

THE ROLE OF LAW IN THE DEVELOPMENT OF SCIENCE, TECHNOLOGY AND INNOVATION IN NIGERIA*

Abstract

Law serves a myriad of functions in any society; from its obvious roles of maintenance of order and dispensation of justice, to its less apparent function of social engineering. The notion that the law should not merely issue legal sanctions by looking at people's faults but should change citizens' behaviour for society's welfare is a widely recognized idea. It is on the above recognized premise of law as an instrument of social engineering; conferred on it by its ability to encourage or deter behaviour that its role in the development or regression of any field or sector emanates. This paper seeks to explore the state of science and technology in Nigeria, the sector's relationship with the law and the role of law in the development and advancement of science and technology in Nigeria. The paper concludes that law plays a very important role in the development of science and technology especially in any developing nation.

Keywords: Law, Science, Technology, Innovation and Nigeria

1. Introduction

Law serves a myriad of functions in any society; from its obvious roles of maintenance of order and dispensation of justice, to its less apparent function of social engineering.¹ The notion that the law should not merely issue legal sanctions by looking at people's faults but should change citizens' behaviours for society's welfare is a widely recognized idea.² It is on the above recognized premise of law as an instrument of social engineering; conferred on it by its ability to encourage or deter behaviour that its role in the development or regression of any field or sector emanates.³ This paper explores the state of science and technology in Nigeria, the sector's relationship with the law and the role of law in the development and advancement of science and technology in Nigeria.

2. Science, Technology and Innovation in Nigeria

Nigeria has witnessed rapid adoption of basic technology in many aspects of human life over the past few decades. These introductions, while mostly imported, or copied from other climes, have significantly eased the life of average Nigerians. The federal government of Nigeria has also played a part in this development with establishment of science and technology focused governmental ministries and agencies like the Federal Ministry of Science & Technology, National Biotechnology Development Agency (NABDA), the National Space Research and Development Agency (NASRDA) and the National Agency for Science and Engineering Infrastructure (NASENI) among others. However, despite the fair show of interest in science and technology by the government, the recent penetration and adoption of technology has sadly mostly been at elementary level at best. Nigeria currently has an unimpressive footprint in notable prime sub-sectors of science and technology like robotics, artificial intelligence and space exploration; sectors which have been known to deliver notable and significant benefits. Robotics and artificial intelligence for example have been proven to have undeniably positive

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¹ 'Major Functions of Law in Modern Society Featured' - David Funk. 23 Case W. Res L. Rev. 257 (1972)

² 'Law as a Tool of Social Engineering' – Harpani Matnuh. *Advances in Social Science, Education and Humanities Research (ASSEHR)*.

³ Ikenga K.E. Oraegbunam, 'Humanism and the Law: Towards African Renaissance', *Ogirisi: A New Journal of African Studies*, Vol. 9, 2012, pp.245-268. Also available at <http://dx.doi.org/10.4314/og.v9i1.13>. Available also at www.ajol.info/index.php/og/article/download/84688/74677.

impacts on sectors like healthcare, transport, manufacturing, retail and education.⁴ Nigeria's near total absence from these fields is further highlighted by the fact that a country like Singapore, which gained independence in the same decade as Nigeria, has recorded so much success in robotics and artificial intelligence that almost every sector of its economy has been immensely transformed as a result of the technology.⁵ Nigeria has similarly performed below expectations in space exploration, a field with notable potential benefits like the ability to give better assistance to farmers, improvement of national communication infrastructure, early knowledge of potential environmental disasters and improved monitoring of key regions like the oil rich Niger Delta and the currently insurgents-troubled North-Eastern part of the country.⁶ Specifically, since 2003 when Nigeria kicked off its space program with the launch of the Kosmos-3M, it has only managed to launch an additional four over the period of almost two decades that followed.⁷ In comparison, India, which was also a former British colony, has launched more than eighty satellites into outer space, dwarfing Nigeria's space adventure.⁸

Furthermore, valuable scientific and technological breakthroughs in agriculture such as livestock genetics/breeding, crop genetics/pest management and mechanization have transformed agriculture in technologically advanced countries through improved efficiency and productivity.⁹ These tremendous transformations are also largely unfelt in Nigeria.¹⁰ It is therefore apparent that while Nigeria has witnessed a good level of penetration of basic technology, the upper echelon of current scientific and technology trends like artificial intelligence¹¹, robotics/mechanization, space exploration and sophisticated livestock and crop genetics remain largely elusive, implying that more attention needs to be paid to fixing this predicament.¹² It is equally important to state that at policy level, Nigeria have been able to churn out significant policy initiatives meant to catapult the Nation's drive into a technologically cum knowledge driven economy viz: National Science, Technology and Innovation Roadmap (NSTIR) 2030- An Integrated roadmap 2017-2030, National Science, Technology and Innovation (STI) Policy, National Policy on Methanol Fuel Production Technology, National Leather and Leather Products policy, FGN Official Gazette No.25, Vol.105 of 5th February 2018 known as Presidential Executive Order No.5. Significantly, these myriads of policies should ordinarily serve as Conventions that provide a legal basis for implementation which will also have some form of sanctions in case of default or deviation that tends to alter negatively the National STI priorities.

3. Intersection between Law, Science and Technology

The field of law on one hand and science and technology on the other seem to occupy different ends of a spectrum. However, a closer look reveals that they enjoy a cozier relationship. For example, within the realm of science and technology, the foundational theories and principles upon which advancements and breakthroughs are built are generally referred to as 'laws',¹³ notable among which include; Newton's laws of motion,¹⁴ laws of thermodynamics,¹⁵ and Newton's law of universal gravitation.¹⁶

⁴ See <https://www.cio.com/article/3292616/how-singapore-is-using-artificial-intelligence.amp.html> (accessed on 21/09/2020).

⁵ See <https://www.gpc-gr.com/robotics-singapore/detail.php?seq=1> (accessed on 21/09/2020).

⁶ See <https://www.bbc.com/news/world-21954395> (accessed 22/09/2020).

⁷ See <https://www.lexology.com/library/detail.aspx?g=f3a24bfa-5269-4cc3-9de2-cadb36a29018> (accessed on 22/09/2020).

⁸ See <https://www.aerospace-technology.com/features/featurethe-10-countries-most-active-in-space-4744018/> (accessed on 21/09/2020).

⁹ See <https://www.stearsng.com/article/embracing-technology-in-nigeria?amp-content=amp> (accessed on 24/09/2020)

¹⁰ See <https://iowaagliteracy.wordpress.com/2018/06/02/5-ways-technology-has-changed-farming/amp/> (accessed on 24/09/2020)

¹¹ See Ikenga K. E. Oraegbunam & Uguru Eme Uguru, 'Artificial Intelligence Entities and Criminal Liability: A Nigerian Jurisprudential Diagnosis', *African Journal of Criminal Law and Jurisprudence* 3(2018), 1-14.

¹² See Ikenga K.E. Oraegbunam 'Jurisprudence of Genetic Engineering in Nigeria: Prospects and Challenges for Human Dignity in the Light of the National Health Act 2014', *International Journal of Business and Law Research* 3(4): 9-25, Oct.-Dec., 2015. <http://seahipaj.org/journals-ci/oct-dec-2015/IJBLR/abstract/IJBLR%206.html>.

¹³ Scientific laws are statements based on repeated experiments or observations that describe or predict a range of natural phenomena

¹⁴ See <https://www.britannica.com/science/Newtons-laws-of-motion> (accessed on 22/09/2020).

¹⁵ See <https://www2.estrellamountain.edu/faculty/farabee/biobk/BioBookEner1.html#:~:text=Laws%20of%20Thermodynamics%207C%20Back%20to%20Top&text=First%20Law%20of%20Thermodynamics%3A%20Energy,from%20one%20form%20to%20another.> (accessed on 21/09/2020).

¹⁶ 'From Paradox to Reality: Our Basic Concepts of the Physical World' - Fritz Rohrlich (25 August, 1989). Cambridge University Press, pp.28.

These scientific laws, while distinguishable from laws in the general sense are nevertheless relevant in understanding the interconnectedness of law with science and technology.¹⁷ Conversely, science and technology play an essentially role in the smooth operation of the legal system; from the vital role of forensic science in criminal proceedings to the immense impact of computers and accompanying accessories in almost all stages of legal proceedings. It is evident that both fields intersect even in their distinct and separate operations and are therefore not alien to each another. The establishment of this inherent interconnectedness makes the notion that each of these fields can significantly aid the advancement of the other less strange, the bottom-line being that law indeed has roles to play in the advancement of science and technology in Nigeria. In fact, Law is a great enabler of Science without which it cannot prosper, because law ensures Freedom of Thoughts which is the very foundation and bedrock of scientific cum technological breakthroughs.

4. Roles of Law in the Development of Science and Technology in Nigeria

It has been established that the current stage and pace of scientific and technological advancement in Nigeria is unsatisfactory. There are numerous ways to bring about improvement in this regard; this section looks at the possible roles of law in ameliorating the situation.

Intellectual Property Laws

Intellectual property law comprises of a system of policy levers that legislatures tailor and courts interpret in order to promote innovation and protect the integrity of markets.¹⁸ It comprises of distinct legal regimes such as patent, copyright and trade secrets through which it achieves the objectives of fostering innovation and improving interest in science and technology. The promise of a guaranteed avenue to reap economic or financial gain from one's successful idea or invention is a strong incentive which intellectual property law seeks to harness. Intellectual property law regimes generally grant an inventor exclusive right over their invention for specified period of time thereby ensuring that the cost of research and an additional reasonable gain is secured on the invention. In protecting intellectual property rights in science and technology, patents, being the most suitable are particularly relevant. A patent offers the possibility of a limited period of exclusive rights to encourage research and development aimed at discovering new processes, machines, articles of manufacture and compositions of matter and improvements thereof.¹⁹ This protection is particularly crucial in light of estimates that approximately two-thirds of the value of major industrial companies derives from intangible assets.²⁰

Intellectual property rights are generally recognized in Nigeria, inventors can approach the Trademarks, Patents and Designs Registry of the Commercial Law Department of the Ministry of Industry, Trade and Investment to register their intellectual property. The courts will also protect these rights if approached for adjudication. However, considering the important nature of intellectual property rights to the development of science and technology, it is noteworthy to state that there are notable avenues for improvements as problems such as low level of awareness of the public on protected rights, inadequate penalties for infringement, official corruption and lack of coordination among the various agencies involved in the development and protection of intellectual property rights are issues in need of urgent address.²¹

Intellectual property laws are essentially the life-wire of high technology industries such as computer software and biotechnology where ideas and innovations rather than infrastructure are the primary assets.²² The law, through the proper recognition and protection of intellectual property rights can enhance the development of science and technology since enough motivation and incentive would have

¹⁷ Oxford English Dictionary. 3rd Ed. Oxford University Press. September, 2005.

¹⁸ 'Intellectual Property' - Menell & Suzanne Scotchmer, Handbook of Law and Economics, University of California at Berkeley.

¹⁹ 'Intellectual Property in the New Technological Age: 2016 Volume 1: Perspectives, Trade Secrets and Patents' – Mark A Lemley et al

²⁰ 'The significance of intellectual property assets, risks and insurance' - Swiss Reinsurance Company (2000)

²¹ <https://www.mondaq.com/nigeria/trademark/788714/strengthening-intellectual-property-rights-and-protection-in-nigeria> (accessed on 23/09/2020).

²² See <https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/science-technology-and-law> (accessed on 24/09/2020).

been provided to attract both the sound minds and capital needed for research and innovation. It is to be noted that Nigeria's STI policy recognizes this important aspect of IPR by the establishment of National Office for Technology Acquisition (NOTAP) which main functions are the registration of patents and science related research findings. It is noteworthy that despite the seeming slowness of the process, NOTAP have been able to register about 57 patents to guarantee in accordance with the Laws and conventions the individual's right to have not only propriety rights over such patents but enjoy the commercial reward associate with such patents.

Again, despite these efforts, Nigeria still lags behind in developing an atmosphere which requires creativity to thrive under a legal framework when compared to other Countries even in the sub-saharan Africa. Recently, the World Intellectual Property Organisation (WIPO) released its Global Innovation Index 2020 and Nigeria is listed as No.117 amongst the world's 130 most innovative countries. Sadly, even in sub-saharan Africa, Mauritius (52), South Africa (60), Kenya (88) are leading this region.

A number of reasons could be responsible but most notable is a weak legal framework to advance IPR of inventors; Mauritius in the 2020 rankings by WIPO suggests that it's the 9th most innovative upper middle-income economy in the world, while South Africa and Kenya are due to a strong market capitalization cum domestic credit to private sector and economy that is holding the record of innovation achievers for the past ten years respectively.²³

Antitrust/Competition Laws

Antitrust or competition law refers to laws restricting business practices considered unfair or monopolistic.²⁴ It looks at metrics like market allocation, bid rigging and price fixing to determine if an unfair playing ground is being established.²⁵ It seeks to promote innovation by preventing companies from exercising monopolistic habits or colluding together to block new market entrants and innovations. Anti-trust laws, through the promotion of competition and eradication of monopoly are very important in ensuring that new entrants and their innovations are able to enter and participate in a market or sector without being unfairly killed off by already established participants in such sectors. This is important in order to ensure that new ideas, innovations and inventions in science and technology are given a chance to compete with already existing ones. Nigeria has shown considerable interest in combating anti-competitive practices. In 2019, the Federal Competition and Consumer Protection Act came into force and established the Federal Competition and Consumer Protection Commission charged primarily with the responsibility of promoting competition in Nigerian markets at all levels through elimination of monopolies, prohibition of abuse of dominant market position and penalizing other restrictive trade or business practices.²⁶ It is therefore accurate to state that Nigeria has put in place mechanisms to ensure that new and often smaller innovators in the science and technology space in Nigeria are given a chance to participate on a level playing field through the propagation of competition in all sectors and that this is another way through which the development of science and technology is being encouraged in Nigeria through the law.

Indirect Subsidization

The government controls taxation through the instrumentality of the law, the law is therefore also capable of promoting science and technology in Nigeria through taxation. In instances where the authorities wish to give relief to a particular sector, it has the discretion of issuing reliefs such as tax holidays, tax-free dividends and tax losses.²⁷ This is in fact a familiar tool for the Nigerian government. In 2017, through the National Investment Promotion Commission, the Nigerian government issued updated guidelines for application for Pioneer Status Incentives in Nigeria to encourage and attract investment into the manufacturing of computers, electrical equipment/components, information and communications technology (ICT) infrastructure and some other science and technology sub-sectors of

²³ See Global Innovation Index 2020. Accessed from <https://globalinnovationindex.org>.

²⁴ See <https://www.britannica.com/topic/antitrust-law> (accessed on 24/09/2020).

²⁵ See <https://www.investopedia.com/ask/answers/09/antitrust-law.asp> (accessed on 24/09/2020).

²⁶ Section 17 of the Federal Competition and Consumer Protection Act, 2019.

²⁷ See <https://www.mondaq.com/nigeria/corporate-tax/691392/tech-start-ups-understanding-the-ict-tax-regimes?signup=true> (accessed on 24/09/2020).

the economy.²⁸ This mechanism can further be extended to more areas of science and technology to drive more interest in the sector and allow more growth.

Controlling the Risks of New Technologies

The law plays a vital role in controlling the many known and potential health, safety, environmental and socio-economic risks posed by scientific and technological advancements. The law is used by the legislators and regulators to control these risks by providing participants in the sector an obvious guideline thereby giving them an avenue to focus on the more important tasks of researching, innovating and inventing. Legislation and regulation seek to address and reduce risks *ex ante* i.e. before the risks are imposed. The legislature in most jurisdictions, Nigeria included has plenary power and typically delegates to regulatory agencies the authority to regulate subject to the substantive and procedural requirements included in the legislation. The delegation of regulation to agencies is often reasonable due to the generally greater technical expertise, available resources, and familiarity needed to address these risks possessed by the agencies. The above features of regulatory agencies are crucial since *ex ante* legislation and regulation by agencies statutorily empowered to do so presupposes the capability to adequately predict potential harms, a challenging undertaking for most risks. Also, a major concern with regulating risks associated with science and technology is that the risks are rapidly changing and evolving due to advancements and as such requires regulations that are flexible and easily amendable, making regulation more apposite since they are significantly more flexible than legislation. Hence, through both legislation and the subsidiary regulation through delegated power, the law performs the dual function of protecting the populace from possible potential risks by preempting same and regulating before their occurrence and gives players in the scientific and technological space the opportunity to focus on their more important undertakings.

5. Challenges to the Development of Science and Technology in Nigeria

The abysmal general state of science and technology identified earlier is brought about by a myriad of factors, the conjunctive existence of which has resulted in an underwhelming national performance in science and technology. Below are some of the important factors militating against the proper development of science and technology in Nigeria.

Inadequate Funding for Research and Development

Research is necessary to achieve progress in the sophisticated categories of science and technology. Investment in universities and research institutes improve the quality of research as has been proven by increase in publications in top journals and patent awards in China and South Korea. Nigeria has however failed to provide the intensive level of funding needing to achieve this objective and as such currently lacks the requisite expertise.²⁹ Over the past three decades, Nigeria's gross expenditure for research and development is 0.2% of GDP, less than the world average of 0.4% and lesser than smaller African countries like Mozambique (0.5%), Mauritius (0.4%), Uganda (0.4%) and Botswana (0.5%).³⁰ While there has undoubtedly been spending on research and development by the Nigerian government, the level or rate of funding, especially in comparison to the rest of the world and even other African countries is a clear challenge. The non-provision of the level of funding required is arguably the biggest challenge to development of science and technology in Nigeria.

Corruption and Poor Management

Nigeria currently battles with corruption in virtually all aspects of national life. In 2018, Nigeria was ranked 144 out of 180 in a list of the most corrupt countries.³¹ It is estimated that Nigeria has lost over 400 billion dollars to corruption since her independence in 1960.³² The implication of the levels of

²⁸ Federal Republic of Nigeria Gazette No. 84, 14th August, 2017. Volume 104. <https://nipc.gov.ng/pioneer-status-incentive/#one> (accessed on 23/09/2020).

²⁹See <https://dailytrust.com/the-nigerias-agency-for-robotics-and-artificial-intelligence-rai-a-few-pointers> (accessed on 22/09/2020)

³⁰See <https://theconversation.com/science-and-technology-hold-the-key-to-nigeria-reaching-its-full-potential-45055> (accessed 14/09/2020).

³¹ Transparency International Corruption Index, 2018.

³² See <https://dailypost.ng/2012/08/31/nigeria-lost-400bn-oil-revenue-corruption-since-independence-ezekwesili/> (accessed on 23/09/2020).

corruption witnessed in Nigeria on science and technology ranges from the embezzlement and mismanagement of the already insufficient funding for the sector to the inability of worthy institutions, scientists and technologists to secure any form of governmental assistance without resorting to bribery. The development of science and technology in Nigeria is therefore greatly hindered by systemic corruption as it eats into the already insufficient funding and prevents allocation of resources to the appropriate quarters.

Incessant Changes in Governments

The machinations of politics also affect the development of science and technology in Nigeria. Firstly, like in many other countries, elected officials in Nigeria are eligible to hold elected posts for two terms of four years each. This in itself is a normal and widespread practice. However, change in administration in Nigeria often simultaneously result in change of appointed officials heading several governmental agencies and parastatals. This incessant change has meant that there has been lack of continuation in policy and direction; this has no doubt contributed to the slow pace of scientific and technological development in Nigeria. The effect is constant policy summersault and incoherent implementation strategies culminating in the creation of multiple and duplicitous organisations working at cross - purposes. For instance, the creation of the Ministry of Communications and Digital Economy operating side by side with the Ministry of Science and Technology creates unnecessary bureaucratic bottlenecks that hinders the flourishing of science and technology, creates unhealthy rivalry and fight for space and control of who for example have propriety over ownership of Artificial Intelligence and Robotics etc.

Lack of Coordination among Institutions

The link between the Nigerian scientific and technological industry and the colleges, universities and research institutes conducting research is virtually non-existent.³³ The effect of the this lack of connection and linkage is that the industry is unaware of novel findings from research institutes which results in this research not being acted upon and converted into practical inventions for the benefit of the nation.

Lack of Venture Capitalist Investments

For any meaningful progress in STI, Nigerian investors as venture capitalist must invest in innovative efforts of Nigerian scientist so that such R&D outcomes can be commercialized to create a manufacturing activity that will create wealth and jobs. That is how brands like Samsung, Techno, and Apple developed etc. Nigeria must provide an enabling environment for STI to thrive by providing a legal framework for incentivizing venture capitalist in such investment drive.

6. Conclusion and Recommendations

Science and technology promise immense value to any nation that takes it serious. The benefits are enormous; notable among which include efficiency, productivity, security and better information. Nigeria currently finds herself unable to reap these benefits due to a lack of robust science and technology sector. Even worse, the pace of development and advancement currently follows a similar trend, giving no hope for the future. In a bid to change the state and pace of development of science and technology in Nigeria, the law as an instrument of social engineering has already been playing numerous important roles in the background; nevertheless, there is need for improvement in the performance of these very important roles.

The following recommendations are proffered to address the challenges facing the development of science and technology in Nigeria and enable an environment where the countries full potential in this sector can be reached:

1. Provision of adequate funding to directly facilitate research, development and education in science and technology and rendering support to participants in the sector through further indirect subsidization. There is an urgent need for the establishment of an R&D Bank to finance only STI related research findings. The legal framework

³³See <http://www.unesco.org/new/en/natural-sciences/science-technology/sti-policy/country-studies/nigeria/science-makes-a-fresh-start-in-nigeria/> (accessed 22/09/2020).

should clearly state the mandate and focus of the Bank and provide for sanctions where there's deviation from its core mandate and objectives.

2. Implementation of a more robust intellectual property law regime to protect intellectual property rights in Nigeria and increase interest in research and innovation.
3. Protection of small and new entrants into the science and technology sector through strict adherence to antitrust and competition laws to enable a level playing field.
4. Tackling the persistent national corruption head-on through the entrenchment of the rule of law and ensuring in the short term that incorruptible and competent persons are appointed into governmental agencies and parastatals overseeing the science and technology sector of the country.
5. Ensuring that candidates running for elected posts commit to the continuance of good policies already laid down by past and previous administrations.
6. Devising a practical and efficient link of communication and interaction between the various research institutes and the industry with resources to actualize the findings of researches.
7. The prioritization of STI by serving and succeeding Government as a national emergency, as no Nation progresses without Science, Technology and Innovation.