ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2157

Research and Development in Nigeria's Tertiary Institutions: Issues, Challenges and Way Forward

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Abstract:- Nigeria's tertiary institutions' Research and Development (R&D) landscape is marked by a complex interplay of potential, challenges, and the urgent need for strategic reform. This paper delves into the multifaceted realm of R&D in Nigerian higher education, identifying key issues such as underfunding, inadequate infrastructure, and a lack of collaborative endeavours between academia and industry. Despite the recognised potential for these institutions to be powerhouses of innovation and socio-economic development, they face significant hurdles. Underfunding severely limits the scope and scale of research projects, while infrastructural deficits hinder the quality and efficiency of research outcomes. Additionally, the siloed nature of academia from industry in Nigeria stifles the translation of research findings into practical, marketable solutions that could benefit the broader economy. The paper further explores the consequences of these challenges, including diminished academic quality, reduced international competitiveness, and a lag in the contribution of Nigerian tertiary institutions to global knowledge production. Through a comprehensive review of existing literature and analysis of current R&D policies, the study presents a series of strategic recommendations to revitalise R&D in Nigeria's tertiary institutions. These include increasing government and private sector funding, enhancing research infrastructure, promoting interdisciplinary and collaborative research projects, and fostering stronger partnerships between universities and industries. The paper argues that implementing these recommendations is crucial for transforming Nigerian tertiary institutions into catalyst innovation, economic diversification, and sustainable development catalysts study contributes to the ongoing discourse on higher education reform in Nigeria by offering a detailed examination of the R&D ecosystem and proposing a forward-looking framework for enhancing research capacity and impact. By addressing the systemic barriers to effective R&D, Nigeria's tertiary institutions can play a pivotal role in achieving the nation's development objectives and positioning itself as a leader in the global knowledge economy.

I. INTRODUCTION

Research and Development (R&D) is a vital factor contributing to the success of developed countries worldwide, enabling them to lead in the industrial and high-tech era through innovations that enhance their global leadership position (Spithoven & Merlevede, 2023). R&D investments, predominantly funded by the government and supported by the public sector in these countries, have been pivotal in creating significant economic spillovers, both directly and indirectly, improving job creation, industrial capabilities, quality of life, and national security (Crespi et al., 2020). The strategic importance of R&D investments extends to enhancing a country's competitiveness in the global market by establishing a strong brand and creating niche products (von Brasch et al., 2021). Furthermore, in the context of globalisation and economic liberalisation, R&D acts as a cornerstone for countries aiming to develop, produce, and commercialise innovative products for the global market (Wang et al., 2021).

To improve the effectiveness and quality of R&D, developed countries have systematically involved universities, recognising them as crucial hubs for gathering intellectuals and scholars to undertake foundational research that drives innovation (Zhang et al., 2022). Rather than relying solely on consultancy, this collaboration between universities and the government has been vital in leveraging academic expertise to address diverse problems and advance knowledge (Audretsch & Belitski, 2020). Following the example of developed nations, the Malaysian government has decided to increase research project awards under FRGS and RUI to universities. The aim is to transform universities into centres of research excellence capable of generating new knowledge and providing solutions to various societal challenges, supported by adequate research funding (Vujanović et al., 2022). This initiative aligns with Malaysia's aspirations towards becoming a developed nation but necessitates comprehensive planning to ensure that universities can achieve these ambitious goals. Thus, the strategies adopted by developed countries in leveraging R&D through university partnerships serve as a model for enhancing Malaysia's R&D capabilities, with the hope that

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2157

within 15-20 years, Malaysia too can ascend to a position of global leadership in R&D.

➢ *Background*

With this in mind, the time is ripe for examining R&D in Nigeria and a way forward to a better tomorrow. This paper attempts to identify the issues and challenges faced in Nigeria's higher learning institutions and a way forward for more effective R&D in the future. Despite its benefits, R&D is risky as it encompasses innovation and technical changes that hope to produce new products or improve the existing product's viability. As a developing country, Nigeria has long recognised the importance of R&D in its plan for economic recovery and technological growth (Ukpabio et al., 2020). Notwithstanding this, Nigeria still has a long way to go. Nigeria continues to lag behind other countries in a similar development category, with R&D expenditure of 0.44% of Gross Domestic Product (GDP) being less than the recommended 1% R&D spending from the United Nations Educational, Scientific and Cultural Organization (UNESCO) (Olayiwola et al., 2021).

Research and Development (R&D) has been the cornerstone of development in industrialised nations and the provider of the much-needed leapfrog technologies that have enabled these nations to cut the gap between them and the advanced industrial countries. It is the prime force behind rapid technological changes and is a key element in attaining international competitiveness (Dobrzański et al., 2021). In the global context, R&D has been identified as the driving force towards self-reliance and the major factor in determining the relative growth rates of different countries (Ngangah, 2023). Furthermore, it's instrumental in fostering a culture of innovation and technological advancement, crucial for enhancing Nigeria's position in the global economy (Quadri, 2021).

➢ *Purpose of the Study*

This project aims to investigate the state of research and development in Nigeria's tertiary institutions and identify the problems militating against the much-desired research and development achievement. At the end of the project, a way forward would be suggested as a guide to a solution and a better tomorrow. Specifically, the programme aims to understand research and development activities in Nigeria's tertiary institutions. Also, to identify the roles and impact of policies made on education by the government towards research and development in tertiary institutions. The project seeks to identify research and development problems and their effects on tertiary institutions. It would also strive to suggest a possible solution. The project aims to do a comparative study of fund opportunities for research and development in countries abroad and Nigeria. This would be to know what efforts have been made and how fruitful they have been based on the situations in both circumstances and to learn one or two things that can be implemented in Nigeria to enhance research and development activities. Finally, it aims to be a document that could be used as a reference for someone seeking to know the state and problems of research and development in Nigeria's tertiary institutions.

➢ *Research Questions*

This study will look into various aspects of research and development in Nigeria's tertiary institutions. The following research will aim to identify the various issues and challenges faced. It will also benefit from elaborating strategies and possible solutions to these challenges. The research will highlight the reasons for the fall in research and development in these institutions and provide a detailed view of the amount of research and funding each institution receives. The essay will also expose the importance of research and development in tertiary institutions and highlight the issues and challenges using some institutions as a case study. The case study also used comparative analysis to examine Japan and Nigeria and the differences in research and development in the two countries. This is intended to identify some best practices used in other countries to boost research and development in institutions. Finally, the essay will also look at policy and governance, their impact on research and development in institutions, and the way forward from here.

II. CURRENT STATE OF RESEARCH AND DEVELOPMENT IN NIGERIA'S TERTIARY INSTITUTIONS

R&D at Nigeria's universities has a long history. An early attempt to promote R&D was the establishment of the National Universities Commission (NUC), an academic planning body created to develop a national policy and strategic plan for higher education in Nigeria. It aimed to meet the development requirements of Nigeria's new economic emphasis and developing technological production capabilities. The Commission sought to achieve these goals by increasing university research and training in science, technology, and social sciences with the expectation that well-trained, highly qualified manpower would be made available to plan and lead the nation to become a developed country (Ibeme, 2020). During its earlier years, the NUC made considerable financial resources available to universities for faculty development, research, and training. Unfortunately, these efforts did not produce the desired outcomes due to policy discontinuity and the volatile educational sector funding that ensued from Nigeria's oil booms and busts during the 1970s and 80s (Jesuleye et al., 2021).

Research and Development (R&D) is an essential activity for Nigeria's tertiary institutions, in which universities represent the nucleus of the nation's intellectual and innovative capabilities. In an era of globalisation and a knowledge-driven economy, R&D remains critical for economic growth and expansion, technological advancement, and societal development (Forson et al., 2021). In order to facilitate national development and global competitiveness, Nigeria's universities have embarked on the mission to create a vibrant R&D base. The objective is to imbibe a research culture that is capable of addressing national problems and needs, effectively utilising Nigeria's human and natural resources, and contributing to national well-being as well as engaging the global R&D community

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2157

to exploit the benefits of globalisation (Asaju, 2023; Abdulmalik, 2020).

- *Overview of Research and Development Activities*

Research and development (R&D) activity in Nigeria's tertiary institutions embraces the core functions of teaching and community services provided by the academia. Inadequacies in regular operational funding have resulted in these institutions heavily depending on earnings from student enrollment for funding R&D activities (Ibeme, 2020). The recent drastic reduction in public funding to higher education, following the general reduction in the allocation of resources to the education sector, has compounded the problem of funding R&D in tertiary institutions (Ogunode & Ade, 2023). The ramifications of this situation on the total national system of innovation are not fully perceived. However, they could be adverse, considering that the institutions are expected to be the hub of the country's system of innovation and knowledge production (OBIANAGWA et al., 2023).

A study on the national system of innovation in Nigeria points out that the ability of the national institutional framework to support the R&D activities in all the sectors and the ensuing active interactions amongst the sectors for the production and dissemination of knowledge are critical factors in the success of building a national system of innovation that can tackle the issue of sustainable development in the long run (Igiri et al., 2021). This suggests that there is a need to have a clear understanding and a rethinking of the role of tertiary institutions and the system of knowledge production in the development process and its implications on the R&D activities in those institutions (MOJI & ADEUGA 2020).

- *Challenges Faced by Tertiary Institutions*

There are several challenges affecting research in Nigerian universities. It is common knowledge that, in most cases, the environment is not conducive to promoting research. Nigerian tertiary institutions are saddled with teaching so much that little thought is given to whether knowledge is being created or new ideas generated through research. This is very damaging to the intellectual and professional development of academics, not to mention the students (Jacob et al., 2020). The country has not sorted out the dichotomy of the HND and BSc regarding graduate employability, and very little research has been done to determine whether polytechnic or university education is more suited to the country's needs (Ogunode & Ade, 2023). The role of academics has been relegated to teaching with large teaching loads, creating very little research time. Only a handful of students are interested in higher degrees, often only for career advancement (Raji & Oyedeji, 2021).

The vast majority of academics and students alike are not research-driven. Many business and government organisations are not interested in solving problems or improving productivity, as Nigeria lacks a knowledge creation and dissemination culture (Ladipo et al., 2022). Instead, they are interested in software acquisition or falling back on tried and tested methods. The poor educational infrastructure and the lack of research facilities in many institutions, notably public universities, make it very difficult to do any form of essential research (Ndayebom & Aregbesola, 2024). The inconsistency and severe fluctuation of government educational policies have also affected the system and led to confusion and inaction (Jacob et al., 2021). Improving education research to determine the causes and possible solutions to that and many other problems is necessary. The quality of education is believed to impact the nation's developmental efforts directly, and education itself is a prime area for human capital development and knowledge creation. This should be addressed from primary education through tertiary education. In terms of comparison between education in Nigeria and elsewhere, it will be easy for the rest of the world to pass Nigeria by, leaving the country to make many avoidable errors. This will largely be due to our lack of adequate research.

- *Impact of Limited Funding on Research and Development*

Research and experimental development are complex and expensive undertakings, and the available data clearly shows that concentrated research in Nigeria is facing severe financial obstacles (Azoro & Agulefo, 2023). Funding for research thus becomes an imperative issue, especially when considering the current world moving towards a knowledge-based economy. According to Clark's column model, there are four types of knowledge: routine, science-based, innovative, and professional, which are higher forms. The current situation for Nigeria would fall under lower forms of knowledge while the world is moving towards the higher forms (Nwaehiri et al., 2022). Technology worldwide has resulted in the development of many new products. Nigeria relies on adopting and adapting foreign technology rather than developing it and producing the new products mentioned above (Rostami et al., 2024). This explains why Nigeria continues to export crude materials and has lost significant money on its importation. Additionally, the prices of oil and other essential products are unreasonably dependent on the fluctuations of global prices, which are determined by the products Nigeria is exporting (Oladele et al., 2020).

Inspired by this, it is only through innovation and research that new ways of doing things and good products can boost the economy. The development of any nation depends on the general advancement of its human resources, which is accomplished through training and research (ADEKOGBE, 2020). On this premise, Nigeria places considerable significance on its tertiary education sector. The nature of training provided in these institutions is assessed to a great extent in terms of the graduates they produce and, therefore, the importance and relevance of their graduation to the country's set objectives and measures of training (Lu et al., 2023). Information from the public resources service showed that there were a total of 1,206 active research projects between 1993 and 1997. These involved 642 primary research tasks and 564 experimental development ones. Unfortunately, only 348 of these projects were completed by the end. Of the 12 Nigerian universities, the top 3 participated in 29% of the projects, while the last

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three participated in just 3.5%. However, the same amount of time was allocated for these projects.

III. STRATEGIES FOR ENHANCING RESEARCH AND DEVELOPMENT IN NIGERIA'S TERTIARY INSTITUTIONS

The strategies for enhancing research and development in Nigeria's tertiary institutions are multi-faceted. In proposing a strategy to improve collaboration between institutions and industries, A.T. Salawu (2003) outlines a systematic approach involving five stages. These stages are designed to bridge the gap between academic research and industry needs, fostering a symbiotic relationship that benefits both parties and the broader economy. The first stage involves identifying research priorities. Salawu suggests the establishment of a joint committee consisting of industry and academic representatives to identify common areas of interest for both parties (Salawu, 2023). This collaborative effort ensures that research initiatives are aligned with industry needs and can have practical applications, enhancing academic research's relevance and impact. Next, the research agreements that materialise from this initiative will define the terms and conditions of research and the sharing of knowledge between the two parties. Therefore, communication between institutions and industries must be enhanced to ensure the successful completion of these agreements (Omenyi & Odok, 2023). Effective communication channels facilitate the seamless exchange of ideas and findings, maximising the benefits of collaborative research efforts.

Academics and industry personnel must take a proactive approach to maximise mutual benefits from research outcomes. This involves formalising agreements, continuous engagement, and dialogue throughout the research process (Ogwu et al., 2023). Student work experience and internships will provide a means for students to increase industry awareness and readiness and apply the knowledge they have acquired throughout their academic studies (Eze et al., 2020). This practical exposure is invaluable, equipping students with the skills and experience necessary to transition effectively into the workforce, thereby increasing the employment rate of higher education graduates. The final stage involves establishing research and development centres as a focal point for research activities between institutions and industries (Adu et al., 2022). These centres would serve as hubs for innovation, providing the infrastructure and resources needed to support sustained collaborative research efforts. By focusing on areas of mutual interest and leveraging the strengths of academic institutions and industry, these centres can drive significant advancements in technology and knowledge production. In summary, enhancing research and development in Nigeria's tertiary institutions through improved collaboration with industry is a strategic imperative. By following Salawu's systematic approach, institutions can align their research efforts with industry needs, enhance the practical application of academic research, and prepare students more effectively for their future careers.

- *Strengthening Collaboration between Institutions and Industries*

Facilitating collaboration between Nigerian tertiary institutions and the industry involves tailoring research and teaching programs to meet industry needs, with active involvement from industrial representatives (Gatawa, 2020). Additionally, institutions can provide off-campus services and consultancy to bridge the gap between academia and industry (Solomon et al., 2020). While local industry collaboration presents immediate benefits, researching global issues through partnerships with multinational companies and international organisations can integrate Nigeria into the global economy, offering local solutions to global problems (FASANYA et al., 2023). A successful partnership between academia and the Nigerian industry can address both sectors' challenges. Industry often encounters costly problems due to a lack of research capabilities. By providing relevant research, tertiary institutions can mutually benefit (Amadi & Nwogu, 2023). Industry-sponsored research equips institutions with resources and practical opportunities while involving students and cultivating graduates with industry-relevant skills (Austin, 2020). This collaboration aims to establish a long-term connection, enhancing research and development capabilities in both sectors.

Despite the potential, the academic research environment in Nigeria faces challenges such as low morale, resource scarcity, and outdated methodologies, contributing to a 'brain drain.' Many students and faculty members opt to conduct research abroad, believing it offers better opportunities. Addressing this trend is crucial for solving local challenges and advancing progress. Internationally, Nigerian institutions can enhance their research capabilities by seeking overseas funding and creating collaborative programs with foreign institutions, starting with information exchange and evolving into joint research projects and personnel exchanges (Ibeme, 2020). Establishing collaborative ties between academic institutions and the industry is paramount for advancing research and development in Nigeria (Jacob et al., 2020). This synergy is a crucial driver for innovation, ensuring academic efforts align with industry needs. Collaboration should be pursued locally, internationally, and among Nigerian institutions (Ogunode & Ade, 2023). Locally, institutions can pool resources for joint research and teaching programs, sharing laboratory facilities, expensive equipment, and personnel, enhancing efficiency and scope (Abodunde & Jegede, 2020). In the social sciences, collaborative research can analyse societal problems and inform policy and practice (Igiri et al., 2021). Collaborative efforts maximise resource use, foster cooperation, and contribute to national research and development progress.

- *Promoting Research Culture and Capacity Building*

There was a time when Nigerian universities and other higher institutions launched pads for national development, problem-solving, and innovations tailored to national needs. Unfortunately, those times have become mere flickers of memories, as highlighted by Mohamed and Abdulle (2023). Nowadays, there's almost a complete emphasis on

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knowledge dissemination and qualifications, with most tertiary institutions competing to certify their students as capable of performing specific tasks. This situation is exacerbated by the priority of publicly funded research institutions, which is given to problems of national relevance, often using research to secure funds rather than those resources to solve the problems at hand (Adamu et al., 2023). The current allocation of only 0.2% of GDP to research starkly contrasts with the 1% recommended by UNCON (16), underscoring that research has been relegated to the backseat in rebuilding our nation (Agri & Emmanuel). Scholarly research forms the foundation of development, and its importance for societal advancement cannot be overstated (O'Neill, 2021). Research serves society as R&D does to industry; it is a process of inquiry through which significant and lasting contributions are made to knowledge, furthering people's understanding of the world (Imoloame, 2021). Research represents intellectual exploration for new ideas and knowledge, specifically enhancing the capacity and capability to solve real-world problems. The fast-changing global environment pressures researchers to keep pace with international developments. It is a glaring fact that the capacity and capability of an organisation, and by extension, a nation, are directly reflected in the capacity and capability of its researchers. A low-capacity individual inevitably leads to a low-capacity organisation, an analogy that holds in both micro and macro contexts. This highlights the pressing need for a revitalised focus on enhancing research capabilities within Nigerian higher institutions to foster national development and global competitiveness.

- *Improving Funding Mechanisms for Research and Development*

In recent years, the Federal Government has made concerted efforts to support Research and Development (R&D) in tertiary institutions and other organisations. This assistance has manifested through various channels, facilitated by several administrative bodies and parastatals. Most of this support has been direct financial support for research activities at individual tertiary institutions (Wapmuk, 2021). Other avenues of support have included block grants for R&D to universities, R&D cost-sharing with industry, and the provision of physical and infrastructure support. This has encompassed the direct funding of research infrastructure, such as laboratories and research centres, and research assets like computers and scientific equipment (Aregbeshola, 2021). Support for R&D in tertiary institutions was a cornerstone of the Nigerian government's April 1980 initiative to foster economic development. This initiative had three main prongs: firstly, to strengthen the interaction between research institutes and industry; secondly, to transfer modern scientific and technological findings into practical skills and applied technology, particularly in indigenous machine building and equipment production; and thirdly, to mobilise Nigerian tertiary institutions for original research aimed at solving specific technological problems and developing new prototypes for industries (Dike et al., 2020).

This initiative is still regarded as the most significant policy statement by the government concerning the role of tertiary institutions in national development through R&D (Ozuluonye et al., 2022). The emphasis on creating a synergy between research institutions and industry, alongside mobilising tertiary institutions for original research, underscored a comprehensive strategy to leverage R&D for economic development and industrial innovation (Nwadiubu & Onwuka, 2021). The government's ongoing support for R&D reflects a commitment to enhancing the research capabilities of tertiary institutions and aligning them with national development objectives.

- *Enhancing Policy Support for Research and Development*

Two critical aspects of policy are relevant to research activities in tertiary institutions. The first aspect involves formulating institutional policies, encompassing various administrative and research issues. The second aspect pertains to the broader policy environment in which these institutions operate, especially concerning funding and the overarching framework for conducting research. Generally, Nigerian tertiary institutions have encountered significant challenges in developing research-specific policies and have faced considerable difficulties in implementing such policies (Imoni et al., 2023). Furthermore, lacking a supportive broader policy environment has been identified as a significant long-term constraint on Nigerian institutions' research and training capacity (Taiwo & Joseph, 2020).

At the institutional level, a key priority is to enhance the capacity of individual institutions to formulate and implement administrative and research policies that bolster a robust research culture. This endeavour will necessitate interventions to develop relevant skills within institutions and improve coordination regarding research policy issues within the higher education sector (Olatunde-Aiyedun & Hamma, 2023). Given the diversity of the higher education sector, different types of institutions will require tailored support. In particular, there is an opportunity to develop a robust research role for some comprehensive institutions possessing a broad range of disciplinary expertise (Cross et al., 2023). Conversely, other institutions may optimally contribute to a broader research culture by functioning as centres of excellence in a limited number of disciplines and fostering collaboration with other institutions and the broader international research community (Olatunji et al., 2023). This nuanced approach acknowledges different tertiary institutions' varied capabilities and roles within Nigeria's higher education landscape. Addressing the institutional capacity for policy formulation and the broader policy environment can significantly enhance the research and development ecosystem within Nigerian tertiary institutions. This, in turn, could lead to more effective contributions to national development and a stronger position in the global academic and research community.

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IV. CONCLUSION

Previous investigations on the R&D theme, problems and S&T core outlined a weakening relationship between invention and knowledge creation. This function was at a range of levels, including explicit ones. It was suggested that rather than focusing on the path of invention to communication of knowledge and new processes to development outcomes, invention and a single-minded attempt to reverse-engineer advance were at the fore, significantly affecting what was communicated to those taking over the R&D mantle. Also noted was the lack of an integrated approach to knowledge and instruction and research objectives being met without regard to tertiary education implications.

It has been shown on numerous occasions that rapidly changing technology is rarely followed by structural and pedagogical shifts at the tertiary level. The material becomes quickly outdated, and students find that the content they have learned has little relevance to the mass of technology and development practice. This aspect calls for more excellent networking between tertiary institutions and industry both within R&D activity and in attempts to translate the gains made in R&D to better development outcomes. The academics involved in such undertakings must bring their students into the process as an investment in the future of development practice in Nigeria. Currently, the nature of knowledge to be communicated and process to be taught is very rarely the same work undertaken in Nigerian development, and the long-term effects of this dispersion are grim.

- *Summary of Findings*

The study reveals that Nigeria's tertiary institutions have experienced slow growth in research activities, which initially matched developed countries post-independence but has stagnated since. This sluggish growth has led to reliance on foreign technology and expertise. The lack of a robust research and development system hampers technology and knowledge transfer, risking perpetual dependence on external solutions and unsuitable foreign technology. The poor state of research underscores the need for enhanced development in this area, especially within academia, where its research and teaching strength gauges the value of a university. Nigerian universities and research institutions are not highly regarded, with university research aimed at high technology being sporadic rather than institutionally driven. There is general apathy among university teachers and researchers towards research, reflected in inadequate funding for educational institutions. Without sufficient funding, research efforts are bound to fail. A former Nigerian Minister of Science and Technology emphasised that Nigeria's aim to develop a science and technology-led economy is futile without proper research and development, which should have been prioritised during the oil boom years of the 1970s and 80s. This lack of research persists, highlighting the ongoing neglect of addressing Nigeria's technical and socio-environmental challenges.

- *Recommendations for Future Actions*

To increase funding outside the national budget, there is a need to mobilise more significant funding from the private sector. Numerous multinational corporations and industries in Nigeria, yet only a few are actively involved in joint research projects with tertiary institutions. An incentive for the private sector to fund research and development is that the recent Nigerian tax reforms have provided tax benefits for companies involved in research and development while allowing tax deductibility for the expenses incurred in R&D. This is an opportune time to encourage greater private sector involvement in funding research and development and tax incentives can be further revised to provide more benefits. Mobilisation of required resources, which are found inadequate for research and development in Nigeria's tertiary institutions, involves allocating substantial funds and providing adequate facilities for research and development. In this regard, there is an urgent need to increase budgetary allocation to the education sector to a meaningful level; according to UNESCO, Nigeria and other developing countries in Africa pledged in 1996 to allocate to the education sector 26% of the annual national budget. Currently, the Nigerian government spends only 8-10% of its annual budget on the education sector, which is grossly inadequate, considering that the education sector is the largest employer in Nigeria. The amount allocated to research and development is even lower, reflected in Nigerian institutions' poor quality and quantity of research output.

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