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Contributions of Tertiary Institutions to National Development in Nigeria: A Critical Review of Their Roles in Key Economic Sectors

Olumoyo Aderonke Esther, Ph.D¹, Abimbola Christianah Aina², Adesola Michael Babatunde³

1. Federal College of Education Technical Akoka Lagos, Department of Educational Foundation and Management
2. Ekiti State University Ado Ekiti, Department of Educational Management
3. Ekiti State University, Ado – Ekiti, Department of Educational Management

* Correspondence: aderonke.olumoyo@fcetakoka.edu.ng, christianah0751@gmail.com, michaelbabatunde6@gmail.com

Abstract: This paper critically reviews the contributions of tertiary institutions to national development, with particular attention to key economic and social sectors including healthcare, agriculture, engineering and infrastructure, information and communication technology, education, industry and entrepreneurship. The paper adopts a critical review approach, drawing on policy documents, institutional reports, empirical studies and relevant literature on higher education, research and national development in Nigeria. The review establishes that Nigerian universities, polytechnics, colleges of education and other tertiary institutions contribute significantly to the production of skilled professionals, generation and dissemination of knowledge, development of agricultural technologies, training of health personnel, provision of engineering and digital skills, support for entrepreneurship, and provision of evidence for public policy. However, the developmental contribution of these institutions is constrained by inadequate and irregular funding, obsolete infrastructure and research facilities, weak university-industry linkages, skills mismatches, limited commercialisation of research findings, inadequate collaboration and weaknesses in the implementation of research outcomes. The paper argues that the developmental value of tertiary institutions should be assessed not only through enrolment, graduation and publication statistics but also through research utilisation, innovation, graduate employability, industry partnerships, entrepreneurship, policy influence and measurable community impact. The paper recommends increased and sustainable funding, improved research infrastructure, stronger university-industry-government collaboration, greater emphasis on applied and problem-oriented research, strengthened entrepreneurship and innovation ecosystems, curriculum reforms and improved mechanisms for translating research into products, policies, services and technologies. It concludes that tertiary institutions constitute critical components of Nigeria's human-capital and national innovation infrastructure and that strengthening their capacity is essential for sustainable and inclusive national development.

Keywords: tertiary institutions, universities, national development, human capital, research, innovation, Nigeria.

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1. Introduction

Tertiary education is an important component of national development because it provides advanced human-capital formation, generates knowledge, develops professional competencies and creates opportunities for technological and socioeconomic transformation. In contemporary knowledge-based economies, the capacity of a country to develop and utilise knowledge is closely associated with the quality and effectiveness of its higher-education institutions. Tertiary institutions therefore perform functions that extend beyond classroom instruction and the award of academic qualifications. They

serve as centres for research, innovation, professional development, entrepreneurship, community engagement and policy support. In Nigeria, universities, polytechnics, colleges of education, monotechnics and other specialised tertiary institutions constitute important components of the national system for developing the human and intellectual resources required for economic and social transformation.

Nigeria's development challenges make the role of tertiary institutions particularly significant. The country requires skilled professionals to support healthcare, agriculture, education, engineering, manufacturing, information and communication technology, public administration and other productive sectors. It also requires research and innovation capable of addressing challenges relating to food security, public health, infrastructure, energy, unemployment, environmental sustainability and digital transformation. Consequently, the developmental contribution of tertiary institutions cannot be adequately understood by considering them merely as institutions that produce graduates [1]. Their broader contribution lies in their capacity to generate knowledge, develop solutions to societal problems and transfer knowledge and technologies to government, industry and communities.

The Nigerian National Policy on Education recognises high-level manpower development, reduction of skill shortages, promotion of scholarship and entrepreneurship, generation and dissemination of knowledge, and contribution to national economic goals as important objectives of tertiary education. These responsibilities place tertiary institutions at the centre of Nigeria's human-capital development strategy. Their graduates occupy professional and technical positions across virtually every major sector of the economy, while their researchers contribute to scientific knowledge, technological development and evidence-based policymaking. The contribution of tertiary institutions is particularly visible in sectors such as healthcare and agriculture. Medical schools, teaching hospitals and university-based research centres train doctors, nurses, pharmacists, biomedical scientists and other health professionals while also contributing to medical research and specialised healthcare services. Similarly, agricultural faculties and research institutes undertake research on crop production, animal science, agricultural engineering, soil management, food processing and climate-resilient agriculture [2]. Such activities have the potential to improve productivity, strengthen food security and support rural livelihoods.

Tertiary institutions also contribute to engineering, infrastructure and the digital economy through the production of engineers, technologists, computer scientists, software developers and other technical specialists. Universities and polytechnics provide training and research relevant to transportation, construction, energy, telecommunications, manufacturing and information technology. The increasing importance of digital technologies has further expanded the role of tertiary institutions in developing the digital skills required for employment, entrepreneurship and innovation. Research and training in these areas can contribute to productivity and economic diversification when supported by appropriate infrastructure and effective links with industry.

Another important contribution is the generation and utilisation of research. Nigerian tertiary institutions produce research across a wide range of disciplines, including health, agriculture, engineering, economics, education, environmental studies and social sciences. Research funding mechanisms such as the Tertiary Education Trust Fund's National Research Fund have provided support for research addressing national priorities. However, the existence of research output does not necessarily guarantee developmental impact. Weak university-industry relationships, inadequate research infrastructure, limited funding, inappropriate research orientation and poor commercialisation mechanisms can prevent research findings from being transformed into products, services, technologies and policies [3]. Against this background, this paper critically reviews the contributions of tertiary institutions to national development in

Nigeria, focusing on their roles in key economic and social sectors. It examines their contributions to human-capital development, healthcare, agriculture and food security, engineering and infrastructure, ICT, scientific research, industrial development, entrepreneurship, teacher education, public policy, community development and national innovation capacity. The paper also identifies major constraints limiting the effectiveness of these contributions and proposes measures for strengthening the capacity of Nigerian tertiary institutions to contribute more effectively to sustainable national development.

2. Materials and Methods

2.1 Conceptual Terms

2.1.1 Concept of Tertiary Institutions

Tertiary institutions are institutions that provide education after post-basic education and include universities, inter-university centres, polytechnics, monotechnics, colleges of education, innovation enterprise institutions and other specialised institutions such as colleges of agriculture and schools of health and technology. This is the definition used in Nigeria's National Policy on Education. Tertiary institutions can be defined as post-secondary institutions established to provide advanced academic, professional, technical and vocational education and training. In Nigeria, these institutions constitute the higher level of the national education system and provide qualifications ranging from certificates and diplomas to undergraduate and postgraduate degrees.

Tertiary institutions are organised educational establishments that provide advanced teaching, professional training, research and knowledge development beyond secondary education. Their developmental purpose includes producing skilled manpower, reducing skill shortages and preparing learners for employment and self-reliance. These functions are explicitly recognised in Nigeria's National Policy on Education. Tertiary institutions may be defined as higher-level educational and research organisations responsible for generating, preserving, transmitting and applying knowledge through teaching, research, innovation, professional training and community engagement. This understanding moves beyond the narrow conception of tertiary institutions as places where students obtain degrees and recognises their role in national knowledge and innovation systems. UNESCO similarly identifies education as a mechanism for developing the knowledge, skills and capacities needed to address economic, social and environmental challenges.

Tertiary institutions are formal post-secondary educational organisations established to produce high-level manpower, develop knowledge and skills, promote research and development, encourage entrepreneurship and community service, and contribute to national economic and social development. This definition closely reflects the Nigerian policy position, which states that tertiary education should contribute to national development through high-level manpower training, reduce skill shortages, promote scholarship and entrepreneurship, foster national unity, and generate and disseminate knowledge and competencies that contribute to economic goals.

2.1.2 Concept of National Development

National development can be defined as the sustained process through which a country improves the economic, social, political, technological, human and environmental conditions of its population. It therefore goes beyond economic growth to include improvements in education, healthcare, employment, infrastructure, equality, governance and quality of life. This broad understanding is consistent with the United Nations' view that sustainable development requires the harmonisation of economic growth, social inclusion and environmental protection. National development refers to the progressive improvement in the welfare and capabilities of citizens through deliberate government and societal actions. From this perspective, development is achieved when people gain greater access to quality education, healthcare, decent employment, social protection, productive opportunities and other conditions necessary for a meaningful life.

The United Nations links development to inclusive economic and social progress and the reduction of inequalities.

National development may also be understood as the process through which a nation transforms its productive capacity by developing human resources, institutions, technology, infrastructure and economic systems capable of generating sustainable wealth. Education is particularly important within this definition because UNESCO identifies education as a fundamental means through which individuals develop the knowledge and capabilities required for broader development. National development is a continuous process of transforming a country's economic and social structures in ways that improve present living conditions while protecting the ability of future generations to meet their needs. This definition incorporates the principle of sustainability: development must simultaneously consider economic progress, social welfare and environmental protection. National development can be defined as the systematic advancement of a nation through the development and effective utilisation of human and material resources to achieve national goals. In the Nigerian educational context, this includes developing high-level manpower, reducing skill shortages, promoting entrepreneurship, strengthening community service and generating knowledge that contributes to national and local economic goals. These objectives are explicitly incorporated into Nigeria's National Policy on Education.

2.1.3 Theoretical Framework: Human Capital Theory

2.1.3.1 Human Capital Theory

This study is anchored on the Human Capital Theory, which explains that education and training constitute investments that enhance the knowledge, skills, competencies, and productive capacities of individuals. Becker argues that investment in human capital improves individual productivity and generates wider economic benefits. From this perspective, tertiary institutions are important instruments of national development because they produce skilled manpower, undertake research, promote innovation, and facilitate the transfer of knowledge and technology.

In the Nigerian context, universities, polytechnics, and colleges of education contribute to national development by preparing graduates for participation in various economic sectors. Their contributions extend beyond the production of graduates to include research and development, entrepreneurship development, technological innovation, professional training, and community engagement. These functions can influence productivity and economic transformation in sectors such as agriculture, manufacturing, healthcare, education, ICT, and public administration.

The relevance of Human Capital Theory to this study lies in its ability to explain the relationship between tertiary education and national development. Where tertiary institutions provide relevant and high-quality education, conduct useful research, and develop industry-relevant skills, they can contribute to a more productive labour force and support economic growth. Conversely, weaknesses such as inadequate funding, obsolete infrastructure, curriculum–industry gaps, limited research capacity, and graduate unemployment may reduce the extent to which tertiary institutions translate educational investment into national development outcomes. The theory therefore provides a useful framework for critically reviewing the roles and contributions of Nigerian tertiary institutions across key economic sectors. It suggests that the developmental impact of tertiary education depends not simply on the number of institutions or graduates produced, but also on the quality, relevance, accessibility, and utilization of the human capital and knowledge generated by these institutions.

2.1.4 Contributions of Tertiary Institutions to National Development in Nigeria

2.1.4.1 Contribution to Human-Capital Development

The most fundamental contribution of tertiary institutions to national development is human-capital development. Universities, polytechnics and colleges of education produce the doctors, nurses, engineers, teachers, lawyers, economists, accountants,

agricultural scientists, administrators, ICT specialists and other professionals who operate the Nigerian economy. The importance of this function is supported by Nigeria's graduate-tracer initiative. The NUC's collaboration with UNIDO and the Industrial Training Fund was specifically designed to determine whether science and engineering graduates possessed the knowledge and skills required by the workplace. The study covered graduates from 2009–2014 and examined their employability and job satisfaction in relation to the skills acquired from university. From the Nigerian scholarly perspective, this means that the value of tertiary education should be measured not simply by enrolment or graduation figures but by the extent to which graduates become productive participants in national development. Ogunode and colleagues' recent work on knowledge production similarly places capacity building at the centre of the developmental role of tertiary institutions. The relationship between tertiary education and human-capital development is not automatic. Agbeke, Ofem, and Yahya's recent empirical study of state-owned universities in Ogun State, using institutional data covering 2015–2024, found a very strong positive and statistically significant relationship between research funding and internal efficiency of human-capital development ($r = .904$, $p < .05$). The finding suggests that the quality of human capital depends partly on the resources available to institutions to support research, staff development and institutional operations.

2.1.4.2 Contribution to the Health Sector

Nigerian tertiary institutions have made significant contributions to healthcare through medical education, nursing, pharmacy, biomedical sciences, public-health research and teaching hospitals. University medical schools have produced generations of medical practitioners and health professionals who constitute a substantial component of the country's health workforce. The research function of universities is equally important. University-based research centres undertake studies on infectious diseases, maternal and reproductive health, cancer, genetics, epidemiology, pharmaceuticals and other health challenges. This allows tertiary institutions to contribute simultaneously to health-worker production, scientific knowledge and clinical practice. The contribution becomes clearer when tertiary education is considered as an integrated system. A medical school does not simply award medical degrees; it provides clinical training, produces postgraduate specialists, conducts research and provides services to surrounding communities. In this regard, tertiary institutions become part of the health system itself. Nigerian scholars' emphasis on research and innovation reinforces this position. Ogunode, Nwisagbo, and Amachree (2025) identify research and innovation and community engagement as central mechanisms through which tertiary institutions contribute to sustainable development. In healthcare, these functions appear in the form of medical research, clinical training, public-health education and specialised services. The University of Ibadan's Institute for Advanced Medical Research and Training (IAMRAT), for example, conducts research in malaria, cancer, genetics, pharmaceutical research, environmental health, HIV/AIDS, epidemiology and other health fields. The institute reports that its facilities are used by postgraduate and undergraduate researchers from different Nigerian universities and that it trains more than 10 PhD and 20 master's students annually. The significance of university-based medical research is demonstrated by Nigeria's network of specialised research and training centres. Under the African Centres of Excellence programme, Nigerian universities secured centres covering genomics of infectious diseases, neglected tropical diseases, reproductive health, phytomedicine and other health-related areas. This contribution goes beyond classroom teaching. Medical schools and university research centres simultaneously perform three functions: training health personnel, generating medical knowledge and supporting clinical practice. A critical point, however, is that the existence of medical schools does not automatically guarantee excellent healthcare. Research on Nigerian undergraduate

medical education identifies continuing challenges involving curriculum relevance, teaching resources and technological facilities.

3. Result

3.1 Contribution to Agriculture and Food Security

Agriculture provides another strong example of the developmental contribution of tertiary institutions. Agricultural universities and faculties undertake research in crop science, animal science, soil science, agricultural economics, agricultural engineering, fisheries, forestry and food technology. The contribution is not merely theoretical. Nigerian universities and research institutions have developed and disseminated improved agricultural technologies and crop varieties. Ahmadu Bello University's Institute for Agricultural Research, for example, has contributed to the release of improved crop cultivars for Nigerian farmers. Such research provides a direct link between academic knowledge and agricultural productivity. This is an important form of national development because research results are translated into productive agricultural technologies rather than remaining exclusively within academic publications. The Federal Government has also identified agriculture and food security as a priority research area for TETFund's National Research Fund. Its research framework includes agriculture and food security alongside health, transport, power, ICT, engineering, water and sanitation. University research has consequently contributed to agricultural productivity through improved crop varieties, agricultural technologies, extension knowledge and training of agricultural professionals. This contribution is increasingly important because the World Bank's 2026 agricultural-development programme identifies low agricultural productivity, limited access to quality inputs, climate shocks and weak market linkages as continuing constraints on Nigerian agriculture. The programme specifically includes agricultural research and extension services and improved climate-resilient seeds among its interventions. Ogunode, Nwisagbo, and Amachree argue that tertiary-institution knowledge production should be connected to societal problems and sustainable development. In agriculture, this implies that the ultimate value of university research should be demonstrated by its ability to improve farming practices, productivity, food processing, agricultural employment and food security [4].

3.2 Contribution to Engineering and Infrastructure Development

Engineering education in universities and polytechnics has contributed significantly to Nigeria's infrastructure and industrial manpower. Civil, mechanical, electrical, chemical, agricultural, computer and petroleum engineers are products of tertiary institutions. Nigeria's infrastructure development requires specialised knowledge in transportation, construction, energy, telecommunications, water systems, environmental engineering and manufacturing. Tertiary institutions supply this knowledge through teaching, research, consultancy and professional development. The relationship between tertiary institutions and industrial development is reflected in the NUC graduate-tracer initiative. The programme specifically examined science and engineering graduates in relation to the needs of the petrochemical and steel subsectors. This is evidence that the relevance of tertiary education is closely connected to industrial manpower requirements. The challenge, however, is that the existence of engineering programmes does not automatically translate into industrial transformation. Universities need modern laboratories, equipment, research grants and stronger industry partnerships. Dahunsi makes a related argument concerning research generally: Nigeria conducts substantial higher-education research, but the quality, applicability and implementation of the research remain important concerns.....noted that the role of tertiary institutions is reflected in the National Research Fund's thematic structure [5]. TETFund identifies transport, power and energy, science and engineering, water and sanitation, industry, innovation and infrastructure as priority research areas. The NUC's accreditation records also show that engineering programmes across Nigerian universities are subject to

assessment of academic matters, staffing, physical facilities, research collaboration and employer ratings. For example, the 2024 accreditation assessment of Agricultural and Biosystems Engineering at the Federal University of Agriculture, Abeokuta recorded strong performance across academic matters, staffing, facilities, research/collaboration and employer rating and resulted in full accreditation. Universities and polytechnics therefore contribute to infrastructure development in two ways: first, by producing engineers and technical personnel; and second, by developing knowledge and technologies that can be applied to infrastructure problems.

3.3 Contribution to Information and Communication Technology

The digital economy has created another important area of tertiary-institution contribution. Universities and polytechnics train software developers, computer scientists, information-system specialists, telecommunications experts, data analysts and other digital professionals. ICT education also provides opportunities for entrepreneurship and remote employment. Nigerian tertiary institutions have therefore become important sources of digital human capital. This contribution is consistent with the knowledge-production argument advanced by Ogunode, Nwisagbo, and Amachree, who identify innovation, collaboration, capacity building and knowledge dissemination as important mechanisms through which tertiary institutions contribute to sustainable development [6]. The establishment of the TETFund Education Research and Academic System (TERAS) also demonstrates the increasing digitisation of Nigeria's tertiary-education knowledge system. TETFund reports that TERAS connects 225 public tertiary institutions and provides access to digitised undergraduate and postgraduate research and other scholarly works. This development is significant because it changes research from isolated institutional activity into a more interconnected national knowledge ecosystem. Also, the World Bank's Nigeria Digital Economy Diagnostic argues that Nigeria requires strategic investment in digital connectivity, digital skills and digital financial services to unlock economic opportunities, create jobs and transform lives. The connection between university training and digital employment has also been demonstrated empirically. A World Bank-supported randomized evaluation involving Nigerian university graduates found that participants receiving ICT training were 26% more likely to work in the ICT sector two years later. This finding is important because it provides empirical evidence that higher-level skills development can affect the occupational destination of graduates [7]. More recently, the World Bank has emphasised advanced digital and technical skills within tertiary education as part of building digital economies, while stressing the importance of stronger university-industry connections.

3.4 Contribution to Scientific Research and Knowledge Production

Research is one of the clearest ways through which tertiary institutions contribute to national development. Universities generate knowledge that can inform policy, improve professional practice and produce technological innovations. Ogunode, Nwisagbo, and Amachree directly identify knowledge production as a critical driver of sustainable development in Nigeria. Their review found that research and innovation, curriculum development, policy influence, community engagement, collaboration and capacity building are among the major ways tertiary institutions contribute to development. Similarly, Adedeji argues that higher education has a pivotal role in sustainable development, particularly through research and innovation. Nkang's research on higher-education research and economic growth in Nigeria also examined the relevance of higher-education research to economic development using evidence from lecturers in Nigerian universities. The implication is that university research should not remain an academic exercise disconnected from production, government and social development. Ogunode, Nwisagbo, and Amachree's earlier study on research output is even more direct. They identified poor university-industry synergy, limited access to grants, inadequate research infrastructure, weak research policies, political factors, inappropriate research focus and inadequate research funding as factors limiting the utilisation of

tertiary-institution research output [8]. This is an important critical point: Nigeria's problem is not simply lack of research; it is also the weak conversion of research into products, policies, services and technologies.....opined that the NUC's Research, Innovation and Information Technology Directorate explicitly defines its mission around facilitating relevant, innovative and quality-driven research that meets national and global economic needs. Its responsibilities include sponsoring research relevant to national development and facilitating innovations in Nigerian universities. TETFund provides an important financial mechanism. Under its National Research Fund, ₦3.9 billion was awarded to 128 research projects in the 2019 grant cycle, while the Fund subsequently approved ₦7.5 billion for the 2020 cycle. The research themes cover agriculture, health, transport, energy, ICT, engineering, water, industry, national security, economic development and entrepreneurship. TETFund has also acknowledged continuing research-infrastructure problems. Its 2024 national survey found significant gaps, including outdated facilities, equipment-utilisation problems and limited inter-faculty collaboration. Thus, Nigerian tertiary institutions make an important contribution to knowledge production, but the national return from research is constrained when research findings do not move effectively from laboratory → prototype → industry → market → society [9].

3.5 Contribution to Industrial Development and University–Industry Linkages

Tertiary institutions contribute to industrial development through manpower production, consultancy, industrial training, research collaboration and technological innovation. The NUC graduate-tracer study provides direct evidence of this connection because it examined the relationship between university-acquired skills and the needs of industrial sectors. The problem is that the relationship between universities and industry remains weaker than required. The National Universities Commission has recognised the importance of determining whether university graduates possess the skills required by industry. Its pilot graduate tracer study, conducted with UNIDO and the Industrial Training Fund, examined the employability and job satisfaction of science and engineering graduates and compared their university-acquired skills with workplace requirements [10]. The study also specifically considered the petrochemical and steel subsectors. Similarly, NBTE's mandate includes liaison with industries, tracer studies, industrial attachment and coordination of research and innovation in polytechnics. This demonstrates that the relationship between tertiary institutions and industry is institutionalised within the regulatory architecture, even though the effectiveness of that relationship varies considerably across institutions and sectors. Ogunode, Nwisagbo, and Amachree (2024) found poor synergy between industries and tertiary institutions to be one of the factors limiting the utilisation of research output. This finding has an important implication. A university may produce a technically excellent research result, but if there is no company prepared to test, finance, manufacture and commercialise it, the economic impact remains limited [11], [12]. Thus, national development requires a stronger university–industry–government research triangle.

3.6 Contribution to Entrepreneurship and Employment Creation

Tertiary institutions increasingly contribute to employment through entrepreneurship education, innovation centres, business incubation and skills acquisition. TETFund's entrepreneurship interventions provide an institutional mechanism for supporting entrepreneurship in public tertiary institutions. More broadly, the recent TETFund–UNDP partnership explicitly focuses on strengthening research commercialisation, innovation, entrepreneurship, digital transformation and job creation within Nigerian tertiary institutions. TETFund described the partnership as part of the movement towards an innovation-driven economy. This represents an important shift from the traditional expectation that graduates should primarily seek salaried employment. Universities and polytechnics are increasingly expected to prepare students to become job creators, innovators and technology entrepreneurs [13]. However, graduate

entrepreneurship should not be romanticised. Entrepreneurship cannot solve all graduate-employment problems when access to finance, infrastructure, electricity, markets and industrial demand remains constrained. Therefore, entrepreneurship education must be accompanied by a supportive economic environment.

Tertiary institutions contribute to national development by preparing people for employment, but the evidence also demonstrates an important qualification: education alone cannot create jobs. The NBS Labour Force Survey for Q1 2024 recorded an unemployment rate of 2.0% among people with postgraduate education and 9.0% among those with post-secondary education. The ILO has identified chronic skills mismatches, limited labour-market transparency and weaknesses in employment services as important factors affecting Nigeria's labour market. This means that tertiary institutions contribute through skill formation, but national development depends on the interaction between education quality, economic structure, private-sector growth, industrial policy and labour-market demand. The most useful way to judge the contribution is therefore not simply by counting graduates but by asking whether graduates can be absorbed into productive sectors, create enterprises, improve existing organisations and contribute to technological and social innovation.

3.7 Contribution to Teacher Education and Educational Development

Tertiary institutions are the foundation of Nigeria's teacher-development system. Colleges of education and universities prepare teachers who subsequently serve in primary and secondary schools [14]. This creates a powerful multiplier effect. The contribution of a university lecturer in teacher education extends beyond the students directly taught because those students may subsequently teach hundreds of children and adolescents. Research generated in faculties of education also contributes to curriculum development, educational planning, policy formulation, school administration and pedagogical improvement. Ogunode, Nwisagbo, and Amachree identify curriculum development and knowledge dissemination among the major pathways through which tertiary institutions contribute to sustainable development. This is particularly applicable to education faculties because their research directly influences how teaching and learning are organised.

3.8 Contribution to Public Policy and National Planning and Community Development

Tertiary institutions constitute an important reservoir of expertise for government. Economists, political scientists, educationists, sociologists, public-health specialists, engineers, lawyers and other academics contribute research and expert advice to public institutions. Beyond manpower production, universities conduct research that informs public policy. The University of Ibadan Research Foundation, for example, describes research translation into innovations, strategies and evidence for policy as important to national development, particularly in agriculture, commerce, energy, health, infrastructure and security. The significance of this function should not be underestimated. Government decisions concerning taxation, education, health, agriculture, population, economic management, conflict resolution and environmental protection require evidence. Universities provide an institutional environment where such evidence can be generated, tested and debated. The NUC similarly assigns its research and innovation structures responsibility for developing and monitoring university research policies in line with national goals and needs. The policy function of universities is explicitly identified by Ogunode, Nwisagbo, and Amachree, who regard the policy influence and advisory role of tertiary institutions as a significant part of their contribution to sustainable development. The importance of evidence-based policy is particularly relevant to Nigeria because government programmes require reliable research on education, poverty, health, employment, agriculture, infrastructure and population. The TETFund Executive Secretary's 2026 lecture on driving national

development through research and innovation similarly places research and innovation at the centre of the relationship between tertiary institutions and national development.

Also, the contribution of tertiary institutions extends beyond campus boundaries. Universities conduct community-based research, agricultural extension, health outreach, adult education, legal assistance, environmental studies and professional consultancy. Ogunode, Nwisagbo, and Amachree specifically identify community engagement and extension services as mechanisms through which tertiary institutions support sustainable development [15]. This function is particularly important in developing communities where universities may be among the few institutions with laboratories, professional experts and specialised knowledge. A university can therefore serve as a development hub for its immediate community.

3.9 Contribution to Gender and Social Development and National Innovation Capacity

Tertiary education also contributes to social development by expanding access to professional knowledge and creating opportunities for women and other historically underrepresented groups. Universities provide women with pathways into medicine, engineering, law, education, economics, science, management and research. The presence of women in academic and professional positions has implications for household welfare, labour-force participation and representation in decision-making. However, the contribution should be interpreted alongside persistent inequalities in access, leadership representation, research opportunities and academic advancement [16]. Thus, tertiary institutions are simultaneously agents of social transformation and sites where wider social inequalities may be reproduced. Ogunode, Ukozor, & Abiodun, noted that a critical modern function of tertiary institutions is the development of national innovation capacity. Innovation is not restricted to inventions. It includes new production processes, improved agricultural practices, digital systems, educational technologies, health interventions, management systems and policy approaches. TETFund's current direction illustrates this transition. Its partnership with UNDP is designed to accelerate innovation, digital transformation and the knowledge economy through Nigerian tertiary institutions. Ogunode, Nwisagbo, and Amachree similarly place research and innovation at the centre of sustainable development. Therefore, universities should increasingly be regarded as national innovation infrastructure, rather than merely institutions for awarding academic certificates [17].

3.10 Tertiary Institutions as Centres of Applied Research

A particularly important development is the increasing expectation that Nigerian universities should move from knowledge transmission to knowledge production and knowledge application [18]. The University of Ibadan provides an instructive example. Its Research Foundation was established around the idea of translating research into innovations, strategies and evidence for policy and national development. Its collaborative research priorities have included agriculture, energy, health, water resources and infrastructure. The African Centres of Excellence programme provides another empirical demonstration. Nigerian universities secured 10 of the first 19 centres selected in the West and Central African programme, with Nigerian centres covering STEM, health and agricultural sciences. These examples show that Nigerian tertiary institutions are capable of producing internationally relevant research when appropriate funding, infrastructure, collaboration and institutional leadership are [19].

3.11 Critical Assessment of the Contribution

Although Nigerian tertiary institutions have made substantial contributions, the evidence also reveals an important paradox: Nigeria has considerable academic knowledge production but comparatively weak knowledge utilisation. Ogunode, Nwisagbo, and Amachree (2024) identify poor university-industry relationships, inadequate research funding, poor research quality, inadequate infrastructure, weak research policy and inappropriate research focus among the factors responsible for poor

utilisation of research output. Dahunsi reaches a related conclusion, observing that the issue is not simply whether research is being conducted but whether its quality and recommendations are sufficiently strong and implemented to address societal challenges. A recent empirical study by Agbeke, Ofem, and Yahya provides another dimension. Their ten-year institutional analysis of state-owned universities in Ogun State found a strong positive relationship between research funding and internal efficiency of human-capital development [20], [21]. This suggests that funding is not merely an administrative issue; it has implications for the quality and efficiency of the developmental functions of universities. The policy implication is clear: Nigeria should move from measuring tertiary institutions predominantly by student enrolment, number of graduates and number of publications toward measuring their contribution through research utilisation, patents, innovations, graduate employment, industry partnerships, community impact, policy influence and economic value created.

4. Discussion

Based on the critical review of the contributions and challenges of tertiary institutions in Nigeria, the following measures are suggested to strengthen their role in national development:

a. *Increase and Sustain Funding for Tertiary Education*

Government should increase funding for tertiary institutions and ensure that funding is timely, predictable and sufficient to support teaching, research, infrastructure and staff development. Particular attention should be given to research funding because the availability of research resources has implications for the quality of human-capital development and knowledge production [22]. Funding mechanisms such as TETFund should continue to support national-priority research while ensuring transparent, competitive and effective allocation of research resources.

b. *Modernise Research and Teaching Infrastructure*

Federal and state governments, together with tertiary institutions and development partners, should prioritise the rehabilitation and modernisation of laboratories, workshops, libraries, ICT infrastructure, teaching facilities and specialised research centres. Engineering, medical, agricultural and science-based programmes require functional facilities if graduates are to acquire practical competencies relevant to contemporary workplaces. Modern infrastructure would also improve the ability of researchers to conduct internationally competitive and locally relevant research.

c. *Strengthen University-Industry-Government Collaboration*

There is a need to establish stronger and more systematic relationships among tertiary institutions, industry and government. Universities and polytechnics should work more closely with industries in curriculum design, student industrial training, research projects, product development and technology transfer [23]. Industry representatives should participate more actively in identifying emerging skills requirements, while government should create policies and incentives that encourage firms to invest in university-based research and innovation.

d. *Promote Applied and Problem-Oriented Research*

Research funding should increasingly support research that addresses clearly identified national and community problems. Priority should be given to areas such as food security, healthcare, renewable energy, transportation, manufacturing, digital technologies, climate adaptation, water and sanitation, education and public policy. At the same time, basic research should not be neglected because many technological and scientific breakthroughs originate from fundamental research [24].

e. *Improve Research Commercialisation and Technology Transfer*

Nigerian tertiary institutions should establish or strengthen technology-transfer offices, innovation hubs, incubators and research-commercialisation units. Researchers should receive institutional support to move promising findings from the laboratory to

prototypes, production, markets and public use. Intellectual-property management should also be strengthened so that researchers and institutions can appropriately protect and commercialise innovations [25].

f. Reform Curricula to Reflect Labour-Market and Societal Needs

Curricula should be periodically reviewed to ensure that graduates possess relevant technical, digital, entrepreneurial, professional and problem-solving skills. Greater emphasis should be placed on practical training, experiential learning, interdisciplinary education and emerging areas of technology [26]. Curriculum development should involve employers, professional bodies, researchers and other stakeholders so that training remains responsive to changes in the economy.

g. Strengthen Entrepreneurship and Innovation Education

Entrepreneurship education should move beyond theoretical instruction to practical enterprise development. Tertiary institutions should provide students with access to incubation facilities, mentorship, business-development support, innovation competitions and opportunities to develop marketable products and services. However, entrepreneurship initiatives should be integrated with access to finance, infrastructure and markets because entrepreneurship education alone cannot overcome broader structural constraints on business development [27].

h. Improve Graduate Employability and Labour-Market Linkages

Tertiary institutions should establish stronger career-development and graduate-tracking systems. Graduate tracer studies should be conducted regularly to determine employment outcomes, skills gaps and employer satisfaction. The findings should inform curriculum review, teaching methods and institutional planning. Stronger links between institutions and employers would also improve opportunities for internships, apprenticeships, industrial attachment and work-integrated learning.

i. Strengthen Staff Development

Academic and technical staff should have regular opportunities for postgraduate education, professional development, research training and exposure to contemporary technologies. Staff-development programmes should particularly strengthen research methodology, digital competencies, innovation, entrepreneurship, grant writing, intellectual-property management and industry collaboration. Improving staff capacity would enhance both teaching quality and research productivity [28].

j. Promote Inter-Institutional and International Research Collaboration

Nigerian tertiary institutions should increase collaboration among universities, polytechnics, research institutes and other knowledge organisations. Collaborative research can facilitate the sharing of specialised equipment, expertise and research data while reducing duplication of effort. International partnerships should also be expanded where they provide opportunities for skills development, technology transfer, joint research and access to global research networks.

k. Strengthen Community Engagement and Extension Services

Tertiary institutions should develop systematic mechanisms for transferring knowledge to surrounding communities. Agricultural extension, health outreach, adult education, legal services, environmental programmes and community-based research can enable universities and other institutions to address local development challenges [29]. Community engagement should therefore be incorporated into institutional planning and performance assessment.

l. Establish Broader Measures of Institutional Performance

Assessment of tertiary institutions should go beyond student enrolment, graduation rates and publication counts. Institutional performance should also consider graduate employment, patents, innovations, research utilisation, technology transfer, industry partnerships, policy influence, entrepreneurial outcomes and community impact [30]. Such measures would provide a more meaningful assessment of the actual contribution of tertiary institutions to national development.

h. Improve Research Policy and Coordination

Government agencies responsible for tertiary education and research should strengthen coordination among research funding, higher-education policy, industrial policy and national development planning. Research priorities should be linked to clearly defined national development objectives while preserving academic freedom and encouraging diverse areas of inquiry. A coordinated national research and innovation framework would reduce fragmentation and improve the utilisation of research findings [31].

i. Encourage Evidence-Based Public Policy

Government at federal and state levels should make greater use of expertise available in tertiary institutions when designing and evaluating public programmes. Universities should be encouraged to establish policy and research centres capable of translating academic findings into accessible policy evidence. Such collaboration can improve the quality of decisions relating to education, healthcare, agriculture, employment, infrastructure, environmental management and economic development [32], [33], [34], [35].

j. Ensure Greater Inclusion and Equal Opportunities

Policies should promote equitable access to tertiary education and research opportunities across gender, geographical location, socioeconomic background and disability status. Particular attention should be given to reducing barriers that limit participation in science, technology, engineering and mathematics [36], [37]. Greater inclusion would expand Nigeria's pool of human capital and allow a wider proportion of the population to participate in knowledge-based economic activities.

5. Conclusion

Tertiary institutions constitute a critical component of Nigeria's national development system. Their contributions extend beyond the conventional functions of teaching and the award of academic qualifications to include human-capital development, scientific research, technological innovation, entrepreneurship, healthcare, agricultural development, engineering, digital transformation, teacher education, public-policy support and community development. Universities, polytechnics, colleges of education and other tertiary institutions provide the skilled professionals and knowledge required to operate and transform major sectors of the Nigerian economy. The review demonstrates that the developmental contribution of tertiary institutions is particularly significant in key sectors such as health, agriculture, engineering, ICT and education. Through professional training, research and community engagement, tertiary institutions contribute to the development of health personnel, agricultural technologies, engineering expertise, digital skills and educational capacity. Their research activities also provide opportunities for addressing national problems and informing government policy. Initiatives involving research funding, graduate tracer studies, entrepreneurship programmes, digital research platforms and university-industry partnerships demonstrate the increasing recognition of tertiary institutions as components of Nigeria's knowledge and innovation system. Nevertheless, the review also reveals a substantial gap between knowledge production and knowledge utilisation. Nigerian tertiary institutions produce research and skilled graduates, but inadequate funding, weak research infrastructure, skills mismatches, limited university-industry collaboration, insufficient commercialisation mechanisms and weaknesses in policy implementation constrain the extent to which these outputs generate wider economic and social benefits. Consequently, the developmental effectiveness of tertiary institutions depends not only on the quantity of graduates and research produced but also on the extent to which knowledge and skills are effectively connected to productive activities, public policy, industry and community needs. The paper therefore argues that tertiary institutions should be viewed as **national human-capital and innovation infrastructure** rather than simply as institutions for

credential acquisition. Their contribution should be evaluated through broader indicators that include graduate employability, research utilisation, technological innovation, entrepreneurship, industry partnerships, policy influence and community impact. Strengthening these functions requires sustained investment in infrastructure and research, curriculum reform, staff development, stronger university-industry-government partnerships and more effective systems for transferring research findings into practical applications. Ultimately, the ability of Nigerian tertiary institutions to contribute to national development will depend on the strength of the relationship between education, research, industry, government and society. A tertiary-education system that produces relevant skills, generates useful knowledge and successfully transfers that knowledge into products, services, policies and social interventions can make a substantial contribution to Nigeria's economic diversification and sustainable development. Strengthening this system should therefore remain an important component of national development planning.

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