

HARNESSING INDIGENOUS INNOVATIONS FOR ECONOMIC DEVELOPMENT IN NIGERIA

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DOI: 10.29816/sjss.8.3.23

ABSTRACT

This paper examines indigenous innovations as important drivers of economic activities that could foster economic development in Nigeria. Indigenous innovation is recognised to be an output of indigenous knowledge as well as an input for economic growth and development. Developing an indigenous innovation agenda in most sectors of the economy in Nigeria would propel entrepreneurial inclinations and foster the creation of small firms, since they are regarded as flexible drivers of innovation. Furthermore, creating supportive ambience for the adoption and adaptation of existing technologies, and creation of new technologies are suitable for the local economy instead of over reliance on the imported technologies. The paper reviews indigenous innovation practices in China and India to draw appropriate lessons for Nigeria. Among the strategies that the paper suggests for harnessing indigenous innovations for economic development is the adoption of national innovation system approach, whereby indigenous knowledge outputs are properly documented, coordinated and exchanged among relevant stakeholders including government, industry and academia and local people (who are custodians of this knowledge). Other regulatory agencies could also come in to ensure conformity to international standards in terms of production, distribution and quality. The paper concludes with specific policy suggestions on strategic positioning of indigenous innovation to enhance wealth creation and national competitiveness.

Key Words: Indigenous innovation; indigenous knowledge; economic development; national innovation system; standardisation; Nigeria.

1.0 Introduction

Innovation has been recognised as a major driving force of economic growth and development. The growth theory as developed by Robert Solow showed that technological progress and innovation is the greatest engine of economic growth (Solow,

1956). Studies have equally shown that industrial policies of the world's developed nations emphasised the strategic role of innovations in generating new business ideas which translate into greater economic growth through proper coordination of institution and

policies. This shows that national development aspirations require paying adequate attention to the generation and exploitation of intellectual assets, including those of indigenous people (Goh, 2005). This is because economic conditions of nations are hinged on the capability to produce goods and services that are better, cheaper and faster than other nations (Adelowo, Olaopa and Akinwale, 2016). It involves providing local solutions to local problems through non-conventional use of a given product, local improvisation/modification with scope of replication, new application of the product/materials and combination of traditional skills. The concept of 'Indigenous innovation' was crafted after China's development agenda of promoting local businesses through apt efforts on innovation in 2006. The agenda, known as "National Medium and Long Term Program for Scientific and Technological Development" identifies innovation as a new national strategy for China to advance into the ranks of innovative countries by 2020. The term 'Indigenous Innovations' was translated as 'independent and self-reliant' one that combines three distinct elements: original, or genuinely new; integrated, or combining existing technologies in new ways; and assimilated, or making improvements to imported technologies (The AeA Competitiveness Series, 2007). Indigenous innovation agenda aims to foster the growth of smaller and entrepreneurial companies since they are regarded as flexible drivers of innovation.

Indigenous innovation arises when a new idea or improvement of the resources is accomplished through traditional methods or knowledge systems. Indigenous innovation has come to be associated with the terms like 'rural' and 'grassroots' innovation. These indigenous innovations can help find the best solutions to local problems by utilising the indigenous knowledge and existing resources available, and in turn generating new

employment opportunities. The outcomes of these indigenous innovations help foster self-confidence and self-respect amongst the community which finally leads to economic growth and social change in the community. Indigenous innovations encourage local self-reliance, decentralization of decision-making and fair access to natural resources (Akinwale, 2018). One of the challenges of most developing nations is international technology transferred to their nations without proper knowledge and capabilities on how to use such technology efficiently in their countries (Akinwale, 2018). This has led to the loss of billions of their home currencies to the foreign expatriates. This is not unconnected with the documentation and ascertaining the indigenous knowledge available in their local environments. Indigenous knowledge could be referred to as the base for indigenous innovation. What indigenous knowledge is to indigenous innovation is the same as what science is to technology. This implies that indigenous knowledge must exist before indigenous innovation can be generated. Thus, the need to utilise indigenous knowledge for creating appropriate solutions to developmental challenges have been viewed as indigenous innovation, particularly, the application of indigenous knowledge in food and herb production (Nakata, 2002). These innovations are prevalent in the areas of farming, traditional/herbal medicine, and production of domestic equipment among others which are also environmentally friendly (Sopazi and Andrew 2005). It should be noted here that indigenous innovation and indigenous knowledge cannot be separated.

This paper seeks to address the fundamentals of indigenous innovation and knowledge, and how they could be applied to solving practical developmental challenges. It also addresses strategies to overcoming innovation challenges in developing economy like Nigeria, having drawn lessons from

specific indigenous innovations in China and India.

2.0 Globalisation, Indigenous Knowledge and Innovation for Development

Globalisation, trade openness and knowledge economy have opened up the world and facilitated the flow of information and knowledge (Akinwale and Grobler, 2019). It has been argued that the generation, exploitation and diffusion of knowledge are fundamental to economic growth, development and the well-being of nations (Adeoti et al., 2010; Malerba and Nelson, 2011). This has been confirmed as being central to the development of a knowledge economy (Adelowo, Akinwale and Olaopa, 2017). However, the flow of knowledge has been governed by uneven economic and political power between developed and developing countries (Moahi, 2005). Therefore, economic survival of nation is dependent on the length and depth of information available and how fast a nation learns and adapts new things. Knowledge production and utilisation has been seen as critical components of overcoming problems associated with human lives and underdevelopment. The technologically advanced nations continue to dominate the global economy through intensive R&D efforts and the application of science and technology, robust innovation policy, capability and competence building among others (Akinwale et al., 2012a). The latecomer economies need to create environment for technological learning and direct efforts towards benefitting from indigenous knowledge practices within the system. The importance of indigenous knowledge (IK) practice has been acknowledged as fundamental for health, agriculture, and commercial value additions in many other products. Arts and crafts emanating from IK have also attracted a great deal of attention (Moahi, 2005). Such products

are parts of a multi-million trades and investment in the world and it has been established that the global market for herbal products is growing, and estimated to reach USD 5 trillion by 2020. Four out of ten people in the US are using what they call alternative medicine, even when the cost is not covered by medical insurance (Herman, Craig and Caspi, 2005; Frass et al., 2012). This revealed some of the potential indigenous knowledge practices possessed by Citizens in developing countries towards transforming their respective economies, if given proper attention.

Before the advent of scientific knowledge, traditional or indigenous knowledge played significant roles in sustainable management of food production, health care delivery, and transportation among others. Since huge percentage of the world population live in the rural areas, especially in Asia and Africa, they tend to rely on indigenous knowledge as a mean of survival. This knowledge is passed orally from one generation to another and most means of acquiring the knowledge are through observation, learning by doing, trial and error, apprentice, proverbs and folklores among others (Siringinidi, 2006). This knowledge is unique to a particular culture or society which forms basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management and a host of other activities in rural communities (Siriginidi, 2006; Warren 1991). Indigenous Knowledge is the information base for a society, which facilitates communication and decision-making. Indigenous information systems are dynamic, and are continually influenced by internal creativity and experimentation as well as by contact with external systems (Flavier et al. 1995). It is important because it provides the basis for problem-solving strategies for local communities, especially the poor. It represents an important component of global knowledge on development issues. But it is

underutilised in the development process of most developing nations.

However, indigenous knowledge and innovation practice is faced with diverse challenges which complicate its promotion within the national, regional and global scenes. Some of these challenges include; lack of proper codification and documentation; lack of database; increasing biopiracy; poor participation at global fora on IK information exchange; and inadequate mechanism for IK protection and commercialisation among others. Although, IK cannot be protected under the conventional Intellectual property regime because of its nature of communal ownership rather than individual coupled with the fact that people's culture is equally of prime importance on this issue. The global advocacy for *Sui generis* as enshrined in the Convention on Biodiversity (CBD), 1992 and the AU model law of 2001 are also of great concern to African countries as the benefits' sharing and material transfer agreements do not have uniform administration mechanism but depend on the parties involved and their capacity to negotiate .. Robust strategies must be devised to tackle these challenges and chart a new course for the future. Therefore, the next section presents an overview of indigenous knowledge practices in Nigeria and how they impact on growth and productivities, challenges facing the practitioners, and concludes with requisite policy recommendations to address them.

2.1 Indigenous knowledge Practices and Development

Indigenous knowledge (IK) has become popular for its intrinsic and the potential value to science and conservation (Kunwar and Bussmann, 2008). The term 'indigenous knowledge' refers to the content or substance of knowledge resulting from intellectual activity in a traditional context, and includes the know-how, skills, innovations, practices

and learning that form part of traditional knowledge systems, and knowledge embodying traditional lifestyles of indigenous and local communities, or contained in codified knowledge systems passed between generations (Kongolo, 2009; WIPO, 2005) which then leads indigenous innovations. It is not limited to any specific field, and may include agricultural, environment and medicinal knowledge, and knowledge associated with genetic resources. This shows that the spectrum of IK is not only wide but also very unique in its wide variety of application to all areas of human endeavour. IK represents accumulated experience, wisdom and know-how unique to a given culture, society, and/or community. It stands apart as a distinctive body of knowledge that has evolved over many generations in a particular ecosystem (SubbaRao, 2006). Louise (1998) defined indigenous knowledge as the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographic area. Indigenous knowledge also referred to as traditional or local knowledge embedded in the community and is unique to a given culture, location or society' It is large body of knowledge and skills that has been developed outside the formal educational system and that enables communities to survive. IK implies any knowledge produced by and or distinctive to a particular culture group or any loosely defined group of resource users in a given area (Maden, Kongren, and Limbu, 2007. According to Purcell (1998), IK is the body of historically constituted knowledge instrumental in the long-term adaptation of human groups to the biophysical environment. It is the knowledge which is rooted and embedded in the rural community.

Moreover, IK refers to the methods and practices developed by a group of people from an advanced understanding of the local environment, which has formed over

numerous generations of habitation. This knowledge contains several other important characteristics which distinguish it from other types of knowledge (Rajib et al., 2008). These include originating within the community, maintaining a non-formal means of dissemination, collectively owned, developed over several generations and subject to adaptation, and imbedded in a community's way of life as a means of survival (Rajib et al., 2008). This is also in line with the postulations of Chambers (1998) and CTA (2004) that indigenous knowledge and skills are passed from one generation to another in oral form to provide them with survival strategy in areas such as linguistics, medical clinical psychology, Botany, zoology, ethnology, ecology, climate, agriculture, animal husbandry and crafts. The characteristic of IK according to Ellen and Harris (1996) are enunciated below:

- (i) It is local and resides with particular set of people living in those places;
- (ii) It is transmitted orally, or through observation, imitation and demonstration;
- (iii) It is consequent on practical engagement in everyday life and constantly reinforced by experience, trial and error;
- (iv) It is empirical rather than theoretical knowledge due to characteristics mentioned at (i) and (iii);
- (v) Repetition is a defining characteristic of tradition, even when new knowledge is added;
- (vi) It is constantly changing, being produced and reproduced, discovered as well as lost;
- (vii) It is characteristically shared to a much greater degree than other forms of knowledge and it is usually asymmetrically distributed within a population, by gender and age, and preserved through distribution in the memories of different individuals, and

specialists may exist by virtue of experience, or ritual or political authority;

- (viii) Although IK may be focused on particular individuals and may achieve a degree of coherence in rituals and other symbolic constructs, its distribution is always fragmentary, it does not exist in its totality in any one place or individual;
- (ix) despite claims for the existence of culture-wide abstract classifications of knowledge based on non-functional criteria, where IK is at its densest and directly applicable, its organisation is essentially functional; and
- (x) It is characteristically situated within broader cultural traditions, hence separating technical from non-technical, rational from non-rational, is problematic.

These characteristics clearly show inherent risks of disappearance in IK management in that it is only transmissible by oral means or observations, imitation and demonstration but largely undocumented. These occur probably because of high rate of illiteracy among the local people and as a result many of these IKs are no longer available to their successors. Government must take measure to ensure codification of this valuable knowledge for dissemination through appropriate mechanism that will foster innovation in the economy. On the relevance of IK practices, it has been argued that it constitutes part of the global knowledge for addressing the challenges of the poor (World Bank, 1997).

When some of this indigenous knowledge are being commercialised in the production of goods and services, then it is termed indigenous innovation. This is necessary to transform local and semi-urban community into a hub of innovation. The current increase in the supply of food supplements and local herbs from China and India to the global market are practical examples made possible through governments' apt efforts in turning

local knowledge into wealth. Other developing economies and Nigeria in particular need to learn from these nations to promote and transform local communities through existing knowledge within her domain. It is innovation which makes it possible, although by no means inevitable, to improve the economic positions of many different groups of people—workers, managers, financiers, consumers, and governments—who participate actively in national economic activities. The next section therefore discusses innovation and economic growth

3.0 Innovation and Economic Growth

The idea that innovation drives productivity and economic growth has been well established in the literature. Most of the developed nations have been able to reach their industrialised stage as a result of science, technology and innovation (STI). That is, economically successful countries are those that are able to turn technical innovation into economic productivity (Akinwale, Adepoju and Olomu, 2017). By the way, innovation is defined as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations (OECD, 2005). This broad definition of innovation encompasses a wide range of possible innovations. Innovations are generally categorised as product innovations, process innovations, marketing innovations and organisational innovations. This definition of innovation encompasses both technical and non-technical form of innovation. A product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. A process innovation is the implementation of

a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. The implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing is referred to as marketing innovation. An organisational innovation is the implementation of a new organisational method in business practices, workplace organisation or external relations. Product and process innovations are termed technological innovation while marketing and organisational innovations are termed non-technological innovation. All over the world, innovation has become a yardstick for measuring competitive advantage and a major determinant of enhanced productivity at both the firm and national levels (Federal Ministry of Science and Technology [FMST], 2010).

There are diverse studies that have been conducted as far back as 1950s that have established the relationship between innovation and economic growth. For instance, Solow (1957) derived estimates of United States (US) total factor productivity between year 1909 and 1949 which made him to conclude that technical change and innovation (usually referred to as residual) was responsible for the majority of economic growth in US within that period. Also studies such as Abramovitz (1957) and Kendrick (1956) established that technical change contributed between 80% - 90% to aggregate productivity. There are also recent studies that have also confirmed the contribution of innovation to productivity (Kim, 2011; Akinwale *et al.*, 2012b; Oyelaran-Oyeyinka, 2006; Adeyeye, Jegede and Akinwale, 2013). The rates at which technology and economic changes occur in the global economy have created a radically new environment especially for the developing nations and their firms (Perez, 1989). This has led to the globalization of manufacturing sector, the

emergence of new systems of manufacturing based on flexible production processes and rapid advances in information based technologies which present both threats and opportunities to developing countries in taking advantage of their huge local demands. The developing countries have relied so much on their natural resources neglecting their research and innovation activities. Much of the innovation that is being carried out in the developing countries is not in the realm of world technology frontier. This is not unconnected with the situations that the firms in less developed countries (LDCs) face which are quite different from that of the firms in developed countries (DCs) in terms of regulatory, infrastructural and institutional environments, nature of production processes in use, the quality of the factors of production, and the ease of doing business among others. Atul (1990) stated that DC firms unlike the LDCs operate in an environment where institutions, services and infrastructure have evolved as complementary, that is in a relatively "friendly" environment - one where the supply of skills (e.g., from universities), resources (e.g., venture and risk capital), infrastructure (transport), institutions (banks, regulatory agencies) and values - complement its own. Though the LDC firms may be far from world technology frontiers, but the firms still engage in various innovativeness in product and process development which keep them productive. This reinforces the definition of innovation by Mytelka (2000) which is a process by which firms master and implements the design and production of goods and services which are new to them, irrespective of whether they are new to their competitors, their countries or the world. Learning is the central point to this definition. This is because learning is expected to move a sector from the learner's position to the expert's position (Stahl, 1990). One of the challenges of the developing countries is engaging in technological activities that are

not scientific based whereas technology activity is a scientific process. Ogbimi (2007) opined that learning competencies of the LDCs can be improved through increasing capabilities and knowledge of the scientific population. All indigenous innovation and knowledge is by definition born out of and therefore primarily relevant to the respective innovation system of different locality. Since this innovation involves different set of stakeholders who interact in solving the economic problems of their locality. This goes a long way to help a society make decisions about activities, such as agriculture and education that are acceptable to their ways of life. Making such decisions requires improving the indigenous knowledge from traditional ones to scientific ones. This leads us to discuss national innovation system and how it can be managed to assist in harnessing indigenous innovation for economic development.

4.0 Specific Case Studies from China and India: Lessons for Nigeria

Indigenous innovations that transit Korea from imitation to innovation in the 80's has made Chinese to rank among the largest economy in the world today (based on GDP) (Kim, 2007). Few lessons could be learnt from the following case studies in order to move Nigeria away from being import dependent.

4.1 Indigenous Innovation in China

Since innovation process itself had to be analysed in terms of a set of social institutions that influences the strategic allocation of resources and returns in business enterprises (Lu, 2000), the S&T infrastructure that China had put in place during the era of central planning provided the platform for technological capabilities that generated the indigenous innovations in the 1980s and 1990s. This is because investment decisions (those who makes investment decision, types of investment decision and how investment

returns are distributed) in an economy determines the level of technological accumulation and competence (Lu, 2000).

The social process for indigenous innovation in China identified how business enterprises strategise, organise, and finance in order to transform productive resources into goods and services that customers want at prices they can afford and that innovation requires learning about how to transform technologies and access markets in ways that generate higher quality, lower cost products. Moreso, innovation process is collective as learning cannot be done alone; learning requires the collaboration of different actors with different capabilities. China recognised the need for critical mass of scientist and enterprise for effective knowledge generation and transfer to develop innovative economy, hence increased funding for R&D, creation of R&D commercialisation infrastructures, provision of incentives for innovation and creativities and effective implementation mechanisms of government policies among others.

Multidisciplinary R&D targeted at solving immediate societal problems was prioritised and mechanism for public private partnership was in operation in china to promote technology transfer to the industry.

China's economic reform process gave them that chance by making it possible for them to use the S&T infrastructure as a foundation for their entrepreneurial endeavours. Among the S&T infrastructure that gave Chinese economy a boost is the creation of technology incubators and science parks coupled with the Torch programme of Ministry of science and Technology (MOST). These facilities across China have created millions of jobs and ventures. Some of the enterprises created through these incubators and science parks have been listed on stock of exchange in China and New York. Today, China serve as the training ground for many developing countries on incubation and

technology transfer management because of the experience they have garnered over the years (McCuaig-Johnston and Zhang, 2015).

On the production of herbal medicine, Chinese ranked among the best and highest supplier of herbal drugs worldwide (Statista, 2019). This is as a result of application of scientific knowledge to the indigenous process of developing local communities and robust standard policy.

4.2 Indigenous Innovation in India

The indigenous innovation in India was championed by Grassroots Innovation Augmentation Network (GIAN), Ahmedabad which successfully supported Amritbhai Agrawat, an artisan-innovator from a small village in Gujarat, to further develop his innovation of a four-wheeled bullock-cart integrated with tilting mechanism (Gupta, 2000). This new innovative cart eliminates the drudgery for the farmers and labourers involved in manually carrying and spreading the farm manure in the field. The tilting cart can be used single-handedly by the farmer to distribute manure over the entire field. GIAN arranged the innovator to refine and improve this new innovation, get the necessary micro-finance and also helped Amritbhai file patent for his innovation, which is now licensed to three entrepreneurs on district basis for its production (Gupta, 2000).

Another success story is that of the 'rain gun', innovated by Anna Saheb, a local innovator in Kerala who made use of indigenous knowledge available in the community. Anna Saheb was successfully supported by Rural Innovation Network (RIN) which helped to understand its market potential, its further improvements and finally its technology transfer to another company (Banerji 2004).

These two case studies are the examples of successful interventions for the implementation and commercialisation of

indigenous innovations (Shashank Mehta and Ravi Mokashi-Punekar, (n.d)

5.0 Strategies for Harnessing Indigenous Innovation

Diverse strategies have been employed by different nations to deploying indigenous innovation for development and of particular interest are the cases of India and China cited in section 4 of this paper. Nations that have achieved industrial revolution through self-efforts have provided channels for latecomers to learn. It should be noted that learning itself must be leaned through apt efforts of formulating, integrating and implementing S&T and economic policies and programmes that engender innovation within the economy. Some of these strategies are highlighted below:

5.1 Adopting National Innovation System Approach

National Innovation System (NIS) could be referred to the flow of technology, information and innovation among people, institutions and enterprises which is key to technological progress of a country. The innovation and technology development of a nation are results of a complex set of relationships among actors in the system. The NIS concept emphasises the significance of the interactions or linkages among the various actors involved in technology development towards translating the inputs into outputs. According to Freeman (1987), NIS is the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies. Tiffin (1997) opined that the actors of the NIS work together to develop, apply, fund and regulate science, technology and innovation (STI) with a view to solving economic, industrial, environmental and cultural needs. Meanwhile Lundvall (2000) believed that continuous interactions among

the actors of NIS create learning possibilities which hitherto transform the indigenous learning into general knowledge embodied new technological equipment, hardware and software systems or even new business solutions. In practically all parts of the economy, and at all times, are expected to witness on-going processes of learning, searching and exploring, which result in new products, new techniques, new forms of organization and new markets (Lundvall, 2000). Lundvall stresses that innovation is both gradual and cumulative, and is a process rather than a stage. This process, however, is not linear “but involve(s) continuous interactivity between suppliers, clients, universities, productivity centers, standard setting bodies, banks and other critical social and economic actors” (Mytelka, 2001). Therefore innovation is not merely an individual act of learning by a firm or entrepreneur, but is situated within a larger system that both enables and draws on the innovative process (Ogbimi, 1990). It is dynamic due to the “financial flows between government and private organizations, staff mobility between universities, firms, and government laboratories, regulation flows emanating from government agencies towards innovation organizations, and knowledge flows(spillovers) among these institutions” (Niosi, 2002).

The Nigerian National Innovation System like other countries includes four major elements which are government, industries/private sectors, universities/research institutes and financial institutions. These elements of innovation system are expected to interact with one another so as to improve productivity and foster economic growth. However, some studies (Tiffin, 1997; Oyewale et al, 2003; Oyelaran-Oyeyinka, 2006; NACETEM, 2010; Akinwale et al., 2012; Adelowo, Akinwale and Olaopa, 2017) have shown that Nigeria has not been able to engage in various innovation activities that

could revolutionise the industry as a result of weak linkage among the elements of the Nigerian innovation system, lack of political commitment on the part of government, over reliance on the revenue from oil, poor funding of R&D and innovation, lack of proper implementation of STI policy and poor scientific base for technological innovation among others. Considering the rate of depletion of natural resources in so many naturally endowed countries and the extent of global competitiveness, it has become imperative for developing countries like Nigeria to embrace R&D and innovation as a vital tool for accelerating their socio-economic development (Siyanbola, 2011; Akinwale and Ogundari, 2017). It is becoming increasingly clear that R&D and innovation are not only important determinants of a country's level of development but also enhance its international competitiveness and its position in the world economy. Nigerian government should foster and ensure a strong collaboration among the elements of innovation system, provide adequate fund for R&D and innovation activities in both universities and research institutes, provide incentives for the private sector to develop indigenous capabilities in fostering innovation, diversify the entire economy instead of depending on the exhaustible oil resources as well as ensuring a full implementation of STI policy. All these would bring about a scientific indigenous innovation that can foster economic development.

5.2 Standardisation

There exist a complex relationship between standards and indigenous innovation. Standards can be a critical enabler of indigenous innovation, particularly in this global era of open knowledge economy. Though, there is no automatic link, but standards can foster economic growth by reducing transaction costs and achieving economies of scale through interchangeability

(Kindleberger, 1983). Economic standardisation theory has shown that standards affect the R&D, production, and market penetration stages of economic activity and therefore have a significant collective effect on innovation, productivity, and market structure (Tassey, 2000). Local production of goods and services in the country using indigenous innovation could be certified by the standard organisation of such country. For instance, Standard Organisation of Nigeria should ensure that consumers are safe while using the product locally produced from indigenous knowledge and in case of food products, national agency for food and drug administration and control (NAFDAC) must certify them. Local firms must of necessity satisfy the condition for certification for their product to be acceptable within the economy. The procedures have forced many firms to engage in innovation activities that guarantee their continual existence.

Global market penetration for local product required high level of competence and standardisation. China's export industry displayed strong support for closing gaps with international standards and to comply with world trade organisation (WTO) commitments. This position reflects China's deep integration into global corporate networks of production and innovation. A good proxy indicator for China's integration into global production networks is that foreign-invested enterprises dominate China's manufactured exports. In addition to the production of high standard products, China has strategically produced critical mass of highly qualified scientist, engineers and technopreneurs that are necessary for transforming the economy.

6.0 Conclusion and Policy

Recommendation

This paper has discussed the significance of indigenous innovation to economic

development. Indigenous innovation involves utilizing local knowledge and locally available materials, skills and resources, to solve typical local problem(s). This kind of innovation though may be generated from outside the local region but must have been adapted to suit the local context, that is, it has to be culturally and economically acceptable to the community. Indigenous innovation is generally carried out to add value, to increase the life-cycle or usage of the available resources and/or products, to reuse or recycle the available products/materials, to create new opportunities and above all to improve the quality of life of the people involved. This type of innovation involves risks and perseverance. The indigenous industries in Nigeria, among others, include the production of pots from clay and aluminium metal scraps, textile making, cloth weaving, bronze casting, sculpturing and they must be mapped and documented. The process of integrating indigenous knowledge as a supporting tool for industrial development must be stimulated, while success stories and best practices from Chinese and Indian experience could be adapted.

This paper shows that indigenous innovations developed through strong indigenous capabilities, learning, knowledge flow and solid industrial policies led to economic growth in countries like as China and India. Hence, a review of our industrial policy to reflect and mainstream the role of the indigenous capabilities and technical know-how is key to achieving cumulative socio-economic growth and development.

This paper recommends that there is a need for a strong National Innovation System which cuts across all actors and stakeholders in the country. Knowledge exchange within and among stakeholders should be facilitated

through robust policies and incentives system. This is because community knowledge exchanges have recently been recognised as a powerful catalytic tool to stimulate community-driven development processes. In the formal sector, communities of practice are often able to share their knowledge at conferences, workshops or retreats. There is a need for an indigenous innovation political and economic campaign that requires collective efforts and call to action for the entire country. Interactive learning is an attribute of the innovation system that fosters improved productivity through learning processes and knowledge sharing. Hence, it should be encouraged among the stakeholders in order to engender economic development. Though there are very few examples of recognised indigenous innovations in Nigeria, its full benefit in the country's industrial landscape is insignificant. There is need for concerted effort and political commitment to create platforms for interactive engagements that will stimulate learning and provide opportunities for the custodians of indigenous knowledge and capabilities to share, add value, commercialise and contribute to national productivity and development. For instance, government could provide enabling environment and easy platform to patent indigenous inventions as well as providing adequate intellectual property regime to protect qualified inventions and innovators. The current STI policy made provision for the mainstreaming of indigenous innovation and needs to be fully implemented by the government so as to develop indigenous capabilities and capacities, and fast track the rate of harnessing indigenous innovation for industrial productivity and national development.

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