



Entrepreneurial opportunities through science and technology education for a diversified economy

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1. INTRODUCTION

It is appropriate at this juncture to define certain key terms and put them in perspective for the purpose of our conference. These important terms are identified as follow: entrepreneurship; science and technology education; diversified economy.

Entrepreneurship – is defined by the businessdictionary.com as the capacity and willingness to develop, organize and manage a business venture along with any of its risks in order to make a profit. Hence, the American Merriam-Webster Dictionary describes an entrepreneur as one who organizes, manages, and assumes the risks of a business or enterprise. In our O'Level economics classes we learnt that when we combine entrepreneurship with labour, land, capital and natural resources, then we will make profit. We will all agree that the drive for profit is the main reason many people are in business and this becomes necessary for every individual to meet several personal and family demands, which ultimately contribute to the GDP growth of the country. This was corroborated by Schmeimann (2012) when he stated that "most writers agree that entrepreneurship is also driven by a desire to generate profit or other types of rewards, be they linked to monetary gain, personal satisfaction, career-related status, a change in lifestyle, recognition, or other benefits.

According to Hagel (2016), "in the public mind, entrepreneurs have been reduced to young people who want to create world-changing businesses that can quickly reach \$1 billion or more in market value". This creates an impression that entrepreneurs are the eagle-eyed young fresh graduates from Colleges and Universities who can put their ideas and visions into concrete models to propel them to the top of the social ladder in a very short span. Hagel argued that there is more to an entrepreneur than that, thus suggesting that "a more useful definition might be someone who sees an opportunity to create value and is willing to take a risk to capitalize on that opportunity; some elements of this are opportunity spotting, risk taking, and value creation". This argument broadens the definition and gives some glimmer of hope to aspiring entrepreneur but who are worried that age is no more in their favour.

Schmiemann (2012) defined entrepreneurship as 'the mindset and process to create and develop economic activity by blending risk-taking, creativity and/or innovation with sound management, within a new or an existing organisation'.

Entrepreneurship ranges in scale from solo, part-time projects to large-scale undertakings that create many jobs. Many "high value"

entrepreneurial ventures seek venture capital or angel funding (seed money) in order to raise capital for building the business. Angel investors generally seek annualized returns of 20–30% and more, as well as extensive involvement in the business; many organizations exist to support would-be entrepreneurs, including specialized government agencies, business incubators, science parks, and some NGOs (Kamalian et al., 2014).

Science and technology education – the Merriam Webster dictionary defines the three key words in this phrase as follows: science is a set of knowledge about or study of the natural world based on facts learned through experiments and observation. (It is a body of knowledge that is essential for exploring and gaining a better understanding the physical world around us); technology is the use of science in industry, engineering, etc., to invent useful things or to solve problems; education is the action or process of teaching someone especially in a school, college, or university.

What we can add is that education may not necessarily be restricted to the three places mentioned in the definition as Africa and other civilisations have a rich history of an informal educational system.

Diversified economy – economy is defined as the management of the resources of a community, country, etc., especially with a view to its productivity (Dictionary.com, 2016) while the Financial Times defines a real economy as "the part of the economy that is concerned with actually producing goods and services, as opposed to the part of the economy that is concerned with buying and selling on the financial markets". An economy is also viewed as an area of the production, distribution, or trade, and consumption of goods and services by different agents in a given geographical location. Diversification is, according to dictionary.com, the act or practice of manufacturing a variety of products, investing in a variety of securities, selling a variety of merchandise, etc., so that a failure in or an economic slump affecting one of them will not be disastrous. Merging these definitions we can conveniently view a diversified economy as that which bases its production of goods and services on a wide array of resources to avoid a devastating impact in the event of a crash of any aspect of the production process.

In the real economic sense, Nigerian economy cannot be said to be totally reliant on a single commodity (crude oil), as there are diverse resources feeding the larger economy. However, the problem could be traced to the failure of successive governments to develop the potentials of the other sectors to provide the shock-absorber needed in the event of the crash in crude oil prices. It is pertinent to remind ourselves here that crude has been the major backbone of the Nigerian economy for more than four decades and it created a deceptive bubble which further created a seemingly invincible aura for itself in the minds of our political leaders over the years. That bubble burst recently and the country almost ran aground.

2. THE NIGERIAN ECONOMY

The state of the Nigerian economy as it stands today is anything but encouraging. All basic ingredients of a once booming economy are in a perilous state. The indices are all pointing to an economy that needs a very urgent massive rejuvenation. It all came to a head in July 2016 when the Nigerian Minister of Finance, Mrs Kemi Adeosun, admitted that the country was technically in recession (Adebayo, 2016). This was further corroborated when the National Bureau of Statistics released their GDP quarterly report for 2016. In it they wrote "in the Second Quarter of 2016, the nation's Gross Domestic Product (GDP) declined by -2.06% (year-on-year) in real terms. According to the report, the GDP was lower by 1.70% points from the growth rate of -0.36% recorded in the preceding quarter, and also lower by 4.41% points from the growth rate of 2.35% recorded in the corresponding quarter of 2015. Quarter on quarter, real GDP increased by 0.82%. During the quarter, nominal GDP was N23,483,954.78 million (in nominal terms) at basic prices. This was 2.73% higher than the Second Quarter 2015 value of N22,859,153.01 million. This growth was lower than the rate recorded in the Second Quarter of 2015 by 2.44% points" (NBS, 2016). The African Development Bank also wrote that "the Nigerian economy has been adversely affected by external shocks, in particular a fall in the global price of crude oil. Growth slowed sharply

from 6.2% in 2014 to an estimated 3.0% in 2015. Inflation increased from 7.8% to an estimated 9.0%. The sluggish growth is mainly attributed to a slowdown in economic activity which has been adversely impacted by the inadequate supply of foreign exchange and aggravated by the foreign exchange restrictions targeted at a list of 41 imports, some of which are inputs for manufacturing and agro-industry. This has resulted in cuts in production and shedding of labour in some sectors" (AEO, 2016).

It should be noted that prior to this recession, Nigeria was rated the largest economy in Africa, overtaking South Africa that had hitherto been in that position. However, the NBS (2016) observed that "the turmoil in global commodity markets, witnessed in the second half of 2014 brought their full weight to bear on the Nigerian economy in 2015. Oil prices fell 66.8% from \$114/barrel recorded in June 2014, to \$38.0 by December 2015. Prices fell even further in 2016, to \$32.6 as at 3rd February, 2016. Beyond commodity markets, recent developments in the global economy created a trifecta of headwinds that the nation has to contend with". The table below gives a historical and projected situation of the key economic indices for the country.

Table 1 Historical and Projected growth rates for GDP, Inflation and trade, annual (%)

Year	2011	2012	2013	2014	2015e	2016f	2017f	2018f	2019f
Real GDP growth	5.31	4.21	5.49	6.22	2.97	3.78	5.03	5.61	5.61
Inflation	10.83	12.22	8.5	7.98	9.55	10.16	9.49	8.67	8.54
Total Trade	48.75	-4.30	-24.26	10.34	-24.30	2.41	31.11	17.31	11.64

Source: National Bureau of Statistics (2016)

With the above statistics and barring any unforeseen national calamities, one can only hope that the projected growths expected in the real GDP and total trade as well as the drop in inflation rates in 2017 will be realistic and sustainable. The import of the figures above is a pointer to nothing but the need to reinvigorate the country's drive towards diversifying its economy farther away from crude oil.

Another ominous indicator of our precarious economy is the growing rate of unemployment among the very active youth population of Nigeria. The NBS in its unemployment/under-employment report for the second quarter of 2016 stated that "in Q2 2016, the labour force population (i.e those within the working age population willing, able and actively looking for work) increased to 79.9 million from 78.5 million in Q1 2016, representing an increase of 1.78% in the labour force during the quarter. This means 1.39 million persons from the economically active population entered the labour force, that is individuals that were able, willing and actively looking for work. This magnitude of the increase between Q1 and Q2 2016 is smaller when compared to Q4 2015 and Q1 2016, which was an increase of 1.59m in the Labour force population. Within the reference period, the total number of person in full time employment (did any form of work for at least 40 hours) decreased by 351,350 or 0.65% when compared to the previous quarter, and also decreased by 749,414 or 1.38% when compared to Q2 of 2015". The infographics in figures 1 – 4 give a snapshot of the unemployment situation vis-à-vis the growing population of Nigeria.

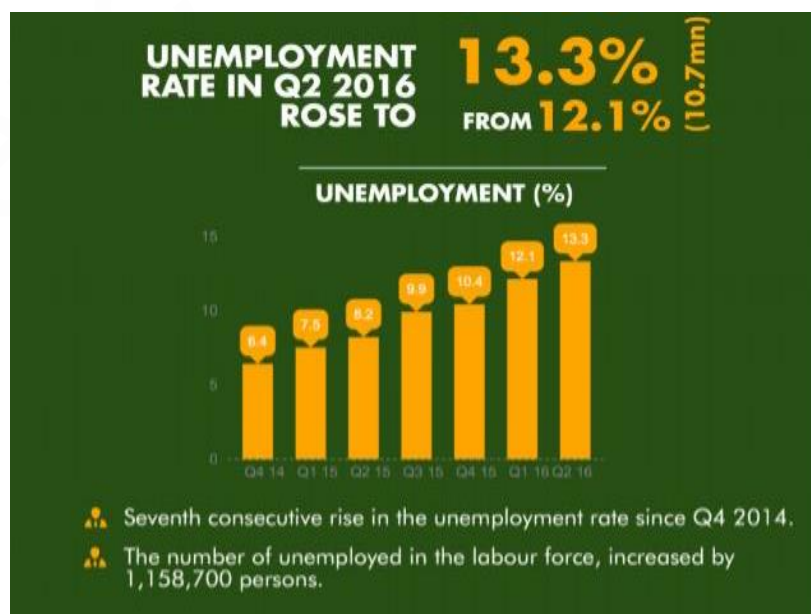


Figure 1 Unemployment rate in Nigeria for the second quarter of year 2016. (NBS, 2016)

It is important to note that the country's population, which was put at 140,431,790 in the 2006 population and housing census, is projected to reach well over 200 million by the year 2020 (World Bank, 2016). In fact a new UN report projected that Nigeria's population, which is currently ranked number seven in the world, is the most rapidly growing population in the world. "Consequently, the population of Nigeria is projected to surpass that of the United States by about 2050, at which point it would become the third largest country in the world" (United Nations, 2016).

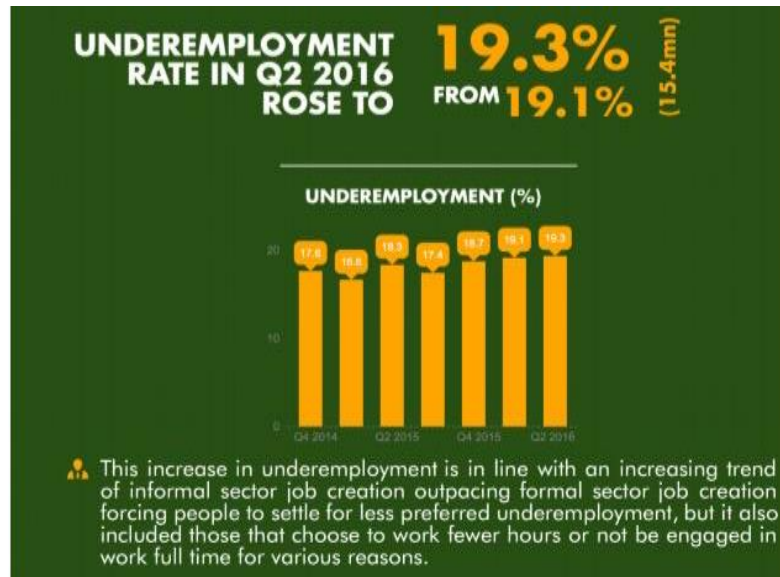


Figure 2 Rate of underemployment in Nigeria for the second quarter of 2016. (NBS, 2016)

The most disturbing aspect of the demographics is the rate of youth unemployment. As can be seen from figure 3, there are 17.6 million unemployed/underemployed youths in Nigeria as at the second quarter of 2016. This is 49.5% of the youth labour force in the country and if we do not want to give this vibrant and energetic class of the population the excuse to become a menace to the entire country, then there is a need to be more innovative in providing employment or, at least, create the enablement for them to be gainfully engaged.

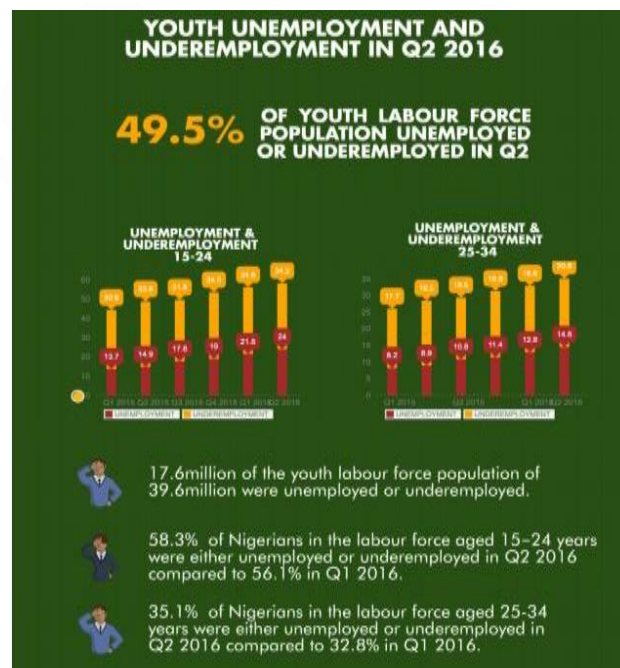


Figure 3 Rate of youth unemployment in second quarter of 2016 (NBS, 2016)

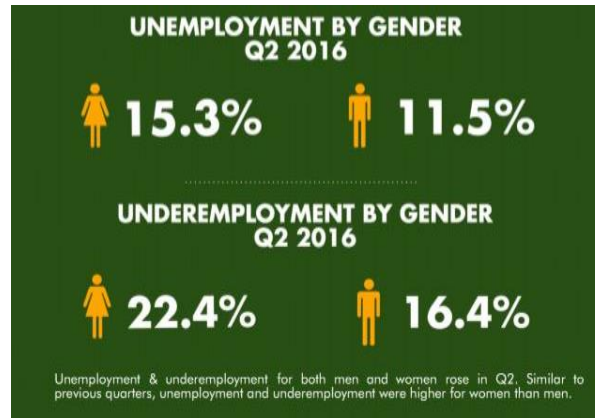


Figure 4 Rate of unemployment/underemployment on gender bases in second quarter of 2016. (NBS, 2016)

3. KEY INDICATORS OF ENTREPRENEURSHIP

Entrepreneurship can be viewed from different perspectives and many authors have defined it from the economic, social, philosophical and management angle. However defined, what cuts across in all angles is the fact that the phenomenon has a broader scope beyond the market economy or profit-oriented perspectives. It is a concept driven by individuals, who have identified opportunities and courageous enough to take the attendant risks and which outcome ultimately impacts on the society at large. In fact economic policy experts have suggested that entrepreneurship has the potential to alter macroeconomic indices either positively or negatively and this has led various governments in Nigeria to pay so much attention to programmes encouraging youths to set up businesses in pursuance of their entrepreneurial dreams. One good example is the Youth Empowerment Scheme, under different epithets, embarked upon by various state governments. The federal government, through the Bank of Industry's N10billion-Youth Entrepreneurship Support (YES) scheme, launched such scheme aimed at developing the entrepreneurial capacity of youths and providing start up loans at concessionary interest rates to execute their business plans. The realisation of the important link between entrepreneurs and National economic growth was alluded to in Schmiemann (2012) when he wrote that "indeed, economists and policy-makers have long identified entrepreneurs as important drivers for employment, innovation and economic growth, although the links between entrepreneurship and the various facets of economic growth are less well understood".

The motivation for the entrepreneurial venture ranges from desire for profit, status change, social mobility, altruism and personal satisfaction, among others.

There are many key indicators of entrepreneurship which are recognizable in individuals. These include, inter alia, relevant skills, personal drive, ability to identify opportunities, and risk taking.

Relevant Skills

A prospective entrepreneur must possess certain skills necessary for him to successfully nurture his entrepreneurial ideas to fruition. Such skills could have been acquired through some form of training (formal and informal education) and knowledge gathering. Such skill acquisition begins with the knowledge of businesses and business ventures, specialist knowledge in relevant fields/endeavours as well as managerial skills to enable him manage human and material resources towards deriving benefits from them. Above all the entrepreneur must have something useful to offer.

Risk Taking

Risk is the potential of losing something of value, weighed against the potential to gain something of value (Kungwani, 2014). According to Johnson (2005) entrepreneurs are leaders willing to take risk and exercise initiative, taking advantage of opportunities in the market by planning, organizing and making use of resources, often by innovating new or improving existing products. The Merriam Webster Learner's Dictionary defines risk taking as the act or fact of doing something that involves danger or risk in order to achieve a goal. Entrepreneurship means risk. The risk of walking away from security and career path to create something new (Ashbrook, 2016). An entrepreneur could be an individual who was in paid employment but has ceased to derive any form of satisfaction from the previous job, a fresh graduate from a tertiary institution, a corps member who had just concluded the one-year mandatory National Service or even a recently retired worker who believes he can still actively engage in some form of meaningful business venture. Whichever of the foregoing, entrepreneurship involves taking a plunge into a world previously unexplored by the

individual and this will entail some risk taking. After all, "If you dare nothing, then when the day is over, nothing is all you will have gained" (Gaiman, 2008).

Personal Drive

As mentioned earlier, the entrepreneur is driven by the desire to attain some personal goals in life and this may be influenced by profit, desire for status change, zeal to make an impact in his society, quest for survival or even satisfying personal ego. Whatever the driving force is, a successful entrepreneur must have set goals driving him. In addition to this is focus because there are many distractions from friends and family that are capable of derailing the drive.

Ability to Identify Opportunities

A focused entrepreneur must have the eyes to see what other do not necessarily see. This is not about conjuring a super-human imagery of the prospective entrepreneur but it took Bill gates the ingenuity to identify the need to make computers more user-friendly in coming up with the Windows operating system (OS) and a variety of windows-compatible applications software. His business shrewdness saw him sealing deals with major desktop computer manufacturers to have his windows OS as the default operating systems on their computers. All the indicators mentioned above as well as others such as resilience, focus, self-restraint and discipline, ability to market ideas and products, managerial skills, readiness to learn new ideas, etc. are qualities required for any prospective entrepreneur to succeed.

4. SCIENCE AND TECHNOLOGY EDUCATION IN NIGERIA

Science and technology education can be viewed as a pedagogic system that focuses on the teaching of science and technology in a formal learning environment. Our societies are dominated and even 'driven' by ideas and products from science and technology (S&T) and it is very likely that the influence of science and technology on our lives will continue to increase in the years to come (Sjøberg, 2002). The Nigerian government also recognises the importance of science and technology in national development hence admission into many of the tertiary institutions is skewed in favour of S & T education. In the National Policy on Education, the Federal Government of Nigeria clearly affirmed their bias for science and technology when they stated that "special provisions and incentives shall be made for the study of the sciences at each level of the National education system. For this purpose, the functions of all agencies involved in the promotion of the study of sciences shall be adequately supported by government. In addition, Government shall popularize the study of the sciences and the production of adequate number of scientists to inspire and support national development". The National Policy further states that "science and technology shall continue to be taught in an integrated manner in the schools to promote in the students the appreciation of basic ideas". (NPE, 2004)

Bybee et al., (2008) identified the following categories of goals for science education: scientific knowledge, scientific methods, social issues, personal needs, and career awareness.

Science and technology education has evolved through various developmental processes and curriculum modifications since the advent of education as it is known today in Nigeria. These programmes have tinkered with the concepts, operations and curriculum of science and technology education with the aim of tailoring them toward the contemporary needs of the country.

Although the focus of this paper is not on the historical evolution of science and technology education in Nigeria, however it is pertinent to mention a few of the government programmes and interventions driven towards improving S&T education in Nigeria (parts adapted from Ojimba (2013).

- Yaba College of Technology was established in 1947 as an immediate successor to Yaba Higher College.
- Establishment of higher colleges for the defunct HSC (A' Level) programmes.
- The Science Teachers' Association of Nigeria established in 1957.
- Basic Science for Nigerian Secondary Schools (BSNSS) undertaken in 1962 at the Comprehensive High School, Aiyetoro.
- Nigerian Integrated Science Project (NISIP) in 1971, a project of the Science Teachers Association of Nigeria (STAN).
- In 1969, the historic national curriculum conference further paved way for the involvement of some government agencies such as;
 - the defunct Comparative Education study and Adaptation Centre (CESAC),
 - Nigerian Educational Research Council (NERC), which later merged to become the Nigerian Educational Research and Development Council (NERDC) to fully participate in many other science curriculum development projects both at the primary and secondary levels of our educational system

Irrespective of the interventions, it cannot be said that Nigeria has attained the desired levels of development in S&T of the expected outcomes. The sector is still bedevilled with a lot of problems, largely in the areas of implementation of the various

policies. According to Okebukola (2014) “science education is not as impressive as it ought to be in Nigeria”. He noted that students are not doing as well as expected in public examinations in the sciences. According to him, “at the university level, the quality of students that we are getting is not impressive in terms of their knowledge of Mathematics, Biology, Chemistry and Physics.”

The fall in quality of science and technology graduates is all the more disturbing because the country’s dream of having them contribute meaningfully to national development becomes unrealistic.

In the opinion of this paper, the problems with the science and technology education in Nigeria are not as much with the policies as there are with the implementation of these policies. It is also worthy of mention that, based on personal observations and experiences, the following are also culpable in the ineffective implementation of the country’s science and technology education policies:

Overpopulation – the population of students admitted into science and technology related programmes in the Nation’s educational institutions (Senior Secondary and tertiary institutions). According to the NPC/RTI (2015) “the percentage of youth aged 12–17 years attending secondary school more than doubled from 1990 to 2015. In 2015, 56% of secondary school-aged youth attended secondary school, compared with 44% in 2008, 35% in 2003, and only 24% in 1990. In 2015, the overall GAR was 69%, compared with 65% in 2008, 61% in 2003, and 35% in 1990. If we compare this astronomic rise in Net Attendance Ratio (NAR) and Gross Attendance Ratio (GAR) between 1990 and 2015 to the investment in infrastructure then there seems to be no correlation as many public schools remain understaffed. The teacher: student ratio is far higher than the recommended standards. (NAR is the percentage of the official secondary school-aged population (aged 12–17 years in Nigeria) who attends secondary school. GAR is the total number of students attending secondary school—regardless of age—expressed as a percentage of the official school-going age.). Although this statistics made no distinction between arts and science students, we can only imagine the population ratio based on the National Policy on Education.

Inadequacy and Incompetence of Teachers – the quality of graduate teachers being produced by many of the teachers training institutions have also attracted concerns among researchers and relevant government agencies. It is clear that the downturn in the Nation’s economy over the years, corruption as well as poor political leadership have led to the neglect of many critical sectors begging for attention. Education sector has been one such critical sector with successive budgetary allocations falling below UNESCO’s recommended standards. The little allocations that came went mainly into overheads and recurrent expenses. It has also affected the quality of training and training facilities in the many conventional institutions. This has necessitated the commissioning of several training and re-training programmes by government. Even at that, there are still the problems of inadequacy of instructional materials especially in the science and technology disciplines. Another problem is the lack of competence in the handling of such materials where available. The question, however, remains what the trainee teachers do with the training received.

Relevance of policies and training modules to societal needs – there is no doubt that Nigerian educational policies, at the points of conception, hold so much promise for the potential turn-around of the Country’s educational sector into a utopia of sorts. A sector that could serve as a solid base for the knowledge-driven economy that will project Nigeria into an enviable position among the league of world leading economies. However, there is always that yelling gap between conception and implementation. Societal needs are dynamic so should the educational policies be if the Country’s graduates must become relevant in the quest for sustainable national development to fit into the fast-changing global dynamics. The old order of spending years through three levels of education and settling into a public service job then wait till retirement is no longer attractive; neither is it capable of propelling the country to the heights of economic and social development we desire. Countries leading the world today have leveraged on scientific and technological breakthroughs to dominate the important sectors of the global markets – agriculture, Medicare, electrical/electronics, construction, automobiles, aviation, communications etc. All these are billion-dollar industries.

Disorientation of Learners – this is a very disturbing trend in the Nigerian educational systems these days. It is common to find pupils list music icons, film actors and showbiz personalities as their role models these days. More disturbing is a scenario where those who occupy the upper quartile in the academic performance ratings end up in professions with remunerations that cannot afford them the luxuries of life that these youths find attractive. The attractions of lucre as flaunted by people with dubious reputations, corrupt politicians and fraudsters have caused majority of the present day Nigerian youths to misplace their sense of value judgment. This has become a disincentive for purpose-driven education. It is not uncommon to see pupils in secondary schools and tertiary institutions skipping classes and practical sessions, only turning up for examinations with a view to obtain just the minimum pass or at best cheat their ways to get the certificates. The focus is on just the certificates worth nothing more than the paper it is printed on.

Poor Quality of Research in Tertiary Institutions – universities and tertiary institutions are basically set for teaching, research and community development. However, the quality of many research outputs, in the sciences and technology disciplines, from the many universities have yet to make the necessary impacts on the relevant sectors of the Nation’s economy. It is still obvious that majority

of the consumer products derived from science and technology found in the Nigerian market are imported. Save for a few agricultural inputs and herbal products, Nigeria is yet to tap fully from the potentials offered by science and technology.

Science, Technology and Entrepreneurship – the opportunities

According to Ilori et al., (2009) it has been shown, both theoretically and empirically, that technological innovation and entrepreneurship play an important role in fostering the development of today's industrialised nations. They viewed technology entrepreneurship as “a style of business leadership based on the process of identifying high-potential, technology-intensive business opportunities, gathering resources such as talent and cash, and managing rapid growth using principled, real-time decision-making skills”. However a likely discouraging aspect of this view in present day Nigeria is the ‘technology-intensive’ aspect because of the inefficient electricity industry.

The first symposium on technology entrepreneurship was held at Purdue University in October 1970. This was the first time researchers gathered together to exchange findings and observations on this topic (Bailetti, 2012). Afonja (1986) made a distinction between technological and commercial entrepreneurship when he said the former deals with the manufacture of products or provision of technical services and the latter means trading, buying and selling or provision of non-technical services.

In Ilori et al., (2009), they identified a ‘valley of death’ between research resources and commercialisation resources. The former refer to the various research outputs in the engineering and science-based courses while the latter means the resources required to turn technology ideas into profitable business ventures. This valley is further deepened by factors such as sincerity of the researcher, quality of the research output, adequacy of research inputs, timing of the research, unfriendly investment climate, high interest rates on lending, low return on investments and poor business ethics.

Opportunities abound for S&T entrepreneurship and the following are highlights of these areas:

Biotechnology – the biotechnology industry cover industries from drugs, food and agricultural as well as environmental products. It uses biological systems or living organisms for the development of its products. According to the Biotechnology Innovation Organization (BIO), the biotechnology industry has grown rapidly in recent years, doubling in size between 1993 and 1999. Globally, around 170 billion U.S. dollars were spent on biopharmaceuticals in 2013. This figure is expected to exceed 220 billion U.S. dollars by 2017 (Statista, 2016). Nigeria is blessed with rich floral and faunal resources that could be exploited for their bio-resource potentials to tap into these billion dollars opportunities.

ICT – information is power, as they say, but what we do with the information is what matters. ICT generates, organises, manipulates and trades information in a way to attract value to them. According to Christine Zhen-Wei Qiang, World Bank economist and editor of a new Bank Group report on information technology and development “the mobile platform is emerging as the single most powerful way to extend economic opportunities and key services to millions of people”. Various aspects of the ICT are open for skilled entrepreneurs to tap into. These include data encryption and security, software development (including mobile apps), hardware inventions (computers and mobile technologies), movies and entertainment, financial transactions etc.

Electronic/electrical/automobiles – this is another aspect of S&T that is capable of generating huge incomes for individuals and the Nation. Although capital intensive, however of there are genuine ideas that are capable of attracting investors’ attention, then why not. Remember that General Motors Chevy Volt was designed by a Nigerian.

Chemical and cosmetics industries – global chemical industry turnover was put at 3.534 billion euros in 2015 while the cosmetics industry, over the past decade, has witnessed a steady growth and is anticipated to grow with a CAGR of 4.3% during the forecast period of 2014 -2022. According to the Allied Market Research website, “rising trend of the use of natural ingredients in cosmetic products is observed among various manufacturers. This trend caters to the ever increasing demand for natural or organic cosmetic products among customers. Use of herbal cosmetic products minimizes the chances of any possible side effects of the product. This ultimately increases the usage of cosmetics among individuals”. With Nigeria’s vast agricultural potentials we can leverage on the demands by supplying the herbal raw materials at first then escalate to the major production industry.

Ways Forward for Nigerian science and technology entrepreneurs

There are a few commendable efforts aimed at commercialising research outputs in Nigeria. However, there is yet to be built that critical bridge across the ‘valley of death’ in order to engender the required synergy between research efforts, industries and investors for the Nigerian economy to become science and technology driven. There is no gainsaying the facts that all developed economies in the world today have ridden on the back of science and technology to arrive at where they are at present. In view of this realisation the following are some suggestions for Nigeria to leverage on S&T to leapfrog into the league of developed countries of the world.

Strengthening science and technology education

There is no doubt that the Nigerian government has done a lot in providing adequately for educational advancement of the country's teeming youth population. There have been various government programmes, multilateral interventions and international cooperation aimed at improving the education sector. Policies are in place to promote science and technology education. There are investments in procurement of S&T teaching aids and facilities; although electricity which is a basic requirement for the operations of these facilities remains unreliable. In fact, available records have shown that Nigerians in the diaspora are contributing immensely to the intellectual foundations of most technological achievements in the world with many of these science and technology eggheads having their educational foundations in Nigeria. Hence, we need to find that disconnect between the massive investments in educational institutions and the outputs because as it stands, the quality of outputs cannot justify these investments. However, there is the need to further strengthen S&T education as no amount of investments is ever too much in education.

University spinoff

This is a concept referring to a commercial relationship between universities and the industries. University spin-offs transform technological inventions developed from university research that are likely to remain unexploited otherwise (Shane, 2004). It is actually an offshoot of a broader concept called research spin-offs which, according to Callan (2001) may fall into at least one of the four following categories:

- Companies that have an Equity investment from a national library or university
- Companies that license technology from a public research institute or university
- Companies that consider a university or public sector employee to have been a founder
- Companies that have been established directly by a public research institution

This idea comes highly recommended if Nigeria must join the league of countries generating huge income from science and technology ventures. Some examples of spin-offs are Qinetiq (a British multinational defence technology company); Genentech, Inc. (is a biotechnology corporation which became a subsidiary of Roche in 2009); Crucell (a biotechnology company specializing in vaccines and biopharmaceutical technologies, a subsidiary of Johnson & Johnson, based in Leiden, Netherlands); Lycos, Inc., (a search engine and web portal established in 1994, spun out of Carnegie Mellon University); Plastic Logic Germany (originally a spin-off company from the Cavendish Laboratory at the University of Cambridge) based in Dresden, Germany.

In Nigeria, the National Biotechnology Development Agency was established in 2001 and part of its mandate is to develop viable and commercial biotechnology and technologies through strategic investments in biotechnology R & D to support innovation and economic development. Another body is the National Board for Technology Incubation which oversees the Technology Incubation Center (TICs) established in 1993. They were designed to nurture new start-ups in science and technology related businesses; and speed up the commercialization of R&D results by effectively linking talents, technology, capital and know-how in order to accelerate the development of new enterprises. There are many such technology incubation centres scattered all over the country. However, these agencies and research centres in our tertiary institutions do not seem to have attracted enough confidence and trust from industries and investors.

Improving business climate

Nigeria ranks number 169 in the world ranking of ease of doing business. We were 170 hitherto. Many investors have been driven out of Nigeria largely due to systemic corruption, inconsistent economic policies, unreliable industrial adjudication procedures and dilapidated infrastructure. If Nigeria must attract the needed investments in critical but delicate S&T businesses, then we must have a solid infrastructure base such as stable electricity, efficient and timely transports system, access to funds and security.

5. CONCLUSION

Science and technology entrepreneurship have a potential to catapult Nigeria to the league of developed nations in a very short time if there is the political will. This paper has reviewed the concept of entrepreneurship and its key indicators, science and technology education and some of the challenges. Attempts were also made to present the state of the Nigerian economy vis-à-vis the socio-economic indices.

While it is obvious that there are challenges, it is not all a tale of gloom as we, as a country, have all the ingredients required to propel Nigeria further ahead in its leading role as Africa's largest economy and the most populous black nation on earth. In our bid to succeed, we must be ready to take on our challenges head-on. A major one being corruption.

Corruption is not only about embezzling money or misappropriation of funds. An insincere science researcher is corrupt if the sole motive for his research is seeking monetary returns by falsifying research results, publishing untruth in order to meet promotion

criteria and exploiting research students. There are many science professors out there who might not have stayed one hour in any laboratory.

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