Digital intellectual property and privacy right in achieving the sustainable development goals using South Africa as a case study

Oluwasegun Julius Aroba[1,2*],and *Manduth* Ramchander[2]

[1]Department of Centre for Agroecological Intelligence, Faculty of Engineering and the Built Environment (FEBE), University of Johannesburg, B3 Lab 215, Mechanical Engineering Science, Auckland Park Campus e-mail: jaroba@uj.ac.za.

[2] Department of Operations and Quality Management, Faculty of Management Sciences, Durban University of Technology; 4000, Durban South Africa, e-mail: manduthr@dut.ac.za

Abstract. A key barrier to achieving the Sustainable Development Goals (SDGs) is the intersection of intellectual property (IP) rights and privacy concerns, especially as reliance on digital technologies grows for economic and social progress. One of the critical ethical trade-offs in IP rights in IT in South Africa is the tension between protecting the interests of creators and promoting access to Information and knowledge, particularly in the context of the digital divide. This article, with a focus on South Africa, examines how digital IP and privacy rights impact SDG 9, 16 (Peace, Justice, and Strong Institutions). Loopholes, copyright protection is not always compatible with I.T. technology. Through legal analysis, policy evaluation, and case studies, it explores how IP protection can spur economic growth, ensure fair competition, and promote innovation while addressing privacy threats. The study also assesses existing policies' effectiveness in advancing SDG 9, 16, protecting privacy, and fostering innovation across vital industries. The study's conclusions advance knowledge of the intricate relationships between digital intellectual property, private property rights, and sustainable development. Particularly in the context of South Africa, the analysis provides insights into policy recommendations and best practices for practitioners, stakeholders, and policy makers to effectively exploit digital technologies while protecting individual rights and achieving the 9th and 16th SDGs.

Keywords : Sustainable Développement Goals, Digital Intellectual Property, Trademarks, Trade Secrecy.

1 Introduction

Intellectual property is still a crucial instrument for the growth of society, culture, economy, and technology in the twenty-first century. Intellectual property is a key driver for social, cultural, economic, and technological advancement, especially in the 21st century. Fundamentally, intellectual property (IP) refers to ***creations of the mind*** as protected in law by patents, trademarks, industrial designs, trade secrets, geographical indications, copyright and plant variety rights (World Intellectual Property Organisation). The protection of intellectual property rights (IPRs) encourages economic progress, but as these developing nations are still in the transitional period of their economic development, invention comes at

* Corresponding author: Oluwaseguna@dut.ac.za ,Jaroba@uj.ac.za

a higher cost than imitation. This indicates that, given their current level of economic and infrastructure development, these middle-income developing economies are ill-equipped to handle this problem (Janjua and Samad 2007; Braga, Fink, and Sepulveda 2000).

Essentially, such creations which include inventions, artistic works, drive the global economy and promote the achievement of Sustainable Development Goals (SDGs). The protections of such creations is perfected by intellectual property rights (IPRs). However, in some instances the IPRs have been found to impede access to information in developing and Least Developed Countries (LDCs) as data literacy, teaching and learning, and access to works may be limited. According to the World Bank, South Africa is classified as a developing country. It is a member state of various multilateral agreements on IP including the Berne Convention for the Protection of Literary and Artistic Works since 1928; the Paris Convention for the Protection of Industrial Property since 1947; the WIPO Convention since 1975; the UPOV Convention for the Protection of New Varieties of Plants since 1977; the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) since 1995; the Budapest Treaty on the International Recognition of the Deposit of Microorganisms for Patent Procedure since 1997; and the Patent Cooperation Treaty since 1999. Furthermore, at a domestic level, IPRs are recognized in the country under various legislations including the Patent Act no. 78 of 1978 (as amended) which protects scientific and technological inventions; the Copyright Act no. 98 of 1978 (as amended) which protects author's work; the Designs Act no. 193 of 1993 which protects the ornamental or aesthetic aspect of an article; and the Trademarks Act no. 194 of 1993 (as amended) which protects a recognizable image, word, or phrase used to identify and separate products or services from one another on the market. Such IP laws allow for fair competition and trade among creators. Importantly, the regulation of such IPs in South Africa is enforced by the Companies and Intellectual Property Corporation (CIPC) and the Department of Trade, Industry and Competition (DITC) (Sherwood 2019).

With technology advancing quickly and Web 3.0 emerging – the control of copyright laws is becoming harder to implement as Information is now readily available with a click of a button. The evolution of digital technology over time has significantly challenged the scope covered under the various IP legislations in South Africa thus trigerring several amendments. Notably in 1992, the Copyright Act of 1978 was amended to include computer programs as a distinct class of protected works. However, there is still need for further revisions of the South African legislation on IP to address the ever-evolving digital technology.

Knowledge and technology are the power the world economy in the twenty-first century, and intellectual property is becoming more and more valued as a commercial asset and a catalyst for technical advancement. Among other nations, South Africa acknowledges the significance of intellectual property rights in several development, commerce, and industrialization-related policy initiatives (Chidede 2022). The evolution of digital technology has greatly impacted traditional ideas about copyright. Digital creations have consistent qualities and thus are easily duplicated, distributed, and saved. The authors pointed out that technological protection measures, especially in poor countries, may impede teaching and learning, data literacy, and access to work. For instance, attempts to update the copyright legislation in South Africa recently haven't succeeded in taking a fair stance (Pistorius and Mwim 2019). Intangible assets produced by human intelligence and innovation, inclusion inventions, artistic works, and trade secrets, are intellectual property (IP) (Bently *et al.* 2022). These intangible assets are protected by intellectual property rights (IPR.s), which provide their creators or owners exclusive rights These rights enable them to manage the exploitation and use of their intellectual property, which may have significant economic worth and the SDG 9 in South Africa, ensure the benefit of innovators to contribute to the inclusive growth (Dutfield and Suthersanen 2020; Mupangavanhu 2018). Protection of intellectual property rights may have a significant impact on economic growth by changing the incentives for

innovation (Gould and Gruben 1996). In addition, intellectual property is becoming more and more important in policy domains like commerce, investment, health, culture and customs, science, and technical development. For example, South Africa acknowledges the importance of IPRs in several trade, industrialization, and development-related policy initiatives (Chidede 2020; Aroba 2024).

Several laws and rules guarantee that IP owners and creators have the legal right to govern how their creations are used and exploited. The Copyright Act of South Africa protects original work authors' Copyright and forbids unauthorized duplication or reproduction of their designs (Netshakhuma 2021). Contrarily, trade secrecy refers to private Information used for businesses and is confidential. Trade secrets are valued highly in South African law, which offers legal protection against disclosure or theft (Jha 2021, Aroba 2024).

A trademark is a recognizable image, word, or phrase used to identify and separate products or services from one another on the market (Grinvald and Tur-Sinai 2019). Trademarks are legally protected in South Africa under the Trademarks Act, providing their owners the sole right to use them in connection with their products or services. However, domains are distinctive identifiers used to find websites on the internet. The patent law in South Africa protects inventors and enables them to stop others from creating, using, or selling their ideas without their consent for a set amount of time. (Du Bois 2020) The goal of South Africa's evolving intellectual property (IP) laws has been to balance the needs of the public and those of IP creators and owners.

The Companies and Intellectual Property Commission (CIPC) and the Department of Trade, Industry, and Competition (DTIC) are just two government organizations enforcing the nation's comprehensive IP protection laws in the area of resgistration of companies and intellectual rights and oversees broader trade and policies(Sherwood 2019). However, issues like access protection, complexity of laws , enfrocement challenges, innovation stifling still need to be resolved, notably regarding enforcement and raising awareness of the need to protect intellectual property. Intellectual laws allow developers to create innovative content via their software and hardware methods, granting protection for their creators and exclusive rights to their work and creation. In the area like the development of Internet of protection of ideas, market exclusivity access This does and will continue to allow fair competition and trade, prevent infringement of their IP rights, and prevent unauthorized use of their work while allowing their work to be distributed and accessible.

Ideally, computer programs (the codes) anywhere in the world are considered as software that fall under copyright/ trade secrets in IP protection, the most advisable being a copyright. One may then choose to distribute the software license. The concept behind the computer program is what may be registered as a patent but not the program itself. While the underlying concepts or inventions behind a computer program may be patentable, the code itself is not typically eligible for patent protection, leading to confusion in intellectual property rights discussions. Although it wasn't initially recognised, the Copyright Act of 1978 was amended in 1992 to include computer programs as a distinct class of protected work. Thus, the amendment marked a significant shift in how software was treated under copyright law, allowing for clearer protections for developers (Du Bois 2020). It should be emphasized, however, that under specific conditions, such as those involving systems and apparatus for using software or equipment, the Act's exclusion may not be violated. This will depend on how each patent is expressed and used, which may vary from instance to case.

Copyright protection is inconsistent with IT. technology and allows exceptions and loopholes. Therefore, it is fundamental for innovative businesses, designers, and creators to understand digital Copyright and the impact of their countries' policies and laws. The deep research and analysis of said laws are crucial due to the influx of digital content, platforms, and software development.

1.1. Purpose of the study

The study aims to analyze and understand the restraints of the field at a micro level for upstarting businesses and innovative creators in computer programming design. With high unemployment rates. South Africans are encouraged to focus on starting their interactions; for their companies to enhance to the sustainable development goals, and to be aware of the laws that help protect their assets, ideas.

2 The challenges of social issues and professionals in information technology computing

2.1. Copyright

The term copyright means to prevent original work from being copied without permission (Grinvald and Tur-Sinai 2019). For your product to be copyrighted, it must exist in material form; It must be original and written/ recorded. Only the expression of the idea is protected and valid for a limited time. However, the Minister of Trade and Industry may at his/her discretion extend the validity of such protection. The first owner of the copyright program is the person who created it (Grinvald and Tur-Sinai 2019). However, this is not applicable where the program is developed within the term of employment, in this case, the copyright owner of the program is the employer. Another instance would be when a program is requested to be made under the command of a state; in this case, the state owns the Copyright on such program. Importantly, only original computer programs are eligible for Copyright in South Africa (Khumalo 2020). After a product is made available to the public, the Copyright is only valid it for 50 years (Khumalo 2020).

The Copyright Act provides for two types of infringements, direct and indirect violation. Direct infringement is when someone, not the owner, does any restricted action under the Act. The excuse for doing such unknowingly is not a valid defense of the primary infringement. If part of the copyrighted work is taken and essential, such work is considered stealing. If a piece of work is made and is like a copyrighted work, it is not labeled as stealing if it was not copied. Indirect infringement is when a person from outside South Africa brings in a piece of work that is copyrighted and intends to sell or use it for purposes other than his personal use (Khumalo 2020). In comparison, IP continues to be an essential tool for social, cultural, economic, and technological growth despite the heated discussion around its effects on development. In the twenty-first century, when information and technology power the global economy and development, IP systems are essential for progress. The market is gradually realizing the importance of IP as a valuable commercial asset and a catalyst for technological advancement. To further their own goals, many governments have changed their intellectual property laws

Digital technologies make it harder to prevent copyrighted items from being used illegally. Multiple countries are now amending their copyright act so that Information can still be used only within the context of education or personal gain, such as research (Jha 2021). Pistorius and Mwim (2019) speculate that with the copyright reforms occurring within South Africa, many researchers will prefer to publish their work overseas to ensure that their results are not infringed upon due to their (overseas countries') copyright policies. Pistorius and Mwim (2019) elaborate on how this will lead to knowledge degeneration and negatively impact access to knowledge, especially in a third-world country like South Africa.

2.2. Trade secrets

The protection under trade secrecy grants the right to a company or person to keep Information of a certain kind confidential or private. The criteria for trade secrets that the information is innovative, proves to be an investment to a party, some effort in developing it, and lastly that the owner has made some rules to ensure it was kept a secret (Department of Computer Science U.C.T., 2019:96). Employees of big organizations have to sign non-disclosure agreements stating that they will not disclose confidential Information about the company. For instance, with the fast food outlet Kentucky Fried Chicken (KFC), employees sign these non-disclosures and cannot release the secret ingredients used for making K.F.C. products (Briffa 2020).

However, rather than enabling innovation, trade secrets tend to hinder innovation by employees. Contigiani and Hsu (2019) speculate that with employers and companies that emphasize trade secrets, employees tend not to be as innovative with ideas over the term of employment as opposed to companies that focus less on trade secrets. This conclusion was brought to light when employees were asked whether they would market their ideas to companies with high trade secrets. They responded that they would instead go to companies that focus less on trade secrecy as they would not be asked to sell their ideas and sign non-disclosure agreements after that for ideas they created. Also, with technology advancing quickly, many companies clash when trying to license a trade secret because they want to register the same idea as their own. The question it raises is which company created the idea first. Therefore, companies must now show evidence as to when this secret was completed and put into effect.

2.3. Trademarks and domains

A trademark is a legal term related to intellectual property that refers to a recognizable sign, design, or expression that identifies and distinguishes the goods or services of a particular company from those of others. Trademarks include logos, brand names, slogans, and sounds or smells. The purpose of a trademark is to protect a company's brand identity and prevent other businesses from using similar marks that might confuse consumers. A domain is a unique identifier for a website on the internet. Users type the address into their web browser to access a particular site. Domain names are registered with a domain registrar and can be bought and sold like other property types. Domain names can be used to establish an online presence, promote a business, or sell products and services.

The Trademarks Act 194 of 1993 states the registration and certification of trademarks must be provided and provides for incidental matters (South African Trademarks Act, No. 194 of 1993, 1993). This Act precludes registration of those marks that do not constitute trademarks within the meaning of the term "trademark" as defined in the South African Trade Marks Act section 10(1). This Act requires a mark to have three essential elements to be eligible, i.e., it must be represented graphically, distinguishable from goods or services Trademarks person, and be used or applied to goods or services related to trade. (Maunganidze, 2006).

Trademarks and domains pose social and professional issues that impact businesses and individuals. These include:

- Trademark infringement: occurs when an individual's trademark looks similar or identical to someone else's, which is confusing.
- Domain squatting: the practice of registering domain names similar to popular brands or trademarks to sell them for a profit.

- Cybersquatting: occurs when someone registers a domain name that is similar to or identical to someone else's trademark to profit from it which may cause harm to the reputation of the business.

Trademarks and domains play a vital role in the IT and computing industries. They are the critical elements in building a business's brand identity. The Trademarks Act provides a stable guideline for maintaining a solid online presence through various registration and protection procedures. However, these areas also present challenges, such as domain squatting, trademark infringement, and cybersquatting. Overall, social and professional issues related to trademarks and domains can significantly impact businesses and individuals, and it is essential to understand and take steps to mitigate these risks. Companies must know these challenges to protect their intellectual property and online presence.

2.4. Patents

A patent is a form of intellectual property that provides exclusive rights to an inventor or applicant for a limited period, typically 20 years from the filing date (WIPO). The purpose of a patent is to encourage innovation and promote the dissemination of knowledge by providing inventors with a legal means of protecting their ideas and inventions from unauthorized use or copying (Sherwood 2019).

According to section 25(2)(a) of the South African Patents Act (1978), a patent may be granted for any invention which involves an inventive step and which is capable of being applied/used in trade, industry, or agriculture. However, the Act also states that "Anything which consists of a program for the computer shall not be an invention for the Act, and this provision shall prevent, only to the extent to which a patent or an application for a patent relates to that thing as such, anything from being treated as an invention for this Act," which means if the patent or patent application relates to an invention that involves a computer program, but also includes other elements or technical effects beyond just the program itself, then it may still be considered patentable.

In South Africa, the boundaries of patentability of software and computer-related inventions have yet to be determined, as the judicial system has never examined the concept of patenting software. While it is argued that software patents provide startup companies with the traction they need to build their businesses as actual international competitors (DKVG Attorneys, 2019), patents are also seen as anti-competitive, with significant software patent portfolios frequently registered in developing countries by multinational software companies, with the legal protection provided by patents, these larger companies may be able to prevent smaller companies from using certain technologies or implementing certain features in their software, ultimately reducing competition and potentially stifling innovation in the industry (DKVG Attorneys, 2019). Furthermore, the complex test and area of law used to determine whether an invention is patentable necessitates potential patentees seeking legal counsel from an intellectual property expert before incurring costs for any patent application (DKVG Attorneys, 2019). Table 1 and Table 2 give more insight into the intellectual property rights in South Africa.

Table 1: South African laws in terms of intellectual property**.**

South African Rights Act	**Year (as amended)**	**Description of Act**
Copyright	1978	It helps protect users' work, including literary, cinematic, artistic, musical, and computer programming and design. Lasts for 50 years. Gives exclusive rights to the creator to adapt, distribute and produce their work
Patent	1978	Officially grants exclusive rights to the creators for a period. They must apply to trade or business, are novel and inventive, and can last 20 years.
Trademark	1993	Allows logos, designs, slogans, and names to be protected in the market environment and grant exclusive rights to the trademark owner. They can be registered and renewed indefinitely.
Design	1993	Registers design for protection, giving protection and licensing rights to the owner, and can last for 15 years on registration.
Counterfeit	1997	It makes the sales, distribution, and production of counterfeit products illegal. Legal measures are used to protect I.P. rights and mitigate and prevent counterfeiting.

Table 2: Qualitative data on different methods of intellectual property, trade secrets.

AUTHORS	PROBLEM	METHOD	CONCLUSION
(Contigiani and Hsu 2019)	Trade secrets are protected by non-disclosure and non-compete agreements, but it is unclear if these agreements will impact future innovation.	N/A	Argue that an employer-friendly trade secrecy rule can eventually be detrimental to innovation. Additionally, it emphasizes how the legal framework affects innovation outcomes and warns policymakers about the possible harm that trade secrecy laws may do to innovation performance.
(Du Bois 2020)	Analysis of South African Patent Laws	Breakdown of South African Acts with Limitations and possible improvements	It is shown that public awareness of all Acts should become more common knowledge, with clarity of limitations and restrictions broken down and improved on
(Grinvald and Tur-Sinai 2019)	Determining whether repairing/modifying products for personal use is infringing on I.P.	Breakdown of I.P. laws on what is considered infringement and violation of I.P. rights and repair services	Trade secrets are a significant roadblock for their inconsistency on what can be considered a trade secret.
(Foster and Hanekom 2021)	Highlights South African intellectual property law. It summarizes the regulation and enforcement of the following kinds of I.P.R.s: trade secrets, patents, trademarks, licensed and unlicensed designs, and copyrights.	N/A	N/A

(Modic *et al.* 2019)	Analyzing the innovation, limitations, and opportunities in I.P.	Interviewing with prominent I.P. experts from reputable companies is analyzed and reviewed.	The potential to improve I.P. laws in It remains open and untapped, and ideas need time to spread.
(Makgamathe 2022)	Raises a severe worry about the problem of piracy and how it affects African content producers. Theft of creative works threatens the lives of authors and the worth and viability of African material as a whole.	N/A	Additionally, consumers are crucial in the fight against piracy. The issues created by piracy must be addressed by stakeholders, particularly the government, corporations, civil society, N.G.O.s, and consumers. Legislation must be improved, current laws must be enforced, and a culture that values and respects original works must be promoted.
(Netshakhuma 2021)	This research explores the value of understanding global copyright rules in digitizing records produced in many nations with various legal systems.	A qualitative approach includes a variety of data-gathering techniques, including interviews, analyzing documents, and observation.	It stresses the significance of complying with copyright laws for any organization working on digitalization initiatives and the requirement for collaborations between project stakeholders and tech firms.
(DKVG Attorneys 2019)	The article illustrates how software patents and Copyright may be used to safeguard intellectual property. Software has to be protected as intellectual property because of its worth and the resources used to generate it.	N/A	Focuses on the intricate nature of patent law and suggests obtaining legal counsel before launching a patent application. Smaller local software businesses are urged to see an attorney and think about patenting their software creations in order to safeguard their rights and equalise the playing field.

(Department of Computer Science U.C.T., 2019)	Discusses and provides an overview on different Intellectual Property Rights (I.P.R.) and how these rights apply to the university's access to resources	N/A	N/A
(Sherwood 2019)	Briefly touches on how nations with advanced economies have public perceptions of intellectual property safeguard regimes that are relatively trustworthy. When those systems are given any attention at all as opposed to being taken for granted, they are seen as being relatively effective in preserving innovation and artistic expression.	N/A	N/A

3 Discussion

IP protection has been an underlying challenge experienced in South Africa. Protecting the intangible creation and ideas that have become tangible, documented, and executed. (Du Bois 2020). The research discussion chosen to study Intellectual Property in South Africa is the qualitative study. The Table 2 above throw more insight into different method and problems being encountered and solution deployed. This allows us to explore the intellectual property in South Africa, allowing to understand the phenomenon better through a wide range of

perspectives. (Kothari 2004). Exploring the challenges South Africa would face in Protecting Intellectual Property, such as the copyright law being unable to address the needs of libraries and education and only a few universities integrating patents in their research projects (Netshakhuma 2021).

The approach taken when conducting this project was a qualitative data study. This research method ensures that the Information collected best portrays the problems and challenges that IP faces within a South African context. The data source incorporated in this research is secondary source data; hence the collection is varied between the different qualitative data collection styles. Data were collected from focus groups; a specific example would be university researchers who wouldn't integrate patents into their research projects. Data collected from observation, such as the South African copyright law being outdated, will help lead the investigation of the topic further. It should also be noted that many relevant readings have become obsolete due to the rules not being altered over the years.

4 Analysis

An analysis of Intellectual Property rights and protection issues in South Africa reveals that there is legislation in place for individuals to protect their intellectual property and inventions. These protections can come in trademarks, copyrights, patents, and design protections. In South Africa, the Copyright Act of 1978 (as amended) is the primary law that governs copyright protection for IT-related works. This Act protects various positions, including computer programs, databases, websites, and other digital content. Copyright protection for computer programs lasts the author's lifetime plus 50 years (Foster and Hanekom 2021).

One key provision of the Copyright Act for IT-related works is the provision for fair dealing. This provision allows using copyrighted works for research, private study, and criticism without the copyright owner's permission. However, the use of copyrighted works must be fair and not unreasonably prejudice the copyright owner's rights. The Copyright Act also provides for the protection of technological protection measures (TPMs). Copyright owners use these measures to protect their works from unauthorized copying, and the Act makes it illegal to circumvent or remove these measures without permission from the copyright owner. In addition to civil remedies, such as injunctions, damages, and accounts of profits, the Copyright Act also provides criminal penalties for copyright infringement. This includes the unauthorized copying or distribution of copyrighted works and the circumvention or removal of TPMs. The Act provides comprehensive legal protection for IT-related jobs in South Africa. However, the Act must be updated to keep pace with technological developments and the evolving nature of IT-related works.

The South African Trademarks Act, No. 194 of 1993, provides legal protection for trademarks in South Africa, including those related to IT. Trademarks are used to distinguish and protect brand names, logos, and other distinctive marks used in software, websites, and other digital content. The Trade Marks Act allows for registering trademarks in South Africa, giving the owner exclusive rights to use the mark in connection with the goods or services for which it is reported. To register a trademark in South Africa, an application must be made to the South African Trade Marks Office. Once a trademark is registered, the owner has the exclusive right to use the mark in connection with the goods or services it is written for. This means that no one else can use the effect, or a similar impact, in a way that would confuse consumers (Smit and Wyk 2021). The cancellation of trademarks occurs in certain circumstances, such as if the mark has not been used for five years or more or if the spot has become generic. A significant number of IT-related patents are filed and granted in the country. South Africa has a growing technology industry and is home to many innovative

I.T. companies and startups developing new technologies and inventions (Aroba et al., 2020; Aroba et al., 2022a, Aroba et al.,2022b; Aroba Oluwasegun 2022; Fagbola et al. 2022; Aroba et al.,2023a; Aroba et al.,2023b; Aroba et al.,2023c)
In South Africa, the relationship between intellectual property (IP) and information technology (IT) presents a number of difficulties, especially in light of Sustainable Development Goal 9 (SDG 9), which aspires to advance infrastructure, industry, and innovation. While this intersection is crucial for fostering an environment conducive to innovation, the need to ensure that creators' rights are protected is paramount. Kongolo (2016) claims that the existing intellectual property (IP) system in South Africa frequently benefits well-established firms, resulting in a concentration of power and reducing the chances for SMEs and regional innovators to prosper. The precise innovation that SDG 9and 16th aim to encourage is undermined by this circumstance (Kongolo 2016 ; Aroba et al.,2023d; Aroba et al., 2023e).

For instance, in recent years, patents have been granted for IT inventions such as new computer hardware components, cyber security systems, and data processing technologies that falls under copyright law. In addition, many international companies operating in the IT industry also file patents in South Africa to protect their inventions and intellectual property rights. The number of IT patents in South Africa will likely increase as the country continues developing its technology industry and encourages innovation and investment (DKVG Attorneys 2019). Furthermore, "literary, artistic, and scientific works; performances of performing artists, phonograms, and broadcasts; inventions in all fields of human endeavor; scientific discoveries; industrial designs; trademarks, service marks, and commercial names and designations; protection against unfair competition; and all other rights resulting from intellectual activity in the industrial, scientific, literary, or artistic fields" (Art. 2, § viii) are among the things that are covered by the 1967 Convention establishing the World Intellectual Property Organization (WIPO). A right holder may possess intangible property and prevent others from using it for a set amount of time, or, in certain situations (where appropriate), indefinitely, thanks to intellectual property, or IP" (Saxena 2021)

4.1. Challenges of Intellectual Property in Information Technology

The challenges to Intellectual Property (IP) protection in Information Technology (IT) in South Africa are similar to those faced in other countries, with some unique factors related to the country's socioeconomic context. One of the critical challenges to IP protection in IT in South Africa is the lack of effective enforcement mechanisms. The country's legal system is often overwhelmed, and IP cases may not be given sufficient priority, leading to delays in resolving disputes and a lack of enforcement of IP laws. This creates an environment in which infringement is more likely to occur and may discourage investment in innovative I.T. solutions.

Another challenge is the high rate of software piracy in South Africa. This is particularly problematic for the IT sector, which relies heavily on copyright protection. Piracy undermines the ability of creators to profit from their works, and it also creates an uneven playing field, as legitimate software developers are competing with those who can offer pirated software at lower prices (Makgamathe 2022). In addition, there is a lack of awareness and understanding of IP rights among the general public in South Africa. Many people may not understand the importance of protecting IP rights or may view them as a hindrance to the free flow of Information. This can create a culture of infringement, making it more difficult for IT creators to profit from their work and stifling innovation.

Another challenge is the tension between IP protection and the promotion of open access to Information and knowledge. South Africa has a history of social and economic inequality, and many people may not have access to the latest IT innovations or the resources

to develop their solutions. This creates a tension between the desire to promote innovation and the need to ensure that everyone has access to the benefits of IT There is a need for greater coordination between government agencies and the private sector to ensure effective enforcement of IP laws. This requires a multi-stakeholder approach involving various actors, including law enforcement agencies, the judiciary, and the private sector. By working together, these stakeholders can create a more effective system for protecting IP in IT in South Africa.

One of the critical ethical trade-offs in IP rights in IT in South Africa is the tension between protecting the interests of creators and promoting access to Information and knowledge, particularly in the context of the digital divide. South Africa has one of the highest internet penetration rates in Africa. However, there is still a significant digital divide between those with access to technology and those without access. This can limit access to important Information and knowledge, which can have substantial social and economic implications.

Another ethical trade-off in IP rights in IT in South Africa is the tension between protecting the interests of creators and promoting cultural diversity and indigenous knowledge. South Africa is home to diverse cultures and traditions, and there is a growing recognition of the importance of protecting and promoting indigenous knowledge. However, IP protection can limit the use of indigenous knowledge in creative works, which can restrict the ability of artists and filmmakers to create pieces that draw on existing cultural elements.

5 Roles of intellectual property rights and trademark

Intellectual Property (IP) refers to the intangible assets that is produced by a human with their ingenuity and creativity, such as inventions, artistic works, or trade secrets. The assets in question are protected by IPRs, which provide the inventor, designer, or creator with the only authority to control or distribute their IP is maintained or used. They are considering the potentially high financial value involved. These IPRs are crucial (Bently *et al.* 2022). In South Africa, many laws govern the protection of IP., including the Copyright Act, the Trademarks Act, the Patents Act, and the Designs Act. Trademarks and Patents are used for the unique identification of IP, the critical difference being that a Trademark is a word, symbol, or design that is used to identify and determine the goods and services of one seller from those of other sellers (Smit and Wyk 2021).

On the other hand, trademarks are essential for the company's brand and reputation and ensure customers or clients can recognize the workings of that particular company. A Patent, however, is functional to protect an innovative idea that has been established by someone and will provide the inventor with the ability to leverage and monopolize their concept to other people/companies, or it incentivizes them to develop new and valuable products and technologies, since they are the only individuals with the authority or access to their ideas as shown in figure 1 below (Sherwood 2019).

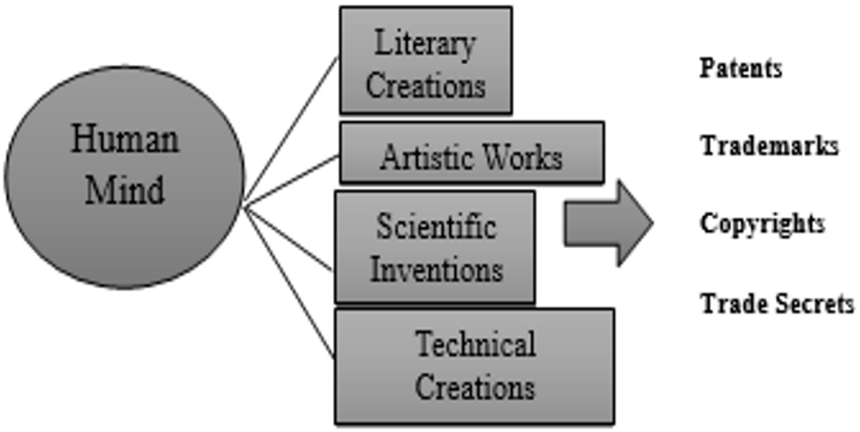

***Figure 1**: Human's Mind Thought Pattern. Author's own construct*

As shown in Figure 1 above, Copyright refers to a limited-time restriction on the use of the original work to prevent unauthorized copies. The creator is often the original owner of the Copyright, however there are several exceptions where the work was produced for the benefit of the employer or the government. There are two different kinds of copyright violations: direct and indirect. Controlling copyright laws is getting more difficult as technology develops, and many nations are amending their laws to restrict Information in the context of education or personal benefit. Trade secrecy is the legal right to keep specific information secret, and it is given to businesses or people. To protect trade secrets, employers need employees to sign non-disclosure agreements. Trade confidentiality, however, can stifle innovation (Contigiani and Hsu 2019), and the difficulty lies in determining which company created the idea first when licensing a trade secret.Given the strong rationale behind developing within the human rights framework, a rights-based approach to development is highly recommended. Development and intellectual property are regarded as legal rights that should be upheld. Thus, a great deal of the discussion will be driven by international law and agreements as well as Customary International Law (CIL) standards pertaining to intellectual property rights and development. Unless it conflicts with a parliamentary act or the constitution, CIL is a component of South Africa's domestic law. When national legislation or a statute incorporates South African government, it becomes a component of domestic law and is binding on South Africa.8 Furthermore, South African courts are required to take into account or favor a reasonable interpretation that is consistent while reading laws or the Bill of Rights (Chidede 2022).

One major topic of disagreement is also how well intellectual property (IP) promotes or hinders effective collaboration collaboration and knowledge exchange. Communities and organizations can pool resources and knowledge through open-source models and collaborative projects (Liu, Hull, and Hung 2017), which can speed up the development of customized solutions that address local requirements and advance sustainable practices. These methods are in line with Goal 17, which places a strong emphasis on collaboration to achieve the goals. Traditional IP regimes, however, frequently place a premium on individual ownership, which can impede collaborative efforts—which are crucial for tackling difficult global issues (Siltaloppe and Ballardini 2023). In the end, the discussion emphasizes the necessity of a nuanced approach to intellectual property that acknowledges the significance

of defending the rights of creators while also making sure that breakthroughs further the more general objective of sustainable development for all.

6 Conclusion

This study examined the laws governing intellectual property that control computer programming and design. Intellectual property laws are meant to protect the exclusive rights of innovators and stop the illegal use of their work while promoting fair trade and competition. Copyright does not cover the concept of the work itself, which only protects the author's literary works. Patents are a type of registered intellectual property rights, and trademarks assist businesses and inventors in online brand marketing. Though it occasionally allows for exceptions and loopholes, copyright protection is not always compatible with I.T. technology.

Computer work was specifically acknowledged as a separate type of work protected by the copyright work Act in the 1992 amendment. In order to prevent unlawful use and copying, software and supporting documentation are granted the same legal protections as conventional literary works. Any unauthorized use of this kind of material may result in fines and other legal repercussions, such as injunctions. The incorporation of computer programs adapts copyright law to new forms of expression, reflecting the dynamic nature of creativity and technology. This framework encourages innovation and originality in both technology and literature by making sure that creators are acknowledged and paid for their work.

This study further discusses how difficult it is to protect intellectual property in South Africa, especially for ideas and inventions already produced. The qualitative case study approach was adopted to further discuss this occurrence from various angles. According to the findings, South Africa confronts several obstacles when preserving intellectual property, including copyright legislation that cannot adequately satisfy the demands of libraries and education and a lack of colleges that include patents in their research initiatives. Using a mixed-methods approach, qualitative Information was gathered from various sources, such as focus groups and observations of the archaic South African copyright legislation. For the benefit of her population, the recommendations of IP legislation should include both public and private interests in advancing the objective of sustainable development. IP protection needs to be utilized in methods that both safeguard and maintain innovation and investment, as well as safeguarding the welfare and health of the general people, traditional knowledge, and culture.

The ability of intellectual property (IP) to serve as a link between computing innovations and the Sustainable Development Goals (SDGs) depends on striking a balance between encouraging innovation and guaranteeing accessibility. Robust intellectual property rights can stimulate the creation of novel technologies aimed at tackling pressing issues like sustainable energy, medical care, and education, thereby directly supporting several Sustainable Development Goals. For example, improvements in data analytics and software can improve resource management and productivity across a range of industries, supporting objectives such as sustainable production and consumption. Strict IP laws, however, can also erect obstacles to access, especially in underdeveloped nations where the high price of patented technologies may prevent them from putting vital solutions into practice. This conflict makes it unclear how IP laws should be written to support both fair access and innovation.

References

1. M. Abbajay Forbes. [Online] Retrieved from https://www.forbes.com/sites/maryabbajay/2019/01/20/mentoring-matters-three-essential-element-of-success/?sh=4049e4d945a9 (2019)

2. Microblog, . TheCeoViews. [Online] Available at: https://theceoviews.com/big-data-analytics-uses-benefits-and-challenges/ (2023).

3. T.M., Fagbola, F.I, Fagbola, O.J., Aroba, R., Doshi, K.K., Hiran, and S.C. Thakur, Smart Face Masks for Covid-19 Pandemic Management: A Concise Review of Emerging Architectures, Challenges, and Future Research Directions. IEEE Sensors Journal. (2023)

4. E.O.Anwana, and O.J, Aroba, African women entrepreneurs and COVID-19: Towards achieving the African Union Agenda 2063. H.T.S. Teologiese Studies/Theological Studies, 78(2), p.7.(2022)

5. O.J.Aroba, N. Naicker, T. Adeliyi, and R.E., Ogunsakin, Meta-analysis of heuristic approaches for optimizing node localization and energy efficiency in wireless sensor networks. International Journal of Engineering and Advanced Technology (IJEAT), 10(1), pp.73-87.(2022)

6. O.J.Aroba, Improving node localization and energy efficiency for wireless sensor networks using hyper-heuristic optimization algorithms (Doctoral dissertation).(2022)

7. O.J. Aroba, N. Naicker and T.T, Adeliyi, Node Localization in Wireless Sensor Networks using a Hyper-He uristic DEEC-Gaussian Gradient Distance Algorithm. Scientific African, p.e01560.(2023)

8. M. Liu, E.C Hull, and Y.T.C Hung. Starting open source collaborative innovation: the antecedents of network formation in community source. *Information Systems Journal* 27, no. 5 (2017): 643-670.

9. O.J. Aroba, .T. Xulu, N..N, Msani, T.T,Mohlakoana, E.E., Ndlovu, and S.M., Mthethwa. The Adoption of an Intelligent Waste Collection System in a Smart City. In 2023 Conference on Information Communications Technology and Society (ICTAS) (pp. 1-6). IEEE.(2023)

10. O.J, Aroba, and S.B., Mnguni, S.B. An Enterprise Resource Planning (ERP) SAP Implementation Case Study in South Africa Small Medium Enterprise Sectors. In Digital Technologies and Applications: Proceedings of ICDTA'23, Fez, Morocco, Volume 1 (pp. 348-354). Cham: Springer Nature Switzerland.(2023)

11. O.J., Aroba, P., Mabuza, A., Mabaso, and P. Sibisi. Adoption of Smart Traffic System to Reduce Traffic Congestion in a Smart City. In Digital Technologies and Applications: Proceedings of ICDTA'23, Fez, Morocco, Volume 1 (pp. 822-832). Cham: Springer Nature Switzerland. (2023)

12 J., Siltaloppi, and R. M., Ballardini. "Promoting systemic collaboration for sustainable innovation through intellectual property rights." *Journal of Co-operative Organization and Management* 11, no. 1 (2023): 100200.

13. O.J., Aroba, K.K., Chinsamy, T.G., Makwakwa. An ERP Implementation Case Study in the South African Retail Sector. In: Abraham, A., Hong, TP., Kotecha, K., Ma, K., Manghirmalani Mishra, P., Gandhi, N. (eds) Hybrid Intelligent Systems. HIS 2022. Lecture Notes in Networks and Systems, vol 647. Springer, Cham. Retrieved from https://doi.org/10.1007/978-3-031-27409-1_87.(2023)

14. L. Bently, B. Sherman, D. Gangjee, and P. Johnson, 2022. Intellectual property law. Oxford University Press. (2022)

15. B. Briffa. Confidential Information – who do you trust to keep your secret recipe? [Online] Available at: https://www.briffa.com/blog/confidential-information-who-do-you-trust-to-keep-your-secret-recipe/ (2020)

16. H. Contigiani and D.H., Hsu, D. H. How trade secrets hurt innovation. [Online] Available at: https://hbr.org/2019/01/how-trade-secrets-hurt-innovation (2019)

17. D.M Bois, State use provisions for patent law, and expropriations: Some comparative law guidelines for South Africa during the Covid-19 crisis and beyond. Potchefstroom Electronic Law Journal/Potchefstroomse Elektroniese Regsblad, 23 (1) (2020)

18. G. Dutfield, and U. Suthersanen. Dutfield and Suthersanen on global intellectual property law. Edward Elgar Publishing. (2020)

19. D. Foster and D. Hanekom. Intellectual Property Rights in South Africa: Overview. [Online] Available at:https://uk.practicallaw.thomsonreuters.com/3-519-5897?transitionType=Default&contextData=(sc.Default)&firstPage=true#co_anchor_a967854 (2021)

20. L.C.Grinvald, L. and O. Tur-Sinai. Intellectual property law and the right to repair. Fordham L. Rev., 88: 63. (2019)

21. N. Jha, Emerging trends in Digital copyright law [Online] Available at: https://www.linkedin.com/pulse/emerging-trends-digital-copyright-law-lets-learn-law-lll- (2021)

22. P. Khumalo. Infringement of copyright, assignment & licensing. [Online] Available at:https://www.golegal.co.za/infringement-copyright-licensing/ (2020)

23. C.R.Kothari, . Research methodology. (2014)

24. C. Makgamathe. South Africa needs a comprehensive, multifaceted strategy to curb the economic impact of piracy. Mail&Guardian [Online] Available at: https://mg.co.za/thoughtleader/opinion/2022-08-26-south-africa-needs-a-comprehensive-multifaceted-strategy-to-curb-the-economic-impact-of-piracy/ (2022)

25 D. Modic, A., Hafner, N. Damij, and Z.L Cehovin Zajc. Innovations in intellectual property rights management. European Journal of Management and Business Economics, 28 (2): 189-203.(2019)

26 N.S Netshakhuma,. The International Copyright Laws and South Africa Copyright Act: Implications on the African National Congress Liberation Archives Digitization (1960–1990). Collection Management, 46 (1): 57-72.(2021)

27 R.M., Sherwood. Intellectual property and economic development. Routledge.(2019)

28. A. Smit and Wyk, Trade Marks, Designs and Patents in Africa. [Online] Available at: https://www.svw.co.za/ (2021)

29. WIPO. World Intellectual Property Organization. What is Intellectual Property? [Online] Available at: https://www.wipo.int/about-ip/en/ (2024)

30. Department of Computer Science U.C.T. Social Issues and Professional Practice in I.T. & Computing. University of Cape Town. [Online] Available at:https://open.uct.ac.za/bitstream/handle/11427/30659/SIPPlecturenotes.pdf?sequence=1&isAllowed=y (2019)

31. T. Maunganidze. An evaluation of Trade Mark and Domain Name Rights in South Africa. [Online] Available at:https://core.ac.uk/download/pdf/145055445.pdf (2006) South African Trade Marks Act, No. 194 of 1993. [Online] Available at:https://www.gov.za/documents/trade-marks act#:~:text=The%20Trade%20Marks%20Act%20194,to%20provide%20for%20incidental%20matters. (1993)

33. ICANN. What is a domain name? [Online] Available at:https://www.icann.org/resources/pages/what-is-a-domain-name-2019-07-08-en (2024).

34 DKVG Attorneys. Intellectual Property Law: The Protection of Software Intellectual Property. [Online] Available at:https://dkvg.co.za/intellectual-property-law-the-protection-of-software-intellectual-property/ (2019)

35. South African Patents Act. . [Online] Available at:https://www.gov.za/documents/patents-act (1978)

36. South African Government. (1993). Designs Act 195 in 1993. [Online] Available at:https://www.gov.za/documents/designs-act-195-1993 (1993)

37. O.J. Aroba., Professional Leadership Investigation in Big Data and Computer-Mediated Communication in Relation to the 11th Sustainable Development Goals (SDG) Global

Blueprint. International Journal of Computing Sciences Research. 2024 Feb 8;8:2592-611.(2024).

38. T.Pistorius,and O.S Mwim, The impact of digital copyright law and policy on access to knowledge and learning. Reading & Writing-Journal of the Reading Association of South Africa, 10(1), pp.1-7 (2019).

39. T., Chidede, The role of intellectual property rights' protection in advancing development in South Africa. Law, Democracy & Development, 26(1), (2022).

40 D. Saxena. Intellectual Property Law and Sustainable Development in the Context of Goal 9." In Industry, Innovation and Infrastructure, pp. 643-654. Cham: Springer International Publishing, 2021

41. T. Kongolo. African contributions in shaping the worldwide intellectual property system. Routledge, 2016.

42. Y. Mupangavanhu. "The protection of intellectual property rights within the continental free trade area in Africa: Is a balance between innovation and trade possible." International Journal of Business Economics and Law 15, no. 4 (2018): 14-22.

43. D.M. Gould and C.W Gruben. "The role of intellectual property rights in economic growth." Journal of development economics 48, no. 2 (1996): 323-350.

44. P.Z Janjua, and G. Samad. "Intellectual property rights and economic growth: The case of middle income developing countries." The Pakistan Development Review (2007): 711-722.

45 C.A.P. Braga, C. Fink, and C. P., Sepulveda. Intellectual property rights and economic development. Vol. 412. World Bank Publications, 2000.