

# Towards a Knowledge-Based Economy: Challenges and Opportunities for Nigeria

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**Abstract** – The competitiveness of economies is increasingly dependent on their capability to create, use and diffuse knowledge. The knowledge economy literature identifies four key pillars of the knowledge economy. These pillars, which cover a wide spectrum of factors relevant to knowledge creation and management, include: Human Capital Development, Information and Communications Technology, Effective Governance, and a developed System of Innovation. The global shift towards the development of knowledge economies calls for an increased emphasis on the role of knowledge in developing the Nigerian economy. The knowledge readiness of the Nigerian economy, when compared with other nations, is low. This paper provides strategic implication for policy making for government and for industry, towards developing a knowledge-based Nigerian economy.

**Keywords:** Knowledge Economy, Nigeria, Development.

## I. INTRODUCTION

In recent times, economies have been competing on the global scene based on their capability to create, use and diffuse knowledge. Knowledge-intensive economic activities are important factors of production in the leading economies and this has led to a new description of economies as knowledge-based, as against the traditional natural resource-based economy. A Knowledge-Based Economy (KBE) is “one where organizations and people acquire, create, disseminate and use knowledge more effectively for greater economic and social development” [1]. The KBE is one that supports the optimal acquisition and utilization of knowledge for value creation.

The Scientific and Industrial Revolutions in the 17<sup>th</sup> and 18<sup>th</sup> century, respectively, laid the foundation for the knowledge economies which exist today. Productivity and technical efficiency during these revolutions grew intensely, as a result of the systematic applications of scientific and technical knowledge to the manufacturing process. The term “knowledge-based economy” is thus a result of an emphasis on building economies around knowledge and technology.

Studies on the KBE became prominent in the 1990s, with the observed increase in the contribution of knowledge-intensive industries to GDP and employment

[2]. Although intangible, knowledge has received high recognition as a significant input in the production process. Owing to advances in technologies and greater flows of information, knowledge is increasingly viewed as a central driver of economic growth and innovation [3], [4], [5]. Wealth creation is therefore as a result of knowledge application and creativity, rather than physical capital accumulation or the extraction and processing of natural resources [6]. Knowledge can even mean the difference between poverty and wealth [7].

Changes in the global pattern of economic growth reveal that economies are now growing with regards to how they exploit knowledge and technology and not just their possession of natural resources. Sub-Saharan African economies seem not to follow this growth pattern as most are still natural resource-driven and do not engage in productive investments and value creation [8]. As a result, the region’s level of competitiveness is low. Indeed more than half of the 20 lowest ranked countries in the 2014 Global Competitiveness Index (GCI) are sub-Saharan [9]. With respect to creating a Knowledge Economy, African leaders are yet to give knowledge accumulation and dissemination the centre stage in the economic development process. Based on the World Bank’s 2012 ranking of countries’ preparedness to compete in the Knowledge Economy, 15 African nations are ranked among the least 20 nations. The largest African economy, Nigeria is still driven by factor endowments (primarily crude oil) and its competitiveness is ranked quite low (127<sup>th</sup> out of 144 economies in 2014) [9]. The 2012 Knowledge Economy Index of Nigeria (2.2), placing the economy in the 119<sup>th</sup> position out of 145 economies, shows that knowledge is yet to take the centre stage in economic growth and development.

The requirements for building a knowledge economy are greater than resource abundance. A knowledge economy strongly depends on new technology investments, high-technology industries and highly skilled labour [10]. In the midst of Nigeria’s abundant natural and human resources, it is important to also understand how knowledge can be exploited to improve the economy’s competitive performance. This study is a descriptive analysis of the challenges and opportunities of transiting into a KBE in



Nigeria. The discussion in this paper centres on the four pillars of the knowledge economy as identified by the World Bank. The rest of this paper is as follows: Section II provides a brief description of the knowledge economy pillars; Section III gives examples of countries with better knowledge ratings than Nigeria, highlighting lessons which can be learnt from them. In Section IV, Nigeria's present knowledge status is examined using most recent available data and information, while Section V suggests knowledge economy strategies for Nigeria. Section VI concludes.

## II. PILLARS OF THE KNOWLEDGE-BASED ECONOMY

There is a wide spectrum of factors which are relevant to the knowledge economy. The World Bank Institute [1] identifies four key aspects of an economy, which are regarded as the pillars of the knowledge economy. It is expected that these pillars would help countries articulate strategies for their transition to a knowledge economy.

### A. Economic and Institutional Regime (EIR)

This comprises incentives that stimulate and promote enterprise development via knowledge creation, dissemination and use. The process of knowledge creation and diffusion in a knowledge-based economy heavily depends on appropriate government policies that are usually the outcome of economic incentives and institutional regimes [11]. By implication, addressing tariff and nontariff barriers, improving regulatory quality, and improving the rule of law will influence how quickly individuals can identify and exploit market opportunities to create wealth, jobs, and economic growth. In addition, improving the policy and business environments to create conditions favorable to trade is one of the most important ways for countries to obtain knowledge from abroad [12].

### B. An educated and skilled population

A highly-skilled and flexible human capital is essential to compete effectively in today's world and is a key building block of a knowledge-based economy [7]. Access to basic education, number of years of schooling and exposure to tertiary level of education determine the proportion of the economy that is literate.

### C. A dynamic information infrastructure

Access to ICT infrastructure facilitates the effective communication, dissemination, and processing of information. The infrastructure strength and coverage of the telecommunications sector is revealed in the number of people with ability to use computers, with access to internet and the mobile telephony subscriber base. Number of internet users serves as an indication of how well a population has advanced to the level of adapting and using advanced communication channels to serve its priorities.

### D. An effective innovation system

This allows for close relations among knowledge institutions (research centres, universities) and firms with which they can tap into the growing stock of global

knowledge, adapt it to local needs, and create new technological solutions.

Effective use of knowledge in any country requires appropriate policies, institutions, investments and coordination across these four pillars. In a full-fledged knowledge-based economy, one can expect to find the following:

- Full recognition of the role of knowledge and technology in economic growth;
- Increase in the contribution of knowledge-intensive sectors and the service sector to GDP;
- Investments are directed towards high-technology goods and services (particularly information and communications technologies), R&D and human capital development (education and training);
- Highly-skilled labour is in highest demand; and
- Strong University-Industry collaborations (Efficient National Innovation System).

## III. SELECTED ECONOMIES FROM EUROPE, ASIA AND AFRICA

Sweden is the most advanced knowledge economy [13] and the 10<sup>th</sup> most competitive economy [9] in the world. The country boasts of strong institutions that are regarded as transparent and efficient, excellent infrastructure, and healthy macroeconomic conditions that include low levels of fiscal deficit and public debt [9]. Sweden creates the right set of conditions for innovation and scores well with respect to royalty payments and receipts, science and engineering journal articles, and patents. The country is at the innovation-driven stage of development at which companies compete by producing new and different goods using the most sophisticated production processes and by innovating new ones. Swedish firms are among the best performing in the world and its ICT adoption is among the highest in the world [9]. In its route to the knowledge-based economy, Sweden has been able to build on a strong knowledge foundation in both the public and private spheres of society and boasts of knowledge-intensive multinational firms and a highly productive research system [14]. Like other Nordic countries, Sweden is doing very well with regard to its economic and institutional regime, having recorded success in the implementation of policy reforms.

In 1960's and 1970's, Nigeria and Singapore had comparative GDP per capita but Singapore has exceeded Nigeria in growth due to increase in infrastructural development and total factor productivity [15]. Singapore is rated the 2<sup>nd</sup> most competitive country in the world [9], consistently occupying the position of the highest-ranked country from Asia in the past decade. Singapore has a high share of its export being classified as technology-intensive [16]. The knowledge-based economy (KBE) has become increasingly important to Singapore over the years. It's



Knowledge Economy Index of 8.26 places the country in the 23<sup>rd</sup> position in the world [13]. The build-up of capital and labor are becoming less important as drivers of economic growth as more attention is being given to Singapore's ability to create, acquire, disseminate and apply knowledge to sustain its economic growth. The country benefits from good governance, strong commitment towards development and good institutional frameworks. Singapore's 2012 ranking on Economic Incentives and Institutional Regime (EIR) is 1<sup>st</sup> in the world. The economy possesses world-class infrastructure, with excellent roads, ports, and air transport facilities, sound macroeconomic environment and fiscal management [9]. Singapore's competitiveness is further enhanced by its strong focus on education. The Singaporean workforce is highly educated, highly motivated, highly skilled and highly productive. Singapore's private sector is also fairly sophisticated and becoming more innovative and the economy can boast of latest technologies. The ICT infrastructure in the country is comprehensively developed and Singapore now produces a diversity of goods, ranging from electronic goods to transportation equipment and machinery, all of which are knowledge-intensive.

With respect to knowledge and competitiveness, South Africa performs better than Nigeria (Table I). The South African economy is efficiency-driven, enjoying high quality institutions, intellectual property protection, efficiency of legal framework, accountability of private institutions, and strong financial market development. The country also has an efficient market for goods and services, and it does well with respect to business sophistication and innovation. The innovation system features good scientific research institutions and strong collaboration between universities and the business sector in innovation [9].

TABLE I. KEY ECONOMIC INDICATORS

Country	2013		2012	2014
	Population (millions)	GDP (US\$ billions)	KEI Score (1-10)	GCI Score (1-7)
Sweden	9.6	557.9	9.43	5.4
Singapore	5.4	295.7	8.26	5.6
South Korea	50.2	1221.8	7.97	5.0
South Africa	53	350.8	5.21	4.4
Nigeria	169.3	286.5	2.2	3.4

Source: World Economic Forum, 2014 and World Bank, 2012.  
KEI (Knowledge Economy Index)  
GDP (Gross Domestic Product)  
GCI (Global Competitiveness Index)

Building a Knowledge-based Economy is important to the South African government. Government efforts towards closing the knowledge gap between South Africa and advanced countries include focusing the national system of innovation on long-range objectives such as commercialisation of the results of scientific research, and production (in both a qualitative and quantitative sense) of knowledge workers which are capable of building a

globally competitive economy. An important component of the South African drive towards a knowledge economy is the Ten-Year (2008-2018) Innovation Plan which is proposed to help lead economic growth by the production and dissemination of knowledge for the enrichment of all fields of human endeavour [17]. The South African knowledge economy vision is to create a society that uses its knowledge systems and human capital to solve problems, while exploiting economic opportunity in a sustainable way.

#### IV. NIGERIA'S KNOWLEDGE PERFORMANCE

As a factor-driven economy which is based on exploiting the abundance of crude-oil, Nigeria is highly sensitive to world economic cycles, commodity price trends and exchange rate fluctuations. This signifies a great need to diversify the economy, particularly away from crude oil and the need to begin to generate wealth and employment via knowledge creation, use and diffusion.

In spite of Nigeria's vast natural resources which range from crude oil, copper, gold and tin, to arable soil, abundant water resources and a large population, its Global Competitiveness Index Rank is 127th out of 144 countries [9]. This corroborates the assertion that a nation's competitiveness and prosperity depends on the capacity of its industries to innovate and upgrade and not just on its natural endowments [18]. In transiting to a knowledge-based economy, Nigeria appears to have a long distance to cover. The 2012 Knowledge Economy Rankings places Nigeria in the 119th position out of 145 countries, with a Knowledge Economy Index of 2.2.

The economic incentives and regulations required for a dynamically functioning business environment in Nigeria are quite inadequate. The ease of doing business in Nigeria is ranked 170 out of 189 economies [19]; this is lower than the 2013 ranking of 147 [20]. As displayed in Table II, the regulatory quality of the business climate in Nigeria is low. An adverse business environment can add substantial production costs to firms and stifle innovation and entrepreneurship. Business obstacles in Nigeria include poor access to and the high cost of finance, poor electricity supply, poor transport system, weak macroeconomic environment, difficulty in trading across borders, corruption, and crime [7]. Communal disputes and religious clashes also pose as major constraints to doing business in Nigeria. Furthermore, there is need to strengthen the capacity of legal provisions to ensure transparency and accountability in the business environment.

Nigeria, according to the 2014-2015 Global Competitiveness Report, is still at the factor-driven stage of development. By implication, companies in Nigeria compete on the basis of price and are yet to compete by producing new and different goods using the most sophisticated production processes and by innovating new ones. Firm-level capacity to absorb technology in Nigeria is

weak and this is a key area in which a knowledge economy can outperform a traditional economy [7].

TABLE II. REGULATIONS AFFECTING BUSINESSES IN NIGERIA (Ranking among 189 countries)

Business Regulations	2014	2013
Starting a business	129	122
Dealing with construction permits	171	151
Getting electricity	187	185
Registering property	185	185
Getting credit	52	13
Protecting Investors	62	68
Paying Taxes	179	170
Trading across borders	159	158
Enforcing Contracts	140	136
Resolving Insolvency	131	107

Source: World Bank Doing Business 2013, 2014.

Table III provides a representation of the state of Nigeria's innovation system as being weak. Few patents are granted to Nigerian companies, demonstrating a low level of sophistication of research and development activities in the country. This may not be unconnected with the lack of institutional capacity to address intellectual property rights (IPR) issues. For instance, copyright piracy, particularly in the entertainment industry, discourages producers from investing in high quality movies and musical productions, and thus stifles innovation.

While there is ample evidence of interaction between universities and industry in developed and newly industrializing countries, developing countries are replete with universities that function, for the most part, independent of industry; and industry that depends on foreign sources of knowledge to sustain production and possibly meet competitive challenges [21]. Several authors [22], [23], [24] have identified weak university-industry interaction as the most significant problem within the National Innovation System in Nigeria. Weak interactions among universities and firms have implications for the national system of innovation and for the knowledge economy as it impedes the commercialisation of new knowledge.

University education in Nigeria, as accredited by the National Universities Commission (NUC), is provided by 40 federal universities, 39 state universities, and 50 private universities ([www.nuc.edu.ng](http://www.nuc.edu.ng)). Although government expenditure on education in the 2012 national budget was 8.42%, the second largest priority in the budget [25], there are academic staff shortages in most areas of tertiary education, particularly in the critical areas of science and technology. This shortage is attributed to the brain drain phenomenon, with the implication that qualified academic personnel relocate to developed countries where the return to their human capital is higher. Clearly, the capacity of the universities to accommodate the burgeoning student

TABLE III. NIGERIA INNOVATION INDICATORS

Indices	Value* (/7)	Rank (/144)
Capacity for innovation	3.7	73
Quality of scientific research institutions	2.8	120
Company spending on R&D	2.8	106
University-industry collaboration in R&D	2.8	123
Gov't procurement of advanced tech products	3.0	109
Availability of scientists and engineers	3.8	89
PCT patents, applications/million pop	0.0	117

Source: World Economic Forum, 2014. \*values are on a scale of 1 (lowest) to 7 (highest)

population is low. Nigerian students, on the other hand, have resorted to seeking quality education from the developed world. In the United States, for instance, Nigeria was in 2009/2010 reported as the 17th largest source of international undergraduates, the 19th largest source of international graduate students, and also the largest source of students from sub-Saharan Africa [25].

Having a well-rounded view of education is important in building a knowledge economy in Nigeria. Paper qualification is viewed in the society as the ultimate indicator of being educated, but this is usually not the case because the Nigerian education system is plagued with corrupt practices [26]. Hence, calls have been made to de-emphasize paper qualification as a measure of employability because it plays down the importance of skills and creativity which are key ingredients of knowledge creation. Nigeria risks being further marginalized in the competitive global knowledge economy because its education and training systems are inadequate for equipping learners with the skills needed for active participation in the global knowledge economy [27].

The spread of Information and Communications Technology (ICT) in Nigeria has offered a world of opportunities to Nigerians. The liberalization of Nigeria's telecommunications sector has allowed rapid growth in the sector. The sector in Nigeria has experienced major structural changes and growth since 2000 that has positively impacted the business, economic and social lives of Nigerians. Before 2001 and the advent of digital mobile telephony, telecommunication services were expensive to acquire, difficult to obtain and very expensive to use. Also, the total connected active lines in Nigeria before full liberalisation were just a little above 400,000 making the country one of the lowest in terms of teledensity (0.4) in the world at the time [28]. However, as at the end of December 2014, just about thirteen years after full liberalisation, Nigeria had about 139 million active lines with a teledensity of 99.32. Aside the rapid growth in the telephone subscriber base, internet subscription is also recording significant increases. Total active internet subscriptions, and wireless broadband (3G) connections, as at December, 2013, were 64,417,110 and 17,531,781, respectively [28].

Nigeria is currently ranked as the leading telecommunications country in Africa ahead of South



Africa in terms of subscriber base [28]. Reforms in the sector have enabled the development of a vibrant, dynamic and rapidly expanding telecom industry. ICT penetration into the economy has transited beyond the ownership of mobile phone and computers to the use of tablets, apps and software to enhance learning, promote ICT literacy in schools and provide solutions to societal problems. Also gaining widespread acceptance is the use of smartphones. For instance, MTN Nigeria recently reported that its smartphone customer base had increased by 54% between 1<sup>st</sup> Quarter 2012 and 1<sup>st</sup> Quarter 2013, and that its smartphone average revenue per user (ARPU) is 3.5 times larger than its non-smartphone ARPU [29]. There is also a rapid growth in online shopping in Nigeria, significantly as a result of services offered by online retailers such as Jumia and Konga which are shopping portals that sell consumer electronics and fashion goods.

In spite of the recorded progress in ICT, Nigeria's capability to employ ICT in boosting competitiveness and well-being is low, when compared with such countries as Singapore and South Africa. The networked readiness of Nigeria as reported in the Global Information Technology Report [30] ranks the country in the 112<sup>th</sup> position out of 148 economies; Singapore is ranked 2nd. Some of the challenges faced by the ICT sector in Nigeria include the limitation of computer and internet access to the urban areas, low level of computer literacy in the rural areas, high cost of owning personal computers, and a relatively high cost of accessing internet services. The internet market is still plagued by poor network quality and sluggish rollout, as well as low fixed line and personal computer penetration [7]. Mobile internet access is increasingly becoming the service of choice for most business and residential customers, but prices are still high.

TABLE IV. SYNOPSIS OF NIGERIA'S KNOWLEDGE ECONOMY RATINGS

<b>Innovation Index 2012</b>		2.56
<b>Human Development 2013</b>	Index	0.504
	Rank	152 (of 187)
	Life expectancy at birth	52.5
<b>Networked Readiness 2013</b>	Index	3.31 (of 7.0)
	Rank	112 (of 148)
<b>Ease of Doing Business Rank 2014</b>		170 (of 189)

Sources: World Bank, World Economic Forum, United Nations Development Programme (2014).

## V. KNOWLEDGE ECONOMY STRATEGIES FOR NIGERIA

Although Nigeria made progress in its knowledge economy ratings between 2000 and 2012 (from 124<sup>th</sup> to 119<sup>th</sup>) [13], the current position among the least 30 economies leaves much to be desired. Between 2000 till date, the formulation of certain policies, programmes and projects of the Nigerian government, such as the National Policy on Science, Technology and Innovation (2011), the UBE Programme (Act 2004), and the liberalization of the Telecom Sector (2001), amongst others, reveals the

attached importance to the key factors contributing to the creation of a knowledge economy. Nevertheless, the current knowledge economy ratings of the country point to the fact that the four pillars of the knowledge economy in Nigeria still require significant interventions, investments and reforms. To improve Nigeria's KEI, what is simply required is to strengthen each of the four pillars:

**Economic and Institutional Regime:** Given that the MSME sector contributes significantly to GDP (46%) [31], this sector should be well developed via the creation of a conducive environment. Borrowing a leaf from Singapore, it is crucial to ensure continuity in economic and industrial policies and make the business environment secure enough to increase private sector participation and attract foreign direct investments. Setting up a commission to monitor the country's transition into a knowledge economy is also an important strategy.

**Innovation:** To build capabilities for technological adoption, Nigeria can tow the path of emerging economies such as India, to exploit reverse engineering techniques. To do this however, there is great need to improve the engineering design capacity and the technology absorption capacity of the country. In addition, fostering a culture of respect for Intellectual Property Rights must not be underplayed. The new STI policy offers opportunities for commercialisation of research outputs. Hence, adequate attention and supervision should be given to its implementation.

**Education:** The strength (in numbers) and entrepreneurial spirit of the youth population in Nigeria should be optimized. This can be done through adequate investments in education and training. In particular, incentives to encourage undergraduate study in science and engineering fields should be introduced. The needs of the education sector may be addressed by establishing educational centres for the development of knowledge-intensive skills.

**ICT:** The noticeable productivity in the ICT sector has been enabled by high-level competition among private firms, leading to creativity and innovation. Given its sustained growth rate of the ICT sector, Nigeria can leverage on her ICT sector, especially mobile telephony services to significantly improve her KE ranking in the next few years. In addition, adequate investments should be made to extend ICT services to rural areas and improve the national level of computer literacy.

In addition to the four pillars identified by the World Bank, Nigeria has other sectors in which increased creativity and innovation is being observed. One of such is the entertainment industry (Nollywood) which has risen to prominence within and beyond Nigeria and is now ranked alongside America's Hollywood and India's Bollywood [32]. The appropriate exploitation of the role of digital technology in the creation and dissemination of entertainment works in Nigeria has the potential of

increasing the overall knowledge performance of the economy.

## VI. CONCLUSION

The resultant effect on the Nigerian economy of the dwindling oil revenue points to the fact that factor-driven growth may not be sustainable for the economy. Transiting to a knowledge-driven economy requires sustained commitment to investing in human capital, ICT, innovation and good governance. The ICT component of the knowledge economy pillars in Nigeria shows great potential and capacity to support the transition of Nigeria into a knowledge economy. Given the wide acceptance and appreciation of the use of information technology in the country, employing it to address the challenges in the other knowledge economy pillars would prove useful. Therefore, the country can begin its transition process by leveraging on ICT and using this to improve the quality of the business environment, of education and of innovation activities in the economy. The performance of the ICT sector in Nigeria also provides evidence to the fact that leading Nigeria to her knowledge-based future would require the engagement (and in some cases, dominance) of the private sector.

Finally, national policies should be designed to revolve around the creation, use and diffusion of knowledge. The formulation of new and reversal of old policies would be necessary if Nigeria is to move forward from its factor-driven stage of development into an innovation-driven economy in the future. Focusing on key priorities from the national science, technology and innovation policy could provide a sound framework for creativity and innovation and support the realization of the country's Vision 20:2020.

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