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Editorial

Al-Hikmah Journal of History and International Relations (AJHIR) is published annually (December). It focuses on the broad spectrum of history, culture, international relations, political economy, religious and related disciplines.

The Editorial Board was re-constituted in November 2017, with a specific mandate that hinged on three main thrust, i.e. clear the backlog of articles already processed via the peer-review mechanism; invite submission of well researched papers by prospective authors/contributors; and ensure timely publication of subsequent editions of the Journal.

While thanking most sincerely the leadership and the entire members of staff of the department of History and International Studies for their full support and cooperation, the conscientious effort of the Editorial Board has resulted in the successful publication of Vol. 3 of the Journal in December, 2017 and Vol. 4 in September 2018. It is our hope that Vol. 5 shall be completed and rolled-out from the press by January 2019.

We thank you all for your support, understanding and patronage.

Prof. A.O.Y. Raji,
Editor-in-Chief.

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THE DEVELOPMENT OF TECHNOLOGY IN NIGERIA: LESSONS FROM HISTORY

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Abstract

Nigeria's strive for techno-industrial development has remained largely unsuccessful in spite of government constant policy statements assuring the citizens of commitment to technology programme. Since independence, various policies and programmes have been adopted to accelerate Nigeria's technological progress for over-all development. These include technology education anchored on the establishment of technical schools, polytechnics and universities of technology; the use of technology transfer through multinational corporations; and more recently, the use of small and medium enterprises to boost self-employment and self-reliance. However, decades after the implementation of these programmes, technological development still remains a mirage in Nigeria. This paper thus examines potentials of techno-industrial revolution in Nigeria through the emulation of strategies employed by some developed and developing countries. Using both the primary and secondary sources of history, it traces the technological breakthrough in Britain, United States of America and Japan. It argue that Nigeria has huge potentials that can speedily transform her society through a well-established fundamental foundation. It explains further that with abundant water resources, vast arable land, solid minerals, good climate, growing population, indigenous creative ingenuity, and shrewd management of resources, Nigeria have the potential for self-reliance industrial development. It noted that Nigeria's pre-colonial and colonial economies were sustained by proceeds from agriculture, which relied heavily on indigenous technology. Like the developed countries, Nigeria has favourable climate, abundant rainfall, well spread indigenous technology and a massive population, which could be utilize to facilitate the much desired techno-industrial transformation. It concludes that result-oriented exploitation of natural resources, strong political will, visionary leadership, appropriate and

purposeful technology education and the diversification of the economy, are important pre-conditions for Nigeria's technological take-off and sustainable development.

Keywords: Nigeria, technology, natural resources, Technology Education

Introduction

The fundamental essence of history is for man and his society to learn from the past. Africa's underdevelopment is often blamed on the devastating impact which slave trade, colonialism and neocolonialism had on the continent's traditional economy, which was adjudged to be growing, though slowly but steadily, prior to European contact. This fact is incontrovertible. However, without prejudice to this negative impact, Europe moved ahead not by merely taking human and material resources from Africa. Rather, the more fundamental factors were the ability to utilise local and 'foreign' resources to propel development. Europe's interest in writing, science and scholarship as from the Middle Ages, served as impetus for the Industrial Revolution, which came much later in her society. In fact, technological break-through in Britain was hastened by developments in the preceding era, when several discoveries and inventions had taken place through the application of science in different parts of Europe. Also important was the ability to harness natural resources for development. Thus, by the time of the Berlin Conference of 1884/85, Africa's land had become a source of raw materials and market for Europe's manufactured goods, a condition which caused the gap between the two continents to assume a geometric progression. In the same vein, the United States became a model in technology through the harnessing of natural resources and advantageous use of foreign skills. This was further stimulated by her liberal immigration policy at the beginning of the Nineteenth Century.

For Nigeria, a country with abundant natural and human resources, these experiences can be transformed to a point of strength especially considering the fact that Britain, which colonized the country, took advantage of her domestic natural endowments in the pre-Industrial Revolution period. The United States of America, which also experienced colonialism in the hands of Britain, followed the same pattern to develop her technology in the Nineteenth Century. In the Twentieth Century, Japan in Asia equally began her techno-industrial sojourn by first establishing a solid foundation at home, through her indigenous potentials. This perhaps, is why a Zambian economist, Dambisa Moyo, maintains in her book titled, *Dead Aid*,¹ that the fundamental factor for Africa's development is for the continent to harness her huge potentials in

human and material resources for sustainable progress. She argues that Africa should not be a continent of pity, to be given *Aids* which, according to her, have not been beneficial; rather the continent should strive to become an equal partner on the global stage. This paper therefore examines Nigeria's ability to develop her technology using her own potentials.

Conceptual Clarification

Technology and development are two concepts, which are complementary in the life of any nation. The two are strongly connected as they determine the rating of nations in development index in the international system; that is whether a nation is classified as under-developed, developing or developed. This rating is however largely the aggregate of the various ways in which technology has positively touched the lives of the people in a given society. Hamilton, for instance writes:

Different people understandably see technology in different guises. For the factory workers, it has overtones of "automation". The businessmen may think of technology in terms of computer taking over routine payrolls, calculations... To the man on the street, it may well suggest space exploration and landings on the moon. The scientist may perhaps think of technology in terms of finely engineered apparatus in his laboratory. The house wife is more likely to think of it if she thinks of it at all, in relation to her washing machine, plastics, kitchen wares and so on.²

Therefore, the complexity of the concept lies in its broad application and enormous impact it has on different facets of human life. Thus, there is the need to differentiate for instance, between technology as knowledge, technology as a process and technology as a product. Bahagavan makes the following clarification on the subject:

The concept of technology we use is a broad one. It has two parts. The first consists of all kinds of tools, machines, vehicles and buildings. The second part comprises all kinds of production, change and innovation of the first part. We refer to the two parts respectively as 'equipment and technological knowledge'. Technological knowledge is often split into two types; the knowledge of how to do things (know-how) and the knowledge of why certain things have to be done in certain ways (know-why).³

These two dimensions to our description of the concept point, clearly to one fact, that is, environmental challenge is the propelling factor which brings about technology. In other words, technology is central to man's quest to conquer his environment. Therefore, on the basis of the definition above, we can conclude that both know-how and know-why embodiments of technology are inherent in pre-colonial, colonial and post-colonial Nigeria, as evident in the indigenous industries. Technology, as demonstrated by the different Nigerian communities since times past, remains an instinctive part of their consciousness for survival in a continually challenging environment. This explains why technology was, and is still wide spread in the country, in spite of the geographical and cultural differences. This fact of response to environmental challenges clearly suits our purpose in this paper, and has been aptly summed up by L. Beals and H. Hoijer that:

Technology is the sum total of the techniques possessed by the members of a society, that is the totality of their ways of behaving, in respect to collecting raw materials from the environment and processing these to make tools, containers, foods, clothing, shelter, means of transportation and many other materials necessary... Technology is a cultural screen that man sets up between himself and his environment.⁴

Three fundamental points can be deduced from these clarifications. Firstly, African technology was, and is intricately wound around a strong cultural pillar, and is therefore a way of life. Secondly, the ability of the Africans to fashion out tools of different shapes and sizes was a demonstration of the know-how and know-why of their technology. Thirdly there were obvious features of progress on the path of African technology. This is why Boba believes that technology is spread by man and that man lives by technology.⁵

On a broader scale however, technology can also be classified as indigenous (endogenous) and foreign (exogenous).⁶ While the former refers to the internally generated methods of learning and expressing grass-root initiative in technology, the latter deals with the transferred (imported) or foreign input in the technology of a society or nation. Indigenous technology is also referred to as traditional technology while the foreign input is often referred to as modern technology and somewhere between both concepts is the term intermediate technology. This is more of a fusion of the relevant aspects of both indigenous and foreign technologies and this gives rise to the concept of appropriate technology. Appropriate

technology deals more with adaptability of a particular technology to the culture and ecology of a society, whether such technology is traditional or modern. In other words, appropriate technology stresses the socio-cultural and environmental impact of both indigenous and foreign technologies.⁷

A Digest of Cases in Techno-Industrial Revolution

The pioneering efforts of Britain in the Industrial Revolution opened a new era in the history of manufacturing in the Mid-18th Century. Prior to this period, British industries had relied heavily on labour. Her cottage industries were operated on domestic basis with challenges in the supply of cotton to the spinners while the weavers were also affected by the slow pace of the spinning process. Her agriculture also relied largely on simple tools with a relatively low out-put. By 1750 however, Britain experienced a change in industries like iron smelting, transportation, cotton production and textile industry.⁸ This event however, did not come by accident; rather it was the result of events and discoveries, which were already occurring in her society before 1750. During the Renaissance, the search for knowledge had led to renewed interest in writing and scholarship across Europe. Thus, ignorance and mediocrity, that characterised the Dark Ages, were speedily overtaken by enlightenment, discovery and inventions.

Britain's frontline role in this techno-industrial revolution may be attributed to the following factors:

The Enclosure System programme also known as the Agrarian Revolution, was based on government's realization of the fundamental role of agriculture in stimulating changes in British society. Thus, lands were taken from peasant farmers, who cultivated in small scale, and merged to create large mechanised farms. This resulted in increase in the volume of harvest, which in turn, led to transformations in other productive sectors in Britain. For instance, high yields in cotton placed a challenge on the spinning and weaving industries, where the first set of invention and innovation in British cottage industries took place.⁹ It also gradually encouraged the change from domestic to factory system of production in British manufacturing industries.

Britain also put her natural resources like water, coal, iron and other raw materials into optimal use. The central role of iron in British industrialization is a textbook commonplace. Iron was one of those sectors in which indisputable revolutionary changes took place. The use of coke in smelting, the application of steam power, and the perfecting of coal-fired refining methods transformed the prospects of the British iron industry in the course of the 19th Century.¹⁰ The country also had adequate capital resources

which were invested in the technology programme. These moneys were sourced from trade and commercial concerns in her areas of spheres of influence around the world. The country was already the world's largest trading nation in the 19th Century, holding merchant houses and firms locally and internationally in her colonies abroad. Nigeria's oil could also be used to develop her technology through genuine investment in technology education, scientific enquiry and indigenous industries.

Elsewhere, techno-industrial revolution in the United States of America (U.S) equally followed a similar trend. The U.S. industrialization began as early (or as late) as the first quarter of the 19th Century. The major events in her industrial revolution however, took place between 1850 and 1900. Prior to this period, her economy was, as late as 1860, predominantly agricultural, with only about 20% of its population living in towns. By 1910 however, its industries had even surpassed those of her predecessors in the technology programme.¹¹ This feat was not achieved by chance; rather, it was the result of a combination of factors which include:-

Richness in natural resources: the U.S had one of the largest coal deposits in the world. It had large oil deposits and natural water ways. The Country also had a large domestic market, which was boosted by soft immigration laws. Nationals from other countries were allowed to settle permanently in the U.S thereby contributing to the country's development potentials.

Another factor was improvement in transport and communication system, with the railways system forming the nerve-centre of transportation. This also enhanced contacts with other parts of the world, especially the Pacific region, Central and Southern America. The U.S upheld the ideology of capitalism and allowed private investment in 'the commanding height of her economy'. This lessened the burden on government and enhanced the efficiency of the companies. The Result was the emergence of business conglomerates in the automobile, electronics, satellite and other industries. By far, agriculture still remains the biggest investment in the country.

In the same perspective, Asian countries like China, Japan, Singapore and Malaysia represent huge lessons for Nigeria in techno-industrial revolution. These countries grabbed the baton of technology revolution in the 20th Century and since, utilized it to the fullest. Japan and China stand out, particularly in the area of cultural hybridization, through which local endowments enabled them to import technology from the West. In the case of Japan, the period between 1880-1970 stood out as the period of sustained growth in per-capita income and

industrialization.¹² Broadly speaking, Japanese industrialization was made possible by the following factors:

- (i) The proto- industrial base- craft production, which itself was sustained by large agricultural production in both rural and urban areas of the country prior to her industrialization.
- (ii) Investment Led Growth- domestic investment in industry and infrastructure was the driving force behind the growth in Japanese output. Both private and public sectors were involved in infrastructure, while national and local governments served as coordinating agents for build-up. Investment in manufacturing capacity was largely left to the private sector. There was a rise in domestic saving, which made increasing capital accumulation possible. Lastly, Japanese growth was investment led not export led.
- (iii) Readiness to emulate the West- as a result of these domestic advances, Japan was well positioned to take up the western challenge in technology. It harnessed its infrastructure, its high level of literacy, and its proto-industrial distribution networks to the task of emulating western organizational forms.¹³

From our discussion so far, it could be extrapolated that techno-industrial revolution in Britain, the U.S and Japan, followed a similar precept, which was inspired by the availability of natural resources, promotion of local capacity, and a strong political will to use the potentials for accelerated technological development.

Nigeria's Potentials in Technology

All over the world, agriculture provides assured supplies of food, stimulates a high degree of urbanization and specialization, and encourages an increase in population. According to Evans Pritchard, the first revolution that transformed human economy gave man control over his own food supply. Man began to plant, cultivate and improve by selection of edible grasses, roots and trees.¹⁴ This transformation has been aptly described as the Neolithic Revolution.

Nigeria, since the pre-colonial period, has demonstrated great potentials in agriculture. The country was a major contributor to the West African economy as products from her communities were exchanged with those from other parts of the continent. Nigerians still recounts with nostalgia the significant impact of the cash-crop economy, which was instituted by the British and how it sustained the country. Chief among the export crops then were

cocoa, rubber, cotton, palm produce and groundnuts. In terms of employment, agriculture remains by far the most important sector of Nigeria's economy engaging about 70% of the country's labour force.¹⁵ The country's diverse climate, from the tropical areas of the coast to the arid zone of the north, makes it possible to produce virtually all agricultural products that can be grown in the tropical and semitropical areas of the world. Indeed, virtually every part of Nigeria was identified with one agricultural product or another. At the height of the country's agricultural production, the north was for instance, reputed for groundnuts, cotton, hides and skin, leading to the popular groundnuts pyramids of the north, the West was known for cocoa while the East was popular for palm produce.

This territorial specialization brings to mind two related issues. First, the arrangement allowed for intra-regional exchanges in respect of crops that were needed by other communities. Secondly, it encouraged economic relations which stimulated cooperation among the diverse groups.¹⁶ Prior to independence therefore, proceeds from the agricultural sector, such as cocoa, groundnut, palm produce, rubber and so on, were used to develop a virile and viable economy. Four years before Nigeria gained independence however, oil was struck in commercial quantity at Oloibiri in 1956.¹⁷ This was initially a blessing, as the new found fortune speedily transformed Nigeria structurally, but soon took a negative toll on the country's steady progress in agriculture. The country rose steadily in the oil production index to become one of the top oil exporting countries in both crude oil and gas. What is nauseating, according to Akinwale, is that the country has precariously been almost exclusively dependent on the oil and gas sector, which accounts for 95% of the country's export and 76% of government revenue.¹⁸

In the 1960s, before it turned to oil, Nigeria was one of the most promising agricultural producers in the world. Between 1962 and 1968, the country was number one globally in palm oil exports, well ahead of Malaysia and Indonesia, and exported 47% of all groundnuts, putting her ahead of the United States of America. The country supplied 18% of the global production of cocoa, second in the world in the 1960s.¹⁹ The contribution of agriculture to the country's Gross Domestic Product has however declined from 75% before 1970 to less than 5%, which has led to insufficiency in both food production and raw materials. This sharp drop in agricultural production is partly occasioned by rural-urban migration. While the rural areas are faced with declining labour and productivity, leading to hunger and poverty, the urban areas are faced with serious problems of unplanned expansion, urban congestion and decaying infrastructure. Thus, in spite of 33% of Nigeria's 923,768 km² of land being

under cultivation, the country still imports all manner of goods including food items and agricultural raw materials.²⁰ The emphasis here is that notwithstanding this poor performance in agriculture in the recent past, Nigeria's potential in the sector is still huge. The country still has great expanse of arable land, favourable climate, abundant water resources through rainfall, water-ways, rivers and streams, human resources and capital from oil, which can be used to mechanise and transform agriculture for food sufficiency and industrial raw materials. Thus, agro-tech is one area Nigeria can employ to push her technology agenda through massive innovation in agricultural tools for farms

In the same vein, Nigeria has great potential in the solid mineral sector as against oil, which has remained the country's main source of revenue. The National Bureau of statistics lists solid minerals as contributing less than 1% to the GDP, despite significant coal and iron ore reserves, and known deposits of gold, uranium, tin and tantalum. Others are lime, columbite and bitumen. There are over 3 Billion tons of iron ore found in Kogi, Enugu, Niger, Zamfara and Kaduna States. There are also proven reserves of both alluvial and primary deposits of gold, with proven reserves in the shiast belt covering the western half of Nigeria. A number of primary deposits, which are sufficiently big for large scale mechanised mining have been identified in the northeast and southwest of the country.²¹

With this geographical spread of solid mineral across Nigeria, all-round technological development can be achieved, unlike petroleum whose deposits are concentrated in the Niger Delta. Furthermore, the solid mineral sector can help to reduce the pressure on oil and diversify the country's economy.

Nigeria is reputed as the most populous black nation. The country's population has grown astronomically over the years, from the initial 55.5 million in 1963, 88 million in 1991, about 140 million in the 2006 Census,²² now to an estimate of about 190 million people according to World Meters Information.²³ This massive population can help in transforming the country's technology through creativity and innovation as it did in China, India and the United States.

The craft industry had an enviable position in the account of the traditional economy in Nigeria. This includes weaving, pottery, iron smiting industry, the brass and Bronze, ceramics, carving and canoe building, local brewing, soap making, traditional medicine, leather works and tanning. These local industries, as rudimentary as their production processes were, met domestic demands and sometimes, even had surpluses, which were exported. Rodney for instance illustrates how leather sandals from Kano were exported to

North Africa, from where they found their way across the Mediterranean Sea to Southern Europe, where they were erroneously referred to as Moroccan leather. By the middle of the Nineteenth Century, Kano had also become in influence, if not in organization, the Manchester of West Africa, due to the volume of her cloth export.²⁴ The famous traveler, Barth estimated Kano's cloth sales to at least 300,000,000 cowries a year in 1850s, which was equivalent of about £40,000.²⁵

Again, the point here is for the county to revive this feat, especially now that the literacy level of Nigerians has increased due to formal education. There are now engineers, technologists and professionals in various technology fields. India for instance, now makes anything from pins to rocket. She was strict about developing her indigenous capacity. Therefore, the country still uses simple tools for agriculture and road maintenance all of them locally designed and fabricated. She uses suitably lined baskets made of raffia to carry laterite for major road works, thereby promoting local industry and arresting unemployment.²⁶ The case of India is a model of appropriate technology for a developing country. That is, a technology which seeks to accommodate itself to the cultural environment of the society where it is being used. It is therefore a technology, which can be handled locally, without resort to foreign assistance. What this stresses is that every society has a technology tradition and as such whatever new technology that emerges must necessarily grow out of this tradition. In this wise, the only development that makes sense is the development of the people and their skills. Therefore, for these potentials to yield meaningful impact, their technology must emanate from the cultural environment, not a form of foreign know-how, which will be a misfit and difficult to sustain.

Government Approach to Technology Programme in Nigeria

An important driving force in any nation is the government and its leadership style. The relationship between leadership and development is intertwined such that one affects the other. Since independence, Nigeria has had several national development plans. The First National Development Plan (1962-1968), was formally launched in 1962. The Second National Plan (1970-1974) was launched when the country acquired the status of major petroleum producing country. The Third National Development Plan (1975- 1980) was launched at the height of the oil boom. The Fourth National Development Plan (1981-1985) coincided with the inception of a global economic recession which sparked declining foreign exchange earnings, balance of payment disequilibrium and unemployment in the country.²⁷

It should however be stated that, the development plans were envisioned on technological and industrial progress for the country but suffered setbacks at different times the last being the economic recession in the mid-1980s. Nonetheless, the Nigerian government has at different periods implemented various policies aimed at developing her technology to enhance industrial growth. These include establishment of technical colleges, polytechnics and universities of technology, establishment of technology development centres and other technology related outfits. These policies have not been pursued with vigour, hence no meaningful results have been achieved. The indigenous and private cottage industries have not been properly integrated into the school system, which makes transfer of knowledge and linkage to remain elusive. In the same vein, Nigeria's Vision 2020, which embodies the country's blueprint for an industrial revolution, became unrealizable goals due to lack of implementation on the part of leadership. The aim was that in short while, Nigeria, which is Africa's most populous country and the sixth largest crude oil exporter, would have undergone catch-up in techno-industrial development that could catapult her to be ranked among the 20 largest economies . Indeed, Late President Musa Yar'adua, in an address to the Nigerian Economic Summit Group (NESG) in 2008, admitted that the realization of the goals of the Vision 2020 had faced serious constraints of "purposeful leadership", a definite roadmap and growth inducing environment.²⁸ This remark by the then president is an indication of lack of implementation of the laudable objectives of the programme.

Thus, government need to be more pro-active about the technology programmes by adopting realizable policies. The level at which available resources are pragmatically and judiciously applied for the enhancement of socio-economic and technological well-being of the citizen is usually a function of leadership, just as the extent of development often influences leadership functionality. The Nigerian government must provide the enabling environment for technology to thrive. The starting point of that role is to fashion out a technology development agenda that will be all-encompassing. Policies on technology must accommodate both private and public sectors, schools, indigenous industries and the informal sector.

Furthermore, an enabling condition for the revival of technology in the local environment should be created. This can be done through soft loans to the practitioner and periodic research in schools on the challenges and prospects of these industries and their technologies. This will gradually lead to a change from domestic to factory system in their operation thereby increasing their volume of production. Government needs to take full advantage of the potentials in the

solid mineral sector, through genuine and well planned exploitation, with the dual aim of diversifying the economy and improving technology. The abundant opportunities in this sector must be taken as alternative to oil and gas as the main stay of the country's economy. The Nigerian government, like that of India, should promote the culture of using locally manufactured products as a way of encouraging local investment. The country's population can, in this sense, be a great advantage in market for finished goods. Major constructions in roads, bridges, dams, buildings etc. should be handled by Nigerian engineers to encourage them and save cost.

Multi-National Corporations should be compelled to contribute a certain percentage of their post-tax profit to a national trust fund for research and development in science and technology. They should also be mandated to employ more Nigerian engineers and technologists in their production. Government and the private sector should encourage creativity and innovation among Nigerians, particularly among the youths, as witnessed in Britain, Germany, the U.S, China, Japan, India, Singapore and other developing countries. They introduced and vigorously pursued innovations and inventions in their local technologies. Indeed, Germany in her case even introduced a Young Innovators Club to ensure a rapid transformation of her technology. This has not been the case in Nigeria. The pace of transformation has been very slow and insignificant. This is however not unconnected with lack of adequate capital for expansion. Practitioners in the local technology operate in the informal sector of the economy; they thus get little or no recognition from government. They source their funds solely and rely on market forces for their survival.

A New Paradigm for Technological Development in Nigeria

Generally speaking, a country has two main options to achieve technological breakthrough. The first option is to go through the Technology Life Cycle of Innovation Stage (introduction of a new technology), Syndication Stage (demonstration of the new technology), Diffusion State (penetration of the technology into the market) Substitution Stage (Decline in the technology). The second option is to simply import and adopt already developed technology otherwise known as Technology Transfer. However, these two options can be integrated to form an appropriate technology especially when there is a strong indigenous technology system. This is done by adopting relevant aspects of foreign technology and adapting it with internally generated creative knowledge. Unfortunately, Nigeria's policy on technology has been quite erratic. At some points it takes the posture of creating indigenous technology capability in young Nigerians through the establishment of technology-based

schools. At most other times, the country tilts towards the importation of technology. Nigeria is certainly not lacking in natural and human resources; what has consistently been lacking is the proper exploitation of the resources and potentials of the country. This paper consequently believes that Nigeria's technological break-through can be fast-tracked if attention is paid to the following broad areas. These are:

Optimum Exploitation of Natural Resources

Nigeria is highly endowed in human and material resources. The country has a bustling population, a creative and ingenious indigenous industrial sector, which had proved viable in supporting her economy in the past. The lands are arable while solid minerals dot her land scape, which are largely unexploited. Her waterways, climate and abundant rainfall are all great assets. Like in Britain, the U.S and Japan, these local endowments, if properly harnessed, can be used to set the foundation for Nigeria's technological development. Virtually every state in Nigeria is blessed with one mineral resource or the other with some areas having as much as 10 or even more. For instance important minerals like gold, uranium, limestone, magnesite, iron-ore, oil and gas, lead/zinc, coal, kaolin, marble, bitumen, granite, copper, glass-sand, phosphate and so on are among the most common in different parts of Nigeria but majority of which are unfortunately unexploited, as already stated earlier in this paper.

Appropriate Technology Education

Technology education is another factor that needs to be boosted for speedy technological transformation. According to Auta, the major fabric of technology education involves training in the process of applying both science and technology to practical problems right from primary to the tertiary levels of education... It aims at developing practical as well as the creative and innovative ability in students as it enhances and facilitates their problem-solving and decision-making skills. It is a utility education that passes to individuals, useful and usable skills to make them self-sufficient. Technology education engages youths in productive and gainful adventures instead of staying idle and jobless.²⁹

Technology education is thus, a major driving force for developing a creative, innovative, resourceful and self-reliant work force in any country. However, since technology is the application of scientific knowledge for practical purposes, scientific enquiry is the starting point for technology education. The advanced countries, which Nigeria aspires to emulate, rely

heavily on scientific enquiry for developing their technology. Thus, science education needs to be revitalized to give background impetus for technology in Nigerian schools. However, this should be done in close relation with existing potentials among Nigerians, especially, in the indigenous industries. It should be emphasised that that indigenous technology refers to a knowledge of technology that is locally generated, maintained and transferred through a systematic process of participating in the production process, observing the challenges inherent therein, experimenting with option(s), and re-adapting previously identified solutions to the process. Olaoye maintains that indigenous technology embodies various aspects of technology developed by or with active participation of the indigenous people through the harnessing and utilization of local materials and natural resources.³⁰ It makes the heaviest use of abundant indigenous resources, locally produced tools and equipment. Indeed, it is a self-reliant technology that is capital-saving, rather than capital-using, labour using rather than labour saving, and one that could be operated, controlled, repaired and maintained locally.³¹

As illustrated earlier, Britain, United States and Japan all pursued their technology programmes, primarily, from their local environment with the external factor serving as secondary advantage. In Britain for example, cottage industries served as the basis for the transformation. Challenges posed by the labour intensity of the production process in the spinning and weaving industries poised inventors to come up with simple machines, which facilitated production. The invention of the Flying Shuttle by John Kay c.1733, and the Spinning Jenny by James Hargreaves c.1764, greatly enhanced the process by which British textile industries became mechanized.³²

This is the kind of response that Nigeria's indigenous industries require from educational institutions. For instance, Nigeria's traditional textile manufacturing has remained labour-intensive, using the same implement for decades in spite of the proliferation of technical schools, universities of technology and other technology based institutions in the country. The story is the same in most other indigenous industries, which still rely heavily on labour, with little or no innovation in their technologies. The point being echoed here is that there is no linkage between the school system and the indigenous technology at present and this has remained a major setback in the Nigeria's quest for sustainable technology.

Adequate Youth Engagement

The youths are cardinal in the technology programme in Nigeria considering their skills and numerical strength. The Concise Oxford Dictionary

of Current English describes youth as the period between childhood and full manhood. The period between childhood and adulthood, the period of physical and psychological development from beginning of puberty and early adulthood.³³ Youth is also described as a period of unspeakable significance in man's life because of its spirit of adventure and the shine of energy, tempered by a growing sense of maturity and responsibility.³⁴ Thus Nigerian youths if properly empowered can be a formidable source of wealth for the country. The Nigerian youths have demonstrated their strength during colonialism through the founding of the Nigeria Youth Movement (N Y M) in 1933. This was Nigeria's first genuine nationalist organization founded in Lagos and drawing membership across ethnic lines. Prominent among its members were Eyo Ita, Samuel Akinsaya and Ernest Ikoli. Their immediate concern was to foster political advancement and enhance socio-economic status of Nigerian citizens. It later became a strong platform for Nigerian Nationalism with people like Nnamdi Azikwe, H. O. Davies and Obafemi Awolowo playing prominent roles.³⁵

The youth have the largest share of the country's population and they hold the key to Nigeria's success in technology. For instance, the school system can be used to direct the minds of the Nigerian youths towards greater interest in creativity and innovation in new technology as is happening in Developing countries like China, India, and Indonesia. Even when a technology is imported, the youths must be involved in its adoption and adaptation in Nigeria. The youths are also reliable in the provision of the labour requirement of the country. Indeed, the Nigerian youth in recent time are demonstrating the ability to create wealth through their increasing participation in entrepreneurial activities and development of small businesses for self-employment. It is thus obvious that if Nigerian youths are given greater platforms to operate, they can serve as the springboard for creating appropriate technology for the country. With adequate funding and technical support from government, Nigerian youths can create products and services that will impact positively on the economy, reduce unemployment and ultimately, create a base for the country's technological development. Indeed, many young in Nigeria are now aspiring to become entrepreneurs and this can give tremendous boost to the country's quest for technological development, if the needed support and enabling environment is provided by government. This can be facilitated by the provision of funds for youths with entrepreneurial skills and scholarship for scientifically and technologically inclined students as well as sponsorship for converting laboratory and classroom researches into products.

Small and Medium Enterprises

A positive trend in recent time in Nigeria is the upsurge in the role of youths in small and medium enterprises. The increasing rate of unemployment has forced many youth to pursue self-employment as a way of making ends meet. In this regard, the role of Nigerian youths would not only be to create jobs to tackle unemployment, but also to engage in a wide range of personal and social development activities that would offer assistance to other young people to develop their knowledge, skills and attitudes in the bid to take the country to the next level of progress. These include teamwork, communication, leadership, flexibility and responsiveness. Other advantages include creativity and innovation, which involve defining problems, coming up with ways of dealing with them, and sticking to a chosen course of action. The small and medium enterprises due to their large number have the potential to boost Nigeria's technology base for industrial development as was the case in the advanced countries like Britain, the U. S. and developing countries like India, Malaysia and South Africa.

Conclusion

This paper has examined the Nigeria's quest for technological development, particularly through her abundant natural resource potentials. It is noted that the country's precolonial and colonial economies were sustained on agriculture. The country has great potentials in natural resources like water, iron, coal and numerous other minerals that could be used to transform her technology, but they have largely been under-exploited due to over-reliance on oil revenue. Even though the Nigerian government has put up different plans to fast-track techno-industrial development since independence, implementation has remained the bane of realizing the goals of the laudable programmes. There should be a synergy between indigenous technologies, cottage industries, small and medium enterprises and the formal school system so that a Nigerian technology can emerge within a reasonable time. It recommend that the expectation of government for a virile technological advancement would only be attained when the suggestions in this paper are urgently adhere to. This would also stimulate the emergence of a sustainable appropriate technology for overall development of Nigeria as witnessed in the developed countries.

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