

# Lessons for Nigeria: Determining Authorship and Inventorship of Artificial Intelligence Generated Works

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## ABSTRACT

*Artificial Intelligence (AI) has gained widespread momentum in today's tech-savvy world. AI is now capable of creating copyright works and inventions without human intervention. Such AI-created works challenge the frontiers of intellectual property rights (IPR), particularly those on patents and copyright. The extant copyright and patent laws in Nigeria (Copyright Act, 1988, and Patent Act, 1970) were drafted when AI authorship and inventorship were not a primary consideration. The international legal framework on IPR has also not addressed this issue conclusively. Using a doctrinal method of legal research, this paper examines the challenge AI poses to authorship and inventorship under copyright and patent laws. It also takes a peek into advanced jurisdictions which have had the opportunity to address these issues, to draw lessons for Nigeria where a National Centre of AI and Robotics has recently been established and these issues are envisaged to arise as the Centre carries out its objectives. This paper finds that under the extant legal framework in Nigeria, an AI system cannot be designated as an author or inventor. Considering the advancement in AI technology, this will exclude AI-created works and inventions from intellectual property protection in Nigeria. While drawing lessons from other jurisdictions, this paper recommends a responsive regulation of AI technology through a legislative amendment that accommodates AI systems as authors or inventors with a presumption of law that allows ownership, rights, and liabilities to be borne by the owners of such systems.*

**Keywords:** Artificial Intelligence, Copyright, Patents, Author, Inventor, DABUS, Nigeria

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## I. INTRODUCTION

Technological developments have led to an increase in creativity and innovation, resulting in the advancement of how people relate to the environment and society at large. In recent times, there has been an increase in research, development, and application of Artificial Intelligence (AI) in solving various problems. The term AI encompasses a broad scope of technologies (Zurth, 2021, p. 1), and refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem-solving, and decision-making (Ahuja, 2020, p. 272).

The term ‘artificial intelligence’ was coined by a computer scientist, John McCarthy, in 1956 at a conference themed ‘The Dartmouth Research Project on Artificial Intelligence’ (Lakshminath & Sarda, 2012, p. 3). McCarthy (2007) saw the term as the notion of a program processing or acting on information such that the result is related to how an intelligent person would respond to a similar input (Acosta, 2012).

However, there is no standard definition of what AI involves. Several definitions refer to AI as machines that behave like humans and are capable of actions that require intelligence (Russell & Norvig, 2010, p. 1). It can also be defined as the ability of a digital computer-controlled robot to perform tasks commonly associated with intelligent beings (Oriakhogba & Olubiyi, 2021, p. 60).

With regard to works created by AI, two types can be identified: AI-generated creations and AI-aided creations (Ramalho, 2017, p. 2). The World Intellectual Property Organization (WIPO) (2020) defines AI-generated creations as AI generating ‘outputs without human intervention’ capable of changing their behaviour during operations to respond to unanticipated information and events (p. 4). This involves an AI system developing works independently without human intervention; these works are created by an AI system with little or no aid from a human user (Perry & Margoni, 2010, p. 623). AI-aided creation points

to outputs generated with ‘material human intervention or direction’. This category of work involves an AI system being used as a mere tool or aid to help humans create work and involves the use of an AI system to make creative choices and foresee the output of the system. It also entails a program functioning as an instrument or assistant to realise the creation of a work (Perry & Margoni, 2010, p. 623). It involves human intervention although, in the end, the work is created by AI (WIPO, 2020, p. 4).

This paper focuses on the authorship and inventorship of AI-generated creations as these concepts are redefining functions, which were hitherto considered exclusive to humans. In law, it affects who would hold the rights to outputs from AI-generated systems (Ezemena & Ibekwe, 2020, p. 109). Nigeria’s Government recently set up the National Centre for Artificial Intelligence and Robotics (NCAIR), which aims at promoting research and development of emerging technologies in areas of Nigeria’s national interest and focuses on creating a thriving ecosystem for innovation (NITDA, 2022). This indicates that Nigeria seeks to take advantage of the benefits provided by AI in driving technological and societal developments. It also shows that the country is desirous of developing in this regard; however, without commensurate legal development in the field. Hence, there is a need for a responsive legal framework to address this technological development to support the actualization of the objectives of NCAIR. Determining the authorship and inventorship of AI is helpful in ascertaining who among the programmer, owner of the AI, the person who provided the data, operator or trainer should be named as the inventor.

The Nigerian Copyright Act (1988) was enacted over thirty years ago and the Patent and Designs Act (1970) was also promulgated over fifty years ago with no subsequent amendment. These laws were enacted at a time when AI authorship and inventorship were not of primary consideration. Due to the advancement of technology, the world has seen a new generation of creative works and innovations by AI systems with min-

imal human intervention. For instance, the Device for the Autonomous Bootstrapping of Unified Sentience (DABUS) is an AI system which autonomously created two inventions namely: a plastic food container based on fractal geometry and a flashing light to alert emergencies; although these were not created in Nigeria (Oriakhogba (a), 2021, p. 89). The creation of patentable innovations by AI challenges the extant patent system which protects new inventions or improvements on existing inventions (Odion & Ogba, 2010, p. 94). On the other hand, the creation of copyright-able works by AI may also challenge the regime of copyright, a set of exclusive rights granted by the Government for a limited time to protect the particular form, way, or manner in which an idea or information is expressed (Olatoun & Osinachi, 2020. p. 299).

In Nigeria, human beings or legal entities including corporate bodies have been known to be the only owners, authors, creators or inventors of Intellectual property (IP) works (Copyright Act, 1988, s. 2, 4, 5 & 51; Patents and Designs Act, 1970, s. 32). With the establishment of NCAIR, it is hoped that Nigeria would also soon have AI-created inventions and AI-created copyright works. The challenge posed by this legal lacuna is therefore imminent and there is a need to have a responsive regulation approach to this technological development. The law needs to be proactive, dynamic, and responsive in this regard (Fenwick *et al.*, 2017, p. 562). Moreso, the rooster may soon crow close to home due to globalisation and the interests of foreign-owned IP rights, which may need to be protected in Nigeria. In addition, the inventorship of DABUS, which led to addressing the authorship or inventorship of AI in Australia, Europe, South Africa, the United Kingdom, and the United States of America, was done through an international application via the Patent Cooperation Treaty (PCT) (1970) to which Nigeria is also a party.

This paper focuses on the impact of the authorship and inventorship of AI under copyright and patents, respectively, because these questions are likely to arise as the NCAIR continues

its operations. More so, these two aspects of intellectual property rights are more pronounced in Nigeria and similar questions have arisen in other jurisdictions from which Nigeria could learn.

Part I of this paper is this introduction which gives an overview of the current problem that the paper studies. Part II provides the framework for the study by briefly explaining the concept of responsive technology regulation, which provides the fulcrum for the arguments in this paper. Part III discusses the concepts of authorship and inventorship under the copyright and patent regimes in Nigeria to provide the background and context for the discussions in the paper. Part IV examines the impact of AI on the authorship of copyright works and the inventorship of patentable inventions and establishes that, generally, the law in Nigeria does not recognize AI as an author or inventor. Part V discusses how other jurisdictions, specifically, Australia, Europe, South Africa, the United Kingdom (UK), and the United States of America (USA), have dealt with the question in order to draw lessons for Nigeria. Part VI makes recommendations and concludes the paper.

## II. RESPONSIVE REGULATION OF TECHNOLOGY

Technological development in today's society is fast-paced in which the cycles of new technologies are shorter and newer technologies are constantly being developed (Fenwick, 2017, p. 562). AI is one of the most important disruptive technologies that has been developed since it is designed to mimic humans through processes and rational actions with the capacity for self-learning and storing previous experiences (Paulius *et al.*, 2015, p. 378). Its impact is felt in various sectors of the economy and society.

Fast-paced technological advancements usually pose regulatory challenges. Many times, the law lags behind these technological advancements creating a lacuna in which the technology may create more problems or have resultant effects that are not

intended or palatable to the society or others in the society (Ranchordás, 2015, p. 201). Often, regulations are slow-paced and seek stability, while technological innovations are not only fast-paced but can be disruptive of the status quo.

Designing regulations that balance safety, ethics and legitimate use of technology and public enjoyment of technological advancements is not easy (Butenko & Larouche, 2015, p. 72). In particular, AI presents unique challenges in this regard since it is designed to mimic humans, yet it does not enjoy legal personality under both national and international law; hence, it cannot be held responsible for its actions such as when it causes harm or credited legally with its innovations such as patents and copyright works. It can also not exercise its right to sue when its 'rights' are infringed upon. Autonomous AI is playing increasing roles in society including in creating patentable inventions and copyrightable works. Therefore, there is a need to make laws to address the various issues arising from AI technology.

The facts and data needed to premise regulation may be inaccurate or not fully developed or may change in light of rapid technological advancements (Fenwick, 2017, p. 581). However, responding to technological advancements as an afterthought is not always the ideal practice. A better approach is for the law to also anticipate technological developments, and this is the essence of the responsive regulation of technology which anticipates advancement in technology. This means that regulations should be at par or anticipate technological developments to avoid lagging.

Therefore, law-making and regulations need to be more proactive, dynamic and responsive to technological advancements (Kamar, 2006, 175). Hence, within the context of this paper, it is essential that the law, particularly patent and copyright laws, respond to issues posed by the technological advancement of AI with respect to the question of authorship and ownership when AI creates an invention or copyright subject matter.

### III. LEGISLATIVE AND ACADEMIC OVERVIEW OF AUTHORSHIP AND INVENTORSHIP

#### *A. Authorship and Inventorship in Nigeria*

Authorship is a very important concept in copyright law as several rights are dependent on the author of work under copyright. Before a person can be protected by copyright law, apart from the requirement of originality and fixation, such a person must qualify as an author within the laws of the jurisdiction. For instance, before work can be protected by copyright law, the author must qualify for protection by either being a citizen or person domiciled in Nigeria; a body corporate incorporated under Nigerian laws; a Government or international body; or a citizen or person domiciled in a state party to an international treaty to which Nigeria is also a party (Copyright Act, 1988, ss. 2, 4, 5). Apart from where the work was first published in Nigeria (Copyright Act, 1988, s. 3), the protection of copyright is tied closely to the author qualifying.

Generally, the author is understood to be the creator of the work. The author is the person who invested creative and intellectual efforts into the creation of the copyrighted work and not merely mechanical or stenographic efforts (*Donoghue v. Allied Newspapers Ltd*, 1938; *Leah v. Two Worlds Publishing Ltd*, 1951). The author is the person who contributed the ‘originality’ or expended sufficient efforts on the work to give it an ‘original character’ (Copyright Act, 1988, s. 1(2)(a)). Under section 51 of the Copyright Act, (1988) the author of a literary, musical, or artistic work is defined as ‘the creator of the work’. Although this definition does not seem limited to a natural person, but when one considers other definitions of authorship under the Act, it is clear that the Act envisaged an author to be a natural person. The author of a photograph is the person who took the photograph; the author of a cinematograph film is the person who made arrangements for the making of the film; the author of a sound recording is the person who made arrangements for the



making of the sound recording; the author of a broadcast is the person who made arrangements for the making or transmission of the broadcast (Copyright Act, 1988, s. 51).

The authorship of copyright work is also important if one considers the natural right theory for protecting intellectual property rights. The natural rights theory argues that copyright should be protected since it is the product of the mind or brain of the author – their property; thus, they have a natural right to have such property protected (Caddick *et al.*, 2020). Furthermore, copyrighted works are a form of expression of the personality of the author (Oriakhogba & Olubiyi, 2021, p. 158).

Additionally, moral rights are granted to the author (Copyright Act, 1988, s. 12), and the duration of the economic rights are also tied to the life of the author for literary, musical, and artistic works wherein copyright lasts in such work until seventy years after the death of the (last) author where an author is a natural person (Copyright Act, 1988, First Schedule). Furthermore, first ownership of copyright is also vested initially in the author in the absence of any agreement to the contrary (Copyright Act, 1988, s. 10).

With regards to patents, the rights of the patent are vested in a statutory inventor who is ‘the person’ who was the first to file for the invention (Patent and Designs Act, 1970, s. 2(1)). A patentee is also defined as ‘a person’ to whom a patent has been granted (Patent and Designs Act, 1970, s. 32). Therefore, it seems both the phrase ‘statutory inventor’ and the word ‘patentee’ refer to the same thing and the terms can be used interchangeably. Furthermore, the Act provides for the true inventor who has a right to be named as such in the patent application and a granted patent (Patent and Designs Act, 1970, s. 2(2)). Although the true inventor is not defined, the Act uses the pronoun ‘he’ for the true inventor whose right to be named cannot be modified by contract. This may also presuppose that the Act contemplates a natural person as a true inventor unlike a statutory inventor, which could be a corporate body.

### *B. Jurisprudential and academic perspective on authorship and inventorship*

Having examined the meaning of the terms ‘author’ and ‘inventor’ under Nigerian law, it is essential to embark on some jurisprudential and academic study of the concept of authorship and inventorship. According to Owen H. Dean (2015), an author is ‘the person responsible for the creation of the material embodiment of a work through the application of intellectual efforts and skill’. For him, only natural persons can qualify as authors of creative copyright works like literary, musical, and artistic works (p. 55). Asein (2012) posits that the author of a work is the person who created the work or made the production of the work possible, and this need not be human (p. 435). One thing is clear, even from the statutory provisions above, that an author or inventor need not be human. Bodies corporate such as companies, governments and international organizations can also be authors or statutory inventors. The legal uncertainty is concerning the status of AI as an author or inventor.

However, Ginsburg (2003) views an author as a human creator who succeeds in exercising personal autonomy in moulding the work to their vision and is therefore entitled to recognition, payment, and exercise of artistic control over it (p. 1085). For Ginsburg, an author is a natural person and not a juristic person. To allow juristic persons to be authors is to equate authorship to ownership.

Nevertheless, Ginsburg developed six principles for determining authorship after examining the concept of authorship from various jurisdictions. The first principle places the mind over muscle; hence the author is the person conceptualizing the work and not someone who is merely carrying out orders in execution. The second principle places mind over a machine in that a machine or device, such as a computer, should not deprive the author of being named as such, although this author admits that the degree of involvement of a machine in the creation of a par-

ticular work matters. Based on this principle, for instance, the natural person should still be named as such for AI-aided creations. Ginsburg contends that the greater the machine's role in the work, the more the human author has to show how their role determined the form and content of the work. However, this is not the case with AI-generated works where human intervention in the creation of the work is either non-existent or minimal. The third principle equates authorship with originality; hence, it is the person giving the work its original character. The fourth principle relates to the level of effort or labour involved in the creation of the work; hence, the author is the one who perspires over the creation of the work. The fifth principle is that the author is the one that intends to imprint their personality on the work and the sixth principle relates to who provides money, resources and a platform for the creation of the work. This last principle supports the authorship of producers in films, record labels in sound recordings and broadcasting organisations in broadcasts.

Having examined generally the legislative provisions on authorship and inventorship in Nigeria as well as the importance and jurisprudence on this subject, the next segment of this paper focuses on the question of the authorship and inventorship of AI under the relevant IP laws in Nigeria.

## IV. AI AUTHORSHIP AND INVENTORSHIP IN NIGERIA

### *A. AI authorship and copyright in Nigeria*

In Nigeria, the Copyright Act (1988), provides for works that qualify for copyright protection. The eligible works for copyright protection under the Act are literary works, musical works, artistic works, cinematograph films, sound recordings, and broadcasts (Copyright Act, 1988, s. 1(1)). The Berne Convention for the Protection of Literary Works, (1887) (Berne Convention) provides a non-exhaustive list of works eligible for copyright. These include 'every production in the literary, scientific and artistic

domain, whatever may be the mode or form of its expression' (a. 2.1).

The preconditions for legal protection of a work under copyright are that such work must meet the requirements of originality and fixation. The Berne Convention provides for originality as a requirement for the protection of copyright and leaves the requirement of fixation for member states to decide (Berne Convention, a. 2). Originality means that the work must be the author's intellectual creation (Oyewumi, 2015, p. 32-33). However, the threshold of originality differs from one jurisdiction to another. Under common law jurisdictions such as Nigeria, the test of originality entails sufficient effort being expended in making the work to give it an original character (Copyright Act, 1988, s. 1(2)(a)). This also implies that the work must not have been copied as was decided in the UK case of *University of London Press Ltd v. University Tutorial Press Ltd* (1916). Where a literal interpretation of originality is taken, one may ask whether an AI is capable of producing copyright works that have an original character. In this regard, an AI machine can expend time, energy and effort in creating such work without copying; hence, the resultant copyright work can satisfy the requirement of originality under this standard.

The other criterion, fixation, means that the work must be fixed in a medium or expression that can be perceived, reproduced or otherwise communicated either directly or with the aid of a machine or device (Copyright Act, 1988, s. 1(2)(b)). This requirement does not seem to pose any problem for AI to fulfil. The challenge with this stance is discussed shortly in this paper.

In civil law countries, the standard of originality does not require evidence of skill and labour but a mark of the author's personality in the work (Gervais, 2002). Natural rights theorists justify copyright protection because 'it is the right thing to do since creative work generates from the author's mind' (Bently *et al.*, 2018, p. 40). Copyrighted works are consequently viewed as an expression of the author's personality. In this regard, it can be

asked whether AI systems have a personality they can express. Does an AI machine have emotions or sensibilities that its work could portray? It can be argued that AI at its current level of development lacks emotions or sensibilities, a soul or spirit to stamp its imprint on a piece of work. A counterargument could be that AI still exercises a few choices in arriving at a copyrightable work, which could be regarded as instinctual and unexplainable; hence, it has its own stamp on the work. Nevertheless, the choices exercised by an AI machine are limited usually to what was programmed into it. This cannot be compared to the unlimited or unrestricted choices of a human mind in expressing ideas or creativity.

Despite the above argument, it must be stated that copyright law does not impose personality as a requirement for copyright to subsist in a work (Peng, 2020). This was affirmed in the US in the case of *Fiest Publications Inc v. Rural Telephone Service Co* (1991), where the US Supreme Court ruled that the standard of originality requirement does not require any manifestly input from an author to be deemed satisfied. With the expression of an idea and the expansion of sufficient effort being the determining factors for originality in Nigeria, creative works produced by AI systems without human intervention may seem to qualify as original where sufficient effort has been expended by an AI system during the making of a work. This will however be examined further.

Copyright protection entitles an author to both economic and moral rights. The economic right gives the owner the right to exploit their work through reproduction, publication, performance, translations, adaptations, and turning it into a sound recording or film among others (Copyright Act, 1988, ss. 6-8). Under section 12 of the Copyright Act (1988), the moral right entitles an author to claim paternity over a work which they have created and aims at preventing the authorship over such work from being attributed to anyone other than the author of such work. It also gives the author the right to object in connection to

any distortion of their work, a right that cannot be transferred and also lasts forever.

The main aim of copyright is to incentivize and maximize creativity (Oriakhogba & Olubiyi, 2021, p.6). The general principle of copyright relates to the human authorship of works such as literal, artistic, sound recording, music, and cinematography subject to the originality of the work as provided under the Berne Convention (a. 2(1)). Though it does not provide a precise definition of authorship, it can be inferred from the Berne Convention that the protection operates for the benefit of the author and successors in title (a. 2(6)). The definition of an author is left to contracting parties; yet it can be inferred that authorship refers to the human creator or a natural person (Chapon, 2014). This can also be seen by references made in the Berne Convention to the author as the originator of the work and the beneficiary of protection (Berne Convention, 1887, a. 8). Also, the provision for moral rights granted to authors backs the assertion that copyright stems from acts of human creation (Berne Convention, 1887, article 6bis). Even where non-human authors have been recognized, this has been restricted to legal personalities such as body corporates. AI does not enjoy such a legal personality under the law at the moment.

Concerning moral rights and AI systems, moral rights as earlier stated seek to preserve an author's honour, reputation and relationship to their work - they can be seen as personal to an author. In considering whether moral rights can be extended to AI systems, it can be seen that though AI has the potential to create works which can be indistinguishable from human creations, they do not have honour, reputation or a personality which they stand to protect. Also, moral rights are automatically linked to an author (Copyright Act, 1988, s. 12). Not having the status of an author or a legal personality, AI cannot seek to preserve its honour, reputation or relationship to a work, as this would require extra justification which would expand the rationales for moral rights (Miernicki & Ying, 2020).

Although Nigeria's Copyright Act (1988) does not define 'an author', it is clear that it does not recognize copyright in non-humans or non-legal personalities as discussed above. The Copyright Act (1988) provides that the author of a literary, artistic or musical work is the 'person' who created such work, and in a cinematographic film, sound recording and broadcast the author is the 'person' who made arrangements for the making of such film, sound recording or broadcast (s. 51(1)). With the repetition of the word 'person' in the definition of authorship under section 51 and the requirements of qualifications of an author under sections 2 to 5 of the Act, it is clear that the Act does not intend to extend authorship to non-legal persons. Legal personality in the context of the Act is restricted to natural persons and corporate bodies (including companies, governments, organizations, and such other bodies corporate granted the status of legal personality by law). Thus, without legal personality, an AI machine cannot be regarded as an author of a copyrighted work even if the work were to satisfy the requirements of originality and fixation. The Nigerian copyright work also makes no provision for the protection of computer-generated works as in some other jurisdictions like the United Kingdom and New Zealand. This is further discussed in part V below.

This brings to the fore the importance of ensuring that the author of copyright work qualifies as such under the Copyright Act (1988) before the right can be granted or protected. For instance, in *Microsoft v. Franike Associates Limited* (2012), the Court of Appeal held that the applicant who failed to furnish the required certificate from the Nigerian Copyright Commission did not sufficiently prove that they were a qualified author under the Copyright Act; hence, it lacked the *locus standi* to sue the defendant for infringement. Although this decision has been criticized elsewhere by Olubiyi (2014) since it underlies the importance of an author qualifying as such under the Copyright Act (1988) in order to have copyright protection. Fulfilling the requirements of originality and fixation alone will therefore not suffice for protection.

### B. AI inventorship in Nigeria

The interaction between patents and AI has increased in today's technological world as AI is used to simplify the execution of work as well as improve human efforts (Maheshwarib, 2019). Patents aim to boost innovation by ensuring monopoly is granted to the owner of an invention for a limited term of twenty years (Patents and Designs Act (PDA), 1970, s. 7(1)). The Nigerian patent law provides the requirement for an invention to be granted a patent under section 1(1) of the Patents and Designs Act (1970). These requirements are that the invention must be new, involve an inventive step, and capable of industrial application.

An invention is novel or new when it does not form part of what is termed 'the state of the art'. The state of the art here refers to everything in the field of knowledge to which the invention relates that has been made available to the public anywhere and at any time by whatever means before the date of filing the patent or the foreign priority date claimed by the patent (PDA 1970, s. 1(3)). Therefore, in construing the novelty of an invention it must not have been disclosed before its registration anywhere in the world through oral publication, documentary publication, prior use or any other means (*Femento Industries SA v. Mentmore Manufacturing Co Ltd, 1956*).

An invention entails inventive activity if it does not 'obviously follow from the state of the art, either as to the method, the application, the combination of methods, or the product which it concerns or as to the industrial result it produces' (Patents and Designs Act, 1970, s. 1(2)(b)). Essentially, this means that the invention should not be obvious to a person skilled in the art of the field to which the invention relates. Where it is obvious to such experts, then it lacks inventiveness and cannot be termed an invention (*Technograph Printed Circuits Ltd. v. Mills & Rockley (Electronics) Ltd (1972) (UK)*).

The final condition of patentability to be considered is industrial applicability. This means that the invention 'can be manufactured or used in any kind of industry' (Patent and Designs



Act 1970, s. 1(2)(c)). Essentially, the invention should be useful in that it provides some practical benefit or is capable of being manufactured in an industry.

With regards to the question of inventorship, the Patents and Designs Act (1970) does not provide an express definition of an inventor, but section 2(5) provides that a person is not an inventor merely for assisting in doing work connected to the development of the invention without contributing to the inventive activity. Hence, it can be inferred that an inventor is one who contributes inventive activity to the development of the invention.

Furthermore, the Act recognizes the true inventor as the natural person who came up with the invention and the statutory inventor as the first person to file for the patent application (Patents and Designs Act, 1970, s. 2). The statutory inventor could also be a body corporate as stated earlier. A true inventor can therefore be seen as a natural person who contributes inventiveness to the development of the invention. To further protect the true inventor and prevent statutory inventors from applying for patents without the authorization of the true inventor, the Act provides that a true inventor has a right to be named as such in a patent even if they are not the statutory inventor as this right cannot be modified by a contract (Patent and Designs Act, 1970, s. 2 (2)). Therefore, there is a requirement for the consent of the true inventor to be obtained prior to the application for the patent.

If AI was granted inventorship status as a true inventor, can it file the necessary papers or objections or sue where it is not so named by a statutory inventor or where a patent application was made based on its invention without its consent? In the absence of legal personality, a court and other quasi-judicial bodies, including the patents registry, would have to hold that AI systems lack *locus standi* to bring such actions (*NBA v. Fawehinmi; Oriakhogba* (a), 2021).

Furthermore, the rationale and principles of patent system are designed around a human inventor as it aims to reward the inventive activities of an inventor. The concept of invention is the creation of something original in that such creation must not form prior knowledge and must not be familiar to a person skilled in the art. This revolves around the intellectual and creative activities of human creators with no provision for inventions from non-human actors such as AI technologies. From these statutory provisions, it can be inferred that AI systems cannot be accorded the status of an inventor in Nigeria particularly because they do not have legal personality. However, it is important that the law responds to technological advancements in this field hence the need for the discussions in this paper.

## V. A PEEK INTO SELECTED JURISDICTIONS

This section discusses judicial decisions in other jurisdictions with respect to the authorship and inventorship status of AI systems. Specifically, it considers decisions in Australia, Europe, South Africa, the US, and the UK. These jurisdictions are selected because they have addressed the question of AI-created works through computer-generated copyright works and the inventorship of AI (DABUS). The authors examine three jurisdictions for authorship and five for inventorship.

### A. AI authorship of copyright works in selected jurisdictions

In an earlier US decision of *Bleistien v. Donaldson Lithographing Co* (1903), the Supreme Court differentiated between human work and the work of an artificial entity. Justice Holmes broke down the uniqueness of human personality and affirmed this as a prerequisite for copyright. The Supreme Court did this by stating that ‘something irreducible, which is man’s alone.’ This can be interpreted to mean there is no protection for any work that is not a product of man’s creativity (Gervais, 2019). In *Penguin Books USA Inc v. New Christian Church of full Endeav-*

our (2002), the District Court for the Southern District of New York held that a dictation from a non-human author (an alleged ‘voice’ called ‘Jesus’) should not be a bar to copyright protection, particularly in this case where the choice of selection and arrangement of the literary work was by a human. However, Chapter 300 of the compendium of the US Copyright Office (Compendium US Copyright Office, 2017) makes the extant position clear by providing that the Copyright Office shall only register works, which are original and created by the human author(s). This means that works that are created by non-human author(s) have no copyright protection.

The case of *Naruto v. Slater* (2018) is also instrumental with regard to the US’ position on non-human authorship even though it is not specifically on AI authorship. In this case, a British photographer, David Slater, travelled to Indonesia to take some pictures. In trying to get a close-range shot, he placed his photography equipment, and a monkey clicked the camera shutter thereby taking a picture. On the photographer’s return, he published the picture in the Daily Mail and Wikipedia Foundation published this same picture on its site. This brought about the issue of authorship as the Wikipedia Foundation declined to remove the photograph from its site, stating that the image belonged to the public domain.

Slater published a book containing copies of the monkey selfie and the People and Ethical Treatment of Animals (PETA) claimed the copyright in the photograph belonged to the monkey, named Naruto, as its author. PETA instituted this action for the infringement of Naruto’s copyright by Slater under the US Copyright Act (1976) as Naruto’s next friend. However, the defendants filed a notice to dismiss the claim on the ground that the monkey, not being human, did not have the standing to institute the matter under the Copyright Act as an author.

The District Court dismissed the suit by agreeing with the defendants and held that the legislature did not intend the definition of an author to include an animal. PETA further filed an

appeal before the Ninth Circuit of the US Court Appeal, but the Court affirmed the decision of the District Court that the US copyright law does not provide for an animal to file an action for copyright infringement. Therefore, this case establishes that from the perspective of US copyright law, copyright authorship will not be conferred on non-human authors. Therefore, one may conclude that the current state of US copyright law does not allow for authorship by AI.

New Zealand also has clear provisions on the ownership of computer-generated works. Section 2 of the New Zealand Copyright Act, (1994), defines computer-generated works as works generated by a computer in circumstances such that there is no human author of the work. Section 5(2)(a) further provides that the author of a piece of work in the case of a literary, dramatic, musical or artistic work that is computer generated is the person by whom the arrangements necessary for the creation of the work are undertaken. The Nigerian Copyright Act (1988) does not have similar provisions for computer-generated works. It is therefore essential that these special kinds of works be provided for under the law.

With regards to the UK, their copyright law has been amended to determine the author of a computer-generated work as the person by whom the arrangements for the creation of the work were undertaken (Copyright, Patents and Designs Act (CPDA), 1988 (as amended), s. 9(3)). Therefore, AI-generated works can be protected, and the absence of human authorship shall not be a bar to their protection (Banadio, 2020). However, the authorship is accredited not to the AI system but to the person who made arrangements for the creation of the work. Such computer-generated works enjoy protection for fifty years and have no moral rights (CPDA, 1988, ss. 12(7), 78).

In all three jurisdictions above, authorship is not vested in the computer or non-human creator. From the USA perspective, copyright will not vest in works created by non-human authors except if it can be shown that the selection, presentation and

arrangement of the work were made by a human. From the laws in New Zealand and the UK, the author would be the human person or legal personality who made arrangements for the making of the work or the programmer of the computer respectively. Hence, the computer or AI machine itself cannot be considered an author in itself, being a non-human or legal person. Nigeria could learn from these jurisdictions by providing for the protection of computer or AI-generated works even though the authorship shall be credited to the human owner, creator or operator of the AI system or computer.

### *B. AI inventorship in selected jurisdictions*

Regarding the inventorship status of AI-generated works, there are decisions from the US, the UK, Europe, South Africa, and Australia. These decisions essentially revolve around the inventorship status of an AI system called DABUS, which was developed and patented by Dr Stephen Thaler. DABUS had generated two inventions namely a fractal container, which was a plastic food container based on fractal geometry, and a neural flame, which was a flashing light to give alerts during emergencies. Dr Thaler had applied for the patent protection of these inventions under the Patent Cooperation Treaty (PCT) international application, which designated the European Patent Office (EPO), UK Intellectual Property Office (UKIPO), US Patents and Trademark Office (USPTO), South Africa, and Australia, among others. In all these patent applications, DABUS was indicated as the author of the invention and Dr Thaler as an assignee of the patent. Hence, the central question was whether an AI machine could be an author under the laws of each of the above jurisdictions.

Thaler argued that DABUS created the invention; hence, it should be recognized as the inventor, while he, as the owner of DABUS, should be regarded as its assignee (Oriakhogba (a) 2021, p. 95; *Grounds for Refusal: In Re EP 18 275 163.6* and *Grounds for Refusal: In Re EP 18 275 174.3*). For him, recognizing the in-

ventorship of an AI machine would promote the objective of the patent system of incentivising disclosure of information, commercialisation and development of inventions. Allowing the inventorship of an AI machine would incentivize AI technology and increase its use in commercializing socially viable goods further. For him, this could reduce the inappropriate naming of persons as inventors when an AI machine is the actual inventor and also support the public notice function by informing the public of the actual inventors of an invention. He argued that DABUS could be likened to a human minor who acts through legal representatives; hence, he could be considered as the legal representative or successor in title to DABUS thereby ownership of the patent can transfer to him.

In the US, section 115 of the patent law (USC 35) requires a patent application to include the name of the inventor for any invention claimed in the application. An inventor is defined under the Act as an individual or set of individuals who invented or discovered the subject matter of the invention (U.S.C 35, section 100 (a)). This definition eliminates any inference sought to include inventions made by anyone or thing besides humans. Furthermore, the US Patent Act (U.S.C 35, section 115) provides for an inventor or joint inventor to execute a declaration on oath (inventors oath) in connection with a patent application. In applying this to AI systems, it can be deduced that AI systems not being a person, or an individual cannot fill or make an individual oath or execute a declaration. There have been two remarkable developments related to patents and AI in the USA. In 2019, the United States Patent and Trademark Office (USPTO) announced the request for public comments on IP for AI innovations (USPTO, 2019), and this was followed by a consultation result in 2020 (USPTO, 2020).

In 2020, the USPTO released a petition decision, with respect to DABUS, which stated that under US laws, only a natural person may be named as an inventor in a patent application. The decision relied on the case of *Beech Aircraft Corporation v.*

*Edo Corporation* (1991) where the US District Court of Kansas held that only a natural person can be an inventor and also under section 115 of the patent law which provides for an inventor's oath and name, which DABUS did not meet (USPTO, Application No 16/524,350). The Manual of Patent Examining Procedure (MPEP) defines 'conception' as 'the complete performance of the mental part of the inventive act' and it is 'the formation in the mind of the inventor of a defined and permanent idea of the complete and operative invention as it is thereafter to be applied in practice.' Also, the use of terms such as 'mental' and 'mind' in the MPEP indicates that conception must be performed by a natural person. Based on this interpretation of the US Patent Act, an AI machine cannot be designated as an inventor as the definition of an inventor does not capture a machine as an inventor but only humans.

In the UK, section 7(2) of the UK Patents Act, (1977), refers to a patent being granted to an inventor or joint inventor, but fails to define clearly who an inventor is as it only defines an inventor as 'the actual deviser of an invention'. Section 13(1) of the Act states that inventors have the right to be mentioned in any patent or published application and further provides in section 13(2) that an application which is filled by an applicant for a patent shall identify the person who they believe to be the inventor(s) and where such an applicant is not an inventor, a statement must be accompanied indicating a derivation of right from the actual deviser. This provision aims at ensuring that the actual deviser is made part of the patent application.

In *University of Southampton's Applications* (2005), the UK Patent Court clarified who an inventor is stating that an inventor is a natural person who came up with an inventive concept. With this clarification and the multiple references to the term 'person' under the UK Patent Act (1977), it can be inferred that an AI machine cannot qualify as an inventor. The UK also recently updated its manual to clarify that an AI inventor or non-human inventor is not acceptable and would not qualify as a person as

required under the law as they cannot be accorded legal personality (The Inventor -Formalities Manual, 2022). This position is not much different from its position on AI authorship since it does not recognize the computer or an AI machine as an author.

Also, in *Thaler v. The Comptroller-General of Patents, Designs And Trademarks* (2020) (the DABUS case), it was held that an AI machine neither owns property in a patent nor transfers such ownership to a human applicant because from the interpretation of section 13 of the UK Patent Act, the actual devisor has to be capable of conferring the right to an applicant, but this was not the case as DABUS lacked the legal personality to qualify as a person. On the question of ownership, it was held that since DABUS is an AI system, it is incapable of owning property or validly assigning or transferring any right under the UK patent law.

Similarly, the Legal Board of Appeal of the European Patent Office in a public proceeding decided on 21 December 2021, in the combined cases of J 8/20, and J 9/20 (European Patent Office 2021) concluded that DABUS being named as an inventor does not satisfy the requirements of Article 81 of the European Patent Convention (EPC) and Rule 19(1) of the EPC Regulations. The provisions essentially require that a patent application must designate the inventor(s) of the invention(s) and indicate their family names, given names and full addresses. Where the applicant is not the inventor, it must state the origin of the applicant's right to the patent and contain the applicant's signature or that of their representatives. According to the European Patent Office (EPO), AI systems or machines at the moment do not have any rights because they are not legal personalities like natural humans or bodies corporate. In arriving at its decision, the EPO Board clarified that legal personality is assigned to a natural person as a consequence of their being human, and to a legal person based on legal fiction. Presently, there is no legislation or jurisprudence establishing such a legal fiction with respect to an AI machine; hence, it can neither have rights conferred by



inventorship including the right to be so named as an inventor nor can it transfer any rights to a successor-in-title.

However, a contrary position was held in South Africa and Australia. South Africa is the first jurisdiction to recognize the inventorship of an AI machine for patents by recognizing DABUS as an inventor. The Companies and Intellectual Property Commission (CIPC) granted DABUS a patent. South Africa's patent law does not provide an express definition of the term 'inventor', but section 27(1) of the South African Patent Act specifies who may apply for a patent as 'an inventor or any other person acquiring from *him* the right to apply' or both the inventor and such other person (Emphasis added). Although the term 'inventor' is not defined, the fact that the second part of this provision uses the pronoun 'him' to refer to an inventor should suggest that the inventor is intended to be a natural person with the understanding that where the male pronoun is used, it is used as a generic term to also include the female gender.

Proof of title or authority to apply for a patent is required only where the application is made by a person other than the inventor (SA Patent Act, s. 30(4)). However, the Act does not specify the types or specifications of the 'proof of title or authority to apply'. Nevertheless, regulation 22(1) (d) of the Patent Regulations (1978) provides that 'where the applicant has acquired a right to apply from the inventor', the application shall be accompanied by '... an assignment or other proof, *to the satisfaction of the registrar*, of the right of the applicant to apply' (Emphasis added). Hence, it can be argued that where the application is made by someone other than the inventor, all that is required is that an assignment or any other proof that the registrar is satisfied with is provided.

Even before delving into any proof of title or authority to apply, the foundational issue to be addressed is whether an AI machine can be named an inventor. Being a jurisdiction that does not carry out substantive examination but focuses only on compliance with formalities, one wonders whether the CIPC checked

whether an AI machine can qualify as an inventor, or it simply granted the patent as long as a name was filed in the column of the inventor. Also, it is not only an assignment that can be proof of the title of an invention. The law allows for any other proof that satisfies the registrar. Hence, the question of whether DABUS could validly assign or transfer its rights to its owner, Thaler, may not be an issue as Thaler could have also used other proofs of title or authority such as being the owner of DABUS. Yet, this does not address the foundational issue as to whether the Act covers inventorship by an AI machine.

Okorie (2021) disagrees with this decision of the CIPC on the ground that the essence of naming inventors is not for the mere need to establish a link for the inventive effort or activity or to have a name in the form. It also includes the imputation of liability for harm done or choices made about the invention. At the moment, an AI machine cannot feasibly and legally be held responsible for liabilities when such arise in patent applications.

For Okorie (2021), permitting only humans or natural persons as inventors is 'because of the need for a value system in how and what inventions are made (and defended and protected)'. According to her, this may be the more appropriate way to ensure ethical standards while engaging in inventive activities. Therefore, if this ethical objective was considered, the CIPC would not have granted inventorship to an AI machine. The authors agree with this sentiment.

In Australia, the Australian Patent Office had initially denied DABUS the right to be named as an inventor since it was not a human or legal person and by extension, it cannot assign rights to anyone as claimed by Thaler. Regulation 3.2C(2)(a) of the Australian Patent Regulations requires that an applicant for a patent must 'provide the name of the inventor of the invention to which the application related'. Based on this, the patent office issued a directive indicating that the inventor must be human in order to comply with the regulations.

This position was overruled upon appeal to the Federal Court of Australia (FCA), which held that the patent office had confused ‘the question of ownership and control of a patentable invention including who can be a patentee, on the one hand, with the question of who can be an inventor, on the other hand’ (*Thaler v. Commissioner FCA*, para. 13). For the FCA, the patent office held on to the ‘old millennium usage’ of the word ‘inventor’ and failed to recognise the ‘evolving nature of patentable inventions and their creators’. According to the Court, naming the AI machine as an inventor would avoid questions about who among the programmer, owner of the AI, the person who provided the data, operator or trainer should be named as the inventor. It is also believed that this approach would incentivize ‘the development of computer scientists of creative machines, and also the development by others of the facilitation and use of the output of such machine, leading to new scientific advantages’ (*Thaler v. Commissioner FCA*, para. 125).

These decisions arrived at in South Africa and by the FCA in Australia have been criticized. Oriakhogba ((b), 2021) argued that these decisions were erroneously made because in both jurisdictions, the relevant provisions of the law were not properly analysed. More so, patent law exists to strike a balance between the interest of the patent owner as well as the public interest of users and society at large.

In addition to Oriakhogba’s argument, it must be noted that one essence of patent law is to ensure that patents are granted to only those who satisfy both the formal and substantive requirements. The formal requirement of having a valid inventor named must first be satisfied before considering substantive examination. More so, patent law exists as an incentive for inventors to carry out more research and development and come up with patents that can advance science and technology and be beneficial to society. Even Beach J’s reasoning for recognizing the inventorship of an AI machine was connected to an incentive for the owner and not the AI itself. Does this not underlie the fact that

an AI machine, being non-human and without legal personality, does not need patent protection as an incentive? The AI machine cares not about the grant of a patent or its denial before it can come up with an invention if it is designed to do so.

If an AI machine is allowed to be an inventor, other issues arise. For instance, what is the liability of an AI machine when in creating its work or inventing it infringes on either the copyright or a registered patent of another person; the question is who bears the liability (Hallevy, 2015)? Would this be the creator or programmer of the AI machine or the operator of the machine or even the owner of the AI machine? Also, what sanctions can be put in place as punishment or deterrence to AI machines from infringing the intellectual property rights of others? AI machines are incapable of paying fines or serving terms of imprisonment, which are the usual penalties for liability for infringements. AI machines also lack emotions, conscience, or even knowledge of guilt, which is required for conviction for criminal offences under intellectual property laws.

## VI. RECOMMENDATION AND CONCLUSION

### *A. Recommendation: Lessons for Nigeria*

The question of AI authorship and inventorship is more aptly resolved through legislative amendments expanding these statutes to AI systems or machines. It is not a question of interpretation or expansion by the court or IP offices. This can be resolved by either a legislative amendment of the Copyright Act and the Patent Act or by conferring a general legal personality on AI machines. The alternative of a general legal personality for AI machines may however not be feasible at the moment as such a jurisprudence needs to develop over several years as issues arise. A better alternative is therefore to specify the allowance of AI authorship or inventorship and specify sections of the law which will not apply to AI such as moral rights and who bears liability in cases of infringement.

For AI-aided works or inventions, where the AI merely assists the human in creating a copyright work or arriving at an invention, the human may be regarded as the author. This is similar to the position of the US District Court in the *Penguin case* where the humans who determined the selection, presentation and arrangement of the copyright work were adjudged as the authors of the copyright work even though the work allegedly originated from a 'voice' called 'Jesus'.

Concerning AI-generated works where no human assisted in the creation of such a work, first, the Nigerian copyright law needs to recognize computer-generated works as protectable subject matter and not just the computer programme itself. In addition, in the absence of legal personality being conferred on AI systems, the owner of an AI machine or the person operating it may be deemed to be the author of such computer-generated work(s) and inventor in the case of patentable inventions. This will also require a legislative amendment for this presumption of law to be operative just as it is in New Zealand and the UK. Sections 51 of the Copyright Act (1988), on authorship and section 2 of the Patents and Designs Act on the true inventor should be amended to proffer solutions to AI authorship and inventorship, respectively.

Therefore, the owner of an AI machine (the person who acquired such machine from the creator) or in whose control the AI machine was operating at the time the work or invention was created can be regarded as the author or inventor. This will also help answer the question of whom to hold vicariously liable when an infringement is committed. Having human or recognized legal persons as authors or inventors could help in the determination of the qualification of the author, the duration of the work and also the moral rights of the work in instances where the work is mutilated.

In addition to holding creators or owners of AI-created works liable, where an AI system has infringed on the intellectual property rights of others, the sanctions that can be imposed include the prohibition of its use for a specified period of time (similar to a jail term) or a particular purpose (infringing purpose) can

also be put in place. All these can also be achieved by a legislative amendment to the copyright and patent laws. Pending the legislative amendment, the Nigerian Copyright Commission and the Patents Registry, respectively, can formulate the relevant policies. Nevertheless, a legislative amendment is the ultimate solution needed.

### *B. Conclusion*

The emergence of AI has brought about several advancements in the technological world. These advancements have challenged the frontiers of the extant intellectual property laws. Determining the authorship and inventorship of AI is helpful in ascertaining who among the programmer, owner of the AI, the person who provided the data, operator or trainer should be named as the inventor.

As analysed above, the copyright and patent laws in Nigeria do not allow for authorship or inventorship by AI systems as they specifically refer to persons either as natural humans or other legal personalities. Although, both in South Africa and Australia, DABUS, an AI machine, has been recognized as an inventor, it is submitted that these decisions were not well thought out going by the provisions of the law and public policy considerations of ensuring patents fulfil both formal and substantive requirements as well as balance the interest of the users and public.

Hence, this article faults both positions and suggests that there is a need for clear legislative amendments which specify the allowance of AI authorship or inventorship. For instance, for AI-assisted works, the human should be recognised as the author or inventor. In the absence of legal personality being conferred on AI systems, the owner of an AI machine or the person operating it may be deemed to be the author of such computer-generated work(s) and inventor in the case of patentable inventions. It must be noted that further research may be carried out on the ethical, moral or other implications of conferring legal personalities on AI.

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