

Developing Indigenous Technology for Sustainability in the Manufacturing Sector of Nigeria

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Abstract: *Many developed countries have succeeded to attain economic growth and transformation through the exploitation of local know-how and resources within their domains. This process has seen the conversion of local challenges to opportunities necessitating the stated economic growth and transformation by means of indigenous technology. This paper explored the concept of indigenous technology, identifying the potential areas where the development of indigenous technologies is needful, as well as, the relevant strategies required for developing indigenous technology in Nigeria. The paper concludes that indigenous technology is solving Nigeria's problem in a Nigerian way. Therefore, the development of indigenous technology can solve Nigeria's economic over dependence on crude oil, with potency for economic diversification resulting to economic growth and transformation. Furthermore, the paper recommends an increased promotion of R&D efforts across board. Finally, priority should be given to the funding of local innovative ideas and inventions.*

Keywords: *Technology, Indigenous Technology, Sustainability.*

Introduction

Technology is a fundamental resource deployed to actualize economic growth and industrial expansion in today's globalised world (Pacey, 2001). The application of technology has led to an upsurge in revenue generation, enhanced productivity and has a vital place in the overall wellbeing of man. Misa (2003) Pointed out that for a country to cope with the current spate of international competition, she would be required to pinpoint her rich and further develop them through scientific means.

The Asian Tigers, including India and China have succeeded to attain economic transformation through the exploitation of indigenous technology and resources in their domains. Thereby, converting local challenges to opportunities for these transformations in the process (Misa, 2003). More so, the indigenously developed creations of these nations have resulted in market disruption around the glob, and correspondingly brought more wealth and immense national pride to them (Gakuru, 2006).

Okpoko & Ibeanu (1999) proffered that indigenous technologies should be the foundation for technological development. To strengthen this position, Akinwale (2016) attributed the existing competitive space between nations and business organizations to a gap in knowledge. The manufacturing sector of any nation is considered to be the

driving force of the nation's economy, wherein, Nigeria is not exempted. This status is hinged on the notion that the sector provides employment opportunities, creates wealth and contributes in no little way to increase the standard of living (Szirmai, 2012).

Regardless of the abundant human and natural resources in Nigeria, the nation's manufacturing sector has consistently been recording abysmal performances over the years (Omoke, 2010). Worse still, the sector relies mainly on foreign technology to function. These technologies cost billions of dollars to acquire. In spite of the large costs, the technologies have failed to fully solve the nation's industrial challenges because the development of the technologies were not intended to solve peculiar local challenges of the manufacturing sector. As such, the sector is frequently faced with issues of maintenance (Omoke, 2010). Therefore, the thrust of this research was to explore the development of indigenous technology, identifying the potential increase where indigenous technologies are required as well as the relevant strategies for developing indigenous technology.

The Concept of Indigenous Technology

Foundationally, the word technology was derived from the Greek word *techne*, which translates in English as belonging to the arts, crafts or skill (Vandeleur, 2010). There has not been any generally accepted definition of technology, rather, scholars have viewed the concept from different perspectives. For the purpose of this research the researcher has adopted to define technology, as the application of resources and know-how to increase the outputs of the factors of production in order to stimulate economic growth and satisfy human dynamic needs (Akinwale, 2012; Manabete & Umar, 2014).

Lawson (2008) broke the concept of technology into indigenous and foreign technology. He further described indigenous technology as one developed internally within a particular geographical space, while the foreign technology is considered to be imported or transferred into a particular geographical space. Fusing the two above concepts, indigenous technology can be defined as developed unique capabilities, originating or belonging to the inhabitants of a particular geographical locality.

Indigenous Technology in Nigeria

In the course of the pre-colonial era, indigenous households in Nigeria through their interactions with the environment deployed local technologies to solve basic problems within their localities. This they did through small scale local production systems and manufacturing industries (Okpoko & Ibeanu, 1999). Salihu (1991) revealed that iron smelting was carried out in Tarugala, a town in North Central Nigeria as early as 400BC. Indigenous technological breakthroughs were manifest in virtually every part of the country and contributed immensely to make life meaningful and worthwhile to live. Adesina (2004); Okafor (1984); Aremu (2004); Anozie (1981) through their works gave insight into some indigenous feats in Nigeria.

Remarkably, among them were the practice of black smelting, predominant in Oyo (a state in South Western Nigeria) and Kano (a state in North-Western Nigeria) from which farming implements, household utensils and weapons of warfare were produced. There was aluminum casting in Saki (a community in South-Western Nigeria) which produced aluminum pots for cooking. Beads were locally produced in the North Central

part of the country while the Northern part of the Nigeria boasted of leather products and beauty applications such as skin friendly dyes. On the other hand, the South-Eastern part of the country locally produced spears, arrows etc for hunting. They also extracted palm oil from palm fruits. These technologies were all deployed informally through oral instructions and apprentices (Aremu, 2004). However, at the advent of the colonial masters into Nigeria their subsequent introduction of superior products, these indigenous products could no longer suffice due to the imperfections in their production processes and poor product finishing. The technologies essentially failed to upgrade nor converge with modern scientific technologies (Aremu, 2004).

Potential Areas For Developing Indigenous Technology

Palm Oil

Palm Oil is the most abundantly produced vegetable in Nigeria. Nigeria was the leading exporter of Palm Oil in the world before it was over taken in 1934 by Indonesia, who are currently the worlds leading exporters (Teoh, 2002). The Resource has multiple advantageous uses in edible and non-edible industrial applications. Palm Oil is used in the manufacturing of food products, at the same time, it serves as biodiesel and fuel to be burned in power stations to produce electricity (Edum, 2002). Technological innovations associated with the resources has led to the substitution of normal oil for Palm Oil in a bid to reduce green house gas emissions (Tan & Nehdi, 2012). This development has anticipated an increased demand of the resources to satisfy the new biofuel market. Indonesia has commenced the construction of multiple biodiesel plants in response to the trend. (Mba et al, 2018). Speaking on the prospects of Palm Oil, the Governor of the Central Bank of Nigeria, Godwin Emefiele, declared that Edo State (a State in Nigeria) alone can generate 200,000 jobs from the (activation and processing of palm oil (Shobiye, 2019).

He went further to say that in 2017, Nigeria earned \$23 Billion from its major export product, crude oil. Whereas, Indonesia earned close to \$22 Billion from palm oil in the same year. From the foregoing, it is clear that palm oil could be a major foreign exchange earner for the country as well as create the much needed employment opportunities for Nigerians if new efficient technologies and improved methods are adopted for the resources.

Petroleum

With every aspect of human activities directly connected to the use of petroleum or its sub products, petroleum is the main source of energy in the world. For instance the world's entire transportation system is dependant on petroleum for sustenance (Bankole & Ogunkoya, 1978). With an abundant reserve and a production capacity of 2.5 million barrels per day, Nigeria stands as Africa's highest producer of crude oil and the sixth highest producer of the product in the world. (Eneh, 2011). Amazingly, the exploration and production of petroleum are all done by expatriates. Virtually all the petroleum produced in the country is exported to other countries with refined products re-imported into the country due to Nigerian's inability to refine petroleum. Whereas, a large number of buy-products from petroleum are also re-imported into the country.

Iron Ore

Iron Ore are basically rocks, out of which metallic iron can be extracted. Iron ore is the

element, besides its use in different forms across many sectors, it is in the production of steel, which is the world's most used metal (Aremu, 2004). Though Nigeria boasts of an abundant reserve of the mineral in 2018 alone, it imported \$729.92m worth of steel products (Sherifat, 2019). Steel in itself is used in the production of pipes, cars, ships, engines, roofs, nails, nuts, bolts, tools machinery, food cars, paints, inks and cosmetics, (Okoro) all of which are imported items.

Iron ore and steel holds immense employment and revenue potentials for Nigeria and begs for the exploration of indigenous technology. This deficiency, accounts for over 75% of Nigeria's foreign exchange outflows, considering its heavy dependence on imported petroleum products.

Lime Stone

Nigeria is endowed with enormous deposit of limestone. Limestone is a mineral resource considered to be an extremely valuable raw material used in several industries where chemical properties are relevant (Concrete Society, 1987). Particularly, the construction and manufacturing industries are essentially the principal Consumers of the Mineral. For instance, limestone is the major raw material utilized in the production of cement, which is further used in making mortar, bricklaying or concrete blocks (ASTM, 2015).

Lee (1998) suggested that innovation in the use of limestone in the production of cement could lead to the design of cements that could have greater qualities than plastics and metals. Indigenous technologies are required in the extraction of limestone, and their subsequent uses in industrial spheres of the nation.

Strategies for Developing Indigenous Technology

Funding

Lewis (1997) opined that in the absence of proper funding, the best of dreams will fade away while innovations will be dead on arrival. Maizels (1963) expressed that technology cannot be developed in the absence of finance. This situation is attributed to the fact that innovation ideas generated requires to be implemented, whereas, the implementation of innovation ideas requires finance.

To further enthrone the significance of funding, Maizels (1963) proffered that finance is what greases innovation ideas and tends it to reality. On the backdrop of the above, for the development of indigenous technology to take root in Nigeria, there must exist an appropriate structure of funding support to innovations.

Research and Development

Research and development entails creative activities carried out in an orderly manner aimed at enhancing the skills, competences and experiences of individuals and the society at large (OECD, 2010). Research and development efforts inspires the development of new products and inessential properties whilst coming up with ways to improve existing products and processes (CBN, 2017).

The shift from agrarian economy to industrial economy in the 19th and 20th century was catalyzed by research and development. The world leading nations and other emerging economics have relied on research and development to turnaround their economics (Siyabola, 2011). Notably, South Korea, through intense research and developmental activities transformed its industrial sphere within a space of 30 years,

compared with the same industrial transformational results achieved by Western Countries within a period of 100 years (Kim, 2011).

The economic prosperity of nations is an indication of the level of priority and expenditure devoted to research and development. For instance, USA, as the largest sponsor of research and development spent and 495 Billion in 2018 on research and development while Nigeria spent only \$1,374.8 Million (CBN, 2019). It can be deduced from the stated statistics that Nigeria pays very little attention to R & D due to its dependence on crude oil. Apparently, concentrated efforts on R&D would increase Nigeria's development and by extension, drive the manufacturing sector into a prosperous future.

Conclusion

It can be inferred that technology encompasses every aspect of human life, as it proffers new and better ways for getting things done. Indigenous technology entails solving Nigeria's problems in a Nigeria way. This stands is attributable to the fact that it is most suitable when solutions come from indigenously developed answers and resources.

In the development of indigenous technology lies the answer to one of Nigeria's greatest challenge; the diversification of her economy away from the concentration on crude oil, the nation's mono economic export. The nation's indigenous technologies offer great opportunities for local economic transformation. And to a large extent, potentials to enhance its global competitiveness. All of these can only materialize when indigenous technologies are developed and standardized through the path of science, technology and innovation.

From the foregoing, the researchers hereby proffer the following recommendations;

1. As is the global best practice, there should be a robust collaboration between the government and the private sector on the increased promotion of R&D efforts in Nigeria to bring about economic growth and transformation.
2. Proactive measures should be taken to prioritize the adequate funding of the newly established National Research and Innovation Fund, so as to enable the conversion of innovative ideas and innovation to indigenous technology.
3. Science, technology and innovation hubs should be established nationwide to specifically intensify research and development efforts towards the extraction and processing of Petroleum, Palm Oil, Iron Ore and Limestone. So as to chart a cause for the development of indigenous technology supposedly to support the industrialization efforts of Nigeria.
4. The Federal Government of Nigeria should provide an enabling environment for the development of indigenous technology through the provision of infrastructures and the enactment of laws that will protect intellectual properties.

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