Nigeria's Transition to Knowledge-Based Economy: A Triple Helix Approach*

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Introduction

Within the last few decades, experience has shown that our world is now driven by knowledge and technology rather than by ideology. In order to be relevant and competitive therefore, countries design and implement development policies to complement the traditional determinants of productivity – labour, capital, materials and energy by incorporating knowledge and technology in their development trajectory.

In recent times, knowledge is incorporated more directly in theories and models of development under the general term New Growth Theories. There is a firm connection between the activities of the government and movement towards what the UK Department of Trade and Industry (1988) called "a knowledge driven economy (in which) the generation and exploitation of knowledge play the predominant part in the creation of wealth." Today, over 60% of workers in the developing world are knowledge workers who contribute remarkably to the GDP of their countries (Obafemi, 2014). In the more developed countries of the world, the connection among higher education, especially Universities, Industry and Government (Triple Helix) has been credited with national and regional innovations; massive wealth creation and general economic successes (Laydesdorff and Etzkowitz, 1997; Todeva, 2013; Cai, 2014). In this framework, tertiary institutions are gradually regaining their position as viable drivers of social and economic change in countries (Etzkowitx, 2002; Safiulin, Fatkhiev and Grigorian, 2014).

Essentially, the development of the knowledge economy was made possible by the changing relationship between world-class

universities and business organisations in the 1980s and 1990s. Such relationship was established because universities stretched their mission and developed entrepreneurial focus making their research outputs functional and relevant to the industry and the society, at large. The challenge is how to replicate this relationship in Nigeria so as to generate momentum for transition from a resource-dependent country to a knowledge-based economy. This, however, depends greatly on the quality of knowledge production, structure for knowledge-exchange and mechanism for knowledge transfer.

Attempting to establish a concrete and positive nexus between the knowledge-based economy (or k-economy) and economic development of nations is the main focus of this paper. Specifically, the paper attempts to show a strong relationship between investment in higher education required for producing a highly productive and well-educated workforce and the creation of knowledge-based society. The treatment of k-economy will be both evolutionary and revolutionary - how it evolved, conditions necessary for its attainment and sustenance, and the factors responsible for its success. Considering that University-Industry-Government partnerships are not common In developing countries, such as Nigeria, the changing roles of Higher Educational Institutions (HEIs) in driving innovation would be examined along with the binding constraints to effective knowledge production and transfer.

It is also worth noting that a government intervention in strengthening HEIs to help build a strategic innovation network is crucial. As such, the paper examines the nature of interventions of the Tertiary Education Trust Fund (TETFund), being an organisation directly involved with funding HEIs in Nigeria, and the impact that such interventions are making or ought to make in strengthening HEIs to drive the Triple Helix system. At the end, the paper proffers some practical recommendations for policy fine-tuning necessary for catalysing the TETFund-induced initiatives to strengthen triple Helix with the hope of fast-tracking Nigeria's movement into the k-economy.

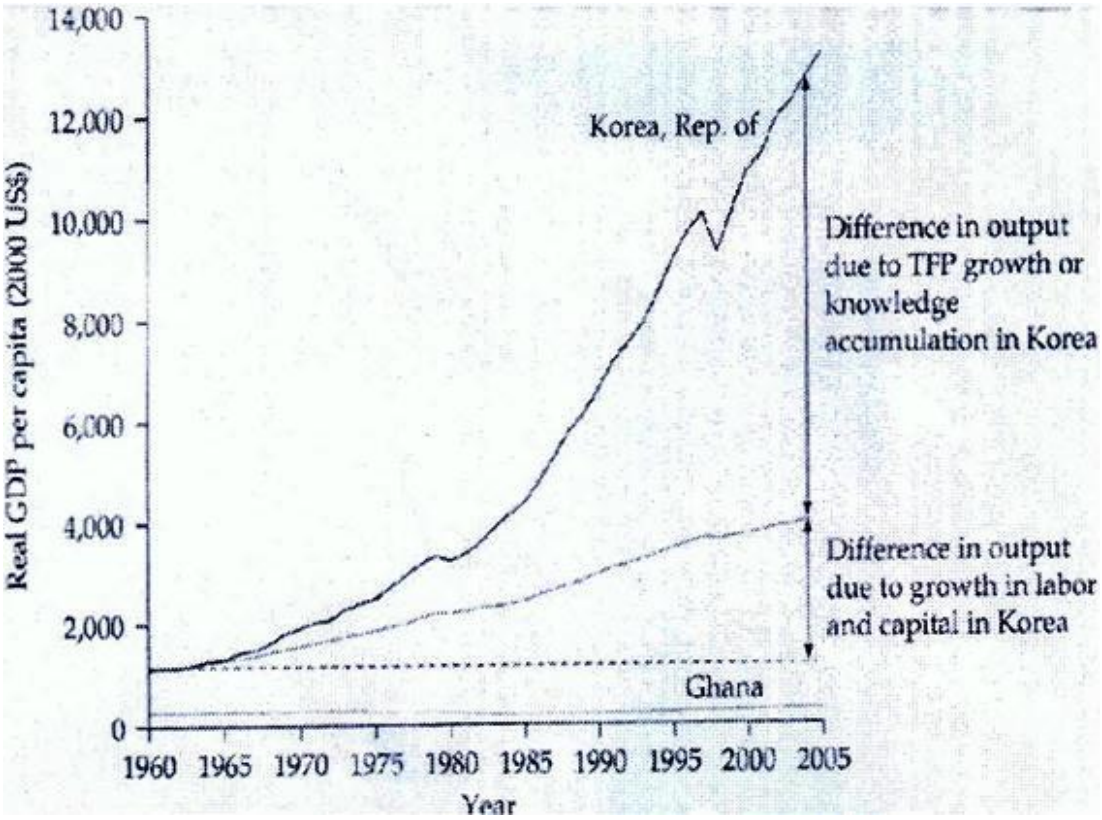
Knowledge Economy and Development

The economies of developed nations are predominantly knowledge and information technology based. The cascading impact of the genetic, digital and knowledge revolutions is being felt all over the world. The knowledge produced in world-class- universities and other prestigious intellectual centres of the world is now recognised as the main driver of productivity and economic growth. Understandably, there is a new vigour by many purposeful countries to come to terms with the position and "role of information, technology and learning in economic performance" (OECD, 1996.3). In fact, the term "Knowledge-based economy" sterns from the fuller recognition of the place of knowledge and technology in modern economies (ibid).

Powell and Snellman (2004: 199) define knowledge economy as "production and services based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as rapid obsolescence. The key component of a knowledge economy is a greater reliance on intellectual capabilities than on physical inputs or natural resources." Knowledge-based economy, therefore, results from a fuller understanding and appreciation of the role of knowledge and technology in economic growth.

As earlier observed, various studies have firmly established a strong correlation between Knowledge Economy and development in all its ramifications - economic, social, industrial, political, and so on. The study by the World Bank (1999) compares the per capita gross domestic product (GDP) growth profiles of South Korea and Ghana over a 50-year period. The study establishes that, even though the baseline GDPs for the two countries in 1960 were around $2,000 each, by 2005 South Korea's GDP had grown by about 550% (to about $13,000) while that of Ghana had stayed around $2,000 (0% growth). The study further establishes that only about 30% of the difference between Korea's and Ghana's growths was attributable to growth in labour and capital in Korea; the remaining 70% was due to growth in total factor productivity (TFP), or knowledge accumulation in Korea, as shown in Figure 1 below:

Figure 1: GDP Growth in South Korea and Ghana Over 50 Years

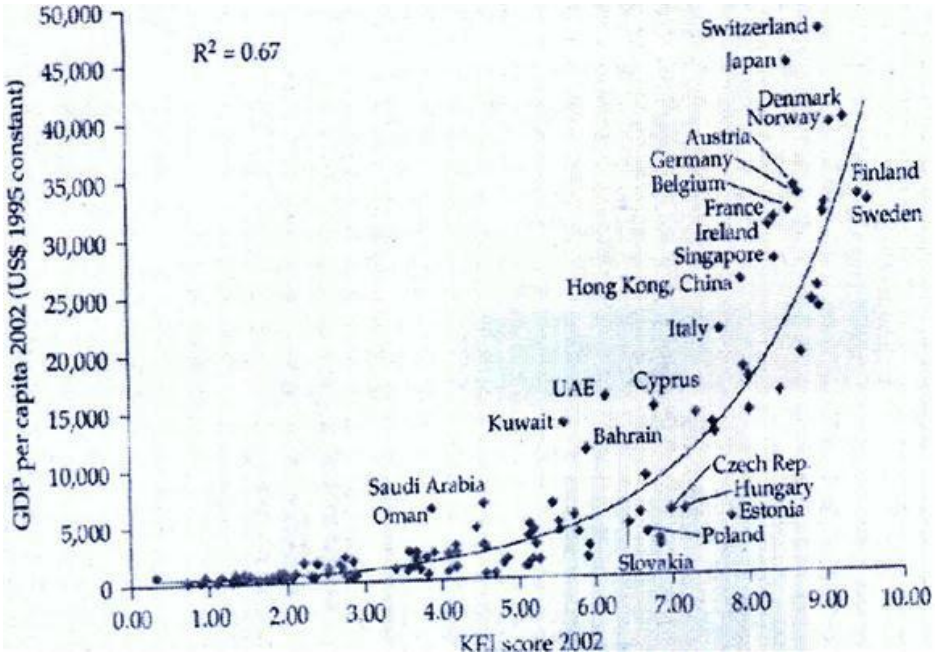


Source: World Bank Institute (2007:4)

Similar studies by the World Bank Institute (2007) depict a very strong correlation between the Knowledge Economy Indicator (KEI) score of a country and the country's current economic performance. Indeed, as shown in Figure 2 below, there is a strong correlation between a country's stock of knowledge and economic progress.

Figure 2: Knowledge Economy and Current Economic Development

Countries that score higher on the Knowledge Economy Index have higher levels of economic development, and vice versa



***Source**: World Bank Institute (2007:33)*

It is instructive to note that knowledge production alone without public policy that fosters innovation will hardly generate solutions to socio-economic challenges. Thus, connecting knowledge production sectors and entrepreneurial sectors is an important policy stride for creating a robust national system for innovation (Cai, 2013; Cai, 2014). This calls for a careful examination of the position of the Nigerian HEIs in providing the much needed knowledge and technology to speed-up the national transformation.

Tertiary Education and Knowledge Economy

In order to fully understand the place of tertiary education and especially universities in Knowledge Economy, we need to consider the pillars of Knowledge Economy. Dahlman and Utz (2005:9) rethe four pillars of knowledge economy as proposed by the World Bank. These are:

1. *An economic and institutional regime* that provides for the efficient creation, dissemination, and use of existing knowledge.

2. *An educated and skilled population* that can create and use knowledge.
3. *An efficient innovation system* of firms, research centres, universities, consultants, and other organizations than can tap into growing stock of global knowledge and assimilate and adapt it to local needs, as well as to create relevant new knowledge.
4. *Dynamic information infrastructure* than can facilitate the effective communication, dissemination, and processing of information.

The World Bank has consequently developed Knowledge Economy Indicators (KEI) which measures the performance of a country on all four pillars. Accordingly, Nigeria is ranked 11Sth in the world based on KEI. The scores of a number of countries are shown below:

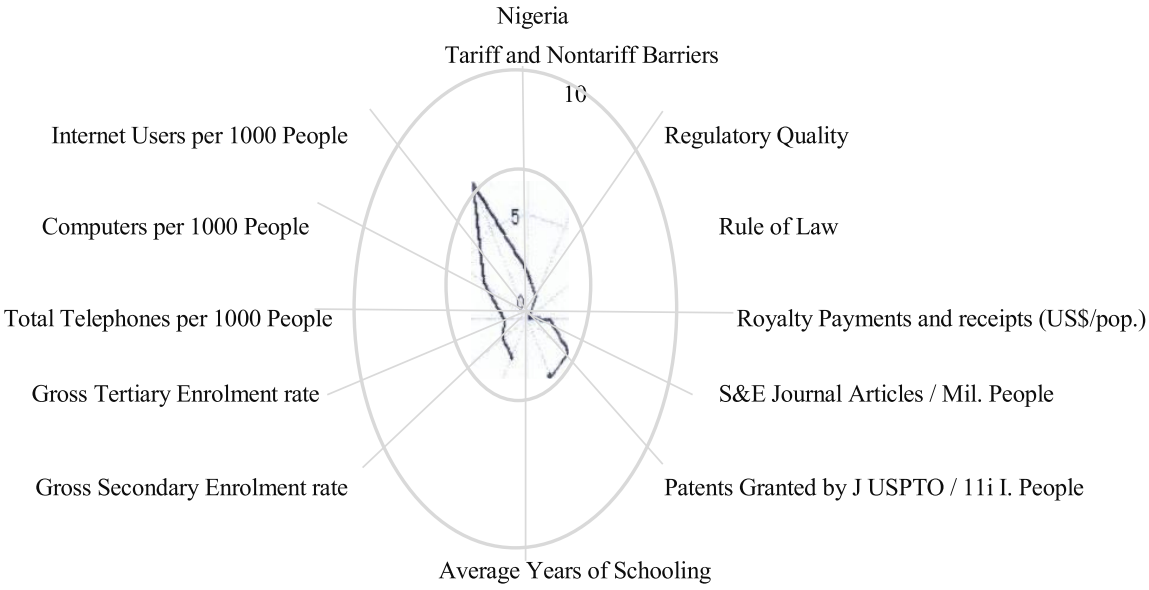
Table 1: Knowledge Economy Indicators for Selected Countries

Country	World Rank	KEI		Economic Incentive		Innovation		Education		ICT	
		Recent	1995	Recent	1995	Recent	1995	Recent	1995	Recent	1995
Ireland	11	8.86	8.95	9.26	9.19	9.11	9.06	8.87	9.02	8.21	8.53
USA	12	8.77	9.53	8.41	9.30	9.46	9.55	8.70	9.44	8.51	9.84
UK	14	8.76	9.09	9.20	9.38	9.12	9.40	7.27	8.44	9.45	9.13
Singapore	23	8.26	8.40	9.66	9.62	9.49	9.05	5.09	5.94	9.45	9.13
S Korea	29	7.97	8.16	5.93	6.93	8.80	8.22	9.09	9.13	8.05	8.34
Malaysia	48	6.10	6.26	5.67	7.16	6.91	6.28	5.22	4.62	6.61	6.98
Russian	55	5.78	5.67	2.23	2.60	6.93	5.64	6.79	7.84	7.16	6.60
Brazil	60	5.58	5.08	4.17	4.83	6.31	5.98	5.61	3.35	6.24	6.17
S/Africa	67	5.21	6.05	5.49	3.74	6.89	7.26	4.87	6.33	3.58	6.89
China	84	4.37	3.99	3.79	3.46	5.99	4.07	3.93	3.68	3.79	4.77
Algeria	96	3.79	3.50	2.33	1.85	3.54	3.41	5.27	3.88	4.04	4.87
Egypt	97	3.78	4.68	4.50	4.14	4.11	5.08	3.37	4.64	3.12	4.87
Indonesia	107	3.11	3.68	3.47	4.08	3.24	2.38	3.20	3.07	2.52	5.20
India	109	3.06	3.57	3.57	3.57	4.50	3.70	2.26	2.51	1.90	4.50
Ghana	112	2.72	3.12	4.05	3.27	2.24	2.60	2.68	2.43	1.93	4.18
Nigeria	118	2.20	2.53	1.26	1.22	2.56	2.67	1.62	2.06	3.35	4.18
Cameroon	132	1.69	2.48	1.21	1.05	2.61	2.92	1.39	1.78	1.56	4.18

Source: http://www.worldbank.org/kam

The Nigeria's performance in the major parameters used in determining the four pillars is shown in Figure 3. It could be seen that Nigeria scored highest in the number of Internet users (about 7.5 out of ten), while it scored very low in Gross Tertiary Enrolment Rate (about 1.5), Royalty Payments, Rule of Law, and Regulatory Quality (almost 0 each). In this measure, no data is reported on Average Years of Schooling.

Figure 3: *Nigeria's Performance in Some KEI Parameters*



Comparison Group: All Type: weighted Year: 1995 (KAH 2012)
Source: http://www.worldbank.org/kam

It is very clear from the foregoing that HEIs have important roles to play in the creation of a Knowledge Economy and a Knowledge Society (Drucker, 2001). A casual glance at the parameters in Figure 3 above shows that they are very closely related to education in general and tertiary education in particular. Such parameters include SAE journal articles, patents granted, average years of schooling, gross secondary school enrolment and gross tertiary school's enrolment rate.

The experience of South Korea shows that as educational landscape of the country changed dramatically between 1960 and 2005, the GDP also grown significantly over the same period. It is, therefore, not a coincidence

that The World Bank Institute (2007) associates economic development in South Korea from 1960s to 2000s with development in human resources and advancement in science and technology.

Nigeria is bedevilled with numerous socio-economic challenges, which must be addressed if the nation is to remain relevant and competitive globally. Many scholars have focused on corruption and mismanagement as the main reason for the crisis and slow economic progress in developing countries (Entrique, 2001) but this is only part of the story. Natural resources, which are the mainstay of the Nigerian economy, provide a temptation to exploit them first, accumulate capital and then educate people. However, this logic is non-functional in a global economy where we produce more for less. The Nigeria's future, therefore, depends on heavy investments to 'build empires of the mind'.

The country is expected to rethink its overreliance on petrodollars and focused on other productive sectors in order to produce enduring wealth. Economic diversification away from extractive sectors depends largely on investment in the production of knowledge. There is no doubt that petroleum resource and the revenues derivable from it will continue to play a significant role in Nigeria's economy. The point, however, is that the world is gravitating towards the supremacy of ideas, of knowledge as opposed to the dominance of natural resources. Countries such as Singapore, with no known natural resources, are today in the big league of nations. Singapore is today a leader in many respects mainly due to the consistent and continuous investment in education.

Education induces Ideas and turbo-charges imagination, which are actually responsible for the changes encapsulated in globalisation, digitisation and interconnectedness which define our times. Therefore, intellect is far more precious than any other resource in a country's quest for development. In essence, the brain is the most "critical means of production" (Nordstrom and Ridderstale, 2000:30). ,

It is, therefore, evident that economic growth today is determined by a country's investment in education, particularly in research and development of new process, new products and service. However, HEIs by themselves cannot create a knowledge-based economy. Erecting the four

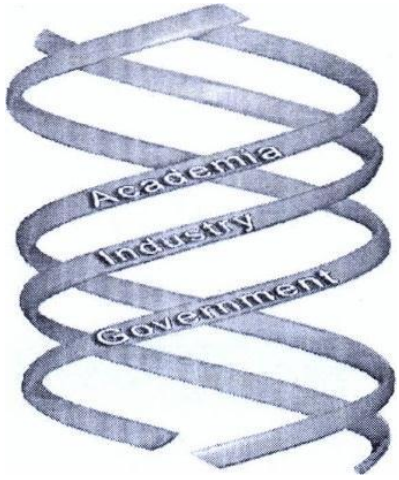
pillars of knowledge economy requires world-class universities working along with other knowledge creation facilitators and knowledge absorption units to drive the change process.

Triple Helix Approach

Nigerian HEIs are expected to be in a strategic position to pave the way for the country's transition into the knowledge age. In this process, government leadership is crucial in ensuring effective policy framework and implementation mechanism to guide towards the creation and sustenance of critical mass of world-class educational institutions capable of generating relevant knowledge required by the industry and the society at large. Similar framework is also needed to allow for the unhindered flow of knowledge between research institutions and the industry in a manner that produces multiple benefits. It is clear that Universities, Industry and Government (Triple Helix) possess certain capabilities, which they could effectively and collaboratively deploy while maintaining their primary roles and distinct identities.

World over, the transition towards the knowledge-based economy is propelled by a dynamic connectivity among Triple Helix with each sphere of the triad gaining, as a result of more interaction, collaboration and support in other spheres. In this process, specialised firms capable of utilising research output are created and strong intellectual property right protection is instituted. Thus, Triple Helix is a tool for well-informed policy formulation to foster growth and innovation.

Figure 4: Triple Helix Network



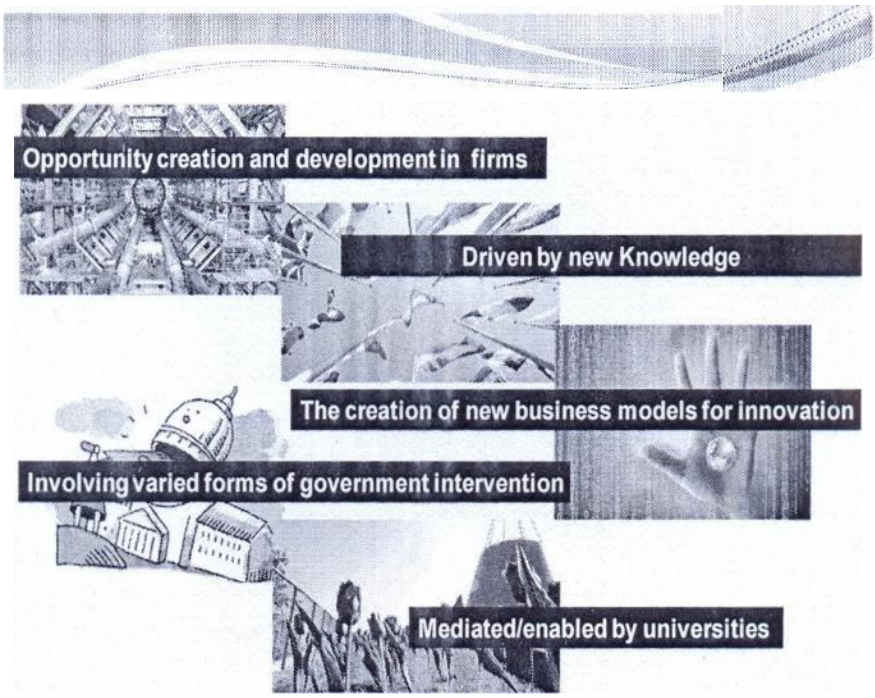
Triple helix is not simply an academic concept but a building block of every day innovation policy and practices. In developed societies and emerging markets, governments are deliberately embarking on policies that favour the transfer of knowledge and technology between universities and organisations aiming to solve social or economic problems. Our major criticism against Triple Helix, however, is that it pays little attention to national and cultural context since the model was developed using experiences of developed countries (Balzat and Shin, 2002; Eun et al, 2006). Recently, studies have proven the relevance of the analytical framework of Triple Helix to the understanding of institutional logic in developing countries such as China and Brazil (Cai, 2013; Todera, 2013). Therefore, regardless of a country's stage of development promoting Triple Helix results in favourable climate for innovation due to the synergistic effect of the triad (Shinn, 2002; Safiulin, Fa tkhiev and Grigorian, 20 14) .

Generally, there is lack of enabling environment for re-orienting (Nigerian) universities towards entrepreneurial roles (Ssbuwufu, Ludwick and Beland, 2012). This is mainly due to the long tradition of over-dependence on government for funding and direction. Also, most publications emanating from Nigerian universities have limited enterprise functionality as they were mainly conceived and conducted for academic purposes (Obanor and Kwasi- Effor, 2013). This tends to make universities' research outputs unattractive to the private sector and policy makers. Even where functional research outputs exist, the weakness in communication between universities, industry and government caused many innovation and technology to remain under developed inside universities (Todeva, 2013). Over the years, this has reduced collaborations between Nigerian HErs and industry to simple and often unstructured transactional relationship in the form of consultancies and grants (Oyeyinka, & Adebowale, 2012).

At the industry level, there is lack of high-tech industries to support innovation and general lack of invention culture In many developing countries (Berry and Sawyer, 2008). More worrisome is that local small and medium firms have no capacity for absorbing Research & Development (R&D) and the foreign subsidiaries relied on Mother Corporation for R&D (Munyoki, et al, 2011). These coupled with the

lack of comprehensive and focused policy initiatives to support university-industry collaborations tend to compromise the journey of many developing countries towards the creation of a true knowledge economy (Mouton, et al, 2008)

Figure 5: Some Stylised Assumptions for Nigeria's Transition to Knowledge-Based Economy



In practical sense, government plays a key role in driving academia and industry to create and deploy knowledge effectively so as to move towards the knowledge age. In realisation of the centrality of education in Nigeria's new economic dynamics, the Tertiary Education Trust Fund was established to support HEIs in producing stock of knowledge required for the development of the country. It is expected that sound education and training can speed-up the Triple Helix interaction as relevant capacity is built across government and industry sectors. Besides its traditional roles, TETFund has a unique responsibility in directing resources towards better understanding of the Triple Helix interaction and the modalities of collaboration to ensure the evolution of long lasting partnerships that would eventually provide solutions to the socio-economic challenges currently faced by the country.

TETFund: An Intermediary in a Triple Helix

The TETFund (formerly Education Tax Fund) was established by Act No. 7 of 1993 as amended in 1998 and 2011 to rehabilitate, restore and consolidate education and educational infrastructure through funding interventions and effective project management.

The Act imposes 2 per cent Education Tax on the assessable profits of all registered Companies in Nigeria, collectible by the Federal Inland Revenue Service (FIRS). The tax so collected is administered by the Fund, and deployed to the education sector through allocations to all benefitting Federal and State HEIs as provided in the enabling Act. The Fund also monitors both tax collections by the FIRS and projects execution by beneficiaries.

To deliver effective, dynamic and sustainable intervention programmes to the HEIs in Nigeria, and in cognisance of the mandate to rehabilitate, restore and consolidate, and knowing that the Fund is not an alternative proprietor of the institutions and cannot solely fund the HEIs in the country, the following core areas of interventions were identified and are being pursued:

a) Provision of infrastructure and improvement of facilities;
b) Capacity building: Postgraduate' staff development and conference attendance;
c) Library systems development;
d) Research Grants and Academic Journals Publication support;
e) Equipment procurement and maintenance;
f) Information and communications technology;
g) Higher education book development;
h) Redressing any imbalance in the enrolment mix as between the higher educational institutions; and other needs, which in the opinion of the Board are critical and essential for the improvement of quality and maintenance of standards in the higher educational institutions.

The meaning of this is that intervention funds from the Fund can only be utilised for capital projects like physical infrastructure for teaching and

learning (i.e. construction and/or rehabilitation of lecture rooms/theatres, auditoria, laboratories, workshop and studios, staff offices, libraries), provision of learning resources (Computing facilities and services, library services, laboratory equipment and machines, power support, and student buses), staff training and research funding.

These interventions are made based on the equality-of-institution and equality-of-state criteria. This implies that monies are allocated equally among the institutions in each of the tiers of our higher education (the universities are treated as equals. Polytechnics and COEs are also treated as equals). In addition, States are also treated as equals irrespective of the number of HEIs owned by the state.

The Fund does not award contracts on behalf of and/ or for any benefitting institution. Institutions access and utilise their allocations. Accessing the funds requires the benefitting institution to prioritize their critical areas of need within the core areas defined by the Fund, submit detailed proposals for which after assessment and vetting, approval-in-principle (AlP) is issued and the project is executed/implemented without any post-approval variation and within a project lifecycle (PLC) of one year (except in the case of staff development, where the duration of study defines the PLC). Funds are released in two or three tranches depending on whether the project is procurement or construction/rehabilitation respectively.

TETFund is undoubtedly a huge success. In every area of its core mandate, it has made very giant strides and is _continuously leaving indelible marks on the Nigeria's HEI landscape. TETFund projects are dotted in all the states of the Federation and distributed in over 300 benefitting institutions. Different institutions have different stories to tell. For some, sponsoring their academic staff to pursue higher degrees in other climes would have remained a mirage without the Fund's intervention in staff development. For others, building new physical infrastructure and providing learning resources would have remained unaffordable luxury without TETFund. The influence of TETFund interventions to the changing role of HEIs in Nigeria can, therefore, not be overemphasized. The challenge is to consolidate the past and current successes and deliberately channel resources to reinvent the country's

educational eco-system to perform its mediating role in creating a true knowledge- based economy.

The Way Forward

A well-informed political process for resource allocation IS the key to supporting entrepreneurial development of technology. The weaknesses in communication and lack of active engagement among the HEIs, industry and the government can be bridged with enhanced capacity development and massive sensitisation campaign. Such intervention may involve relevant other government agencies concerned with education, technology, industries and enterprise development. The purpose is to develop a new configuration to promote innovation required for re-enforcing knowledge-based economic development. In this process, the innovation that takes place in public and private sectors can be made functional. Consequently, the competiveness of and performance of firms is increased as their knowledge absorptive capacity is enhanced.

Public funds still remain critical given .that the governments of most Asian countries support their innovation process (Cai, 2013). The use of public funds to reduce risk of new technology development in critical sectors has long been recognised (Etzkowitx, 2002). HEIs are today the hubs of business/ technology incubator, business/technology accelerator and play a key role in creating science and technology parks. Beyond supporting generic support for researches and publications, TETFund in partnership with other relevant regulatory bodies should support strategic innovation network by encouraging high-impact research and development in thematic areas that generate entrepreneurial innovations that would, in turn, generate new social and economic capital. As cutting-edge research and high-tech innovations are encouraged, an equal attention should also be given to the development of lower-tech solutions or adapting existing technologies to address local problems which may not necessarily require complex technological solution. All these make the nation's HEIs system really functional and relevant.

Conclusions

This paper concurs with the previous studies that established the relationship between the provision of quality and relevant education and the transition towards the knowledge-driven world. Nigeria as a country

or any part of Nigeria as a geopolitical entity can fully join the developed world if it chooses to educate its population and, in the process, create a knowledge-based economy. The paper, however, argues that HEIs alone cannot perform their mediating role in fostering transition from a resource-based to knowledge-based economy without a strategic partnership with the government and the industry. The structure, infrastructure and capacity of Nigerian higher education need to be upgraded on consistent basis in order to attain world-class position. It is by so doing that the citizens acquire knowledge and competencies to reform government institutions and attract recognition and respect from the private sector organisations.

Herein lie the relevance of TETFund interventions in its attempt to turn around HEIs, build a knowledge society and a knowledge economy. Strengthening higher education to drive the structural shift in the country demands active support of critical stakeholders in Nigeria's higher education sector and renewed vision on the part of the TETFund to broadly conceive of a transition to knowledge- based economy, which holds a greater prospect of changing the fortune of our dear nation. As a country, we must build a consensus to start constructing empires of the mind. We can only ignore this to our own peril. a knowledge society and a knowledge economy. Strengthening higher education to drive the structural shift in the country demands active support of critical stakeholders in Nigeria's higher education sector and renewed vision on the part of the TETFund to broadly conceive of a transition to knowledge-based economy, which holds a greater prospect of changing Nigeria's fortune. As a nation, we must build a consensus to start building empires of the mind. We can only ignore this at our own peril.

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