AFRICA UNIVERSITY

(A United Methodist-Related Institution)

PROTECTION OF UNIVERSITY-BASED INTELLECTUAL PROPERTY IN ZAMBIA

BY

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Abstract

Although there was some published literature on the general field of Intellectual Property (IPs) for Zambia, little was known regarding Zambian university-based intellectual property protection. The study, therefore, explored this phenomenon as a case, from the lens of the resource-based theory with an argument that university-based intellectual properties form part of intangible resources that would enhance the competitiveness of each university if harnessed properly. The study revealed that only 5 out of 62 legally recognized universities in Zambian had registered IPs at the Patents and Companies Registration Agency (PACRA) in the form of patents, trademarks and designs. The trends in filing and registration of IPs within the period 2010 to 2021 were generally low. Only two public universities had a combined total of three registered patents and records on protecting their academic gowns as designs with the rest (3) recording only trademarks. Among other, limited IP knowledge, absence and/or unfair institutional policies and absence/centralization of Technology Transfer offices were some of the factors that affected the filing of university-based IPs. The study recommended deliberate awareness-raising intervention for the public and investing in IP-related research to improve the situation.

Keywords: University-based IPs, commercialization, Technology Transfer

Declaration

I declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.

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Copyright

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First, I would like to pay allegiance to Almighty God for giving me a second chance and keeping me alive to work on this document. The work has not been easy but by his grace, I have been able to see the end of this journey.

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To my sponsors, African Regional Intellectual Property Organization, and their partners (Africa University and World Intellectual Property), thank you for offering me the scholarship. I pledge to extend the knowledge gained through this programme to the higher education sector, SMEs and art and culture in my homeland.

Dedication

I dedicate this work to my partner, Nyondwa Zulu; my Daughter, Taonga Phiri; and my mother, Tasila Banda. You mean the world to me.

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List of Abbreviations and Acronyms

IP	Intellectual Property
IPs	Intellectual Properties
GIs	Geographical Indications
IPP	Intellectual Property Policy
US	United States
PACRO	Patents and Companies Registration Office
PACRA	Patents and Companies Registration Agency (PACRA)
EPO	European Patent Office
IPRs	Intellectual Property Rights
IPO	Intellectual Property Office
HEIs	Higher Education Institutions
UK	United Kingdom
SA	South Africa
TT	Technology Transfer
TTO	Technology Transfer Office
TTOs	Technology Transfer Offices
AUREC	Africa University Research Ethics Committee
DRGS	Directorate of Research and Graduate Studies
DRIC	Directorate of Research, Innovation and Consultancy
MoCTI	Ministry of Commerce, Trade & Industry
HEA	Higher Education Authority
NIPP	National Intellectual Property Policy

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CHAPTER 1 INTRODUCTION

1.1. Introduction

This chapter introduces the study entitled *Protection of University-Based Intellectual Property in Zambia*. It starts with the background of the study. The main argument herein is that university researchers, lecturers, and students generate products and/or processes from their daily academic activities that need protection. While it is appreciated that universities around the world have made progress in the area of academic Intellectual Properties, this chapter argues that the Zambia scenario remains unknown and justifies why this area needs to be interrogated. This was evident by the scarcity of published and easily accessible materials on university-based Intellectual Property (IP) in Zambia. The chapter proceeds with the statement of the problem, research objectives, research questions, assumptions of the study, significance of the study and limitations of the study.

1.2. Background of the Study

Universities are, without a doubt, fertile grounds for creativity and/or hubs for knowledge generation. They, initially, existed mainly because of three (3) major categories of functions: i) teaching and training; ii) research and innovation, and iii) public engagement or community service (Boulton & Lucas, 2011; Conceicao & Heitor, 1999). In other words, ". . . discovery, learning, and societal engagement are mutually supportive core missions of the research university. . ." (National Research Council, 2011:1). Recently, calls for industrialization have seen additional functions of universities. In Zimbabwe, for example, the desire to adjust to the demands of *Education 5.0* has seen an addition of two other functions to the traditional university's functions of teaching, research, and

community service and these are i) innovation and ii) industrialization (Rumbidzai Muzira & Maupa Bondai, 2020).

The fact that universities engage in research, in addition to other functions, is proof that academic environments support the flourishment of intellectual ideas into tangible and intangible products, a subject of IP issues and their associated rights. While the concept IP is used to mean any novel "creation of human intellect such as artistic, literary, technical, or scientific creation . . . [i]ntellectual property rights (IPR) refers to the legal rights given to the inventor or creator to protect his invention or creation for a certain period of time" (Saha & Bhattacharya, 2011:88). Such properties and their associated rights can be protected as patents, trademarks, copyright, industrial designs, and Geographical Indications (GIs), among others. Whereas Trademark protection focuses on identities to which organisations trade, such as logos, signs, symbols, and mottos, among others, patents are legal and formal recognition that an invention is novel, has an inventive step, is non-obvious and applicable to the industry. Copyright protections focus on protecting the expression of ideas through literary and artistic works. Industrial design laws protect the aesthetic and ornamental features of a product. Geographical indications protect products that are origin-specific (Saha & Bhattacharya, 2011).

IP issues in the academic environments manifest from the intellectual works of students, faculty team, and academic staff, among others, through teaching, research, and public engagement. Under teaching and learning, academics rely on various sources and materials such as books, videos, and notes, among others, which could be their products or those of authorities in their specialised fields and may need copyright protection. When they get into research, academics generate new knowledge and innovate new products

and/or technologies that could be patentable. The third function of public engagement or community service acts as a conduit through which academics engage extend their knowledge, innovations, and ideas to the public: Such extensions may:

> . . . occur through publications, training and education of students, employment of graduates, conferences, consultations, and collaboration as well as by obtaining rights to inventions and discoveries that qualify for patent protection (intellectual property, or IP) and licensing them to private enterprises (National Research Council, 2011, p.1).

The foregoing quotation confirms the fact that universities need protection against the illegal and/or unauthorised exploitation of their intellectual works. As such, most universities have taken interest in the subject of intellectual property by developing institutional Intellectual Property Policies (IPP), filing patents, licensing their innovations to spin-off companies, and registering trademarks, among others.

In the United States (US), for instance, several universities, just like other public research organisations, improved on their patent filing and licensing behaviour. This is attributed to the "Bayh-Dole Act, signed into law in 1980, [which] gave universities rights to intellectual property (IP) generated from federal funding" (Ezell, 2019). The situation was dissimilar in Europe, in the 1990s, where the 1995 European Commission Report (cited in Silva, Vasconcellos, Tonholo, & Godinho, 2017), revealed that ". . . while Europe played a role of scientific excellence globally, it was lacking the ability to turn that potential into competitive advantage and innovation (Fragkandreas, 2013; Herranz and Ruiz-Castillo, 2013), especially when compared to the USA."

Silva, Vasconcellos, Tonholo and Godinho (2017) further allude that the European case remains a paradox as studies have shown that European individual academicians own more patents than their academic institutions, a situation attributed to the concept of 'professor privileged' which gave university research an advantage, to own a patent than their university. Furthermore, the case of Brazil gives an indication of the state of academic patenting in Latin America. Silva et al, (2017, p.531) observed that the ". . . . Brazilian academic sector has contributed significantly to technological development when measured by patents, considering that the academic sector accounts for 19.5 per cent of total applications with a Brazilian priority, published during the 2002-2012 period."

The Asian scenario of academic patenting indicates that Asian Universities rank third on the continent. A study by Fisch, Hassel, Sandner, & Block (2014) confirms this by reporting that "The majority of universities in our sample are European (42.0%), closely followed by universities from the US (35.7%). Approximately 9.7% of the universities are Asian, while the remaining 12.7% are not located in these regions . . . ."

In Africa, little is reported on academic patenting and universe-based IP in general. A few published studies (Bansi & Reddy, 2015; Hirko & de Beer, 2019; Stofberg, 2019) available point to the fact that African universities do not contribute much to the patenting subject and there is a dearth of research reports and publications on the protection of University-Based IP at African national and regional IP offices.

In Zambia, issues of IP flourished during the Federation of Rhodesia and Nyasaland, and the IP office was in Harare, Zimbabwe. In 1968 after independence, Zambia opened the Patents, and Companies Registration Office (PCRO), currently known as the Patents and

Companies Registration Agency (PACRA). Ziconda, (n.d:3) adds that the IP issues in Zambia are "vested in two Ministries namely the Ministry of Commerce, Trade and Industry and the Ministry of Information and Broadcasting." In terms of the domestic IP legal framework in Zambia, Mulonda (2001) gives three (3) major categories of legislation. The first is the industrial property category where the Patents Act, Trademark Act and Industrial Design Act fall under. The second category relates to Copyright and Related rights where the Copyright and Performance Rights Act is housed. The third category has to do with country-specific legislation and this is where acts like the Merchandise Act, Registration of Business Act and Competition and Fair Trading Act (Mulonda, 2001). Another *Sui Generis* legislation worth mentioning is the Protection of Traditional Knowledge, Genetic Resources and Expressions of Folklore Act No. 16 of 2016. Another positive stride has to do with the development of the Zambian 2020 revised National Intellectual Property Policy (NIPP), from the 2009 national policy. NIPP is aligned to Zambia's Vison 2030 which aspires to guide the nation to be a mid-income nation and followed the World Intellectual Property's IP clusters.

Despite Zambia doing fine in the IP registration framework, as evidenced by various pieces of legislation, nothing much is known about the efforts of Zambia Universities in protecting their IP and their associated rights through formal filing and registration at PACRA. His does not speak to one of the aspirations of the NIPP which is to promote ". . . generation of IP universities, research organizations, business, industry, SMEs and individuals. . ." (Ministry of Commerce, Trade & Industry [MoCTI] 2020). However, intellectual properties, when protected, give an age for the firm to remain competitive in the environment. Registration of intellectual property is one way of protecting tangible

and intangible products of the human intellect. Most nations, the world over, have IP offices for that purpose. Relying on secondary data from PACRA and interviews with key informants at PACRA and selected universities, this laid bare the forms of University IPs that Universities in Zambia sought protection on. Furthermore, the study documented the filing and registration trends of such University-based IPs. It further outlined the factors influencing the low filing of university-based IPs and suggested ways to reverse the situation.

1.3. Statement of the Problem

Universities, the world over, exist as hubs of knowledge generation as their main focus is teaching, researching and public service. While doing this, several Intellectual Properties (IPs) are generated and these need protection in one way or another. Evidence suggests that ". . . in recent years, there is a great emphasis on transferring inventions and technologies originating from academia to industry through technology transfer/licensing or commercialization" (Ravi and Janodia, 2021, p.787). Additionally, the US is the leader in the area of academic patenting. Europe is the second and Asia takes the third slot with the rest at the bottom (Fisch et al., 2014). Even though universities in Zambia are mandated to conduct public research for public disclosure, the national IP policy acknowledges the fact that the "level the of technology transfer and commercialization of IP assets remains very low" (MoCTI, p.5). However, there is a dearth of evidence concerning the forms of protection and filing trends of University-based IPs in Zambia. A few studies (Liswaniso, 2020; Chalwe, 2017) that explored university-based IP in Zambia focused on institutional IP policies and not on documenting the efforts universities had made in protecting the IPs they generated to demonstrate the low

technology transfer and commercialisation efforts claimed in the national policy. This scenario, if left unchecked, had the potential to render Zambian Universities irrelevant to the public as their contribution to the world of innovation, industry and society may remain unknown. This study, therefore, sought to address this gap by documenting the forms and trends of university-based IPs using the evidence available at PACRA for purposes of benchmarking Zambian University's contribution to society.

1.4. Research Objective

The study was guided by the following objectives:

i. To analyse and compare the filling and registration trends of university-based IP in Zambia;
ii. To document the forms of university-based IPs that Zambian universities seek formal protection on;
iii. To document factors influencing the filing of university-based IPs in Zambia;
iv. To recommend the way forward on the protection of university-based IPs in Zambia

1.5. Research Questions

i. How were the filling and registration trends of university-based IP in Zambia?
ii. What were the forms of university-based IPs that Zambian universities sought formal protection on?
iii. What factors influenced the filing of university-based IPs in Zambia

iv. What would be the way forward with regards to university-based IPs in Zambia?

1.6. Assumptions of the Study

This study was proposed with the assumption that the subject of University-based IP in Zambia was underexplored. Of particular emphasis was an assumption that the protection and filling trends of university-based IPs were unimpressive.

1.7. Significance of the Study

The findings of this study would be of greater value to Zambian universities, as they would be made aware of their contribution, relevance and status in society. The study benchmarks evidence from which Universities in Zambia can draw lessons, concerning the protection of their Intellectual property.

1.8. Delimitation of the Study

The study was confined to PACRA and available data, for 11 years, from 2010 when the first IP was filed and registered to 20211. This data was only for five universities that had records of IP protection at PACRA and the same determined the inclusion of key informants.

1.9. Limitation of the Study

Since the study focused on available data of University-based IPs for five universities, that had records at PACRA, and relied on key informants from PACRA and the same five universities, the non-registered IP issues from universities with no records at

PACRA were not captured. The uncaptured universities could have IP issues that would inform policy and practice for university-based IPs in Zambia.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1. Introduction

This chapter synthesizes and critiques literature related to the current study on the protection of University-based Intellectual Property. It starts with a theoretical framework guiding this study. This adopted theory, resource-based theory, assumes that firms develop a competitive advantage over others when they possess unique tangible and intangible resources that form part of the firm's property and that such properties need a form of protection. The critiqued literature tries to build a case on how university-based IPs have fared in the USA, Asia, Africa and other continents because arguing that the Zambian status remains underexplored and not well-defined. Thereafter, a review of studies and literature related to the current study is presented.

2.2. Theoretical Framework

This study applied the Resource-Based theory, proposed by Barney in 1991, to demonstrate how universities in Zambia are failing to or fairly leverage their IPs for competitiveness. The theory asserts that firms develop a competitive advantage if they possess strategic resources. Such tangible or intangible strategic resources must be difficult to imitate, non-substitutable, and must help in sustaining the organisation's competitive advantage.

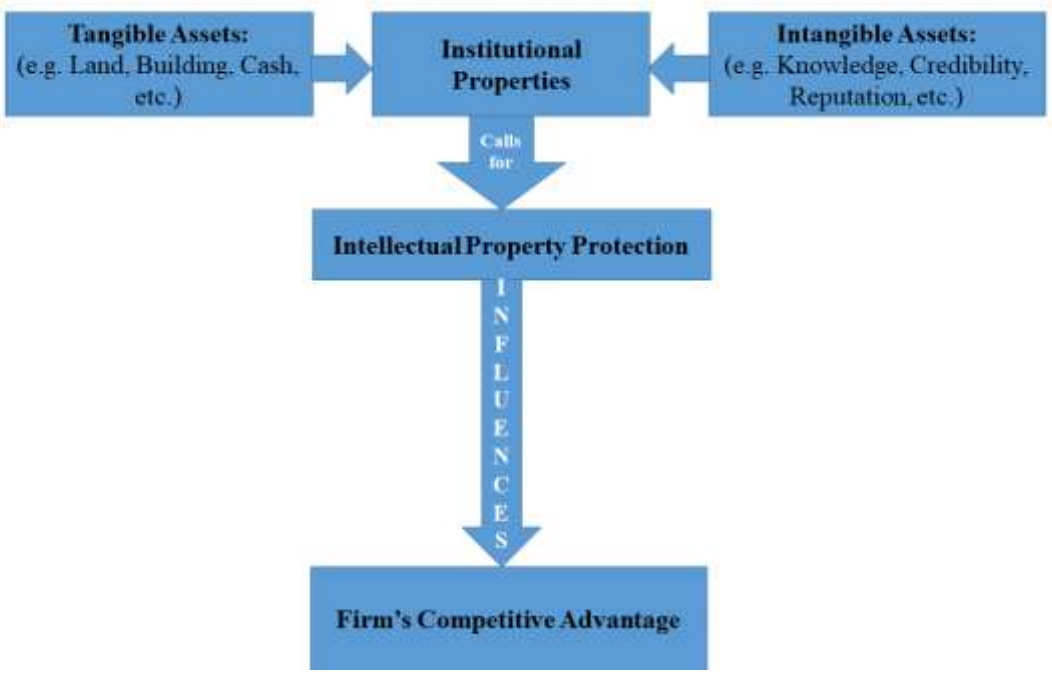
The theory rests on the assumption that every organization has tangible and intangible resources (assets). Tangible assets are all physical resources that can be bought by every firm from the market. These may include land, capital, and products, among others. Such resources offer little or no competitive advantage to the firm in question as all competitors

can easily access and acquire them from the market. On the other hand, intangible resources usually refer to items, processes and/or concepts that may not necessarily have physical value but could be core to the firm's survival and may be owned by them. Such assets may include the firm's reputation, its brand and some secrets, among others, that are distinct. The theory further assumes that it is these (intangible) resources that should be considered 'strategic' resources, as they provide a competitive advantage to every firm. Additionally, the theory assumes that organizations' strategic resources must be i) valuable; ii) heterogeneous; iii) immobile; and v) rare (Barney, 1991). The resources of the organization are deemed valuable if they have the potential to enhance the worthiness and value of the goods, products and services that the organization provides to their clientele. The organization's resources, skills and capabilities are said to be heterogeneous if they significantly differ from those of the competitors. Heterogeneity is what makes the organization unique and different from the others. Strategic resources are immobile if they cannot easily move from one firm to the other or cannot easily be copied by the competitors at least for a good period.

2.3. Relevance of Resource-based theory to this study

This theory was a perfect fit for this study as it assisted in documenting the strategic resources (i.e., IPs) that universities in Zambia have. It further helped in concluding the current efforts in protecting university-based IPs by Zambian universities. The theory helped to make a case on how universities can leverage their IPs to enhance their competitiveness. Figure 1 below presents a conceptualization of the resource-based theory as used in this study.

Figure 1: Researcher's conceptual summary of the resourced-based theory



In this study, the assumption was that tangible and intangible assets feed into the general base of the firm's properties, in that case, university properties. It was assumed that some of these strategic resources are products of the human intellect and as such needed intellectual property protection. The study further assumed that if universities protected their intellectual property, they would have remained competitive in the academic business industry, as their resources would have been heterogeneous, immobile and nonobvious. The theory also set a base to the exploration of how Zambian universities could potentially use their IPs for branding locally and internationally

2.4. Relevant literature and Related Studies

This section synthesises literature related to the study on the protection of university-based IP in Zambia. It draws arguments from studies done in various parts of the world.

2.4.1. About Intellectual Property and Intellectual Property Rights

According to Thole (n.d. p.6), "intellectual property deals with the rights that are given to a person or an entity concerning intangible things that come about through the intellect of a human being." These may include, among others, inventions; literary and artistic works; designs; symbols, names and images used in commerce. Subsequently, trademark laws, patent systems and copyright laws among others protect such works.

Intellectual Property Rights (IPRs) on the other hand are the rights given to persons over the creations of their minds. IPRs give exclusive rights to creators for a certain period. This enables creators of IP to recover the investments they make in generating innovations by bringing them to the market. Furthermore, IPRs systems, comprising their legal and institutional framework make it possible for innovators to sell, license or give away the rights to their innovations to others, who may be better placed to exploit them. In other words, intellectual property rights are a key prerequisite for intellectual assets to emerge in markets (Ministry of Commerce, Trade & Industry, [MoCTI], 2020).

The Zambian IP policy acknowledges the two main branches of IPs, which are Industrial Property and Copyright. The Industrial Property branch, which houses patents, utility models and industrial designs, trademarks, plant variety and geographical indications, is there to stimulate technological innovation and to provide the legal framework for the creation of new technologies and products. The second branch, copyright, has its focuses on protecting literary, music, artistic, phonograms, audio-visual works as well as film and computer programmes. This category also focuses on protecting derivative works and works on performing artists, producers of phonograms and broadcasting firms, among others, through neighbouring rights.

2.4.2. Brief History of IP

Mwalongo (2007) attributes the genesis of IP issues to the renaissance period in Northern Italy when the Venetian Law of 1474 made the first attempt to grant a patent by granting an exclusive right to individual innovators. The same period saw Johannes Gutenberg obtain what is believed to be the first-ever copyright for his movable typo invention and printing press inventions around 1440.

Concerning modern IPs, it is believed that the industrialization period contributed a large deal to IP issues in the 19th century. As Cornish (1996) intimates, the British statute of Anne of 1710 granted sole rights and liberty of printing books to authors and their assigns for 14 years, and the statute of Monopolies of 1623 is seen as the origins of copyright and patent law, respectively. This is cemented by the arguments by Mwalongo (2007) that the 19thcentury saw new ways of manufacturing which were invented and which triggered large-scale industrialization and that was influenced by the urbanization of cities, expanding railway networks, the investments of capital and the growth of the transoceanic trade. This period is also credited for the efforts in shaping the international IP through the 1883 Paris Convention for the protection of industrial properties and the 1886 Berne convention for the protection of literary and artistic works established in 1886 (WIPO, 2004). The main platform underlying the IP system historically has been to recognize and reward IP ownership of inventions and creative works to stimulate further inventive and creative activities that in turn, of course, would boost economic growth (Mwalongo, 2007)

2.4.3. The Bayh-Dole Act and Why IP in Universities

Universities are, by their nature, creators and innovators and as such, IPs underpin their activities. However, there is evidence pointing to the fact that university IPs remained unexploited until the enactment of the previously mentioned act. Liswaniso (2020) argues that before the Bayh-Dole was enacted in 1980, no university research was commercialised, a situation that saw most federal agencies in the United States of America maintain inconsistent policies on whether or not recipients of research federal grants could take title to inventions that sprung from federally funded projects. The act ensured provided for the federal grants to retain title to inventions created under those grants. Universities were also required to reinvest their patent rents in research. Hemmel & Larrimore (2017), further state that the commercialization theory posits that the Bayh-Dole framework facilitates cooperation between University researchers and the private sector firms capable of bringing the product of University research to the market.

The enactment of the previously mentioned act cemented the idea that university-based IPs needed protection and commercialization. As Țîțu, Oprean, Stan, & Țîțu (2017) put it, "Intellectual property plays an important role in the sustainable development of a university." This agrees well with the argument by Monotti (2000, p.23) that all "creative products have the potential for some form of protection under one or more intellectual property regimes that each comprise a separate set of rights. As such, universities have, according to Intellectual Property Office (n.d:11), three main reasons why they should worry about how their IPs are used:

> First, much of the IP universities generate (in the broad sense as we must now consider it) supports their own teaching and research activities. As a

> consequence, universities must take care to protect their own freedom to operate. Secondly, universities have developed capabilities in supporting the process of translating knowledge with immediate application into the wider society and economy. Thirdly the research base (and indeed innovation in education) creates new knowledge and provides a broad foundation for innovation throughout academia and business, often communicated through scholarly conferences, publications or collaborative research, and teaching, but also through technology transfer. This feeds into future (but not necessarily immediate) commercial and public applications.

The above quotations substantiate the argument that university IPs can be used for commercial poses. As Intellectual Property Office (n.d.11) adds, ". . . these key mechanisms for use of IP are all tied to revenue generating possibilities, either through the universities' core business (in the first case) or through a variety of non-core mechanisms."

2.4.4. The Zambian IP legal Framework

Even though the Zambian IPs issues started in the pre-independence era, the Zambian performance on the global revel is still unimpressive. As MoCTI (2020, p.3) revealed:

> . . . the Global Innovation Index (GII) Zambia's level of innovativeness is low. In 2016, the country was ranked 125th out of 128 countries. In terms of protection of intellectual property rights Zambia was ranked 64th position out of 138 countries by the 2016-2017 Global Competitiveness Report (GCR) published by the World Economic Forum.

IP issues in Zambia are not post-colonial matters, as IPR have been protected in Zambia way before the country attained independence in 1964. The country continued to rely on pre-independence IP laws that did not reflect the changes in the socio-economic realities. This situation forced the government to undertake a review of existing legislation, in 2010, and develop new laws to address national aspirations, capture emerging issues and also meet international IP obligations (MoCTI, 2020).

MoCTI (2020) describes the Zambian IP system to be a replica of the WIPO IP system structural approach. This is because the 2020 revised national policy is informed by the thematic IP clusters of the World Intellectual Property Organization (WIPO). The policy intends to operate on the following principles. The first principle is that

The first principle is that of responsiveness. The NIPP strives to be responsive to the socio-economic development aspirations of the country as it is also linked to the Vision 2030 agenda for Zambian of being a prosperous middle-income nation. Secondly, the policy is guided by the principle of Effective Protection Systems as it commits to ensuring that all intellectual property aspects of each sector are administered by an effective system. The third is that of prior consent from local communities when exploiting indigenous knowledge and genetic resources and expression of folklore. This is tied to the firth principle that has to do with Access and Benefit Sharing (ABS). The focus of this principle is on those IP resources such as traditional knowledge, genetic resources and expression of folklore emanating from various traditional cultures and indigenous knowledge system in Zambian. The main aim is to ensure the general community benefits from their knowledge. The sixth principle, which is a main concern for this study, relates to technology transfer and commercialization of IP assets. The policy recognises the importance of technology transfer and commercialization of IP rights. The seventh and

last principles ties Zambia to adherence of international obligations. This principle seeks to facilitate for the domestication of international obligations on IP that are in the interests of the nation.

In Zambia, the legislative framework for Higher Education Institutions (HEIs) is the Higher Education Act of 2013 of the laws of the Republic of Zambia that, in section 12(1), highlights the functions of higher education institutions as to provide higher education and to conduct the research necessary and responsive to national needs. This is supported by the National Development Plans that have continued to echo the need for universities to contribute to socio-economic development by generating research outputs that can provide solutions to social needs (Chalwe, 2017). This mandate ascribes HEIs the mandate to generate and commercialize research results for the benefit of society as per article 7 of the TRIPS agreement that stipulates that:

> The protection and enforcement of intellectual property (IP) rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to the balance of rights and obligations."

To enhance research and development, the Zambian government, through the Ministry of Science and Technology, has come up with a Science and Technology Policy (STP). The Science and Technology Policy is intended to guide and enhance the utilization of abundant natural resources for improved quality of life for Zambians. This is achieved through liberalization and autonomisation of research institutions, promotion of partnerships and encouraging demand-driven research (University of Zambia, 2009). Furthermore, the policy provides for linkages between research institutions and the Social

and Economic sectors of the economy. According to UNZA (2009, P.3), public research is largely funded by the government and carried out by public institutions including:

a) National Institute for Scientific and Industrial Research (NISIR);
b) Public Universities;
c) Tropical Diseases Research Centre (TDRC), and
d) Government Ministries: Agriculture and Cooperatives, Tourism Environment and Natural Resources, Mines and Minerals Development; and Health; Trusts such as: Zambia Agriculture Research Institute (ZARI), Central Veterinary Research Institute (CVRI), Golden Valley (GART) and Cotton Development (CDT).

Despite this set-up, funding for research by both Government and the private sector has been limited and this has greatly contributed to the poor performance and application of Science and Technology in national development. Weak linkages between the research institutions on the one hand and the Government is another contributing factor (UNZA, 2009)

Chalwe (2017, p.9) further alludes that the Government realized that sustainable socio-economic development can only be achieved through a strong well-coordinated and monitored Science and Technology System and as such, formulated the 1996 National Science and Technology Policy. He adds that "the broad policy objective for science and technology is to embed science and technology as part of the culture of the key sectors of the economic for promoting competitiveness in the production of a wider range of quality goods and services."

The Zambian IP legal framework categorises pieces of IP legislation based on the industrial branch and copyright branch. Industrial property category houses pieces of legislation such as the Patents Act No. 40 of 2016; the Industrial Designs Act No. 22 of

2016 and the Layout Designs of Integrated Circuits Act No. 6 of 2016. IN 2016, the Protection of Traditional Knowledge, Genetic Resources and Expressions of Folklore Act No. 16 of 2016 was added to this category.

The first legislation, in the copyright branch, is the Copyright and Performance Rights Act Cap 407 of 1994. This was amended in 2010 in order to enhance enforcement provisions. The Copyright and Performance Rights (Amendment) Act of 2010 introduced among other things, the hologram which is affixed on all authentic audio and video products in Zambia. The amendments also expanded the list of offences for copyright infringement (MoCTI, 2010).

Important to mention is the fact that Zambia is an affiliate member of a good number of international organizations regulate and deal with intellectual issues. In international trade and commercial issues, Zambian pride herself as a bonafide member of the World Trade Organization (WTO) This helps remain up to date with intellectual property issues in the international commercial world. At regional, Zambia is an affiliate of African Regional Intellectual Property Organization (ARIPO). This put be at speed to remain relevant on regional intellectual property issues. At the global level, Zambian remains a member of the World Intellectual Property Organization (WIPO) since 1997.

These as result of her membership to these organization, Zambia is a party to several international treaties and protocols on intellectual property. Some of the international treaties include to which Zambian include but not limited to:

a) Paris Convention for the Protection of Industrial Property (1883).
b) Berne Convention for the Protection of Literary and Artistic Works (1886).
c) WIPO Convention (1967).

d) Patent Cooperation Treaty (1978).

e) Madrid Protocol relating to the Madrid Agreement concerning the Registration of Marks (1989)

f) The Agreement on Trade Related Aspects of Intellectual Property (TRIPS) (1994)

2.4.5. Factors influencing IP Issues in Higher Education

Firstly, some factors influencing IPs in HEIs resolve around economic issues. Since the ideas and expression from HEIs become commodities that can be commercialised, conflict of ownership and rights-holding tend to arise due to competing interests. This perpetuates the growing situation where the "IP registration hinders the sharing and open source information, therefore more and more researchers are withholding research results with preliminary discoveries and confidential formulas (Bansi, 2016, p.57)." The commercial factor has the potential to create a situation where most university-generated innovations would be protected by individual innovators.

The second factor is political and motivated by the need for profit than public service. Murray (2004: 6) (cited in Bansi, 2016) stated that political forces, laws and policies reward innovation and thus, political structures that form national priorities that stimulate innovation and define IPRs. Intellectual property assets have become extremely important to universities because the innovation developed by university researchers plays a crucial role in political-economic exchanges, generating potential revenue, and decreasing universities' dependency on the Government subsidy. "Universities have therefore increased their intellectual property activity, seemingly transforming themselves from knowledge producers for the public good into intellectual property producers for profit" (Baez 2005: 7, cited in Bansi, 2016).

Social forces also tend to be factors influencing IPs in HEIs. Jobe (2006: 9) (cited in Basni, 2016) argues that:

> . . . while IPR's are known to restrict the public from using an innovation without permission, it prevents others from developing and improving on innovations thereby limiting further benefit to the public. In theory, IP systems are necessary to encourage creative endeavours in the interest of public. Although in practice, an IP system is considered a barrier to the flow of knowledge and innovation diffusion.

The other factor relates to legal issues. Due to competing interests, contracts, policies and guidelines are drawn to govern IP issues in higher education. Added to these are technological factors. Since higher education operates in the physical and cyberspace, copyrighted materials used and produced by lecturers, such as books, articles and notes, need protection and clear direction on ownership when used for the institution's work.

A south African study by analysed categorised factors encouraging commercialisation into three levels which are: i) national policy level; ii) institutional level; and iii) individual level. National policy level covers all inventive the state which may. The example sited included the discontinued Patent Incentive Fund by the DSI, and government policies and legislation, such as the IPR from Publicly Financed Research and Development Act 51 of 2008 (IP Act) managing IP at universities.

The Institutional level factors, as noted by Cullen, Calitz, & Chetty (2020), relate to institutional policies that play an important role in communicating the institution's principles, values, and philosophies. These, they note, can be monitory and not monitory. Monetary incentives may come as percentages of revenues paid to the inventor and percentage of revenues paid to the work group of the inventor(s). The study notes that

“non-monetary incentives may include the example inclusion of patent counts in academic performance assessments and awards for granted patents and commercialised research” (Cullen, Calitz, & Chetty, 2020, p.5).

On individual level factors, Cullen, Calitz, & Chetty (2020, p.5) notes the following:

> . . . Universities generally allocate a portion of the funds received for publications and inventions from the government to the researchers responsible for the development of artefact. Monetary rewards such as once-off payments for granted patents and revenue share from the commercialisation of research outputs impact researchers at the individual level.

2.4.6. Influence of National IP on Higher Education IP Policies

The higher education intellectual property policies seem to be influenced mostly by national intellectual property policies. Liswaniso (2020) argues the Bayh-Dole was enacted in 1980, set base for publicly funded research in the United States of America. It was this act that influenced the policy direction of the recipients of federal funds.

A similar situation can be noted in India. Ravi and Janodia (2021) links the Indian starts to policy direction on university-based IPs to the 2008 national Protection and Utilization of Public Funded Intellectual Property Bill (PUPFIP). This was proposed to address the challenges in the university industry technology transfer. According to Ravi and Janodia (2021, p.791), the Bill envisaged providing incentives to the universities through public-funded research wherein:

- Ownership of patents remains with the academic institute on inventions from government funded projects.

- Institute creating an invention must inform the funding agency within 60 days of the creation.
- Research institute must inform the government agency about the intention to patent the invention within 90 days; if they fail to inform, under defined prior Acts, the agency will acquire the title of patent.
- Bill had the provision of 30% of royalties given to the inventor.
- On receiving the government aided funds, the research institute must frame an intellectual management committee to process the innovation in terms of assignment of rights, potential for marketing the invention in concern, licensing agreements.

In Japan, major research activities are undertaken by national universities and they are not given right as independent legal entities. Sattiraju, Ligade, Muragundi, Pandey, & Janodia (2022, p.8) noted that in Japan:

> A legislation was enacted in the year 1998 to encourage the Technology Licensing Organizations at universities. In the 1999 Industrial Revitalization Special Law, a Bayh-Dole like Act was enacted. As a part of that, IP centres were established in universities across the country. Functions of universities are expanded from conventional types i.e. Academia and Research along with Technology Transfer as a new function added to it. Universities were encouraged to enhance IP-focused organizations, to set up rules and regulations for IP ownership, and to secure finance for prosecution.

In south Africa, the intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008 shapes the direction of technology transfer. The act, as cited by Mustapha & Ralphs (2021, p.2) enacted to:

> . . . make provision that intellectual property emanating from publicly financed research and development is identified, protected, utilised and commercialised for the benefit of the people of the Republic, whether it be for a social, economic, military or any other benefit.

Additionally, sets conditions for effective realisation of the aim. The first condition is for public financed universities, universities inclusive, to seek protection of their IPs in exchange for public disclosure of their innovations or creative works. According to Mustapha & Ralphs (2021, p.2), additional conditions are as follow:

> Second, the 'people of the Republic' are to be granted preferential access to the benefits of publicly generated IP. In particular, the Act mentions small and black-owned businesses in this regard. Third, the Act specifies that the inventors of the IP generated must not only be acknowledged, but also rewarded. Furthermore, researchers may publish their findings after the evaluation of a disclosure. Fourth, and finally, according to the Act, the state may use the IP in the public good, if it deems this necessary

It can be noted from the above cases that national policies have an influence on technology transfer and shape the policy direction of universities and research institutions. Zambian seems to not be different from the rest. The National Intellectual Property Policy of 2010 adds the aspect of technology transfer and commercilisation of IP assets and recognises the role universities play in that as leading research institutions. The policy is set to achieve the following objectives:

a) promote innovation, research and development, creativity and the generation of intellectual property assets;
b) promote and facilitate the exploitation and commercialisation of intellectual property assets and technology transfer;
c) ensuring intellectual property rights are respected and effectively enforced;
d) educating and enabling the Business community and the general public to understand, manage and protect their intellectual property;
e) promote strategic use of IP system for the protection of Traditional Knowledge, Genetic Resources and Expressions of Folklore; and
f) promote IP awareness for the public at large.

It can be noted from the above objectives that objective two and three of the Zambian IP policy focus on generation, protection and commercilisation of IP assets. The policy set strategic objectives which recognised IPs coming from universities. To achieve objective one, the policy commits to, among other things, ". . . orient national research laboratories, universities, and other research institutions towards emphasis on protection and commercialization research output rather than publication only…" (MoCTI, p.8).

For African where public university funding is even meagre, development of effective intuitional policies would help monetise intellectual assets. WIPO (n.d., p.6) gives guidelines on what African universities can focus on by noting that in order to harmonize the various conflicting interests of stakeholders and achieve broad-based objectives, an intellectual property policy for universities and R&D institutions should address some of the following issues:

- coverage of intellectual property policy;

- ownership of intellectual property;
- disclosure of intellectual property;
- marketing, commercialization and licensing of patents;
- distribution of income;
- rights and obligations of an inventor and the institution;
- other pertinent issues.

The hot issues in university IP policy is ownership as it dictate the direction of other related issues like commercialization, protection and licensing. Without clearly spelt terms and conditions of ownership and IP rights, born from a participatory IP policy formulation, management and implementation, university IP systems may remain dysfunctional and/or ineffective. Van Dusen, (2013, p.6) sharpens this argument by stating that:

> While typical university intellectual property policies include a statement of purposes and objectives—such as encouraging creativity, fostering innovation, the sharing of ideas, and the protecting of academic freedom—the overriding reasons for such polices may really be to define who owns intellectual property and thereby provide, through careful guidance, for the future generation of revenue for the university.

2.4.7. Related studies

This section focuses on revealing related studies on trends of filing and protecting university-based IPs. It lays bare the nexuses among varies pieces of studies and how the current study deviates from them.

Dornbusch & Neuhäusler (2015) conducted a study on academic patents by universities and public research institutes in Germany. The study revealed that five per cent (5%) of

the patents were filed at the European Patent Office (EPO). Additionally, the study revealed ". . . the number of patent filings, in absolute as well as relative terms, has increased over the last 20 years, which is even more pronounced for universities than for public research institutes… (Dornbusch, et al., 2015, p.31)". The study attributes this scenario to the growing interest by universities and public research institutes to claim Intellectual Property Rights (IPRs) by their employees. The study further highlights three other issues:

> Firstly, other than previous approaches, we observe a slightly rising trend in academic patenting which is solely driven by the ever-increasing patenting activity not only by universities, but also by public research institutes. Secondly, we find that the largest share of academic patents is filed by large and small firms. Thirdly, however, firm filings in relative and absolute terms exhibit a negative trend" (Dornbusch et al., 2015, p.2)

While the focus on this study stretches beyond university-based IPs by including university institution, the current study focused on university-based IPs. However, this Germany case set the base for future comparative studies on filing trends of IPs by universities and other categories of the organisations.

Another German-based study by Tinnemann, Özbay, Saint, & Willich (2010) is of interest to the current study. Just like Dornbusch & Neuhäusler (2015), the study by Tinnemann, et al., (2010) targeted university and non-university public research organizations but with a specific focus on the analysis of medical patent applications from the previously mentioned categories on institutions in German. This study revealed that of the 10,194 retrieved patents for analysis, 1772 (48%) were linked to 193 universities and public research organizations. Furthermore, the study revealed that:

> . . . . The number of patent applications submitted by universities and university-affiliated institutions more than tripled since the introduction of legal reforms in 2002, constituting almost half of all patent applications and accounting for most of the post-reform increase. Patenting of most non-university public research organisations remained stable (p.1).

While the preceding two studies inform the current study, they both targeted universities and public institutions, their focuses include academic patents and medical patents from academic and research organisations. The two studies touched on only one aspect of Intellectual Property, patents. The current study intends to explore University-Based IP in general. The other area of divergence relates to location. While this may not sound like a major gap, the dynamics in the academic environments and research organisations in German may not be the same in Zambia. It, therefore, follows that researching academic IPs in Zambia would be a great addition to the existing body of knowledge.

Malva, Lissoni, & Llerena (2013) analysed the contribution of the 1999 French Innovation Act in encouraging the protection and commercialization of university-based innovations. The study records that before the act, French universities left IPRs in the hands of their funders, mostly public research organizations and business agencies. The situation changed after the introduction of the innovations as most "‘. . . French academic institutions increased their propensity to claim IPRs over their employees' inventions, mainly under the form of co-ownership with business companies"' (Malva et al., 2013:211). This finding is consistent with the results of the longitudinal study by Lissoni, Pezzoni, Poti & Romagnosi (2013), who recorded a downward trend in academic patenting in Italy by using data on patent applications at EPO for a period of 11 years (1996 to 2007). This longitudinal study covered a period during which Italian universities underwent some

reforms that shaped university-based IPs. The study, however, recorded that following the reforms, the share of patents owned by universities had increased, a sign that the reforms, which aimed at increasing university autonomy, had a positive impact on university-based patenting. These studies point to the need for policy reform related to university-based IPs. They set the case for the current study to also dive into exploring whether the status of university-based IP reforms and policies had an influence in the filing and registration trends in Zambia, an issues that was explored under the second objective of this study.

A more recent survey by the Intellectual Property Office [IPO] (2020), reports interesting findings on IP filing habits by Higher Education Institutions (HEIs) in the United Kingdom (UK). The study reports that ". . . 1.1% of published patent applications, 0.3% of [trademark] registrations, 0.1% of design registrations with the IPO during the period 1999 – 2018 have been from UK Higher Education Institutions (HEIs)'' (IPO, p.4). The study reports an improved relationship between the HEIs in the UK and the business sector, as well as, an upward trend in published patents by HEIs in the UK with a business firm as a co-applicant. While this study indicates the highlights of some of the forms of IPs filed by HEIs, the results indicate the situation as obtained in the UK and thus may not necessarily depict the correct Zambian situation.

While Sterckx's (2011) focus was on giving insights on whether patenting and licensing of university research promotes innovation or undermines academic values, he also commented on the trends in academic patenting in the United States (US) and Europe. He notes that there was hesitation, in the 20th century, by universities in the US to patent and license innovations by their faculty. However, the situation changed in the 1980s in the US and 1990s in Europe, as there was an increase in academic patenting, licensing and university spin-off patents. This, according to Sterckx (2011) has the potential to

undermine academic research if the excessive emphasis is placed on listening bargaining activities and their associated costs. This supports the claim by Thompson (2012, p.1) that although patenting and licensing of academic innovations speed the transfer of discoveries to the public, ". . . exclusionary rights of patents and licenses may fence off areas of research, making the costs to science outweigh the benefits from increased technology transfer. . . ."

In Nigeria, a study by Bansi & Reddy (2015) explored the influence of Intellectual Property Police (IPP) on the creation of IPs by universities in South-west Nigeria. The study revealed that IPP made a positive significant contribution to the creation of IPs in Nigerian universities. The study recommended that South-west Nigerian University management teams must invest much in the making of IPP and make them available and easily accessible to all if maximum creation of IP was to be attained. This seems inconsistent with the case in Botswana, where Hirko & de Beer (2019) reported that despite the existence of national IP policies, Botswana universities did not record any single patent during the review period covered by their study. They reported that:

> Despite the existence of legal and institutional frameworks for IP, the role of IP to facilitate knowledge production and innovation in Botswana is quite limited. For instance, for two years (2016-07), a total of 11 patents applications were filed in Botswana with a single application by its residents. In the same period, only a total of 8 utility model applications were filed by residents in the country. Not a single university does appear on the list. Thus, the negligible figure registered for patents at a national level holds true for the contribution of Botswana's universities and colleges to IP-driven knowledge production and innovation

In South Africa, a study by Stofberg (2019), partly addressed the effectiveness of commercialisation of university-based IPs, by South African (SA) Universities in Western Cape, through Technology Transfer (TT). The study recorded that annually, SA universities contribute a low number of patents and a small number of spin-off companies. This study informed the current one on how to document filing trends of university-based IPs.

In China, where formal IP registration was first recorded in the 1980s, ". . . the number of patent applications filed by Chinese universities has increased rapidly, exceeding 13,000 in 2004. . ." (Guo, 2007, p.1673). This was attributed to the increasing number of IP-related awareness programmes. Guo (2007, p.1673) further reports that despite an increase in the number of patents filed by Chinese universities, most of them are without IP policies and therefore concludes that such an increase in academic-related patent filings may only "reflect a trend for researchers and institutions to use patents as a way of enhancing their reputations, rather than for transferring or commercializing technology. This study touches on what the current study sought to address in terms of unvirsity-based IPs sought and the factors affecting such trends.

2.5. Summary

This chapter demonstrated how the resource-based theory was fit for purpose in the exploration of university-based IPs in Zambia. The chapter showed how tangible and intangible resources fed into institutional properties, in this case universities, and how these properties influenced each university's competitive advantage depending of the status of asset protection. The chapter briefly accounted for the history of IPs and the influence of the 1980's Bayh-Dole was enacted influenced commercialization of publicly

funded research and development of university IP policies in the US and several other nations around the globe. Additionally, the review considered the IP legal framework in Zambia which is largely influenced by the national IP policy. The review also touched on studies related to filing of university-based IPs and factors that influence such filings.

CHAPTER 3 METHODOLOGY

3.1. Introduction

This chapter presents the methodological issues that were considered and applied when conducting a study on the *Protection of University-based Intellectual Property in Zambia*. Since the study sought to describe the status of a particular phenomenon (i.e., university-based IP), a descriptive research approach was employed. Specifically, a case study design guided the process of this research as it helped in defining the specific phenomenon to be described. Thus, the study described the trends in filing and registration of university IPs in Zambia and explored factors influencing the documented trend. The case study approach also allowed the researcher to review documents as it supports the collection of data through document review. The design was also fit to allow the research to employ key informants in the data collection process to help in describing the phenomenon in detail.

3.2. The Research Design

The subject of university-based IPs is underexplored in Zambia. As such, the study relied on an explorative descriptive approach and treated understanding the phenomenon of university-based IPs as a case for in-depth exploration. Thus, the case study design was perfect fit as it enabled the research to explore the depth of the phenomenon of university-based Intellectual Property (IP). Rather than focusing on exploring generalizable facts, the case study is usually aimed at unearthing interesting cases that challenge assumptions, add complexity, or reveal something new about a research problem (McCombes, 2019). Thus, the case tried to benchmark evidence of filing and registration of trends of university-

based IPs to challenges and/or validate the assumption in the national IP policy that such efforts were low. The study used this particular design to describe the underexplored status of university-based IPs in Zambia to reveal something new about the subject and propose the way forward.

3.3. Population and Sampling

The study mostly relied on secondary data sources, from PCRA, to document forms of IPs that universities sought protection, document the trend of filing and registration, and draw comparisons of filing and registration based on specific IPs. One major advantage of using secondary data is the breadth of data available. Many of these data sets tend to be longitudinal as they are collected from the same population or data sources over several different time periods. This allows researchers to look at trends and changes of phenomena over time. To supplement secondary data, primary sources were considered in form of key informants from the five universities that had records at PACRA were. Thus, the population included all registered Zambian universities that had IP records at PACRA offices and all key informants that were responsible for IP issues from the said universities. This was because for a purpose as the study focused filing and registration trend and thus, the inclusion of universities with no registered IPs would not have added value to the purpose of this study. It is for this reason that PACRA, the Zambian IP office, was purposively sampled. From the PACRA records, two (2) public universities and three (3) private universities were found to have had registered IPs. Therefore, all five universities were purposively sampled and similarly, key informants from PACRA and selected universities were purposely sampled. Thus, the sample included two (2) officers from PACRA and a combined nine (9) key informants from two (2) public universities

and three (3) private universities. The sample size, which was determined by the principle of data saturation, was eleven (11). Saturation of data was arrived at when a pattern of responses was developed by key informants and nothing new was coming up specifically for objectives 3 and 4.

3.4. Data Collection Instruments

Two data collection instruments were used for this study. To document the forms of University-based IPs and the trends of filing and registration, a document review checklist was used. The instrument was used to record the forms on IP filed by Zambian universities, year of filing and approval and this helped in create a data set for trend analysing from archival PACRA documents. To document factors that influenced the filing and registration trends of university-based IPs, a semi-structured interview guide was used. This was to allow the researcher to not strictly follow pre-designed questions but allow the respondents to move with their flow. This instrument also helped in probing for more explanation from the respondents.

3.5. Data Collection Procedure

This study, using a document review checklist, collected data from PACRA records and information systems. To access such records, consent was sought from relevant authorities. An introductory letter from the researcher, explaining the details of the study, in addition to a letter from the Africa University ethics committee was submitted to the Registrar's office at PACRA to be allowed to collect data from their records and from selected key informants that were directly involved in IP registration process. The reviewed documents had records of filing and registration for a period of 11 years from 2010 to 2021. The same process applied to the five (5) universities that had registered IPs

at PACRA. A review of their documents was done to crosscheck with the data collected at PACRA.

Using an interview guide protocol, semi-structured interviews with key informants from all the five (5) universities (herein nicknamed as Public1, Public2, Private1, Private2 and Private3) that had registered IPs were conducted. This was to allow partially formalised interviews with the participants by allowing them to dictate the flow of the discussion without necessarily strictly following the order of the questions in the interview guide.

3.6. Analysis and Organization of data

To document trends of filing and draw comparisons, the forms of IPs and their year of filing and registration were entered in Microsoft excel to create a data set. Line graphs were used to compute trends in filing, filing forms per year and draw comparisons of filing based on the forms of IPs filed. Records of research activities, publications and IP asset protection from the sampled institution were presented in frequency tables and these helped in enriching the description of trends and forms of IPs. The study further employed thematic analysis for qualitative data. A constant comparative analysis of interview transcripts, which commenced during data collection, was assisted in developing patterns and creating themes. This process helped to establish the forms of IPs and IP protection sought by universities, describe the filed registered university-based IPs and to describe factors influencing the filing and registration trends as well as explain the proposed way forward from key informants.

3.7. Ethical Consideration

Before data collection commenced, the Africa University Research Ethics Committee (AUREC) cleared the proposed study. The researcher then proceeded to seek consent from the relevant authorities from PACRA and the five (5) universities involved. To ensure confidentiality of the data collected, relevant authorities were saved with a note explaining the details of the study and its main purpose which was purely academic. The researcher further committed to the fact that if the findings of the study were to be published, consent would be sought from PACRA and from all universities that were part of the unit of analysis.

3.8. Summary

This chapter presented methodological issues in the study on the *Protection of University-based Intellectual Property in Zambia*. The chapter detailed how explorative the study was and picked a case design to understand the phenomenon of protection of University-based IPs in-depth. The chapter justifies the selection of 5 universities which was for a purpose as the inclusion criteria considered only those universities that had records of filing at PACRA. The chapter also detailed aspect of the methodology which include data collection instruments, data collection procedure, data analysis and organisation and ethical consideration

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1. Chapter Overview

This chapter presents the findings of the study on the protection of university-based intellectual property in Zambia. Quantifiable data were organised and presented using descriptive statistics in form of line graphs for trends analysis and frequency tables for content analysis. Qualitative data were subjective to a constant comparative analysis to generate patterns and create themes data are presented as guiding headings for analysis. Each piece of finding was then discussed using literature related to the study and the provisions of the Zambian national intellectual property policy. Furthermore, the data analysis, presentation and discussion were guided by the following research questions that were drawn from the research objectives:

v. how are the filing and registration trends of university-based IP in Zambia?
vi. what are the forms of university-based IPs that Zambian Universities seek formal protection on?
vii. What factors influence the filing of University-Based IPs in Zambia?
viii. What is the way forward for university-based IPs in Zambia?

4.2. Filling and registration trends of university-based IPs in Zambia

To document the filing and registration trends of university-based IPs in Zambia, a document review of records from PACRA was conducted. The review was confined to a period of 11 years, from 2011 when, according to available records, the first university-based IP was filed and registered to 2021. The study revealed that only five (5) Zambian universities had registered IPs at PACRA out of the 62(53 private and 9 public) registered

Zambian Higher Education Institutions (HEIs) (HEA, 2021). Furthermore, the study revealed, as demonstrated in figure 2 below, an unimpressive trend of filing and registration of IPs by the same five (5) Zambian universities that had records of filing and registration within the period of review (11years).

Figure 2: filing and registration trends from 2010-to 2021

Findings of the document review, as shown in figure 2 above, show that the filing and registration of university-based IPs in Zambia commenced in 2010 by one (1) university. However, the succeeding three years (2011-2013) saw no filing and registration of any IPs by any Zambian university. The figure further shows that three (3) universities filed and registered some of their IPs in 2014 and this was succeeded by a 2-year dry spell until 2017 when four (4) universities filed and registered their IP assets. The next filing, as indicated above, was in 2019 by one university and the last one in 2020 by one university. Conclusively, the graph demonstrates that the period between 2019 and 2010 had a

constant trend of filing and registration of university-based IPs. Only 5/11 years of the period of review recorded some filing and registration activities of university-based IPs by Zambian Universities.

The above finding, where only a few universities had contributed to the filing and registration of their IPs, is not dissimilar to the Zimbabwean case. As Rumbidzai Muzira & Maupa Bondai (2020, p.15) reported, "A review of filing statistics from institutions of higher learning in Zimbabwe between 2016 and 2018 indicated the dearth in the filing as only four out of 54 institutions had IP filing data." The remaining 50 universities filed no IP.

This similarity has two implications. Firstly, while the period of review for the Zimbabwean case was 3 years, this study considered an 11-year period in which the three years of the Zimbabwean case is covered. As such, there is a possibility that the Zimbabwean and Zambian cases would be different if the review period was the same and covered the same years. Secondly, the similarity may speak to the status of IP registration by the countries in the Sub-Saharan context. As such, it is also possible that the situation speaks to the real and current situation in the two nations concerning university-based IPs. This argument also cemented yet another Sub-Saharan case of Botswana where the country recorded a total number of 11 patents and 8 utility models within the period of two years (2016-2018). However, none of these patents and utility models was a university-based product (Hirko & de Beer, 2019).

The study further documented the total number of University-based IPs filed each year. A line graph was used to show the trend of filing as presented in figure 2 below:

Figure 3: Number of University-based IPs filed per year from 20110-to 2021

Figure 2 above presents a trend of the actual number of IPs filed and registered within 11 years. It was revealed, as indicated above, that from 2010 when the first University-based IP was filed and registered at PACRA, there was no record of filing for 3 years until 2014 when 12 university-based IPs were registered and filed. In 2017, after 2 years of no IP filing and registration activity by any university, a breaking record of 16 IPs was made. There was no activity of filing and registration of university-based IPs in 2018, a record that was followed by one filing in 2019 and another in 2010. The preceding finding seems to speak to the generally low and inconsistent trend of filing and registration of IPs by African universities. African universities, as confirmed by published evidence from a few studies (Bansi & Reddy, 2015; Hirko & de Beer, 2019; Stofberg, 2019) do not contribute much to the patenting subject and there is a dearth of research reports and publications on the protection of University-Based IP at African national and regional IP offices.

The low filing of university-based IPs, revealed by this study, contradicts the European case where five per cent (5%) of the patents filed at the European Patent Office (EPO) as of 2015 come from universities. Additionally, the study revealed ". . . the number of patent filings, in absolute as well as relative terms, has in-creased over the last 20 years, which is even more pronounced for universities than for public research institutes… (Dornbusch and Neuhäusler, 2015, p.31)", a scenario attributed to the growing interest by universities and public research institutes to claim Intellectual Property Rights (IPRs) by their employees.

Furthermore, objective one (1) sought to draw comparisons in terms of the protection sought, trends in filing and the status of the university involved. Figure 4 below summarises the results

Figure 4: comparisons of filing trends per IP form

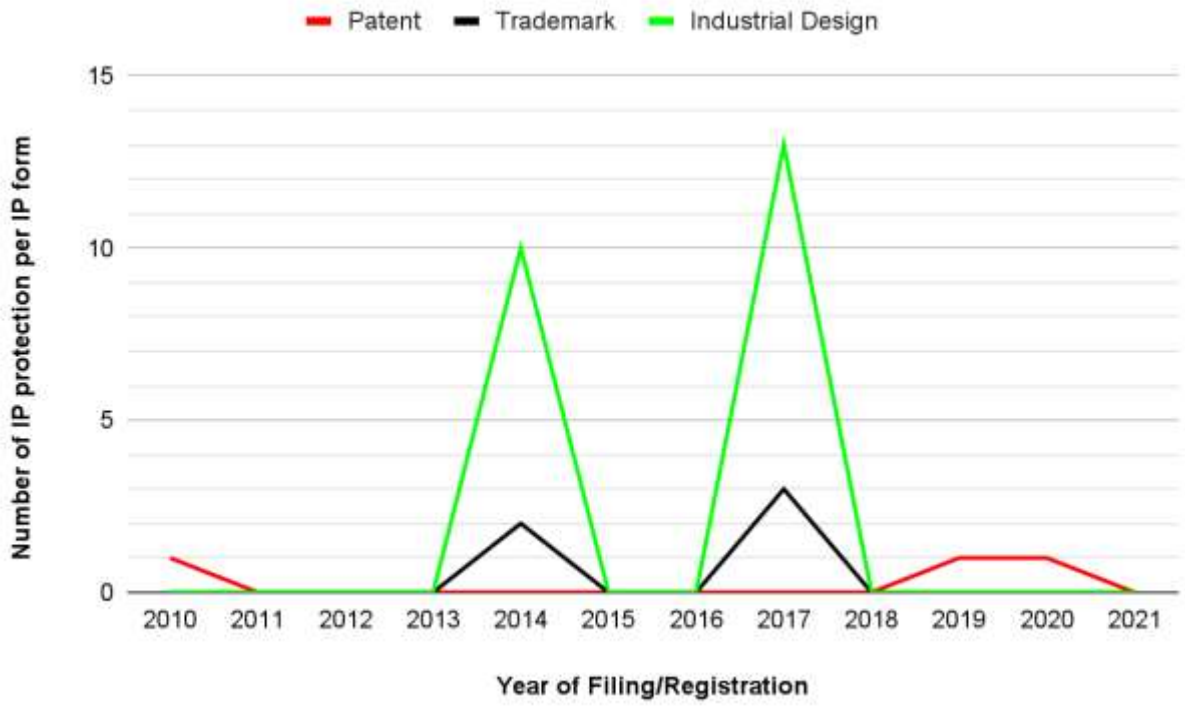


Figure 4 above demonstrates the trends of filing and registration of university-based patents, trademarks and designs for 11 years. While there was generally a low trend of filing and registration of University-based IPs, it can be noted from the figure above that design protection dominated with 10 and 13 successfully filed and registered designs in 2014 and 2017 respectively. Patent protection remained stagnant from 2010 when the first one was filed to 2019 when a second university obtained a patent for their invention. The latest patent was filed in 2020 by the same university that registered the first-ever patent in 2010. Although the filing of trademarks remained unimpressive, it was second to design protection as the 11-year period saw five (5) trademark registrations from the five (5) universities.

The study further unearthed a variation between private and public universities in what they sought protection as presented in table 1 below:

Table 1: Year, university status and form of IP protection sought by Zambian Universities

Year	Uni. Status	Trademark	Patents	Designs	Total IPs
2010	Public2	0	1	0	1
	Total	**0**	**1**	**0**	**1**
2014	Public1	1	0	10	11
	Private1	1	0	0	1
	Total	**2**	**0**	**10**	**12**
2017	Public2	1	0	13	14
	Private2	1	0	0	1

	Private3	1	0	0	1
	Total	**2**	**0**	**1**	**16**
2019	Public1	0	1	0	1
	Total	**0**	**1**	**0**	**1**
2020	Public2	0	1	0	1
	Total	**0**	**1**	**0**	**1**

Table 1 summarises findings, from PACRA, on the contribution of public and private universities to the filing and registration of University-based patents, trademarks and designs. The results indicate that while the two (2) public universities sought the protection of their IPs as patents, trademarks and designs, the three (3) private universities only sought the protection of their trademarks. There were no records of patent and design registration by any of the three private universities. This finding confirm the assertion in the Zambian national IP policy that the:

> . . . level of technology transfer and commercialization of IP assets in Zambia remains very low. The review established that support structures to promote commercialization of IP rights - such as technology transfer offices, university startup companies, technology incubators, prototype development facilities as well as science and industrial parks, are weak or lacking. . .” (MoCTI, 2020, p.5)

It can also be noted from the findings that even though the filing trend was generally low for Zambian universities, the situation was even worse for private universities as all of them (3) did not have institutional IP policies. This speaks to the claim by MoCTI (2020, p.5) that:

> . . . . Lack of institutional IP policy to guide on issues of ownership, benefit sharing, university-industry linkages and the lack of technology transfer policies to guide transfer of new technologies from outside into the country has compounded the situation. Further, there is limited use of intellectual property in the public domain.

Additionally, this current study's finding is partly in congruence with the results of the study by Stofberg (2019) that partly addressed the effectiveness of commercialisation of university-based IPs, by South African (SA) Universities in Western Cape, through Technology Transfer (TT). The study recorded that annually, SA universities contribute a low number of patents. However, the records of university-based IPs by universities in the Western Cape report a small number of spin-off companies, a situation that was not the case for Zambia as per the findings of this study. However, the result of this study seems to be consistent with the Indian case where Ravi and Janodia (2021, p.787) concluded that:

> . . . on analyzing the results, the universities governed under state or central government are consistently performing well in terms of patent applications filed and number of patents granted. This is because for Zambia, only two public universities, which are government owned, attempted to protect not just their trademarks, like private universities, but also their innovations and designs through patent and industrial design laws, respectively.

4.3 Protected IPs and forms of Protection sought by Zambian Universities

The second objective sought to document the actual IPs that Zambian universities sought protection on. The forms of IP protection they sought supplemented this. Three (3) major categories of such IP and their related forms were discovered and discussed below:

4.3.1. Inventions/Innovations

From the PACRA document and record review, it was evident that certain Zambian Universities sought protection on inventions emanating from their research, going by the three registered patents. The study discovered that the first patent, which was filed and registered in 2010, involved a copper processor that could be used to recover copper and cobalt from a material sample. In 2019, as revealed by the document review, a second patent on an improved small-scale timber-drying kiln was sought and obtained. The latest university-based invention that sought patent protection was the 2019 body walk-in sanitiser and the applying university had been given a provisional patent.

The findings of the study seemed to suggest that some Zambian universities sought to protect their inventions, emanating from the research activities, as they sought the protection of such through patent laws. The three (3) registered patents were from two (2) out of the five (5) universities that had records of filing and registration at PACRA. However, the situation is unimpressive, especially in the area of academic patents and contradicts the case of Brazil as the study by Silva et al, (2017, p.531) reported that the ". . . . Brazilian academic sector has contributed significantly to technological development when measured by patents, considering that the academic sector accounts for 19.5 per cent of total applications with a Brazilian priority, published during the 2002-2012 period."

4.3.2. Identities/Marks

The study further reveals that Zambian Universities sought the protection of their brand by filing and registering their identities. It was discovered that all the five (5) universities with registered IPs filed and obtained the protection of two brand identities and these were their names and their logos.

This scenario could still be considered unimpressive considering bearing in mind that Zambian has 62 legally recognised and registered universities. University trademark registrations is considered to be a branding strategy for the university not just locally but internationally as this also has an influence of the university ranking. Aalto University (n.d. pr.2) confirms this by stating that "to secure the university's internationalization strategy, we have been protecting our trademarks very widely from the start, both geographically but also in many different classes… The university also acknowledges the fact that university branding needs protection in the competitive world as they note:

> Our researchers and teachers have managed to build an internationally recognized university, but a recognized brand comes with a higher risk of trademark infringement. With all our trademark registrations in order, these cases have been easy to handle. . . (Aalto University, 2020, pr.3).

Zambian universities may learn from this revelation that they are in a competitive academic world and it was risk for them to operate without trademark protection. The registration of their marks may not only help them escape trademark protection but also brand them as a recognised university locally and globally as well as enhance their ranking odds.

4.3.3. Industrial Designs

The study further revealed that universities in Zambia sought protection for their designs. Of the five (5) universities that had records at PACRA, two (2) sought the protection of designs on their academic gowns and dresses. It was discovered from 2011 to 2013, no design was filed and registered by Zambian University at PACRA. The first filing and registration of university-based designs commenced in 2014 when one university sought

the protection of 10 designs of their academic gowns. The second and late registration was in 2017 when another university filed and registered 13 designs, all related to academic gowns and/or dresses. It was noted that no other form of industrial design was filed and registered by a Zambian university that did not relate to graduation gowns or academic dresses.

This study reveals three main forms of IP protection that Zambian universities sought for their IPs and these are patents, identities/marks and industrial designs. This is not very different from the European where the study by IPO (2020, P.4) reports that ". . . 1.1% of published patent applications, 0.3% of [trademark] registrations, 0.1% of design registrations with the IPO during the period 1999 – 2018 have been from UK Higher Education Institutions (HEIs).'' However, none of the Zambian universities, as per the findings of this study, sought other IP protection than patents, trademarks and industrial designs. This is not the case in Africa where even though the filing of patents was low, a few university spin-off firms were born out of university-based IP (Stofberg, 2019).

Although the current study finds report low filing levels, the results still seem be in congruence with the case of University of Alaska Anchorage (UAA) in terms of forms IP protection sought by universities on patents. However, Case of UAA adds other forms as they that:

> . . . Of the 52 invention disclosures, many included students, and two were developed exclusively by students. 60 patent application filings and copyright filings have been completed. 13 patents have been issued that saw (Office of Research and Graduate Studies, n.d. par.3).

The Zambian case did not reveal any copyright-related filing from the archival data universities that were available at PACRA. The other notable difference is that the

Zambian case did not reveal any attempts of filling by university students, a situation that has implication further research to focus on students.

4.4. Factors influencing the filing of University-Based IPs in Zambia

Objective four sought to document factors that influence the filing and registration of university-based IPs in Zambia. To achieve this, semi-structured interviews with key informants from PACRA and the involved universities were conducted. The findings of the study attribute an unimpressive trend of University-based IP filing and registration to the following thematic factors:

4.4.1. IP Awareness

Findings from the interview on the factors contributing to the unimpressive filing and registration trends on university-based IPs pointed to the issue of IP awareness. The key informants hold the view that most students, lecturers and researchers have little or no knowledge of intellectual property, a situation that made them not seek IP protection for their research output and products. This partly confirms what Liswaniso (2020) reported, concerning academicians, that ". . . intellectual property is not taken seriously, as it is usually taken as an academic success rather than something that gives profits and other benefits. . ." The results also speak to the challenges outlines in the Zambian national IP policy. The policy recognises lack of public awareness concerning IP issues as a major problem in Zambia. This situation speaks to the general problem in Sub-Saharan nations. Commenting of the Sub-Saharan, IP awareness noted that:

> . . . Domestic applications for intellectual property rights are sometimes hindered by the lack of awareness of applicable rights or the inability to afford registration

fees. Some other factors affecting the records of intellectual property rights may include poor record keeping practices and lack of technical capacity and infrastructure at intellectual property registries.

The lack of IP awareness issues in Zambian did not spare Zambian universities, as per findings of the study, a situation that calls for awareness-rising campaigns and publicising the national IP policy.

4.4.2. Knowledge of Institutional IP policies

One major contributor to the low filing trend of University-based IPs, according to the findings, relates to institutional IP policies. While the respondents acknowledged the existence of IP policies in some Universities, they intimated that implementing such policies remains a challenge, partly because most students and lecturers do not know of their existence. This is consistent with the study by Liswaniso (2020) which revealed "the major challenge inhibiting policy implementation is lack of awareness . . . as most of the respondents revealed that they were not aware of the existence of the policy." However, awareness is an important component of policy implementation and without knowledge of the existence of the policy and its provisions, stakeholders cannot have direction on how to deal with the IPs they generate and or how to commercialise their innovations. That would adversely affect the filing and registration trends of university-based IPs.

4.4.3. Publication over commercialisation

Another theme that emerged from the interviews on the factors contributing to the low filing and registration of academic IPs relates to over-emphasis on research for publication and not commercialisation. The study unearthed the fact that lecturers and researchers engaged in research and consultancy for publication and promotion at the expense of the

commercialization of their research findings and/or products. This was also supported by a document review of reports on publications and IPs for certain universities. For example, Table 2 is an extract report of publications and IPs by 13 academic and research units of one (1) public university, herein referred to as public1, for the first quarter of 2021.

Table 2: Public1 Summary of Research projects and their associated products

School/Unit	No. Collaborative Research Projects	No. of Self-Generated Research	Presentations at Local and International Conferences	No. of Publications	Patents	Designs	Trademarks
Sch1	6	13	-	15	0	0	0
Sch2	10	0	-	20	0	0	0
Sch3	24	5	-	7	0	0	0
Sch4	13	5	-	1	0	0	0
Sch5	168		15	28	0	0	0
Sch6	7	22	-	16	0	0	0
Sch7	-	-	-	-	0	0	0
Sch8	11		0	12	0	0	0
Sch9	12	2	-	1	0	0	0
Dir1	23	0	0	1	0	0	0
Sch10	-	-	-	-	0	0	0
Sch11	25	2	-	27	0	0	0
Library	0	0	0	1	0	0	0

Inst1	0	0	0	5	0	0	0
Total	**299**	**49**	**15**	**134**	**0**	**0**	**0**

Table 2 above shows several research activities done by 11 schools (Sch#), 1 directorate (Dir#), the University Library and 1institute (Inst#) of the public1. All the involved units and schools were considered academic units and were expected to conduct research. It was revealed that public1 had a combined 348 research activities, in the first quarter of 2021, of which 229 were collaborative research and 49 self-generated research activities. While the findings of only 4 of the 348 (4%) research activities were disseminated and presented at various academic conferences, the findings of 134 of the 348 (39%) researches were converted into academic publications. However, no product or process generated from these research activities sought patent, trademark, and design protection. This scenario seems to contradict the aspiration of the national policy which seek to promote innovation, creativity and research and development through orienting ". . . universities, and other research institutions towards emphasis on protection and commercialization of research output rather that publication only" (MoCTI, 2020, p.8). Additionally, the current study's revelation on the focus for research for publication at the expense of commercialisation confirms the argument by Warenzak (n.d. par.4) that there is exists another patent issue that frequently occurs with patents in the university setting which relates to the impact that the push to publish has on patent rights as he notes:

> The nature of research institutions requires that professors, graduate students, and other researchers, in order to gain tenure, increase their reputation amongst the scientific community by publishing their research and its results in a continuous

and rapid fashion. However, the rush to publish research can have an adverse impact on patent rights. This is especially the case when the publication occurs before a patent application directed to the same information/inventive concept is filed. In such instances, the publication can be classified as a prior art disclosure that can prevent the acquisition of patent rights.

However, this particular finding of the current study is consistent with the Brazilian case where Dalmarco, Dewes, Zawislak, & Padula (2011, p.150) report an increase in scientific research output which were "not being effectively transformed into new technologies for products and services. . . " They further claim that research results from Brazilian universities ". . . are still far away from commercial applications, and due to the lack of IP expertise from inventors it is difficult to translate the academic result to the commercial world of patents" (Dalmarco et al., 2011, p.165).

From this, we can see that the Zambian contradicts the aspirations of the national IP policy. The focus is still on publishing for the sake of promotion. Less university-based research out results into protected IPs for commercial purposes.

4.4.4. IP ownership and/or authorship

The findings of the interviews suggest that there was a conflict of IP ownership and/or authorship between the HEIs and their member of staff and students involved in research, inventions, and innovations. Although key informants thought that a few universities that had IP policies clearly defined the issue of ownership and/or authorship, it was reported that most staff and students did not agree with the terms and conditions spelt out in the policies, a situation attributed to lack of stakeholder involvement in the formulation and implementation of the policy. This was reported to be the main demotivating factor

among staff and students, who knew about IPs and IP institutional policies, to actively and jointly file and register IPs with their universities. As such, some staff and students from Public1 and Public 2, as indicated by key informants, sought the protection of IPs and individuals and never wanted to associate their works with their university.

This finding seems to be in tandem with Warenzak (n.d. par.1-2) claims that:

> Ownership issues can vary tremendously when it comes to professors. For example, when professors move from university to university, their research travels with them. In such instances, joint ownership issues arise. In addition, professors can have agreements in place with the university that allow the professor to retain certain rights as well. However, in most instances, professors are required to assign their rights to the school.

Clear knowledge of the ownership and/or authorship of intellectual assets within the university is key. This affects how the benefits accrued from intellectual asset generation and protection between the university management or administration and the researchers and academicians. This situation has implication for policy making as it calls for participatory policy formulation and implementation process among university stakeholders.

4.4.5 Technology Transfer Offices

Findings from key informants suggest that the absence and/or dysfunctional university Technology Transfer Offices (TTOs) was another contributing factor to the low filing and registration levels of university-based IPs in Zambia. While the key informants acknowledged the presence of units responsible for technology transfer in the public universities, they were of the view that such units were ineffective and/or dysfunctional

as they were attached to general departments in charge of research, postgraduate studies and consultancy. This, according to the findings, rendered the technology transfer units ineffective and their works were overshadowed by that of other departmental units like research and consultancy. This claim was consistent with the findings of the document review for Public1 and Public2 where technology transfer were duties assigned to the Directorate of Research and Graduate Studies (DRGS) and Directorate of Research, Innovation and Consultancy (DRIC) respectively. Further, the claim that the works of other units in the departments where technology transfer units were housed overshadowed them seems to agree with the findings in Table 2 above, where there was no product or process from the findings of 348 research activities that sought a patent, trademark and design protection.

Further, key informants intimated that most private universities did not have technology transfer offices or units, hence the low filing and registration levels of their IPs at PACRA. This confirms the argument that ". . . TTOs' identity shaping strategies are incomplete and need to incorporate a wholly distinctive identity to complement and reinforce preliminary legitimacy claims made through conformance and manipulation (O'Kane, Mangematin, Geoghegan, & Fitzgerald, 2015, p.1). Additionally, the current study's results speak to the Brazilian case, as reported in the study by Dalmarco, et al. (2011, p.150) which concluded that:

> . . . Universities are facing difficulties in requesting and licensing patents based on scientific results, due to lack of commercial contact with companies and their limitations in adapting available technologies. The increase in scientific output is not being effectively transformed into new technologies for products and services, exposing the necessity for new policies to approach university-industry relations

This situation lays bare the need for TTOs to be effective. As such, they need to be independent TTOs that are committed to the commercialisation of academic knowledge.

4.4.6. Absence of IP policies in private universities

The study further discovered that the absence of institutional IP policies in private universities contributed to the low filing and registration trend of University-based IPs in Zambia. The document review revealed that of the 53 registered private universities in Zambia, only five have registered trademarks. None of these 5 universities, according to key informants, had any known and working institutional IP policy, a situation they thought was the major contributor to the filing and registration of IPs by Zambian private universities. This absence of IP policies relates to the cases in China universities. However, Guo (2007, p.1673) reports that despite an increase in the number of patents filed by Chinese universities, most of them are without IP policies and therefore concludes that such an increase in academic-related patent filings may only "reflect a trend for researchers and institutions to use patents as a way of enhancing their reputations, rather than for actually transferring or commercializing the technology."

4.4.7. Dearth of research findings on University-Based and/or academic IPs

Key informants further attributed the low levels of filing and registration of university-based IPs in Zambia to a seemingly little effort in research in the area of university-based IPs. This, according to them, was evident by the scarcity of published and/or easily accessible research findings on university-based IPs, specifically for Zambia universities, a situation that made it difficult for universities to appropriate the benefits of Intellectual property commercialisation. This finding raises a concern on the available of trained Zambian IP specialist whose research interests are on university-based IPs. This has on

implication on technology transfer and commercialisation of university-based intellectual assets. While it is appreciated that efforts to research on university-based IPs exist (such as those by Liswaniso, 2020 and Chalwe, 2017), the phenomenon of protection if such intellectual assets remain underexplored. The two studies focused on university-based IP policies and awareness of commercialisation approaches. This study adds to this by focusing on the actual filed and registered university-based IPs and factors influencing such filing trends. This scenario proves the need for research on university-based IPs.

4.5. Suggested way forward on University-based IPs in Zambia

Objective five sought to solicit suggestions, from key informants, on the way forward about university-based IPs in Zambia and on how to improve the filing and registration trend of such IPs. Six thematic areas emerged and are discussed below:

4.5.1. Intensify IP awareness interventions

One of the themes that emerged from the interviews relates to awareness issues. Although key informants generally agreed on the fact PACRA conducts IP awareness campaigns, they were of the view that such campaigns are insufficient, generic and focused less on university-based IPs. It was suggested that since universities are hubs of research and knowledge generation, PACRA, with the help of other IP practitioners, should develop and/or intensify deliberate IP awareness campaigns for universities, focusing primarily on university-based IPs. This, according to the findings, would help not only lecturers and students to gain knowledge on IP issues but also the universities themselves on how to leverage their IPs for commercial purposes.

4.5.2. Stakeholder Engagement/Re-engagement

The study further revealed that for University-based IPs to be appreciated by academic staff, researchers and students, Zambian universities already had institutional IP policies needed to re-engage their stakeholders in refining the perceived unfair content in the policy documents. Additionally, key informants suggested that for universities yet to develop such policies, a participatory policy-making process would need to be considered by first mapping all the stakeholders and engaging them at every stage of the policy formulation process.

As intimated by key informants, the two suggestions above would assist in developing and/or improving IP policies that would pump the sense of ownership in the stakeholders as they would reflect and represent their IP needs. Researching on IP technology transfer, Țîțu et al., (2017) intimate to the issue of ownership by noting that . . . "a university's rules on the conflicts of interests between academic teaching responsibilities and external activities have a positive effect on research and development contracts, licenses, and spinoff creation. . . ."

From the foregoing, we can note that the findings suggest development of university IP systems that would minimise conflict if IP interest among stokeholds. Such a participatory approach to IP policy formulation, management and implementation would reduce the conflict of IP ownership and/or authorship as terms and conditions would be defined and spelt out by all the stakeholders within the university environment and general higher education sector in such systems are also aligned to the national IP policy. Thus, policies must, according to Van Dusen (2013, p.6) be:

> . . . . Polices must be drafted in such a way to define ownership rights so that administrators, faculty, staff, and students my peacefully co-exist. In general,

university intellectual property policies cast a wide net in bringing a variety of works and inventions under the umbrella of the policy.

This re-emphasises the need for institutional IP policy as a strategy for minimizing conflict. Zambian private universities may therefore learn that IP policies are vital for the smooth running of the university.

4.5.3. Establish and/or reform Technology Transfer

A further suggestion by key informants was for universities that did not have technology transfer units to establish standalone Technology Transfer Offices (TTOs). For universities that had such units, as suggested by key informants, but attached to general departments with other units, a suggestion was made to detach such units from general departments and make them standalone TTOs. Key informants further suggested that university-based research products and processes that needed IP protection would then be submitted to the TTOs or departments for further action and not just end up in academic publications. These decentralized approaches were thought to have the potential to boost technology transfer works as works of other units like research and consultancy would not overshadow the departments if they were made standalone offices of departments. This agrees with Pronay, Keszey, Buzás, Sakai, & Inai (2021) study result that ". . . the internal embeddedness of a TTO within a university is the most important factor in determining a TTO's performance. A TTO's performance is positively affected by its marketing capabilities and social embeddedness."

4.5.4. Develop and/or improve Institutional IP policies

A suggestion to develop and/or improve institutional IP policies was made. Key informants thought that current IP policies, for universities that already had one, needed

to be revised to incorporate the voice of researchers, inventors and innovators. They further propose that if university-based IPs were to be appreciated, private universities, which are the majority, needed to develop institutional IP policies and implement the provisions of such policies.

4.6. Summary

This chapter presented and analysed the findings of the study. It unearthed the fact that universities in Zambia protect their inventions, identities and designs through patents systems and trademark and industrial designs pieces of registration. The chapter further analysed the unimpressive trend in the filing of the same university-based patents, trademarks, and industrial designs for a period of 11 years, starting 2010 where only 2 patents and 16 designs from two public universities were protected and were 5 trademarks from the 5 universities were registered. Among others, inadequate IP knowledge and policies, lack of institutional policies in private universities and inexistence and/or ineffective technology transfer officers negatively affected the trend in filling and registration of university-based IPs.

CHAPTER 5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter presents a summary of the study on the *protection of universe-based intellectual property in Zambia*. Using the resource-based theory, the study treated the phenomenon of IP protection as a case for exploration to understand the trends and registration of university-based based IPs by Zambian universities. The study was motivated by the assertion that there were low filing levels of IPs in Zambia, as contained in the Zambian national IP policy and with the dearth of evidence in in filing on university-based IP filing and registration. The situation, as detailed in the summary of key findings below and from which recommendations are drawn, was unimpressive. The chapter summarises key findings and their implications, pinpoints recommendations and suggests areas for further research.

5.2. Summary of Research

The summary of the research will address the motivation for the study as well as the theoretical lens used. It shall also highlight key findings based on the research the four research questions which were:

i. how are the filing and registration trends of university-based IP in Zambia?
ii. what are the forms of university-based IPs that Zambian Universities seek formal protection on?
iii. What factors influence the filing of University-Based IPs in Zambia?
iv. What is the way forward for university-based IPs in Zambia?

5.2.1. Motivation and theoretical underpinning

The Zambian national IP policy alludes to the general assertion that the filling of intellectual assets in Zambian is low. The policy also acknowledges the fact that universities in Zambia play an important role in research and generation of intellectual assets which could be beneficial for the country. Although there were various pieces of literature on the general field of Intellectual Property (IP) in Zambia, little was documented on the protection of university-based IPs for Zambian public and private universities. The question arose on what exactly was the contribution of universities in Zambian to the generation of publicly disclosed intellectual through asset protection in exchange for full disclosure. The focus was on universities as they were acknowledged, in the policy, to be among the main institutions conducting public research. This scenario led to the assumption that the protection of university-based IPs could not have been impressive, seeing to it that the policy alluded to the low filing of IPs in Zambian, a country that has more than 50 registered and legally recognised universities. What was clear, however, was the fact that Zambian universities have been engaged in teaching, researching, innovating as well as providing community service. The question arose on whether these universities protected their intellectual properties, hence the motivation to conduct this study.

The study relied on the resource-based theory to understand how universities harnessed or failed to harness their potential from their intellectual properties. The theory assumes that every organization has tangible and intangible resources (assets). While tangible assets include physical resources that can be bought by every firm such as land, capital, products, among others, with less or no competitive advantage, intangible resources

usually refer to items, processes and/or concepts that may not necessarily have physical value but could be core to the firm's survival and may be owned by them. Such assets may include the firm's reputation, its brand and some secrets, among others, that are distinct. The theory further assumes that it is these (intangible) resources that should be considered 'strategic' resources, as they provide a competitive advantage to every firm. Bearing in mind that Zambian universities operated in a competitive environment, the study sought to explore the protection of University-based IPs.

5.2.2. Filing Trends of IPs by Zambian Universities

The first research question sought to explore how the trend in filing and registration of university-based IPs was in Zambia. Relying on archival evidence from PACRA, the study established that the filing rate of university-based IPs in Zambian was relatively low. Of the 62 (53 private and 9 public) legally recognised Zambian universities, only five (5) Zambian universities had registered IPs at PACRA from 2010 when the first university-based IP was registered to 2021. Additionally, the study unearthed an unimpressive trend of filing and registration of IPs by the same five (5) Zambian universities as only 2 out of 5 have filed their IPs at different intervals with the remaining three only having a once-off record each. Some years within the 11-year review period recorded no filling of an IP by a Zambian university. This confirms the assertion in the Zambian national IP policy that there is a general lack of knowledge and understanding of protection of intellectual assets in Zambia and contracts the aspirations of the policy to orient universities and other research institutions about the same. The results further revealed that both public and private universities are not doing well in the protection of their intellectual assets.

Additionally, this research question endeavoured to compare the filing and registration trend based on specific IPs that Universities in Zambia sought protection on. It was found that while the two public universities had the protection of their IP from the three thematic areas of invention, identities and industrial designs, all the three universities only sought the protection of their names and trademarks. Additionally, the filing trend suggested that much of what universities sought protection on were identities in terms of names and trademarks as all the five universities had registered their names and trademarks. Industrial design protection followed with two public universities registering and protecting their academic gowns, the same university that had a combined total of 3 patents to them as a protection of their inventions.

5.2.3. Forms of IPs Zambian Universities protected

The second research question sought to address what form of IPs Zambian Universities sought formal protection on. This was explored through oral interviews with key informants from sampled universities and archival records from PACRA. The study grouped what Zambian universities protected into three (3) thematic areas: i) inventions; ii) identities; and iii) designs. On inventions, it was discovered that only two Zambian universities, of which both were public universities, had obtained patent protection for their innovations, with a combined total of three (3) patents. The study also revealed that all the five universities that had records at PACRA had registered designs that were the university names and trademarks. On designs, two public universities had protected their academic gowns. Despite Zambian having 62(53 private and 9 public) legally registered and recognised universities, as per the provisions of the Higher Education Act No.4 of 2013 of the laws of Zambia, only five (2 public and 3 private) sought legal protection of

their intellectual assets at PACRA via patent systems, trademark and industrial design laws. The remaining 57 had not neither filed nor registered any of their IPs, a concern that call for further research on how such universities obtained registration with Higher Education Authority (HEA) if even their brands and trademarks are unregistered at PACRA.

5.2.4. Factors influencing the filing of University-based IPs in Zambia

Research question 3 sought to establish factors that influenced the filling and registration trends of university-based IPs in Zambia. The study revealed that the IP awareness levels among university administrators, academics and researchers were low. Other factors reveal include lack of IP policy for private universities; highly decentralised or absence of technology transfer offices; research for publication and not commercialization; unfair research and IP policies for public universities; and a dearth of research undertaking on protection of university-based IPs in Zambia. This was more so for the three private universities that all had no institutional IP policies. Although the two public universities had institutional IP policies, much focus by researchers and academics was on research for publication and promotion at the expense of research for commercialisation and as such, less knowledge of the protection of IPs was noted. For a few academics and researchers that had knowledge of IPs, conflict of ownership and authorship of IPs between them and the institution arose as they thought the universities demanded more than they should from the benefits accrued from such IP protection and commercialisation. The other factor related to absence and/or dysfunctional university IP policies to facilitate for protection of university-based IPs

5.2.5. Suggested way forward on the protection of university-based IPs

Research question 4 solicited respondents' suggested way forward concerning the protection of university-based IPs in Zambia. It was suggested that PACRA IP officers could raise awareness levels for university-based IPs through deliberate awareness interventions. Added to that was a suggestion for stakeholder engagement and re-engagement that would result in a consensus between university administrators and academics on the content of institutional IP policies for a win-win deal. Key informants also suggested the establishment of independent and/or decentralisation of university Technology Transfer Offices (TTOs) to allow them to work independently without having technology transfer roles engulfed into other roles when such offices are part of other units of the university. There was also a suggestion to invest in research on IP issues in the Zambian higher education sector.

5.3. Conclusions

The study used the resource-based theory to understand the phenomenon of IP protection by Zambian Universities. It was discovered that although Zambian universities had protected some of their inventions, identities and designs, the rate at which they filed and registered their IPs was still very low, a situation that confirms an assumption in the national IP policy that the filling of intellectual assets in Zambia is low. This scenario is not in line with the resource-based theory that advocates for firms to harness their potential from intangible assets for them to remain competitive. As it was revealed by the study, 57 out of 62 legally recognised universities did not exploit the potential of their intellectual assets through IP protection and commecialisation. Only 5 universities protected their IPs but non-recorded attempts to commercialize via licensing their intellectual assets or

facilitating development of spin-off firms from their intellectual assets. Several other factors affected the filling and registration trends of university-based IPs by Zambian universities but key among them includes low IP awareness levels among administrators, academics, and researchers; absence of IP policies in private universities; and perceived unfair IP policies in public universities. It can therefore be concluded even though some Zambian universities protected some of their IPs, none of them seemed to have relied on intellectual properties as assets for competitive advantage, as per the resource-based theory, a situation that could be partly be attributed to the reason why the Zambian university ranking levels remain unimpressive and global, regional and international level.

5.4. Implications

This section considers the implications of the findings under two (2) headings as informed by factors that affected the filling trends as presented in chapter 4.

5.4.1. Implication on filling trend

As noted earlier on, most academics focus on research for publications and not commercialisation. The knowledge levels of IPs were also discovered to be low among researchers and innovators. The case was worse for private universities that did not even have IP policies. This scenario has an implication on the filling trend as most innovations and inventions that could have sought protection as patents, utility models, and trademarks could end up only as academic pieces of publications and benefit only from the copyright protection common in literary and artistic works. This situation also has implication for the implementation of the national IP policy which aspires to, among other things, promote intellectual asset protection, commercialisation and public disclosure by

orienting Zambian universities and other research institutions on IP asset protection issues. The findings would also call for a re-look, by PACRA and the Republic of Zambia, on how much their IP awareness and orientation campaigns influence or fail to influence IP policy direction in institutions of higher learning in Zambia.

5.4.2. Implication on forms and types of IP protection

As revealed by the study, Zambian universities only protected inventions, identities and designs. Since awareness levels even among university administrators were low, it is possible that other works of the human intellect generated within the universities, which could have sought IP protection, could have remained unprotected. It is possible that some works could have been protected as utility models and trade secrets while some would have been licensed for commercial value. This also has an implication for the comparisons that could be made on the filling trends. This scenario also have influence on what awareness interventions PACRA needs to focus on. It would appear like the only focus is on trademarks, industrial designs, and patents. However, the nature of works in universities is such that they focus on researching on several issues from different sectors of the society. Such research undertakings and university works may generate other IP assets that can sought other protection than patents, trademarks, and industrial designs. Universities in Zambia, for example, engage in research on alternative medicine and on agricultural issues. It is possible that innovations coming from these research focus areas can sought protection under traditional or indigenous knowledge and plant variety pieces of legislation as per the Protection of Traditional Knowledge, Genetic, Resources and Expressions of Folklore. Act. No. 16 of 2016 and the Zambian Plant Breeder's Rights Act, 2007 respectively.

5.5 Recommendations

This study makes the following recommendations as informed by the findings:

1. PACRA should plan deliberate awareness-raising interventions for university administrators, academics and researchers on the process of filing and registering university-based IPs as well as on the types and forms of works that universities should seek formal protection over;
2. Zambian universities should re-align and/or develop their institutional IP policy based on the provisions of the national IP policy;
3. Zambian universities should ensure that IP issues fall under an independent TTO as opposed to assigning such roles to a unit involved in other things. This form of decentralization will assist in ensuring that the process of filing and registration of university-based IPs is not engulfed in other duties and ignored.
4. Zambian Universities must develop IP policies that reflect the interest of both the employers and researchers/academics to avoid demoralizing creators and innovators;
5. The Higher Education Authority to harmonise their registration criteria with PACRA for universities to have registered trademarks;
6. Zambian universities invest in IP-related research to harness the potential of IPs in making the universities competitive.

5.6. Suggestions for Further Research

This study focused on the protection of university-based IPs in Zambia. It did not consider exploring privately protected IPs by academics, researchers, and students. Future studies

should consider analysing whether or not academics, students and researchers protect the works they generated in the universities privately; the reasons for such undertakings; and the challenges they encounter in the process.

Relatedly, the study recommends for a trend analysis study of IP filing and registration based on the sector. This would help map out the sector currently contributing much to IP asset protection. This will help in comprising universities and other sectors see how better, worse, or similar the situation is for universities as compared to the other sectors and can also assist universities to draw lessons from sectors doing fairly well.

Since there is evidence that most academics focus much on research for publications, future researchers could consider carrying out a mapping study to establish potential innovations, inventions and works in published works that can seek other protection than just copyright. This would set the basis for awareness-raising and the potential commercialisation of higher education research in Zambia.

The higher education sector in Zambian categories and that is i) university level; ii) college level; and ii) technical and vocation level. This study focused on one section of the Zambian education sector, university level as it sought to explore protection of university-based IPs in Zambia. Future researchers can duplicate this study but broaden the focus to the general Zambian higher education sector for comparative purpose based on the level of the higher education section. Attentively, future research can focus their studies on a single case from the 2 (college level or technical and vocation level) unexplored sectors of the Zambian higher education section for in-depth understanding of the situation per selected sector.

Another area future researchers can focus on is the feasibility of development of IP policies by private universities in Zambia. As the study revealed, none of the 3 private

universities that had registered their IP at PACRA had institutional IP policy documents. Understanding the situation from the remain 59 legally registered and recognised private universities would help and set the based for exploring the absence of IP policies in private universities and how such affected IP issues at institutional level.

With the noted challenge of conflict of IP ownership between university administrators and academics, future researchers may consider analyzing the current IP institutional policies for Zambia and for universities in regions where university-based IPs are valued for comparison sake.

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APPENDICES

APPENDIX 1: DOCUMENT REVIEW CHECKLIST

Items to review document

i. Universities with field and registered IPs

ii. Forms of IP protections by Zambian Universities (e.g. available parents, trademarks, copyright etc.

iii. Year of filing

iv. Year of registration

APPENDIX 2: INTERVIEW GUIDE FOR KEY INFORMANTS

1. What is your main role at this university?
2. How long have you been working here?
3. How would describe the status of intellectual property at this institution?
4. What much does your University seek the protection formal of IP
5. What forms of intellectual property have this institution sought formal protection on?
6. Which particular protections do they seek?
7. How would you describe the filling trend of IP at PACRA by your institution?
8. How would you describe the knowledge of lecturers and researchers at this institution in seeking protection from innovations coming from their university work?
9. What opportunities does this university have in the area of protection of its IPs?
10. What challenges does this university encounter in the process of protecting its IPs?
11. What measure would you recommend to mitigate the challenges stated?

APPENDIX 3: CONSENT FORM

My name is Davies Phiri, a final year (Master in Intellectual Property) student from Africa University Zimbabwe. I am carrying out a study on the **protection of University-Based Intellectual Property In Zambia**. I am kindly asking you to participate in this study by answering this question and/or responding to the interview questions.

The purpose of the study is to explore the protection of University-Based study IP in Zambia by focusing on formal filing trends and possible factors relating to such trends. You were selected for the study because of your works in teaching and researching and/or as a key informant. If you decide to participate in this study, you will be required to answer a questionnaire and or respond to the interview guide. This may need a maximum of 45 minutes of your time and at your own convenience.

There are no socio-economic, moral, and political risks associated with your participation and should there be one identified by you, kindly alert the researcher and you are free to withdraw from the study at any time. In addition, no financial benefits may arise from this study and as such, participation is purely on a voluntary basis.

The findings of this study will be will not be disseminated without member checking and no name will be disclosed in the findings to ensure your identity is protected. Permission will also be sought before publishing the findings.

Participation in this study is voluntary. If a participant decides not to participate in this study, their decision will not affect their future relationship with the researcher and their university. If you chose to participate, you are free to withdraw your consent and to discontinue participation without penalty. Therefore, before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

If you have decided to participate in this study, please sign this form in the space provided below:

---------- ----------

Name of Research Participant (please print) Date

Signature of Research Participant or legally authorised representative

If you have any questions concerning this study or consent form beyond those answered by the researcher including questions about the research, your rights as a research participant, or if you feel that you have been treated unfairly and would like to talk to someone other than the researcher, please feel free to contact the Africa University Research Ethics Committee on telephone (020) 60075 or 60026 extension 1156 email aurec@africau.edu

Name of Researcher ----------

APPENDIX 5: ETHICAL APPROVAL

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320, Mutare, Zimbabwe, Off Nyanga Road, 164 Mutare Tel (+263-20-60075/60026/61611 Fax (+263-20-61785 website: www.africau.edu

Ref: AU1925/21 25 February, 2020

Davies Phiri
C/O CBPLG
Africa University
Box 1320
Mutare

RE: PROTECTION OF UNIVERSITY-BASED INTELLECTUAL PROPERTY IN ZAMBIA

Thank you for the above titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following:

a) Research proposal
b) Data collection instruments
c) Informed consent guide

- **APPROVAL NUMBER** AUAU1925/21
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** February 25, 2021
- **EXPIRATION DATE** February 25, 2022
- **TYPE OF MEETING** Expedited
  After the expiration date this research may only continue upon renewal. For purposes of renewal, a progress report on a standard AUREC form should be submitted a month before expiration date.
- **SERIOUS ADVERSE EVENTS** All serious problems having to do with subject safety must be reported to AUREC within 3 working days on standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents).
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)
APPROVED
P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU – A/AUREC ADMINISTRATORFOR CHAIRPERSON, AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE

APPENDIX 5: PERMIT APPROVAL LETTER

THE UNIVERSITY OF ZAMBIA
OFFICE OF THE REGISTRAR

Great East Road | P.O Box 32379 | Lusaka, 10101 | Tel: +260-211-251 593
Fax: +260 -1-253-952 | Email: registrar@unza.zm | Website: www.unza.zm

23rd March, 2021

Mr. Davies Phiri
University of Zambia
School of Education
Department of Adult Education and Extension Studies
P.O Box 32379
LUSAKA

Dear Mr. Phiri

RE: PERMISSION TO CONDUCT RESEARCH AND COLLECT DATA FROM THE UNIVERSITY

Reference is made to your letter dated 18th February 2021 and received on 22nd March 2021 regarding the above mentioned subject.

Approval is granted for you to conduct research and collect data at the University of Zambia, for your research entitled ***"Protection of University-Based Intellectual Property in Zambia"*** on condition that information obtained is purely for academic purposes.

Be guided accordingly.

Yours sincerely

Rodgers G. Phiri (Mr.)
ACTING REGISTRAR

cc. Vice-Chancellor
Deputy Vice-Chancellor

Excellence in Teaching, Research and Community Service