**The Role of Innovation in the Economic Development of Nigeria**

Innovation is very vital and critical for the economic growth and advancement of any nation, there are various sectors of the Nigeria economy that needs technological innovation to better enhance the overall effectiveness and performance of the country’s economy architecture. The defects in the legal framework for protection of innovators in Nigeria; examine certain factors challenging technological innovation in the country, based on the data that was collected from statues, case laws textbook and also the internet, it was discovered that the level of innovation and technology in Nigeria is low and the Nigerian patent law is week.

There are factors posing challenges to innovation in Nigeria some of which include;

1. Institutional Framework
2. Human Capital
3. Research/Innovation infrastructure
4. Sophisticated Business Community

The Government on their own part can change the narrative of the Nigerian economy by bringing and implementing policies that would effectively address the challenges in technological innovations. More so the Patent law needs quick amendment, and modern research facilities should be established with human capital development coming in to play a key role.

Africa has been classified as a third world or an underdeveloped continent, despite its rich, human and material resources states the fact that there is a fundamental problem with maximizing and utilization of the human and material resources in the continent.

The Global Innovation Index (GII) 2014 surveyed 143 economies around the world, using 81 indicators to gauge both their innovation capabilities and measurable results. Mauritius, which tops the African countries in the ranking, came at the 40th position, followed by South Africa at 53rd and Tunisia at the 78th position. Nigeria was placed at the 110th position. The foregoing GII ranking has shown that in a global and dynamic world, the economies that can remain flexible, adaptive, and innovative will reap the benefits of world trade. This is because the global competitiveness of any economy depends on its science, technology and innovation (STI) capabilities. In all ramifications of economic development, technology-dependent economies surpass economies dependent on their natural resources.

However, there remain certain challenges to the mitigation of technology in Nigeria, First; the law does not encourage technological innovation and its capability to protect prospective innovators remains in doubt. Furthermore, Nigeria lacks human capital to man effectively its sectors. Moreover, research facilities in the country are either inadequate or outdated. There are no effective policies to serve as incentives to arouse local innovators and to attract foreign investors. Nigerian technological environment is discouraging. Modern infrastructures are also required to encourage foreign direct investment (FDI)

There is virtually no sector of the Nigeria economy that does not need innovation, with time as we continue to enhance our innovative capabilities, a larger percentage of the sectors will become strong pillars of economic development in Nigeria.

Some of the key sectors that need innovation in the Nigeria economy to improve sustainability include;

* **The Agricultural Sector**
* **The Pharmaceutical Sector**
* **Power/Energy Sector**
* **Biotechnology**
* **Mines and Steel Industry**
* **Trade and Manufacturing Industry**

Innovation is a major key driver of competiveness, job growth and a higher standard of living for future generations. This is because innovation is not just about invention and discovery, just as critical is the application of invention and discovery to economic good. According to the United Nations Development Program (UNDP), technological breakthroughs ‘are pushing forward the frontiers of how people can use technology to eradicate poverty’, as they ‘are creating new possibilities for improving health and nutrition, expanding knowledge, [and] stimulating economic growth. According to Odia Omofonmwan, a review of Nigeria’s economic development between 2000 to date revealed that overall macroeconomic policies and development strategies have failed to provide an enabling environment that could alter the structure of production and consumption activities in order to diversify the economic base. The country has continued to be a mono-cultural economy, depending on oil, indicating that the export base is yet to be diversified. They further noted that Poverty and inequality is wide spread with about 71 million Nigerians living below $1 a day. Socio statistics such as infant, (under 5) and maternal mortality rate as well as unemployment rate are higher than the averages for developing countries. We shall at this point consider the roles innovation will play in the economic development of Nigeria.

1. **Diversification of the Economy:** Diversification plays a major role in increasing the wealth of any nation. A nation that has diverse sources at which it earns income has greater potentials to defeat the risk of failure in its economy. All other economic advantages to a great extent hinge on the diversification of the economy. Economic diversification brings about increased productivity which in turn is more likely to enhance economic growth. However, it is not enough that the economy is diversified. A relative balance of the proportions of the diversification is also as important as the diversification itself. It is for this reason that diversifying African economies is not an easy task. One of the key challenges is how to overcome over-specialization, whereby some countries have developed systems and know-how for one specific area of the economy but find it difficult to transfer these to other sectors and activities. This indeed speaks true of the case of Nigeria since its mono-cultural economy has made little impacts on its citizens, notwithstanding its rich natural resources. It has been noted that among the various factors that have the potential to drive economic diversification, a country’s natural resources are crucially important. These resources can be exploited to increase the range of exports and goods a country produces, especially through beneficiation, whereby additional value can be created from the resources extracted. Therefore, Nigeria in this regard has great advantages in the diversification of its economy. The significance of technology over natural resources cannot be overemphasized. Whereas, a country that invests more in technology in the present relative to sole dependency on natural resources will have more of both technological goods and natural resources products in the future. There is nothing that enhances diversification of the economy more than innovation. Advances in science and technological innovation have over the years helped to diversify the economies of the western world. The result is increased productivity which led to economic growth. Moreover, consistent economic growth is more likely to bring about economic development. It has also been noted that advances in Science and technology can help to diversify the Nigerian economy, by improving productivity in sectors like agriculture, while defining new ones. Innovation in the Nigerian agricultural sector can help to incentivize a greater population of Nigeria to venture into the agricultural sector. This is realizable since the country has viable environment necessary for plant and animal productions. Nigeria is blessed with a large population. A large population can to a great extent indicate large availability of market. Certain economic activities thrive where there is large availability of market. For instance, investments in information and communication (I&C), energy/power, pharmaceutical activities, etc., pay better where there is a large market for them. Moreover, as we have noted earlier in this work, information and communication technology (ICT) has made a recommendable impact on the Nigerian economy. Therefore, diversification of Nigerian economy by innovating in the ICT sector can boost the Nigerian economy the more by reducing the cost of communication, internet services, etc. Same is true in the case of other mentioned sectors. Just like the United States, diversification of the Nigerian economy will bring about increase in manufacturing activities. With time, these activities will mature to exportation activities which in turn will earn the country foreign exchanges. The Nigerian economy will thus be boosted.
2. **Economic Growth:** Economic growth results from several factors, but among the most important in recent decades have been innovation. Technological progress can, in principle, drive economic growth without limit, thanks to the unique properties of technological knowledge as an economic asset. Economic growth closely depends on the synergies between new knowledge and human capital, which is why large increases in education and training have accompanied major advances in technological knowledge in all countries that have achieved significant economic growth. Therefore, the enhancement of a nation’s human capital will lead to economic growth by means of the development of new forms of technology and effective means of production. In today’s knowledge-based world, information and communication technology (ICT) plays an increasingly central role in economic growth and productivity. According to Ismail and Giulia, recent evidence has shown that an increase of 10 mobile phones per 100 people can boost GDP growth by 0.6 percent and a 1 percent increase in the number of Internet users can increase total exports by 4.3 percent. Innovation linked to new medical technologies has also become an important source of competitive advantage, especially in the emerging field of life sciences – a key driver of economic growth in the 21st century. Productivity.

Innovation is essential for export growth countries that engage in export activities have greater potentials to earn foreign exchange. The words of Salomon are indeed worthy of note: “As recognized since the mercantilist era, export growth is critical for any country for a variety of reasons. At the macro level:

* Exports help generate foreign exchange;
* Export receipts are vital to finance import and exports;
* The small size of many developing countries and their negligible purchasing power call for the need to explore larger market scales;
* Exports contribute to employment and growth of national product.

Nigerian export potentials and the provision of raw materials for the agro-industries will also get a boost by way of increased productivity. Therefore, innovation is the cornerstone of the foregoing important roles of exports on an economy. Export diversification will help to put across the globe made-in-Nigeria goods, thereby bringing about economic development in the country

1. **Employment Opportunity, Improve Standard of Living and Reduction of Poverty:** In the 21st century, innovation is what produces wealth and creates jobs. History is quite clear on the importance of innovation to sustained job creation. The nations that have leveraged the fruits of science and technology for greater social and economic good have led the world in well-paying jobs and standard of living. Innovation is the key driver of competitiveness, wage and job growth, and long term economic growth. Furthermore, ensuring a country is competitive and has sufficient capacity to innovate is also crucial because the number and quality of jobs is strongly dependent on these two concepts. As competitive businesses grow, they hire more workers and they also tend to pay well; a number of studies have shown that highly productive firms pay above‐average wages. Furthermore, competitive and innovative firms create good jobs. Wages for workers in innovative and competitive firms tend to be higher than wages elsewhere. The United States Department of Commerce indicated that innovation leads to new firms. It stated that between 1980 and 2007, on average over 500,000 new businesses with employees started each year. These new firms produced an average of 3 million new jobs a year. Indeed, science and technological innovations create more jobs than non-science firms and industries. According to the United States Department of Commerce, a report shows that the science, technology, engineering, and mathematics (STEM) workforce earned about 26 percent more than their counterparts in non‐STEM occupations. The United States public investment in the human genome project, for example, had a return on investment of more than 14,000 percent in terms of economic output per federal dollar invested since 1988, and has led to the creation of millions of biotech jobs that could not have existed without it. Similarly, a seemingly tiny investment of the Defense Advanced Research Projects Agency (DARPA) spawned the Internet, giving rise to billions of dollars in economic activity, new businesses, and, more importantly, new ways of doing business. The foregoing discussions have revealed that science and technological innovation enhances the standard of living of nations. Indeed, innovation will help to enhance the standard of living of Nigerians. For instance, incentivizing innovation in the pharmaceutical, power, ICT sector, biotechnological activities, etc., has the capacity to enable many Nigerians to put food on their table. Innovation in the power sector of Nigeria is a potential source of employment. When a good number of electricity companies crop up, invariably they will need human labor to operate and maintain the companies, which means creation of employment opportunities for the vast majority of Nigerians that are jobless. Many graduate engineers and technologists roaming the streets in search of unavailable jobs will finally heave a sigh of relief as most of them will be absorbed by the emerging independent power producers. The private sector of course will play an important role in creating jobs. This will go a long way to reduce the level of poverty in Nigeria.
2. **Improved Health Standard:** Some decision makers recognize that the ultimate benefit of stronger pharmaceutical innovation in Africa goes beyond curing disease and delivering medicines; saying that a healthier workforce brings significant economic gains to a country, as people can better contribute to economic development. Science and technology also play a key role in improving the quality of life. For instance, research in healthcare has proven vital to the prevention, diagnosis and treatment of various killerdiseases. Technology and innovation can introduce significant improvement and services into health services. One of the best examples in this regard is the use of ICTs to introduce telemedicine services and to improve the management of health records. Pharmaceutical innovation is a vital part of improving and saving lives around the world. New medicines, vaccines and other medical tools have revolutionized medical practice in the past century, leading to incredible health improvements. Indirectly, these medical technology advances have contributed to economic and social development, by building healthier and more productive societies. Accordingly, innovation linked to new medical technologies has therefore become an important source of competitive advantage, especially in the emerging field of life sciences – a key driver of economic growth in the 21st century. In most industrialized countries, health care is among the largest sectors of economic activity.

However we shall examine certain factors or challenges to innovation in Nigeria, this factors have constituted a major barrier to the economic growth and development of a Nation known to be have a very dynamic economic potentiality, if its natural and human resources are fully harness. The fundamental challenges to innovation in Nigeria over time are

1. **Institutional Framework:** Nigeria lacks the manpower and modern technology for the efficient protection of innovations. The administration of intellectual property rights (IPRs) in Nigeria is incapacitated by inadequate skills and competence. Nigerian patent office lacks the wherewithal necessary for proper examination of inventions in respect of which patent is sought. Moreover, persons involved in the administration of the office and IPRs are usually not experts. The infrastructure for operation of IPR in Nigeria is still largely undeveloped. Information Technology has not been fully developed and applied towards encouraging proper research by intellectual property (IP) experts, students and scholars. Furthermore, filing of applications IPR is always slow; the process of grant of IPR could be unnecessarily long due to the limited infrastructural facilities at the Trade Mark and Patent Registries. These infrastructure deficiencies have not encouraged business development in Nigeria and with bottlenecks in passage of goods and services across borders in the region. To compound the problems, the Patents and Designs expressly provide that patents are granted at the risk of the patentee and without guarantee of their validity. Issues as to conformity with the statutory requirements are resolved only by the court of law on the application of an aggrieved person. Examination of patent application in Nigeria is devastating whereas some other countries have quite a comprehensive approach to examination of patent application. Babafemi noted that the examiner in most countries has powers to declare an application for a patent valid or invalid, the Registrar under the Nigerian Law performs purely administrative functions. According to the learned author, administrative functions, as necessary as they are, are not sufficient to promote the most desired innovative inventions in this country. Indeed, the powers of the Registrar as regards applications are severely limited. Once an application has complied with the statutory requirements, he has no choice but to grant the application. The registrar cannot enquire as to whether the subject matter of the application is patentable. He cannot also enquire as to whether the description and claims satisfy the statutory requirements. In some other countries (USA and India, especially), the patent office has trained examiners and the power in the first instance to resolve issues bordering on the merits of the invention against the conditions laid down for patentability, before the matter is further laid before the court for resolution. The merit of this is the reduction of litigations arising in relation to examination and grant of patent. The examination by the patent office is intended to cover all possible aspects of the patent law which may affect adversely the validity of the patent when it is granted. It is duty of the examiner to conduct search to discover the state of the art so that the novel elements of the invention can be identified. He can object that the invention is not an invention properly so-called; having regard to the nature of the subject-matter or it is not patently novel or even that the invention will not work. Therefore, procedure in Nigeria adopted for examination of inventions cannot be justified on the ground that the patent office is being over-burned with patent applications. With the present workload in our patent office, it is doubtful if the Nigerian patent office processes up to 20 patent applications a year. It is indeed baffling that under our present law, there is no provision for search at any stage of the process for patent application. Indeed, a situation like this holds no hope of incentivizing innovation in the country.
2. **Human Capital:** Burda and Wyplosz defined human capital as the education, training, or work experience acquired by individuals. Its accumulation is very similar to that of physical capital. Lucas’ endogenous growth theory has shown that countries with a larger stock of human capital experience higher growth rates. Highly skilled and flexible human capital is essential to compete effectively in today’s world and is a key building block of a knowledge-based economy. Such human capital enables a nation to adopt, adapt, use, and produce knowledge, and becomes central to its development. Human capital provides an interpretation of both the lack of convergence between rich and poor countries and the link between growth, investment and saving. The more a country saves to invest in human capital accumulation, the faster it will grow. Therefore, there is no reason to refrain from accumulating human capital forever. The efficiency of local imitation and the potential for a country to adopt, improve a new technology is dependent on its human capital measure. Highly human capital abundance has two implications: first, it implies that local imitation is efficient and less costly; on the other hand, it indicates that local workers are more capable of adapting and improving the technology, thereby implying less training and licensing cost for the innovator. In the latter case, this cost effect encourages licensing activities. Recently, the Global Innovation Index (GII) 2014 surveyed 143 economies around the world, using 81 indicators to gauge both their innovation capabilities and measurable results. In terms of human capital development, Nigeria ranks 134 out of the 143 economies surveyed in the GII 2014. This ranking reflects that Nigeria’s human capital development is only 12. 2 percent. Thus, Nigeria lacks highly developed human capital in virtually all sectors of her economy. According to Ogbu and Nwalo, no more than 10% of the Nigerian firms are approaching international standards of performance on practices such as human resources, innovation and offshore investments. This evidences the fact that both small and large Nigerian firms are adversely affected by lack of human capital. Small Nigerian firms often do not have the human resources to undertake R&D in-house. Even for those progressive firms who have developed internal R&D capabilities, the availability of required skills continues to be a major issue. Education is very imperative for the development of a nation’s human capital. Economic theory also supports the idea of education as a driver of growth and innovation. Investment in education improves human capital and the capacity to innovate. While many universities around the world are at the center of innovations, Nigerian universities are yet to realize how important their role is in driving innovation in Nigeria. Hence, Nigerian Universities over the years cannot drive innovation in Nigeria. The academic sector of Nigeria continues to witness low supply of human capital in science and technology. According to Ogbu and Nwalo, • “Of more interest is the potential future supply of human resources in science and technology, which can be projected on the basis of student enrolments in these areas. In 1996, over 4,480 students graduated in science and engineering fields, accounting for about 20% of all graduates. This reveals a large increase over the 1990 graduate figure of 2,560. However, as a proportion of total graduates, there was a slight decrease over this period (from 24% to 20%).”The curriculum used in the universities is such that does not support innovation and entrepreneurship. This has resulted in a big knowledge gap. Many Nigerian higher education institutions have few formal linkages to industry, and as a result tend to continue teaching outdated materials and producing graduates who are ill-equipped for the working environment. The major cause of the poor standard of education is that Nigerian government over the years does not give the needed priority and attention to higher education in the country. The universities are poorly funded by the government resulting in brain drain, Infrastructural deficiency, knowledge gap, poor ethical standards and inability to drive innovation in Nigeria.
3. **Research/Innovation Infrastructure:** Research and development is the key to global competitiveness. Those working in Research and Development (R&D) of new technologies tend to spawn new and profitable businesses faster than others. This, therefore, enables faster economic development of a nation. In terms of Research and Development (R&D), Nigeria ranks 108 out of the 143 economies surveyed in the GII 2014. This ranking reflects that Nigeria’s R&D is only 1. 9%.cxciTherefore, Nigeria’s research capability and output is too low. Doing academic research for innovation is a major goal of the universities. However, in Nigeria, there is very low interest in research. Many university dons do not have the zeal to carry out research work. This is unlike the developed and newly industrializing countries where research outputs are directed towards commercialization in order to gain competitive advantage and improve the economic well-being of the populace. Research facilities and innovation infrastructures are crucial for the development of a nation’s research and development. Therefore, lack of them will debilitate against innovation. It is obvious that Nigeria is not only lacking human capital but lacks the necessary research facilities and innovation infrastructures. Even where they available, they are either in poor state or in shambles. Obviously, many Nigerian firms still have short rather than long term outlook. This accounts for why most view R&D as an expense and not as an investment. Furthermore, many Nigerian firms lack the requisite innovation infrastructure and tend to be risk averse in adopting new technologies
4. Sophisticated Business Community: The competitiveness of the business community of science and technological industries makes it highly sophisticated. Hence, business sophistication becomes imperative for a nation’s competitiveness in global innovation. Business sophistication concerns the quality of a country’s overall business networks as well as the quality of individual firms’ operations and strategies. This is particularly important for countries at an advanced stage of development, when the more basic sources of productivity improvements have been exhausted to a large extent. Business sophistication is conducive to higher efficiency in the production of goods and services. This leads, in turn, to increased productivity, thus enhancing a nation’s competitiveness. Therefore, higher productivity in the production of produce and services is the result of business sophistication, which in turn, results in increasing of efficiency, thus enhancing the competitiveness of a nation. Moreover, business sophistication plays a main role in a country’s economy which means that it controls the quality of a country’s business networks and strategy of individual firms in general. However, the Global Innovation Index (GII) 2014 survey has indicated Nigeria’s low level of business sophistication. Nigeria, therefore, ranked 128 out of 143 economies surveyed in the GII. Her business sophistication is only 21.3 percent. Science and technology business is a competitive and sophisticated business community. The score indeed reveals Nigeria’s low level of competitiveness in science and technology. She, therefore, cannot measure up in such business community.

The way forward towards Economy Sustainability

1. This study recommends that the Nigerian Patent and Designs Act should be amended. In addition to the weaknesses in the said Act exposed in this study, the purports of the amendment specifically include putting the Registrar of patents and Design in a position to examine and invalidate any patent on grounds of non-compliance with the requirements of the law. The Act should also be amended to make provision for publication of patent application prior to grant of patent, so as to afford the public the opportunity to oppose applications for patent grant, where they warrant such opposition.
2. Nigeria’s innovation policy should center on a number of critical policy domains: economic, regional and industry development, labour market and industrial relations policy, education policy, science and technology policy and immigration policy. This article recommends positive technology policy which should provide sufficient protection to indigenous technology and also open doors to import technology from foreign countries for general national development and productivity. Policy objectives should minimize the risks associated with innovation (e.g. a stable and supportive macroeconomic policy). Innovation policy should act to enhance returns to investment in R&D, and innovation generally, while keeping costs to a minimum. This is because firms will only invest in innovation if they can expect sufficient private returns. Furthermore, there should be fiscal policies that act to reduce expenditures on innovation-related investment in order to incentivize people to innovate. Policy objectives should be geared towards disseminating to the public information with respect to innovation and intellectual property right, especially patent.
3. Capable hands should be employed to administer intellectual property rights in Nigeria. Provisions should be made for adequate infrastructure for operation of IPR in Nigeria.
4. Emphasis should be placed on the acquisition and adoption of foreign technology through licensing, purchasing, know-how, patents, brands, consulting services and technology transfer agreements. Nigeria should not yet venture into bogus and sophisticated technologies (research and development in same should be encouraged). However, this should not discourage Nigeria from moving into innovation. We recommend that rather than avoiding technological innovation, we should begin
5. It is paramount that Nigeria focuses on education and invests in the sector. The Government should increase its funding on education by allocating more to the sector in its budget. This will make education to be accessible to a greater population of Nigeria. Government has the duty to create the enabling environment for the universities to drive innovation in Nigeria. Therefore, education facilities and infrastructures should be unsparingly provided in all levels of education in Nigeria. Nigeria needs to strengthen the quality of teaching in math and science if we must become a full-fledged knowledge economy. A sizable cohort of people educated in math and the sciences helps a country internalize technology and innovations developed abroad, and one day make the jump and develop new ones locally. In this way, the human capital of Nigeria will be greatly improved. Like India, Nigerian Government should be encouraging expatriate Nigerians to return home and help build our local human capital so as to meet up with international competitiveness.
6. Research and development is the key to global competitiveness. Therefore, Government should provide direct support for research in government funded institutions. The capacity of existing research and development facilities should be enhanced. Strong alliances with universities should be formed to develop intensive new curricula in science and technology and to conduct joint research on new technologies. Manufacturing companies should be encouraged to invest a certain percentage of their annual turnover on research and development. Institutions are identified as critical; thus the existing ones, especially research institutes, need to be funded and equipped to conduct value added R&D for the economic development of Nigeria. Government should encourage research collaboration between higher institutions (national and international), research institutions and industries.
7. Since Nigeria is blessed with abundant renewable energy resources such as hydroelectric, solar, wind, tidal, and biomass, there is a need to harness these resources and chart a new energy future for Nigeria. In this regard, the government has a responsibility to make renewable energy available and affordable to all. This will go a long way to provide constant, high quality power supply in the country which will improve the Nigerian business environment.
8. Government policy for the agricultural sector should be geared towards providing for more training and learning support for enhancing both technical knowledge and organizational and management skills. The policy should also be intended to make modern agricultural equipment for sale and hire available to farmers at a subsidized price.
9. Policy for the ICT sector should be targeted at encouraging research and development as well as that would facilitate and enhance local management, capacity and content development in the key areas of ICT. The implementation of this policy should be driven mainly by the private sector, promoting entrepreneurship, innovation and local capacity development, while the government will be the facilitator and catalyst for the projected growth.
10. Since Nigeria has a comparative advantage in the area of pharmaceutical innovation, which includes development and production using African Traditional Medicine and the continent’s rich biodiversity as raw materials of choice, emphasis should be placed on sourcing materials locally. Furthermore, faking, smuggling and dumping of sub-standard products into the country should be stopped to ensure a level playing field for local manufacturers.

In the present era, in all ramifications of economic development, technology-dependent economies surpass economies dependent on their natural resources. Therefore, the economies that can remain flexible, adaptive, and innovative will reap the benefits of world trade. This is because the global competitiveness of any economy depends on its science, technology and innovation (STI) capabilities. Based on the result generated through the analysis of our data which revealed that Nigeria is currently lagging behind technologically, our hypothesis that innovation in science and technology will bring about the diversification of the Nigerian economy, leading to economic growth: employment, productivity, export growth and increased foreign exchange earnings, including healthy and prosperous Nigeria, were all upheld.

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