there is no significant difference between the mean responses of academic staff and senior administrators on the extent to which brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State.

V. Discussion of Findings

The finding from research question 1 revealed that, both academic staff and senior administrators are of the opinion that there is a Very High Extent of brain drain impacts on the availability of qualified academic staff in electronic technology in universities in Rivers State. This implies that, brain drain impacts negatively on the capacity building of electronic technology in universities in Rivers State, by drastically reducing the availability of qualified academic staff. Hence, when qualified academic staff of electronic technology is not adequately available, capacity building of the programme becomes poor and inadequate in universities in Rivers State. Similarly, the finding from hypothesis 1 revealed that, there is no significant difference between the mean responses of academic staff and senior administrators on the extent to which brain drain impacts on the availability of qualified academic staff in electronic technology in universities in Rivers State. This implies that both academic staff and senior administrators are of the agreement that brain drain impacts negatively on the capacity building of electronic technology in universities in Rivers State, by drastically reducing the availability of qualified academic staff of the programme.This outcome aligns with Adebayo (2020), who noted that brain drain creates a vacuum in human capital that directly affects higher education in developing countries.

The finding from research question 2 revealed that, both academic staff and senior administrators are of the opinion that there is a Very High Extent of brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State. This implies that, brain drain impacts negatively on the capacity building of electronic technology in universities in Rivers State, by drastically reducing students' acquisition of practical skills. Hence, when students' acquisition of practical skills in electronic technology is very poor, capacity building of the programme becomes poor and inadequate in universities in Rivers State. Similarly, the finding from hypothesis 2 revealed that, there is no significant difference between the mean responses of academic staff and senior administrators on the extent to which brain drain impacts on students' acquisition of practical skills in electronic technology in universities in Rivers State. This implies that both academic staff and senior administrators are of the agreement that brain drain impacts negatively on the capacity building of electronic technology in universities in Rivers State, by drastically reducing students' acquisition of practical skills in the programme. This agrees with Gregory, Eseyin and Setiel (2023), who argued that universities affected by brain drain produce graduates with poor skill, hence having limited employability and low capacity to innovate in electronic technology industry.

VI. Conclusion

This study investigated the impact of brain drain on the capacity building of electronic technology in universities in Rivers State. It was established in the findingsthat; brain drain has significantly reduced the availability of qualified academic staff in electronic technology departments. The migration of skilled lecturers and technologists has left a vacuum that is not easily filled, resulting in increased workload, reduced mentorship, and weakened institutional strength. From the findings, it was also established that students' acquisition of practical skills has been compromised. Many students graduate without adequate exposure to industry-relevant training, largely due to the absence of experienced supervisors and outdated laboratory facilities. This has implications for employability and the country's technological development. Therefore, brain drain poses a serious threat to the capacity building of electronic technology in universities in Rivers State. Addressing this challenge requires deliberate policy interventions, sustained investment in higher education, and institutional reforms to create an environment that attracts, retains, and motivates skilled professionals.

VII. Recommendations

Based on the findings of this study on the impact of brain drain on the capacity building of electronic technology in universities in Rivers State, the following recommendations were made:

1. Owners of universities should improve the remuneration and welfare of academic staff to discourage migration.
2. Recruitment processes should be strengthened to ensure timely replacement of staff who leave, thereby reducing workload on the remaining staff.
3. Mentorship programmes should be institutionalized to preserve knowledge transfer between senior and junior academics.
4. Universities should upgrade laboratories and provide modern equipment to facilitate practical training.
5. Stronger partnerships with industries and technology firms should be developed to give students access to internships and hands-on experiences.

6. Regular workshops, exhibitions, and competitions in electronic technology should be organized to improve students' practical exposure.

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