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An analysis of intellectual property awareness among researchers at University of Fort Hare, Alice, South Africa

By

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Doctor of Philosophy in Communication

University of Fort Hare
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Department of Communication

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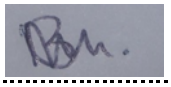
DECLARATION

I, Betina Mawokomayi-Moffat, student number (201608375) hereby declare this thesis entitled **"*An analysis of intellectual property awareness among researchers at University of Fort Hare, Alice, South Africa*"** hereby submitted by me, has not previously been submitted for a degree at this or another institution, and that this is my own work in design and execution. All reference materials contained therein have been duly acknowledged.

Signature  **Date** May 30, 2021

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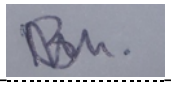
Signature  Date May 30, 2021

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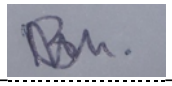
Signature  Date May 30, 2021

DEDICATION

I dedicate this thesis to the most important Lady, my mother, Sekai Shayamano who has been through thick and thin to ensure that my dream of attaining higher education is a success. I love you mum; you are my heroine; I am what l am today because of you.

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May the Lord bless all of you abundantly!!!

ABSTRACT

This study emerges in the period whereby innovation has become relevant in today's society. Globally, universities are shifting from being merely centers of learning to becoming entrepreneurial universities as they are commercialising their intellectual property (IP). This study analyses IP awareness among researchers at University of Fort Hare (UFH). The study was informed by the pragmatic paradigm and a mixed-methods design was used to collect data. The study focuses on IP awareness activities conducted between 2016 and 2019, data was collected between January 2020 and November 2020 as there was need for collecting more data from the Innovation Office to supplement the data that was initially collected. Closed ended questionnaires were distributed to researchers at UFH since they are potential IP creators, an open-ended questionnaire was also used to collect data from one key informant from the Innovation Office, and a semi-structured interview was conducted with one key informant from the Innovation Office at UFH. Thematic analysis was used to analyse qualitative data from qualitative responses on questionnaires, interview responses and the UFH IP policy. Statistical Package for Social Sciences and Microsoft Excel were used to analyse quantitative data. The study revealed that the UFH Innovation Office employs various communication strategies to create awareness of IP among researchers and that the Office hosts at least three IP workshops each year. The study found out that methods used to create awareness include social media posts, email communication, distributing booklets and fliers that contain IP information, interactive discussions with IP experts, and small visits to faculty researchers, or research groups to conduct presentations on IP. However, despite these initiatives at the University, the study found out that researchers have a low level of IP awareness and this needs to be addressed by the Innovation Office. Interestingly, the results further indicated that UFH values IP and in responding to the requirements of the Intellectual Property Rights from Publicly Funded Research Act, of 2008, the University established its Technology Transfer Office that is responsible for facilitation of commercialisation of research outputs and creating awareness of IP among researchers. The study recommends the need to improve communication strategies for IP awareness and that the Office should employ diversified strategies to educate researchers about the importance of IP and its protection and that awareness activities should not be a once off activity but continuous. The study also recommends the University and the government to consider incorporating IP modules in the curriculum of all disciplines so that every student and researcher would have the knowledge of IP and how it affects people's lives. The study also recommends that

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research and development should be prioritised as innovations emanate from research projects.

Keywords: *innovation, intellectual property awareness, entrepreneurial universities, researchers, University of Fort Hare Innovation Office.*

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LIST OF ABBREVIATIONS AND ACRONYMS

AIRCO: Association of Independent Record Companies of South Africa

CeSTII: Centre for Science, Technology and Innovation Indicators (South Africa)

CIPC: The Companies and Intellectual Property Commission (South Africa)

CPUT: Cape Peninsula University of Technology

CUT: Central University of Technology

DST: Department of Science and Technology (South Africa)

DUT: Durban University of Technology

GMRDC: Govan Mbeki Research and Development Center (South Africa)

HEI: Higher Education Institutions

IITs: Indian Institutes of Technology

IP: Intellectual property

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IPEC: Intellectual Property Enforcement Coordinator

IPR: Intellectual Property Rights

JPO: Japan Patent Office

MIT: Massachusetts Institute of Technology

MMNU: Nelson Mandela Metropolitan University

MUT: Mangosuthu University of Technology

NACI: National Advisory Council on Innovation (South Africa)

NRF: National Research Foundation (South Africa)

NIPMO: National Intellectual Property Management Office (South Africa)

NMMU: Nelson Mandela Metropolitan University

NWU: North-West University

R&D: Research and Development

RU: Rhodes University

SAFACT: The Southern African Federation against Copyright Theft

SARIMA: The Southern African Research and Innovation Management Association

SMEs: Small and Medium Enterprises

SPU: Sol Plaatje University

SU: Stellenbosch University

TIA: Technology Innovation Agency

TLO: Technology Licensing Office

TMO: Technology Management Office

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TTO: Technology Transfer Office

TUT: Tshwane University of Technology

UCT: University of Cape Town

UFH: University of Fort Hare

UFS: University of Free State

UJ: University of Johannesburg

UK: United Kingdom

UKZN: University of KwaZulu-Natal

UMP: University of Mpumalanga

UNISA: University of South Africa

UNIVEN: University of Venda

UNIZULU: University of Zululand

UP: University of Pretoria

USA: United States of America

UW: The University of Washington

UWC: University of the Western Cape

VUT: Vaal University of Technology

WIPO: World Intellectual Property Organization

WITS: University of Witwatersrand

WSU: Walter Sisulu University

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CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 Introduction

Technology Transfer Offices (thereafter, TTOs) play a critical role in increasing knowledge of intellectual property (thereafter, IP) among researchers at universities. Proponents argue that a strong intellectual property rights system induces innovation however, if researchers are not well informed about the relevance of IP, it is difficult for the country to reap benefits from public investment in research (Titu et al., 2018; Jayadev & Stiglitz, 2017; Jajpura et al., 2017; Mlambo, 2017; Grobbelaar & De Wet, 2016; Hobololo, 2016; Boateng, 2015; Nwabachili et al., 2015; Hai, 2015; Sahlan *et al.,* 2014; Zainol & Ramti, 2014; Villasenor, 2012; Edelman, 2011; Baker *et al.,* 2007). A study conducted by Sikoyo *et al.,* (2006) points out that most countries in the African continent have limited understanding of IP related issues. Chudi *et al.,* 2015 also reiterates that researchers have limited knowledge of IP. Sharma and Kumar, (2018) argues that there is lack of knowledge of IP. This literature indicates that there is still lack of knowledge of IP among researchers and this denotes the need for widespread education and awareness initiatives at universities. Lack of awareness of IP justifies the relevance of this research as it seeks to analyse IP awareness at University of Fort Hare (thereafter, UFH).

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However, the significance of awareness initiatives in improving the knowledge of IP has long been recognised. This is evidenced by the establishment of World Intellectual Property Organisation (thereafter, WIPO) in 1967, a global forum which provides IP information, offers global services to protect IP, among others (World Intellectual Property Organisation, 2020). This global forum established WIPO Academy in 1998 which focuses on IP education and training for WIPO member states from around the globe i.e United States, India, Australia, Japan, Germany, Canada, Botswana, Zimbabwe and South Africa included (World Intellectual Property Organisation, 2020). As such, the organisation assists member states by offering training programmes and educational resources (e.g IP booklets) that are used to create awareness at research institutions. WIPO emphasised the need for developing countries to educate researchers on IP since it is essential in facilitating the required level of IP awareness programs for capacity building (World Intellectual Property Organisation, 2020). The World Trade Organisation also emphasised that there is need for effective communication on the importance of IP protection (Sahlan *et al.,* 2014).

In line with this perspective, several universities heeded the call for creating awareness of IP and established TTOs i.e University of Michigan established a Technology Management Office in 1982 and The University of Washington established its TTO in 1983 (United States General Accounting Office Report, 1998). Other universities in the global south i.e India also established Intellectual Property Rights Cells (thereafter, IPR Cells) in universities, by 2018, there were about 65 IPR Cells in 12 states such as Punjab, Rajasthan, Gujarat and Uttar Pradesh (Tewari & Bhardwaj, 2018). These IPR Cells perform a similar role with TTOs in other universities. On the other hand, universities in African countries are still in the process of establishing TTOs but South Africa is at an advanced stage than its African counterparts as many universities in the country have functioning TTOs. These TTOs have a huge responsibility to manage IP from universities at the same time create awareness at host institutions. United States (thereafter, US) universities have highly evolved TTOs which have skilled personnel as compared to TTOs in the global south. The establishment of TTOs at universities worldwide indicates that universities have a positive attitude towards IP and are becoming aware of its relevance.


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In addition, a survey of literature (Intellectual Property Enforcement Coordinator Annual Intellectual Property Report to Congress, 2019; Kleyn, 2010; Tankenaka, 2005; Japan Patent Office Annual Report, 2002) evidences that countries in the global north (i.e US and Japan) have been at the fore front in creating awareness of IP. For instance, in the US, the Department of Homeland Security's Intellectual Property Rights centre conduct continuous awareness activities targeted at various publics and they even extend such awareness initiatives beyond their borders (Intellectual Property Enforcement Coordinator Annual Intellectual Property Report to Congress, 2019). Particularly in 2017 about 96 awareness events were conducted in the US (Intellectual Property Enforcement Coordinator Annual Intellectual Property Report to Congress, 2019, p. 27). Japan's patent office also creates awareness of IP at universities and provide textbooks on industrial property rights to Higher Education Institutions (thereafter, HEIs) and several universities offer IP related courses particularly to engineering and science students (Kleyn, 2010; Tankenaka, 2005; Japan Patent Office Annual Report, 2002).

On the other hand, most countries in the global south have started initiatives to increase awareness of IP among researchers with the exception of India which started these awareness initiatives long back (Jajpura *et al.,* 2017; Boateng, 2015; Lakhan & Khurana, 2007). India

invests heavily on IP awareness related activities as there are organisations such as Patent Facilitating Centre which was established by the government in 1995 which creates awareness (Tewari & Bhardwaj, 2018). All these efforts demonstrate the increasing recognition of the role of IP awareness initiatives towards equipping various publics with knowledge. The fact that countries in the global north and in the global south create awareness of IP clearly shows that it is a global concern.

In the context of South Africa, the National Advisory Council on Innovation, (2012) reiterates the need for increasing awareness on IP. The National Advisory Council on Innovation (2012, p. 2) emphasised that "it is time for a game changing type of IP awareness culture to be created around the country, in order to protect the South African public investments in research, development and innovation, for the benefit of its people". This is attributed to the fact that researchers have inadequate knowledge of IP and this has resulted in loss of potential benefits that could have been gained by the country from research outputs of publicly financed institutions (National Advisory Council on Innovation, 2012). Authors such as Ikome and Ikome, (2017) also added that there are inadequate IP awareness initiatives in South Africa and as a result protecting IP in universities becomes a challenge. The Companies and Intellectual Property Commission, South Africa also substantiate these views by arguing that there is low education and low awareness of IP and conversion of knowledge to IP, principally in HEIs (Companies and Intellectual Property Commission Annual Report, 2018/19). Such observations ushered in the necessity for a paradigm shift in approaches to IP awareness from 2012 onwards. The paradigm shift is evidenced by new approaches that were adopted to ensure that there is IP awareness among researchers; the new approaches include the establishment of the Intellectual Property Rights from Publicly Financed Research Act 51 of 2008, South Africa (thereafter, IPR-PFRD Act (2008)) modelled on the Bayh-Dole Act of 1980 which protects IP that emanates from federally funded public institutions in the US; the establishment of the National Intellectual Property Management Office, South Africa (thereafter, NIPMO) in 2013, a dedicated unit of the Department of Science and Technology, South Africa (now referred to as the Department of Science and Innovation) in terms of this IPR-PFRD Act (2008). As such, NIPMO is the custodian of the Act and is at the fore front in ensuring that universities establish TTOs to comply with provisions of the Act (National Intellectual Property Management Office, 2020). The underlying assumption underpinning this paradigm shift is that previous awareness initiatives did not yield meaningful results in terms of improving scientists and researchers' knowledge of IP. This then raises the broader

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question on the role of these awareness initiatives in improving knowledge of IP. Therefore, this study seeks to provide answers to this question by analysing IP awareness among researchers at UFH.

1.2 IP awareness initiatives at South African universities

The Companies and Intellectual Property Commission (thereafter, CIPC) in collaboration with Department of Trade and Industry, Technology and Innovation Agency, NIPMO, WIPO, TTOs at universities among others have been creating awareness targeting both students and staff at South African universities including UFH. The CIPC established a Creative Industries Division, which also focuses on IP Enforcement, Education and Awareness (Lotheringen, 2014) and one of the objectives of the division is to increase knowledge and awareness of IP Laws through conducting workshops, seminars and exhibitions (Companies and Intellectual Property Commission Annual Report, 2018/19). This can be achieved through:

- "Segmentation of target audiences;
- Constant monitoring of education's effectiveness and awareness channels;
- Exploration of new channels for education and awareness;
- Continuous assessment of the impact of education and awareness initiatives; and
- Increase in compliance, and continual updating of staff skills and competencies to ensure consistency and relevance of education and awareness" (Companies and Intellectual Property Commission Annual Report, 2018/19).

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These awareness initiatives signify the relevance of IP communication to researchers as they are being conducted at various educational institutions across South Africa. It is thus significant to note that these awareness events are ongoing as indicted in the Companies and Intellectual Property Commission Annual Report, 2018/19) that one of their strategic objectives over the strategic period 2017/18 to 2021/22 is to increase awareness and knowledge of IP among various publics, researchers included. The Companies and Intellectual Property Commission Annual Report (2018/9) shows that the organisation is set on achieving its targets for instance, the 2018/19 annual target of education and awareness events on IP was set at 30 but the organisation managed to conduct about 56 awareness events. This indicates the relevance of IP awareness initiatives; hence, it is important to

evaluate such initiatives to find out if the initiatives have had an effect on the attitude of target audience and whether their knowledge levels increased.

1.2.1 IP awareness initiatives at University of Fort Hare

The study analyses IP awareness among researchers at UFH. The University was established in 1916 in Alice, a small rural town in Amathole District Municipality in the Eastern Cape province to provide tertiary education particularly for black students. Although education was Eurocentric, the University was racially inclusive as there were black, coloured, Indian students and even white staff (University of Fort Hare Strategic Plan, 2009-2016). The University established itself as a home of aspiring African leaders and some of the African leaders who studied at the institution include the former Zimbabwean leader, Robert Mugabe, first president of Zambia, Kenneth Kaunda and former South African leader Nelson Mandela (Hobololo, 2016). The University was later taken over by the National Party government in 1959, and it was transformed into a college for Xhosa speaking South Africans, however, the University became independent again in 1970 (University of Fort Hare Strategic Plan, 2009-2016). After the end of Apartheid, competition for capable students increased among universities and the University faced challenges which subsequently passed as it attracted students from other countries such as Eritrea and Zimbabwe and the University recruited staff from other countries as well (University of Fort Hare Strategic Plan, 2009-2016).

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However, in 2004, the South African Higher Education sector restructured public universities taking into consideration different academic programmes that they offer (Hobololo, 2016). The restructuring resulted in the establishment of traditional universities i.e UFH, University of Pretoria (UP), University of Witwatersrand, University of Cape Town, North-West University, Stellenbosch University and universities of technology such as Central University of Technology, Durban University of Technology and Mangosuthu University of Technology. Comprehensive universities include University of Johannesburg, University of South Africa and University of Zululand (Hobololo, 2016). Universities of technology, traditional and some comprehensive universities resulted from the merger processes that involved the former technikons. For instance, Nelson Mandela Metropolitan University emerged as a result of a merger between the former University of Port Elizabeth and the former Port Elizabeth Technikon (Hobololo, 2016). UFH on the other hand was merged with the former East London Rhodes campus in 2004 (University of Fort Hare Institutional

Feedback Report, 2017). This explains why the University currently has a campus in East London.

UFH has six faculties which are Law, Health Sciences, Education, Management and Commerce, Social Sciences and Humanities and each faculty is headed by a dean (University of Fort Hare Institutional Feedback Report, 2016). The University has three campuses namely Alice campus, Bisho campus and East London campus. There are about 330 lecturing staff at the University (University of Fort Hare Institutional Feedback Report, 2017). Student enrolment has increased over the years, from 8 700 in 2004, 13 000 in 2014 (University of Fort Hare Institutional Feedback Report, 2016) and about 16 840 in 2019 as shown on table 1.1.

Table 1.1 2019 Statistics of registered students at UFH

Students	Masters students	1396
	Honours students	991
	Ph.D students	546
	Post graduate diploma	388
	Undergraduate students	13519
Total registered students		**16840**

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Source: University of Fort Hare Planning and Quality Assurance Department, 2019

The vision of UFH is as follows: "To be a vibrant, equitable and sustainable African university, committed to teaching and research excellence at the service of its students, scholars and wider community". According to Hobololo (2016), UFH's vision is similar with that of most comprehensive universities that emphasise the quality of education and at the same time maintaining an African identity. The vision does not express any aim to develop IP from research. However, the case is different when it comes to the mission. The mission entails: "To provide high quality education of international standards contributing to the advancement of knowledge that is socially and ethically relevant, and applying that knowledge to the scientific, technological and social-economic development of our nation and the wider world". The mission statement of UFH emphasise the quality of education and conducting research that is beneficial to the society. Hobololo (2016) is of the view that the University aims to develop IP that is beneficial to the society.

To comply with the provisions of the IPR-PFRD Act (2008), a Regional Technology Transfer office was established in the Eastern Cape in which UFH was a member with other Eastern Cape Province universities such as Rhodes University, Nelson Mandela Metropolitan University, and Walter Sisulu University (Hobololo, 2016). However, UFH decided to establish its own dedicated office. As a result, UFH established a technology transfer office (thereafter, TTO) known as the Innovation Office in 2015 as mandated by the IPR-PFRD Act (2008). The Innovation Office is responsible for educating researchers on the importance of IP and its protection, identifying and protecting IP, facilitating commercialisation of IP, sourcing of funding for commercialisation activities, and providing support to researchers to engage with industry (Grobbelaar & De Wet, 2016, p. 19).

Prior to the establishment of the Act, UFH did not prioritise administration and the management of IP or educating researchers about IP hence, the University did not even have an IP policy just like many other South African universities (Sibanda, 2009). It is surprising that UFH had a commercial entity, "Fort Hare Solutions", which generated income by offering various short-learning programmes targeting the public sector but there were no plans to establish a TTO to commercialise new knowledge from Research and Development (R&D) (Hobololo, 2016, p. 20).

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Although UFH was established in 1916, it only managed to establish a TTO towards its centenary, almost 100 years after. This is surprising considering that there are other institutions which established their own TTOs long before the IPR-PFRD Act (2008) i.e University of Cape Town (1999), University of Witwatersrand (2002) and Stellenbosch University (1999). This points to the effects of apartheid which prioritised white universities. Historically black universities are the ones lagging behind in terms of producing innovations and creating awareness at their institutions. Hobololo, (2016, p.17) echoes that "the legacy of the apartheid regime stills adversely affects the ability of historically black universities to make speedy progress in applied R&D in many disciplines". This discrimination explains the differences in the way in which Higher Educational Institutions are resourced, and how other universities fail to conduct innovative research, and even how many universities fail to become entrepreneurial, Fort Hare included (Hobololo, 2016, p 17). Although UFH has served the academic community for 100 years, there is little or no improvement to the quality of life to rural communities in Alice. According to authors such as Grobbelaar and De Wet, (2016, p.14), a question was raised by the community: "How have you contributed to the

improvement of the quality of our lives because we experience very little evidence of the sustained impact of your presence in this area?". This warrants the need for UFH to create awareness of IP so that researchers conduct innovative research that have commercialisation potential and in the long run may improve lives of people in surrounding communities and the country at large. Commercilisation of innovations at UFH has potential to benefit the community as the innovations may improve quality of life.

Currently, the UFH Innovation Office has been at the fore front in ensuring that students and staff at UFH have adequate information on IP. The Office together with CIPC, NIPMO, Adams and Adams Spoor and Fisher attorneys, Tshaya Mashabela Attorneys has conducted several awareness workshops at UFH since 2016. The aim is to make the academic community recognise the role that IP play in encouraging development through innovation and creativity. Researchers are encouraged to be innovative and protect the ideas that emanate from their research projects. These awareness initiatives are targeted at UFH staff and students, particularly postgraduates and also postdoctrates at Alice, East London and Bisho campuses. The University community has shown enthusiasm in knowing about IP as indicated by the huge attendance at various workshops. Hence, there is need to analyse IP awareness among researchers as this may also assist the Innovation Office to improve their communication strategies.

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This study analyses IP awareness activities conducted between 2016 and 2019. The selection of this timeframe is justified by the fact that the Innovation Office was established in 2015 and only started awareness initiatives in 2016. The selected timeframe is also limited by the available research funding from the Govan Mbeki Research and Development Centre which is in line with three-year duration of the Ph.D. program. Given that the researcher enrolled for the program in 2018 and is expected to have completed by the end of the 2020 academic year. Therefore, the researcher collected secondary data (particularly IP awareness materials) up to 2019.

1.3 Rationale

There is a dearth of literature on IP awareness among researchers specifically focusing on researchers' knowledge of intellectual property, the attitude of researchers towards intellectual property and practices of intellectual property at universities. Survey of literature points that previous researches show that most studies on IP awareness at universities focus

mainly on undergraduate students' knowledge of IP (Tinao *et al.*, 2018; Popova & Nacka, 2017; United Kingdom Intellectual Property Awareness Network, 2016; Ong *et al.*, 2012; United Kingdom National Union of Students, 2012; Cheema *et al.*, 2011). In addition, a key limitation of previous research on IP is that the authors did not focus on researchers but they only focused on assessing general knowledge of undergraduate students. This suggests that available literature is from the global north with much focus on undergraduate students' perspective on IP. Likewise, Popova and Nacka, (2017); Edelman, (2011) argue that there is a knowledge gap on the impact of IP communication on attitudes and awareness level among researchers. In line with this view, it is of cardinal importance to undertake research from the global south, to help understand the researchers' level of IP awareness.

The South African situation also points to lack of knowledge on the role that communication play in enhancing researchers' knowledge of IP. The Department of Trade and Industry, 2017, the draft IP policy phase 1 (one) states that to promote a better understanding of IP among researchers, it is vital to conduct a thorough research to understand opportunities and challenges presented by IP. There have been attempts to track progress on IP at research institutions but such attempts were not conclusive as other issues were not exhausted. One of the few studies that was conducted on IP is entitled "The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014" and this survey was conducted by the Southern African Research and Innovation Management Association, NIPMO and the Centre for Science, Technology and Innovation Indicators, South Africa. The survey provides an analysis of overall activity in technology transfer and the results may play a role in informing policy and guide activities at TTOs, NIPMO and other relevant stakeholders in the National System of Innovation. The study therefore developed standard indicators that can be used to track overall activity on management of IP and technology transfer activities at publicly funded research institutions in South Africa. This survey did not focus on analysing IP awareness among researchers at universities, demonstrating a knowledge gap. In light of this, this study seeks to bridge the existing knowledge gap by tracking progress and providing empirical evidence on knowledge of IP from one of the South African universities.

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1.4 Problem statement

The significance of awareness initiatives in improving knowledge of IP has long been recognised. The National Advisory Council on Innovation, (2012, p. 2) reiterates the need for

increasing awareness of IP. The National Advisory Council on Innovation emphasised that "it is time for a game changing type of IP awareness culture to be created around the country, in order to protect the South African public investments in research, development and innovation, for the benefit of its people". This is attributed to the problem that scientists and researchers have inadequate knowledge on IPR and this has resulted in loss of potential benefits that could have been gained by the country from research outputs of publicly financed institutions (National Advisory Council on Innovation, 2012). This problem ushered the necessity for a paradigm shift in approaches to IP awareness from 2012 onwards. The paradigm shift is evidenced by new approaches that were adopted to ensure that there is IP awareness which include the establishment of the NIPMO in 2013 and TTOs at universities. The underlying assumption underpinning this paradigm shift is that previous awareness strategies did not yield meaningful results in terms of improving scientists and researchers' knowledge of IP. Many universities have introduced IP programmes and established TTOs, so there is significantly greater awareness than in 2012. UFH also established its TTO, to give effect to the legislative requirement on enhancing IP awareness. This then raises the broader question on the effectiveness of the new approaches to awareness in improving knowledge of IP. Therefore, this study aims to analyse IP awareness among researchers at UFH.

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1.5 Research aim

The aim of the research is to analyse intellectual property awareness among researchers at the University of Fort Hare.

1.5.1 Research objectives

The aim will be addressed through the following research objectives;

(i) To analyse communication strategies used by the Innovation Office in promoting intellectual property awareness among researchers at the University of Fort Hare.

(ii) To assess the University of Fort Hare researchers' knowledge of intellectual property.

(iii) To explore the attitude of the University of Fort Hare researchers towards intellectual property.

(iv) To explore the practices of intellectual property at University of Fort Hare.

1.5.2 Research questions

The aim will be addressed through the following research questions;

(i) Which communication strategies were used by the Innovation Office in promoting intellectual property awareness among researchers at the University of Fort Hare?

(ii) What is the University of Fort Hare researchers' level of knowledge about intellectual property?

(iii) What is the attitude of the University of Fort Hare's researchers towards intellectual property?

(iv) What are the practices of intellectual property at University of Fort Hare?

1.6 Significance of the study

This study is of paramount importance as it contributes knowledge on UFH researchers' level of IP awareness and their knowledge of the UFH IP policy. In addition, the study itself serves as an IP awareness initiative at UFH. The study will also help policy makers in making an informed decision whether to find other strategies of increasing awareness to ensure that researchers are well informed about the importance of IP to their socio-economic wellbeing, the university and the economy of South Africa. This study will serve as a baseline, providing empirical evidence for the University and the country at large to reflect on the success of the awareness activities and existing policies. This research is thus essential to different audiences such as academics, researchers, policy makers, local and international organisations and the Universities at large as it provides empirical evidence of effectiveness of awareness initiatives towards reaching the desired level of awareness of IP.

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1.7 An overview of the theoretical framework

This study is guided by the diffusion of innovations theory elaborated by Everett Rogers (1962) which emphasise on the role of communication in spreading new ideas or innovations. This theory assists the researcher in analysing data collected through both interviews and questionnaires. Rogers' intention was to understand how people adopt new behaviours. *Diffusion* is defined as the process whereby an innovation or a new idea is communicated to audiences or a target group through a channel over a long period (Rogers, 2003). In diffusion, the messages that are communicated are concerned with new ideas (Rogers, 2003). In order for diffusion to take place, an innovation is communicated to the target group (which are

regarded as potential adopters) which then influence the majority of other potential adopters influencing them to attend to, consider, and in the end adopt innovations (Rogers, 1983). In the context of this study the potential adopters are researchers, they are the target for awareness messages and some of them will influence other people to be innovative or protect their innovations through registering their IP (more details in chapter 2).

1.8 An overview of research methods

The paradigm that guide the study is pragmatic paradigm, and the researcher then used a mixed method approach as the aim is to use the appropriate methods that address the research objectives comprehensively without being limited to a particular paradigm. In light of that advantage, the researcher used a mixed design to collect data. The researcher employed this approach because "a combination of qualitative and quantitative approaches provides a more complete understanding of a research problem than either approach alone" (Creswell, 2014, p. 4). A semi-structured interview and an open-ended questionnaire were used to collect qualitative data and a questionnaire with closed ended questions was used to collect quantitative data. To select the respondents to participate in the study, purposive sampling and convenience sampling methods were used. Purposive sampling was used to select the key informants for the interview since there was need to select those with relevant information that answers the research questions and as such one informant from the Innovation Office participated in the interview while the second participant answered the qualitative questionnaire. Some of the questions that the participant was asked were about the role of the Office and the importance of IP awareness among researchers.

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Gathering data was a process that took almost a year; data was collected between January 2020 and November 2020 as there were many questionnaires to be distributed to researchers at UFH. There was need for collecting more data from the Innovation Office to supplement the data that was initially collected. About 412 questionnaires were distributed to postgraduate students and teaching staff as they conduct research that has the potential to create IP. Distributing the questionnaires was a mammoth task but the researcher was assisted by two research assistants to collect data. Convenience and purposive sampling methods were utilised to select the respondents. Data was collected from students' residences, classrooms and public spaces, lectures' offices. Due to the spread of Corona virus (COVID 19), gatherings were prohibited and social distance was encouraged, as a result the researcher alternatively used WhatsApp and Electronic mail (Email) to collect data during this period.

The researcher used Emails to send the questionnaires to respondents, after completing the questionnaire, they also responded using Emails. When it comes to students, WhatsApp was also used as they prefer communication through social networks.

In addition, secondary data was also collected; the researcher collected materials such as attendance registers filled by researchers during IP workshops conducted between the year, 2016 and 2018. IP booklets and fliers created by WIPO, NIPMO, CIPC and the Innovation Office were collected from the Innovation Office and those materials are used in creating IP awareness. The IP Policy was also obtained from the Innovation office. Quantitative data was analysed and presented using both Microsoft Excel and the Statistical Package for Social Science. These two applications complemented each other. Qualitative data on the other hand was analysed using thematic analysis (more information on research methods is discussed in chapter 4).

1.9 Ethical issues

The researcher followed the University protocol by applying for ethical clearance from UFH's Research Ethics Committee before collecting data from the participants and an ethical clearance letter was granted. The researcher also requested for permission to conduct interviews at the Innovation Office and the permission was granted. The researcher ensured that participants were unharmed in any way during data collection process and requested them to sign a consent form (see, Appendix 3). The findings were presented accurately and fairly. All the sources consulted in compiling the thesis were acknowledged (see chapter 4 for detailed information).

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1.10 Delimitation of the study

The research aims to analyse IP awareness among researchers at UFH. The study targets researchers, comprising the teaching staff and postgraduates and key informants from the Innovation Office at UFH. The research focuses mainly on IP that emanates from publicly funded research. For the purpose of this study, intellectual property refers to ideas or innovations that have the potential to be commercialised and rights that protect such innovations. Copyrighted works are excluded from the definition, they are included in the thesis to explain that most universities prioritise publications than patenting. In addition, the study focuses on IP awareness activities conducted between 2016 and 2019. The selection of this timeframe is justified by the fact that the Innovation Office was established in 2015 and

only started awareness initiatives in 2016. The selected timeframe is also limited by the available research funding from Govan Mbeki Research and Development Centre at UFH which is in line with the three-year duration of the Ph.D. program.

1.11 Definition of key terms/concepts

Intellectual property: The phrase "intellectual property" refers to "any creation of the mind that is capable of being protected by law from use by any other person, whether in terms; of South African law or foreign intellectual property law, and includes any rights in such creation, but excludes copyrighted works such as a thesis, dissertation, article, handbook or any other publication which, in the ordinary course or business, is associated with conventional academic work" (Intellectual Property Rights from Publicly Financed Research Act of 2008, p. 3). Intellectual property encompasses "registerable and non-registerable inventions, expertise, trademarks, trade secrets, copyrights, designs and plant breeders' rights which have come about through the mental efforts, insight, imagination, expertise and creativity of humans" (University of Fort Hare intellectual property policy, 2017, p. 2). For the purpose of this study, intellectual property refers to ideas or innovations (excluding copyrighted works) that have the potential to be commercialised and rights that protect such innovations.

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Intellectual property rights refer to "intellectual property, of which the exclusive right of ownership, with the attendant rights and obligations, belongs by law to a natural or a legal person (company, trust, institution)" (University of Fort Hare intellectual property policy, 2017, p. 2). Therefore, this term was adopted in this study to refer exclusively to rights that protect innovations.

Innovation: An innovation is basically an idea or practice or object that is professed as new (Saleh, 2008).

Inventor: An inventor of a registerable invention is "a staff member (temporary, contract or permanent) or student whose name appears as an inventor in the legal documentation associated with the registerable invention. A person should not be listed as an inventor unless one has contributed significantly to the invention step. Where an invention or creation is not registerable, the inventors/creators must agree on the contributors to the intellectual property" (University of Fort Hare intellectual property policy, 2017, p. 2).

Invention: The term refers to "a registerable invention is any product, process, method, appliance or composition which is new and involves an inventive step, and which is capable of being used or applied in trade or industry or agriculture" (University of Fort Hare intellectual property policy, 2017, p. 2). The term invention also "includes all inventions to the extent where they have not been patented or registered, but rather acquire protection as confidential knowledge. A discovery is not an invention" (University of Fort Hare intellectual property policy, 2017, p. 2).

Interpersonal channels: It involves face-to-face conversations between two or more people, information is usually related to causality intents: using messages to or change human behaviour (Coffman, 2002).

Creator: This refers to "a person who has had an intellectual input in the conception of intellectual property, including the intellectual property that will be protected by statue (plant breeder's rights, patents, registered designs, etc.) and also that which will be protected by common law (trade secrets, know-how or confidential information, etc.)" (University of Fort Hare intellectual property policy, 2017, p. 2).

Communication: Communication refers to "a one-way process of reaching or telling others, but communication is also a process whereby the 'communicator' can learn from the needs and interests of the target groups" (Hunters, 2012, p. 366).

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Communication channel: this refers to the means by which information get from one person to another (Rogers, 2003).

Publicly financed research and development: this refers to research and development conducted using funds from funding agency excluding funds which are allocated for scholarships or bursaries (Intellectual Property Rights from Publicly Financed Research Act, 2008).

Commercialisation: "It refers to "the process by which any intellectual property is exploited (used, or may be adapted to be used, commercially or otherwise to provide a benefit to society" (University of Fort Hare intellectual property policy, 2017, p. 1).

Researchers: the term researchers refer to "professionals engaged in the conception or creation of new knowledge." In addition, researchers "conduct research and improve or develop concepts, theories, models, techniques instrumentation, software or operational

methods" (Organisation for Economic Co-operation and Development, 2015, p. 379). But in this study, the term researchers refer to both students and academics who conduct research.

A public research institution: This refers to an organisation that was created through legislation and the aim of that organisation is of undertaking research that benefits the society, and research that has commercial value (Walwyn, 2018).

1.10 Thesis organisation

This thesis comprises six chapters which include;

- **Chapter 1: Introduction and background**

Chapter one introduces the topic and background information on the relevance of IP awareness to research institutions. This chapter discusses the study rationale, the problem of the study, the purpose of the study, specific objectives, research questions, and discusses the significance of the study, study delimitation, research methodology, theoretical framework as well as the ethical issues. The chapter also defines key concepts that are relevant to the study, states the thesis organisation and at the end, the researcher provides a summary of the chapter.

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- **Chapter 2: Literature review**

This chapter reviews published literature on IP awareness around the globe. The review of related literature is guided by the research objectives. The review enables one to understand trends, controversies, issues and the relevance of knowledge among researchers. The chapter starts by discussing importance concepts that are used in this study. The last section of chapter two discusses the theory (diffusion of innovations) that is used to explain the results of the study and the policy framework, the IPR-PFRD Act (2008) that protects IP that emanate from publicly funded research.

- **Chapter 3: Perspectives of intellectual property**

This chapter discusses IP perspectives from developed economies and developing economies. Developed economies that were focused on are United States, Japan, Germany and from developing economies such as India, Botswana and South Africa. The review was guided by the research objectives; it discusses IP policies and their practices in different countries,

awareness activities and the communication strategies that were employed to reach out to researchers and the role of TTOs in different countries. The discussion demonstrates lessons that can be learnt to enhance the understanding and practices of IP in South African universities.

- **Chapter 4: Methodology**

Chapter four describes the research process and the methods used by the researcher to achieve the objectives. The chapter starts by discussing paradigms that inform the study. In this study, pragmatic paradigm informed the research and a mixed methods design was used. The chapter outlines the sampling procedures, the data collection methods, data analysis techniques and discusses study limitations and ethical considerations. The researcher justifies the selection of research methods and data analysis methods. All the strategies which were employed enabled the researcher to achieve the study objectives.

- **Chapter 5: Data analysis, presentation, and interpretation**

This chapter focuses on data analysis, presentation, and interpretation of research findings guided by the following research objectives. The chapter starts by discussing qualitative results and the second part discusses quantitative results. After separately presenting and interpreting the results from qualitative and quantitative data, the researcher merges the results and then discussed the findings. A summary of the chapter is given at the end of the chapter.

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- **Chapter 6: Summary, conclusions, and recommendations**

This is the last chapter of the thesis which provides a summary of the whole research, provides recommendations and make conclusions based on the research findings. The researcher explains how the knowledge gap was filled and whether the set objectives were achieved. The chapter ends with suggesting areas for future research and also stating the study limitations and how they were dealt with.

1.11 Chapter summary

This chapter is important in research and it introduced the topic and background information on the relevance of intellectual property awareness initiatives to research institutions. This chapter stated the problem of the study, the aim of the study, specific objectives of the study,

research questions, and discussions were done on the significance of the study, study delimitation, research methodology, theoretical framework as well as the ethical issues. The chapter also defined key concepts that are relevant in this study, states the thesis organisation and at the end, the researcher provides a summary of the chapter. The researcher has demonstrated that there is a gap in knowledge of studies that analyse IP awareness among researchers not only in South Africa but in the whole African continent and this research fills that gap by providing empirical evidence. IP awareness initiatives are important to South Africa as it transitions from being a resource-based to a knowledge-based economy. This transition is only possible through technological innovation. Researchers play an important part to facilitate this transition as they conduct innovative research that can be commercialised. The chapter therefore explicitly justified the importance of this research. The next chapter reviews related literature and the theoretical framework for this study.

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CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

As stated in chapter 1, the study seeks to analyse intellectual property awareness among researchers at UFH. This chapter starts by illustrating and explaining the conceptual framework that guides the study. The conceptual framework shows the steps that were taken by the researcher to attain the study objectives. The chapter also defines important concepts to enable one to understand how they are utilised in the context of this study. The chapter reviews published literature on IP awareness initiatives at universities. The chapter also discusses the theoretical framework that guides the study; diffusion of innovations theory elaborated by Rogers in 1966 which explains the diffusion of ideas or practices. The last section of this chapter discusses the policy framework particularly the Intellectual Property Rights from Publicly Financed Research Act 51 of 2008 which protects innovation that emanates from publicly funded research institutions in South Africa.

2.2 Conceptual framework

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A conceptual framework is a map that explains in graphic format and narratively the procedures that the researcher goes through to achieve the study objectives. It links the research problem with possible solutions, by explaining variables that the researcher focuses on such as major concepts, data collection procedures and data analysis techniques (Kumar & Antonenko, 2014; Becker, 2007). The conceptual framework of this study was developed by the researcher after reviewing literature that addresses the study objectives. Fig 2.1 illustrates the conceptual framework of this study.

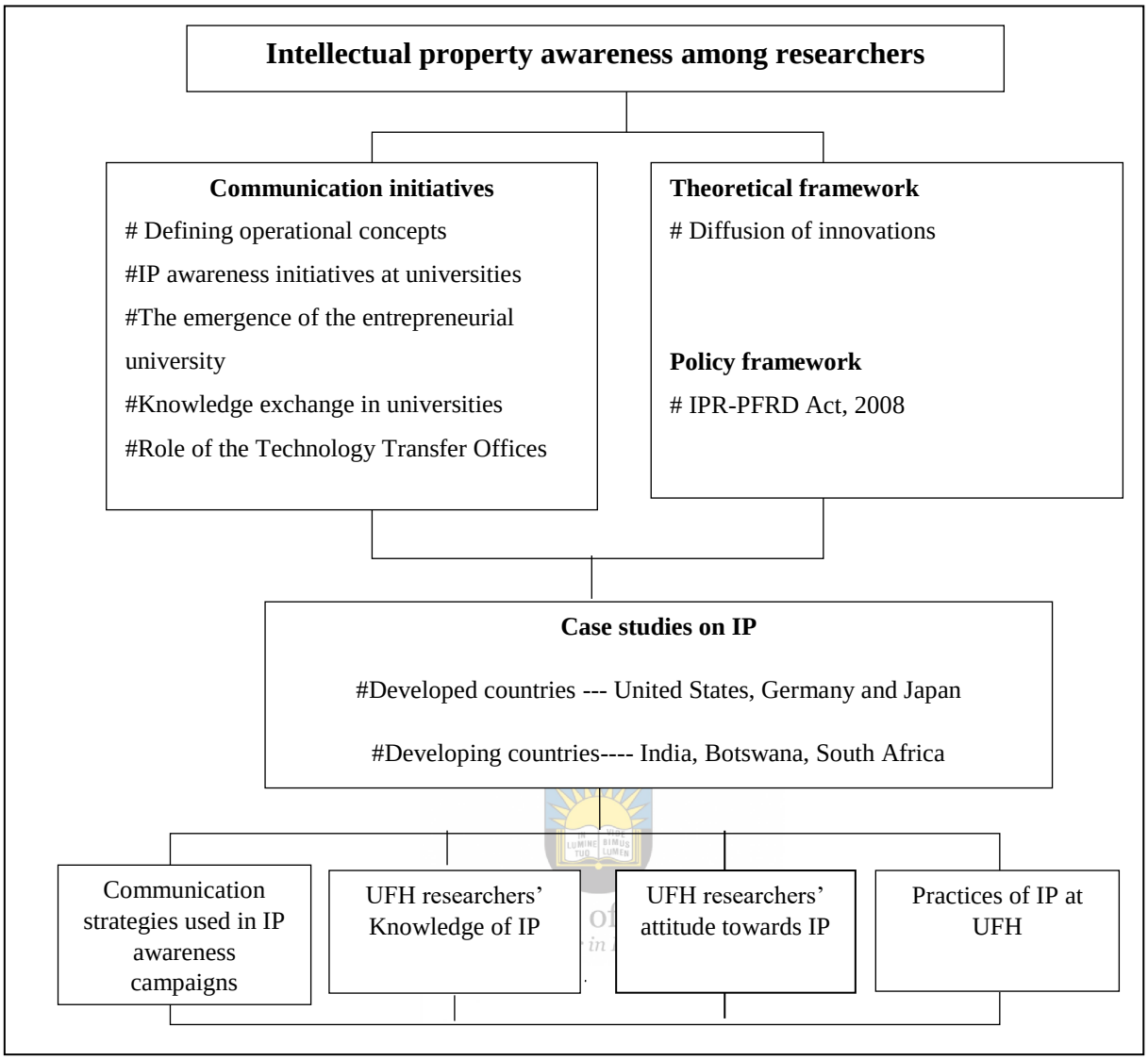

Figure 2.1 Conceptual framework for the study

Source: Author, 2020

The conceptual framework as shown if figure 2.1 illustrates the steps that the researcher followed to attain the research objectives. The broader aim of the researcher is indicated followed by the review of literature on IP awareness initiatives at universities, the emergence of the entrepreneurial university, knowledge exchange in universities and the role of the Technology Transfer Offices. The second part discusses the theoretical framework of the study; the study was guided by diffusion of innovations theory. The last part of the framework indicates the objectives that were achieved at the end of the research.

2.3 Defining 'intellectual property"

The phrase "intellectual property" refers to "any creation of the mind that is capable of being protected by law from use by any other person, whether in terms; of South African law or foreign intellectual property law, and includes any rights in such creation, but excludes copyrighted works such as a thesis, dissertation, article, handbook or any other publication which, in the ordinary course or business, is associated with conventional academic work" (Intellectual Property Rights from Publicly Financed Research Act, 2008, p. 3). IP is a legal term "that describes the application of the mind to develop something new or original and enables the owner to control certain intangibles like ideas or phrases and will be used to create wealth (Companies and Intellectual Property Commission, 2020; Titu *et al.*, 2018). The term simply refers to products, creations, ideas and expressions that are derived from knowledge (Bansi, 2016) and have the potential to be commercialised and in turn benefit the creator and the nation at large if the researchers are well informed of the relevance of IP through effective communication. Therefore, the study uses the term intellectual property as an umbrella term that covers the creations of the mind (excluding copyright) and rights that protect such creations**.**

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IP exists in various forms i.e a new invention, brand, design or artistic creation (Companies and Intellectual Property Commission, 2020). It is important to note that an innovation should be protected by various forms of IP such as Copyright, Trademark, Patent, Design, Plant breeders' rights and Trade secrets as shown in figure 2.2. However, all these types of IP protection are relevant but the study mainly focuses on patent protection which protects IP deriving from publicly funded research. Most IP rights are territorial in the sense that there is a possibility of applying for protection if you decide to conduct business in another territory. For instance, a patent, design or a trademark that was granted in South Africa is only valid in that territory except for copyright which is universally recognised (Companies and Intellectual Property Commission, 2020). The creator of the IP is rewarded for its use to encourage innovation. Various forms of IP are shown on Figure 2.2.

Figure 2.2 Types of intellectual property

Source: Federation of Indian Micro and Small and Medium Enterprises (FISME), 2014

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Figure 2.2 shows various examples of IP ranging from trade secrets, copyrights, trademarks, patents, designs and geographical indication. Figure 2.2 illustrates the 'Coca-Cola' trademark example and also shows that drugs can be patented. Items that can be copyright protected include books and music (as shown on figure 2.2). Various types of intellectual property are discussed in the next section.

2.3.1 Trade secrets

Trade secrets refers to IP rights that focuses on private information that can be sold or licensed. In order for information to be regarded as a trade secret, it must be

- *"commercially valuable because it is secret,*
- *be known only to a limited group of persons, and*
- *be subject to reasonable steps taken by the rightful holder of the information to keep it secret, including the use of confidentiality agreements for business partners and employees"* (World Intellectual Property Organisation, 2020).

Information is held from the general public to allow the inventor to have a competitive advantage over other businesses or another individual (Bansi, 2016). Unauthorised use or disclosure of such information is unethical and also a violation of trade secret protection (World Intellectual Property Organisation, 2020).

2.3.2 A geographical indication

A geographical indication refers to signage on products that originate from a specific geographical location and has certain qualities or a reputation that is determined by its location. In order for a product to be regarded as a geographical indication, a sign must identify that product as having originated from a given place, the product's qualities, or characteristics should also be specific to the geographic location. Thus, there should be a clear link between a product and its place of origin.

2.3.3 Copyright

Copyright is a legal term which describes the rights that are awarded to creators over their literary and artistic works (World Intellectual Property Organisation, 2020). Copyright covers various works that include;

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- *"Literary works e.g. books and written composition novels.*
- *Musical works e.g. songs.*
- *Artistic works e.g. paintings and drawings.*
- *Cinematograph films e.g. programme-carrying signal that has been transmitted by satellite.*
- *Sound recordings.*
- *Broadcasts e.g. broadcasting of films or music.*
- *Programme-carrying signals e.g. signals embodying a programme.*
- *Published editions e.g. first print by whatever process.*
- *Computer programs"* (Companies and Intellectual Property Commission, 2020).

Copyright enables creators to use or authorise other people or organisations to use their work in ways that reward them for their creations (Companies and Intellectual Property Commission, 2020). Copyright is different from other types of IP as there is no need for registration with the exception for cinematograph films. In many countries copyright lasts for 50 years after the creator's death; however, this differs as there are countries where such

rights are extended to 70 years after the death of the creator. Once that time lapses, the work falls into the public domain and reproduction of such work will be free (Companies and Intellectual Property Commission, 2020). However, the creators of such works have been facing challenges that prevent them from benefiting from their hard work, and such challenges include the issue of piracy and plagiarism. Copyright in South Africa is protected by the Copyright Act no

98 of 1978. However, the country is currently undertaking the reform of its copyright law.

2.3.4 Industrial design

An industrial design is essentially about the shape, form, pattern, ornamentation and product configuration (Companies and Intellectual Property Commission, 2020). WIPO's definition of an industrial design focuses on the ornamental aspect of an article consisting of three-dimensional features (particularly the shape of an article), or two-dimensional features (referring to patterns, lines or colour). Essentially there are two types of designs that can be registered namely functional design and aesthetic design.

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Table 2.1 Types of designs and their characteristics

A functional design	**An aesthetic design**
Must be new The shape or configuration is determined by the function Must be able to be produced by an industrial process	Must be new and original Beauty is in its shape, configuration or ornamentation Must be able to be produced by an industrial process

Source: World Intellectual Property Organisation, 2020

Table 2.1 shows the characteristics of a functional design and also of an aesthetic design. The table illustrates that these design types should be both new and should be able to be mass produced. The differences lie in the fact that a functional design's shape is determined by the function whereas an aesthetic design prioritises the beauty of its shape. In South Africa, aesthetic designs can be protected for at least 15 years while functional designs are protected for approximately 10 years. In addition, registered designs should be renewed every year before the end of the 3rd year, as from the date of registration (Companies and Intellectual

Property Commission, 2020). These designs are protected by the Designs Act no 195 of 1993.

2.3.5 Trademark

A trademark is a sign, brand name, a slogan or a logo; it distinguishes services or goods of one person or enterprise from those belonging to other people or enterprises (Companies and Intellectual Property Commission, 2020; World Intellectual Property Organisation, 2020). Thus, a brand name refers to a word or a phrase, for example, Edgars. A slogan is a very short phrase or a short sentence, and a logo is a picture or symbol that represents a certain brand and all these are protected by IPR. A trademark should be registered for it to be under IP protection. In the South African environment, trademarks are therefore defended under the Trade Marks Act, (Act 194 of 1993) and a registered trade mark can be protected forever, provided that it is renewed every ten years after paying the prescribed renewal fee (Companies and Intellectual Property Commission, 2020).

2.3.6 Patent

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A patent is an exclusive right granted for an invention, which is a product or a process that offers a new way of doing something, or a new technical solution to a problem and this means that a patent cannot be made, used, disposing of the invention, importing the invention distributed or sold without the consent of the owner during its life span (De Beer *et al.*, 2014). To get a patent, technical information about the invention must be disclosed to the public in a patent application (World Intellectual Property Organisation, 2020). A patent's protection lasts for 20 years only and once that time expires, the protection also ends and the innovation becomes exploitable freely by the public whether for commercial benefit or not (Companies and Intellectual Property Commission, 2020). Patents are like titles that are owned and can be sold or licenced to others for financial benefits. There are many advantages of registering a patent which includes;

- "It gives you the right to stop others from manufacturing, using and/or selling your invention in South Africa without your permission.
- It lets you licence someone else to manufacture your invention on agreed terms or take legal action against people who are using your invention without your permission.

- It encourages South Africans to continue their research, to develop new and innovative products, exploit new technology and promotes the transfer of technology to South Africa.
- It gives our trading partners the incentive to provide similar rights and thereby protect our exports in markets overseas.
- If you want to protect the way your invention works then patenting may be the most appropriate option.
- If your invention is new, not publicly disclosed and has commercial potential, then you are ready to consider what type of patent will suit your needs" (Companies and Intellectual Property Commission, 2020).

South Africa is one of the 148 countries that are members of Patent Co-operation Treaty and this treaty enables individuals to file both a national and an international patent application at an extra cost, however, the applicants should select countries in which they desire protection and file patent applications (Companies and Intellectual Property Commission, 2020). Patents in South Africa are protected by the Patent Act, Act 57 of 1978. Universities are encouraged to patent innovations that emanate from research. The next section focuses on the role that communication plays in increasing awareness of IP.

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2.4 Intellectual property awareness initiatives

Intellectual property, as previously stated refers to products, creations, ideas and expressions that are derived from knowledge (Bansi, 2016) and have the potential to be commercialised. These innovations benefit the creator, the university and the overall economy if the researchers are well informed of the relevance of IP through effective communication. This becomes possible through creating awareness of the relevance of IP using communication. A survey of literature indicates that IP is regarded as a catalytic tool for development worldwide, hence there is need for effective IP communication to targeted audiences (Jajpura *et al.,* 2017; Boateng, 2015; Leal *et al.,* 2014; Gregory, 2008; Lakhan & Khurana, 2007). As such, various countries have been involved in increasing awareness of IP among different audiences such as researchers, policy makers, and students.

Due to the need for universities to become entrepreneurial, universities are involved in creating awareness of IP among researchers. This is attributed to the fact that universities are the factories of the knowledge economy and IP awareness activities help educate researchers

about the importance of commercialising their ideas. In the context of South Africa, the CIPC in collaboration with NIPMO and university TTOs have been creating awareness at universities using various themes. However, to the researcher's best knowledge, very few publications are available in literature that focuses on IP awareness among researchers at universities. This has been a setback in addressing the study objectives. The next section discusses literature on awareness activities aimed at educating researchers about the importance of IP.

WIPO realised that there is a need for countries to continuously create awareness on IP and its protection by ensuring that IP related issues are on the agenda each and every year. As such, WIPO member states annually celebrate world IP day (26 April) since the year 2000 focusing on a particular theme each year. In 2017, the day's theme was "Innovation improving lives", the focus was on innovations in health and agriculture. As such the purpose is to increase general understanding and create awareness of the importance of IP thereby encouraging people to be creative and innovative (Companies and Intellectual Property Commission, 2017). However, many people still believe that IP rights have little to do with their day to day lives (EUIPO, 2017) and this is why there are so many organisations creating awareness to help people understand the value of IP in today's society.

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There are a few studies available that focus on IP awareness among students. Findings from an online survey about students' attitude towards IP conducted in the United Kingdom by the National Union of Students (2012) shows that the majority of students believe that it is significant to have knowledge about IP, "not only to their education, but to their future careers". The study also shows that other students concentrate on the immediate goal of finishing their degree, without recognising the link that exists between IP knowledge and commercial success (United Kingdom National Union of Students, 2012). In another study conducted by the United Kingdom Intellectual Property Awareness Network (2016), the results indicated that students were not aware of IP because they did not have access to IP information whilst studying, and their attitude shows that they do not consider IP knowledge to be an issue of relevance to them.

Furthermore, another survey conducted by Villasenor (2012) on IP awareness at University of California showed that out of 60 engineering students who completed the survey, 68% showed lack of IP knowledge. This shows a similar trend in terms of lack of IP education and training across various universities. However, universities can do better in preparing their

graduates by developing them to become productive citizens of the knowledge economy by prioritising IP education. This is a challenge confronting many universities all over the globe. IP awareness is critical to running an efficient IP system, therefore, it is important to define what awareness is and thus what needs to be promoted for an IP system to succeed (Pickethly, 2010). The establishment of a culture of IP at universities is determined by the level of awareness on the value of creative ideas, the relevance of protecting property rights, and teaching of IP (Gimenez, *et al.,* 2012; Lakhan & Khurana, 2007). The review revealed that comparatively few studies focused specifically on the knowledge of researchers on IP related matters.

In another perspective, the value of IP is of growing importance to development of society and businesses throughout the world. Lower levels of IP results in low numbers of invention disclosures (Sharma & Kumar, 2018; Chudi et al., 2015; Sikoyo et al., 2006). Therefore, it is vital that proper knowledge and understanding is correctly communicated (Lakhan & Khurana, 2007). The main finding of the review was that more research should be conducted to measure knowledge of researchers on IP related issues since they play a crucial role in IP creation. Previous research has shown that most studies on IP awareness at universities focus mainly on undergraduate students as indicated by studies carried by Tinao *et al.,* (2018) Popova and Nacka (2017), and few studies that focus on postgraduate students (Cheema *et al.,* 2011). From these studies, it is possible to conclude that most students are generally not aware of IP. A key limitation of previous research is that IP communication have been scarcely investigated from the point of view of researchers or scientists from universities in general. The next section discusses the new role of universities and this explains why there is need for creating awareness of IP at universities.

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2.5 The role of higher education institutions in intellectual property protection

2.5.1 The emergence of the entrepreneurial university

The realisation that innovations are critical to the development of a country's economy has led to the need to protect IP from universities and put in place mechanisms for commercialisation. This led to the emergence of entrepreneurial universities. An entrepreneurial university is basically one that is able to transfer innovations from publicly financed research to the marketplace since knowledge production has become an economic activity (Etzkowitz, 2003; Clark, 2001). Through the establishment of TTOs at their

institutions, universities have become entrepreneurial. TTOs are responsible for creating awareness of IP and transferring innovations from researchers at universities in South Africa to the market-place.

There were different academic phases that were passed in order for the emergence of the entrepreneurial university. The first academic revolution started in the 19th century and research became central in universities apart from the traditional role of teaching (Raivio, 2008). The entrepreneurial academic model originated from the United States' universities in late 19th century as there was an absence of an official research funding system (Etzkowitz, 2003). The second revolution emerged in the 20th century and an economic dimension was added to roles of universities and they were now responsible for teaching, research and economic development (Gupta, 2008; Etzkowitz, 2003). Stanford University became one of the institutions to adopt the entrepreneurial academic model in the early and mid-20th century (Etzkowitz, 2003). A third academic revolution was as a result of the convergence of both theoretical and practical approaches and an interactive model of innovation emerged (Etzkowitz, 2003). The emergence of the entrepreneurial university model was as a response to the relevance of knowledge in the innovation system and the acknowledgement that universities create knowledge and inventions (Etzkowitz, *et al.,* 2000).

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In an entrepreneurial university model, "institutional spheres of science and the economy, university and industry, that were separate and distinct, have become intertwined" (Etzkowitz, 2003, p. 109). Oxford University is one of the United Kingdom's most entrepreneurial universities (Etzkowitz, 2003; Leydesdorff & Meyer, 2006). The University has a potential for "new interdisciplinary scientific fields and new industrial sectors, each cross fertilizing the other" (Etzkowitz, *et al.,* 2000; Etzkowitz, 2003, p. 112). Various universities are focusing on identifying, creating and commercializing their IP (Etzkowitz *et al.,* 2000). Thus, they are striving to become entrepreneurial universities.

However, literature shows that some companies are concerned about "new firms emerging from academia as potential competitors are arguing that universities should confine themselves to traditional academic–industrial relationships such as consultation" (Etzkowitz, *et al.,* 2000, p. 314). The need to become entrepreneurial has led to the need for creating awareness of IP at universities. There is need for researchers to be well informed about the role of IP in creating innovations that may improve lives. Universities now have IP policies that guide the whole process from discovering an innovation to its commercialisation. Ncube

et al., 2014 argue that there is need to balance commercialisation of IP with its dissemination for the socio-economic empowerment of people especially in developing countries. The next section discusses the interaction between research institutions and the industry; the role that entrepreneurial universities play in innovation.

2.5.2 Knowledge exchange in higher education institutions

Although the principal mandate of universities is teaching and research, universities have become entrepreneurial as they are now involved in technology transfer. Intellectual property is considered as important to higher education institutions because of economic, political and social forces which regard knowledge and also research as significant assets in today's world (Bansi, 2006). However, researchers at these institutions are involved in community engagement and knowledge transfer to support scholarship and the growth of public goods (Walwyn, 2018). The case is different when it comes to knowledge or technology transfer within the private space because this involves financial benefits. The researchers will be involved in licensing of IP, contract research, consultancy and testing prototypes as shown in figure 2.3. The researchers will in turn reap rewards for their innovations.

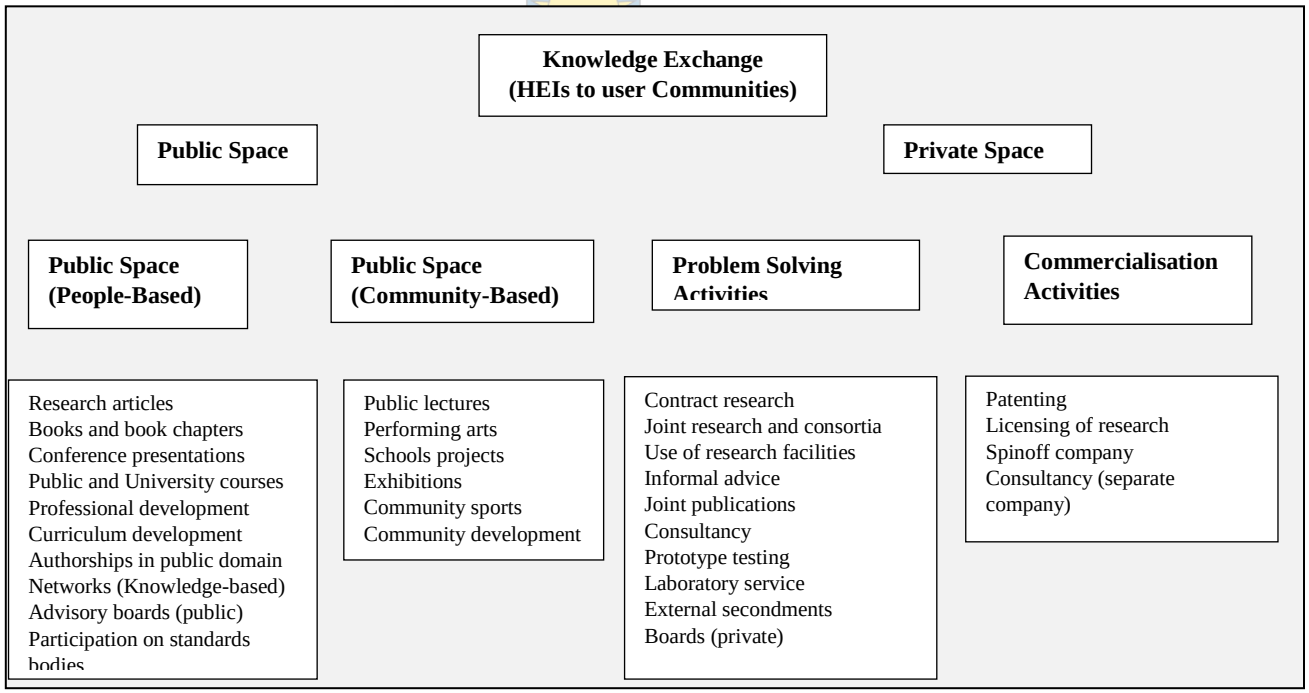

Figure 2.3 Knowledge exchange pathways followed by universities

Source: McMillan Group (2016)

As shown in figure 2.3, universities are involved in the public space through being involved in many activities but TTOs are responsible for commercialisation activities. The relationship

between universities and private companies is significant for the success of technology transfer. Figure 2.3 presents a model for the relationship between companies and universities. Historically, university research was perceived as academic and could not address the needs of the real world but there was a shift in policies which now emphasize the need for universities to be innovative thus, addressing socio-economic needs (Walwyn, 2018). The enactment of the IPRFRD Act (2008) enabled universities to officially establish TTOs and to commercialise innovations from publicly funded research. Figure 2.4 is indicative of the central role that is played by TTOs as they provide a suitable environment for commercialisation of new knowledge

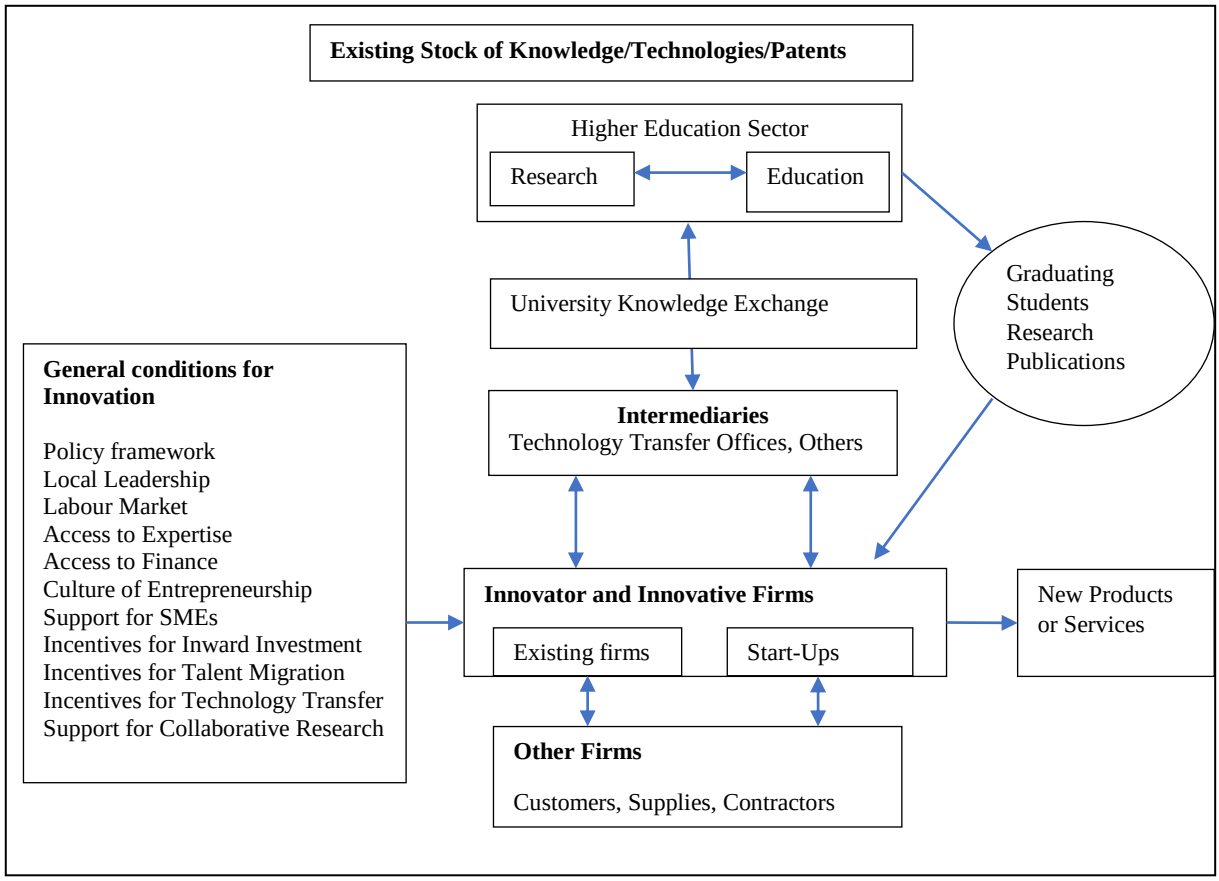

Figure 2.4 Relationships between the knowledge exchange and innovation

Source: Walwyn, (2018)

Figure 2.4 shows that creating an enabling environment for innovation requires a lot of effort as there are many aspects to consider and these include the relevant expertise who have knowledge of IP, and the whole process of technology transfer and a lot of resources are required as well. Students are also important as far as innovation is concerned as they also conduct research that may have potential IP that can result in tangible products and services.

TTOs as shown on figure 2.4 facilitate exchange of knowledge between a university and the industry on the road to commercialisation of university innovations. Therefore, in order for the success of technology transfer, there is need for collaboration particularly between the university and the industry. In addition, other factors such as existing policy frameworks, an organisational culture, availability of financial and human resources, and also diffusion of new knowledge play a role in the success of TTOs (Walwyn, 2018).

2.5.3 Role of the Technology Transfer Offices

Technology transfer involves disclosure of inventions by the researcher, the evaluation of the commercial potential of an innovation, developing a commercialisation strategy, patenting and licensing, seed funding that is used for commercialisation of the technology, incubation period and spinoff of a new company (Walwyn, 2018, p15). The steps that are followed in technology transfer are illustrated in figure 2.5.

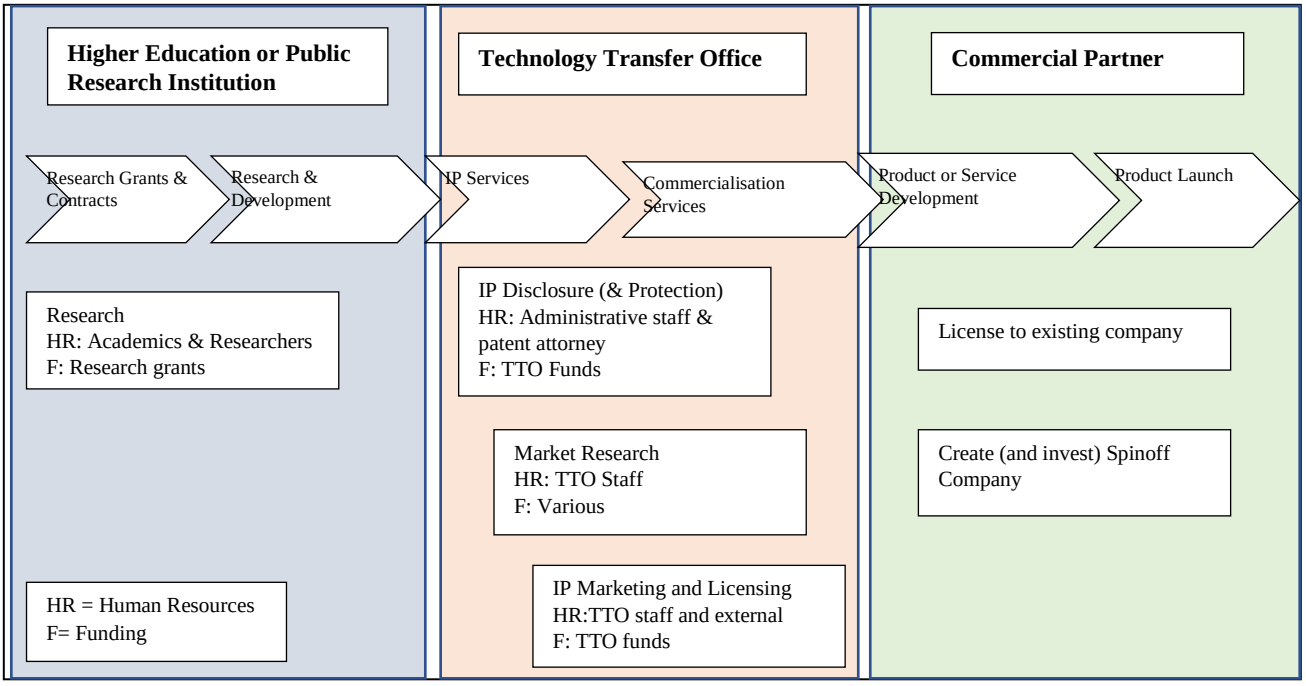

Figure 2.5 Role of technology transfer offices in knowledge exchange and transfer

Source: adapted from Hughes and Kitson (2012).

TTOs should coordinate with the research management office because they are a research management or support function that play an important role in delivering knowledge and disclosures that comprise the main work of TTOs (Walwyn, 2018:16). Literature shows that that researchers are not involved in commercialisation activities because measurement of publication output excludes commercial activity (Bansi, 2016). Bansi (2016) also stresses that

the challenge is that academics engage more in research that is meant for publication and not for patenting. For instance, researchers are rewarded for good research performance and are rated by the National Research Foundation (NRF), they then receive certificates. This may give the impression that publishing research findings is the best practice yet it is vital for researchers to conduct research that has commercialisation potential as well.

Technology Transfer Offices perform several functions. Section 7, subsection (2a) of the IPR-PFRD Act of 2008 describe the functions of a TTO as follows;

- "develop and implement, on behalf of the parent institution, policies for disclosure, identification, protection, development, commercialisation and benefit-sharing arrangements, all relating to IP
- receive disclosures of potential IP
- analyse the disclosure for any commercial potential, the likely success of such commercialisation, the existence and form of the IPR, the stage of development and the appropriate form for protecting those rights
- attend to regulatory requirements (e.g. IPRPFRD Act (2008) and associated referrals to NIPMO) on behalf of the parent institution
- conduct evaluations on the scope of statutory protection of IP in all geographic territories subject to commercialisation potential of the IP
- attend to all aspects of statutory IP protection, transactions and commercialisation"

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In addition to the responsibilities mentioned above, TTOs can also adopt other functions that include to;

- "facilitate the transfer of institution-based creations into new products and services for public use and benefit
- promote regional economic growth and job creation
- provide the best return on investment in research and development
- transfer technology for public benefit
- reward, retain and recruit suitable staff and graduate students
- create and expand relationships with industry and to negotiate IP transactions
- fulfil the legal functions related to research contracts and IP transactions
- generate royalty income for the OTT, IP creators and the institution
- generate new R&D funding support for the institution and/or its staff from sponsored research funding, consulting opportunities and donations of funds or equipment

- operate as a service centre to the institution, its staff and students on all areas related to IP, including providing seminars and consulting services when requested
- actively facilitate entrepreneurship and foster the formation of start-up companies" (Capart & Sandelin, 2004 cited in Walwyn, 2018).

In South Africa, TTOs are mandated by the IPR-PFRD Act of 2008 to develop and then implement IP policies on behalf of an institution that they are operating under (Walwyn, 2018). Such policies should cover different stages from the identification, development to the commercialisation of IP (Walwyn, 2018). Prior to proclamation of the Act, the majority of South African universities did not prioritise the administration and management of IP as they did not have IP policies. In responding to the requirements of the Act, many universities developed institutional IP policies for the protection and management of IP that is developed by staff, students, other visiting researchers using institutional resources and the premises (Ncube *et al.*, 2014). Such universities include University of Free State and also University of Fort Hare.

One of the important roles that TTOs can play is to generate revenue, for instance, from license income, royalties, consulting, sale of equity that is in start-up companies (Walwyn, 2018; Bansi, 2016). Figure 2.6 shows the average revenues in percentages from TTOs in the United States, United Kingdom and Japan. From the table, it is evident that universities in the United States are benefiting from technology transfer activities as shown by the number of spin-off companies that were formed and revenue that is generated by TTOs.

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Item	US (AUTM)	UK (HE-BCI Survey)	Japan (UNITT)
Total Research Resource, A (GBP million)	35,722	7,043	14,715
IP Income (including sales of shares in spin-offs; GBP)	1,290	131	18
IP Income (% of A)	3.6%	1.9%	0.12%
Spin-Off Companies Formed	747	147	18
Research Resource per Spin-Off (GBP)	47.8	47.9	818
Patents Granted	5,163	976	4,776
Research Resource per Patent (GBP)	6.9	7.2	3.1
Industrial Contribution to Research (GBP)	2,330	508	64
Fraction Industrial Research of A	6.5%	7.2%	0.4%
Cashed-In Equity (USA) or Sale of Spin-Off Share (UK) B(GBP)	20	49	3.6
B as % of A	0.06%	0.70%	0.02%

Figure 2.6. TTO activity in the United States, United Kingdom and Japan (2013/14)
Source: McMillan Group, 2016

TTOs have their own challenges, literature survey indicates that most TTOs are regarded as loss-making entities (Heher *et al.*, 2007; Rasor & Heller, 2006). A study by Abrams *et al.*, (2009) on United States TTOs, conveyed that only large research universities are running profitable TTOs while the majority (about 75%) of universities' TTOs are running at a loss. Wessner (2012, p. 11) adds that financing is another obstacle to commercialization of innovations. The Southern African Research and Innovation Management Association, 2016 also states that the challenges that are faced by TTOs include, lack of trained specialists, funds to support technology transfer activities, dedicated TTO staff, and inadequate knowledge amongst researchers regarding the importance IP disclosure and managing IP. Mulder (2008 cited by Oluput 2009, p. 110) adds that TTOs in the South African context face many challenges which include:

> "getting the institutional leaders to embrace technology transfer and commercialization activity and not simply paying lip service; loss of IP due to lack of awareness by researchers; absence of funds for patents; absence of funds for product development and commercialisation; difficulty in market penetration, both local and international markets and inadequate human resources".

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However, other TTOs have success stories. For instance, a study by the Public and Corporate Economic Consultants (2012) which focused on innovation activities in the higher education institutions in the United Kingdom correspond that for every £1 invested, about £6 income was gained by the university and in turn benefits spilled over to the economy. In addition, a survey that was carried out by the Association of University Technology Managers (2012, p. 6) reported that in 2009/2010, United Kingdom universities generated about £84m in revenues from patenting and over 5,600 United States patents were issued and they generated over US$2.267 billion and as a result 550 spin off companies were created. This is not the case in Africa, specifically in the Southern African Development Community region, where technology transfer is still a new concept and this is indicated by a low number of universities that established TTOs (Southern African Research and Innovation Management Association, 2016). Thus, there is need for creating awareness about the relevance of IP in African universities.

2.6 Theoretical framework

This study is guided by the diffusion of innovations theory elaborated by Everett Rogers (1962) which emphasise on the role of communication in spreading new ideas or innovations. This theory assists the researcher in analysing data collected through both interviews and questionnaires.

2.6.1 Diffusion of innovations theory

The "diffusion of innovations" theory expounded by Everett Rogers in 1962 became one of the most influential modernisation theories derived from modernization theory of the 1950s and 1960s (Waisbord, 2000). The theory has ruled development communication for decades and became the blueprint for communication activities (Waisbord, 2000). Rogers' intent was to understand how people adopt new behaviours. Diffusion is regarded as the process by which an innovation or a new idea, new invention is communicated to target audiences or a target group through a channel over a long period (Rogers, 2003). The theory is based on the belief that societal change or individual behaviour change can be seen from how people respond to new ideas or to different ideas or behaviour being introduced (Rice & Atkin, 2013).

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In diffusion, the messages that are communicated are concerned with new ideas (Rogers, 2003). Diffusion results in societal change in the sense that new ideas are invented, then diffused, and they will be adopted or rejected by the target audience and may lead to behaviour change (Rogers, 2003, p. 6). In order for diffusion to take place, an innovation is communicated to a small group of potential adopters who will then influence other potential adopters to attend to, consider, adopt innovations (Rogers, 1983, p. 6). In this study, the potential adopters are researchers, they are the target for the IP messages and some of them will influence other researchers to be innovative or protect their innovations through registering their IP. Diffusion include both planned and unplanned spread of ideas; unplanned spread of ideas is referred to as the spontaneous spread of new ideas (Rogers, 2003, p. 6). The planned spread of ideas is the aim of the communication initiatives and the unplanned spread of ideas refers to the spread of ideas through social interaction.

2.6.1.1 Origin of the theory

With its roots in agricultural studies, diffusion studies expand the two-step flow theory by adding another step. Diffusion concepts emerged in the early 19th century and they were influenced by two people; Georg Simmel, a Germany political philosopher and he argued that interpersonal relationships influence an individual's thought and actions (Dearing, 2009). At the same period, a French sociologist Gabriel Tarde stated that diffusion influence social change and he identified an S-shaped curve which illustrates how individuals adopt innovations over time and the role that is played by opinion leaders (Dearing, 2009, p. 6). The article written by Bryce and Neil (1943) cited in (Dearing, 2009, p. 7) which focused on "the diffusion of hybrid seed corn in two American farming communities" became a blueprint for the diffusion process as it emphasised that individuals are the "locus of decision, adoption as the key dependent variable, the key role of a centralized change agents…, and the importance of different communication channels for different purposes at different times in the individual innovation-decision process" (Dearing, 2009, p. 7).

Everett Rogers was a rural sociologist and his background was more influential in shaping his thinking in relation to how individuals adopt innovations. The author was raised at a farm and he watched his father not adopting innovations and in trying to understand such behaviour, that is when he came up with ideas on how the innovation process begins (Dearing, 2009). Rogers focused on community and interpersonal networks. During the late 19th century, knowledge spread from urban areas to rural areas in the United States and the aim was to address the challenges of farmers, teachers and public health officers (Dearing, 2009). Innovations in most cases require a lengthy period to be widely adopted. Therefore, the challenge is on how to increase diffusion rate (Rogers, 1983). In the context of this study, innovations refer to ideas that the society should adopt, new ways of thinking which will lead to innovations. The process of diffusion of innovations occurs through time phases. There are five main steps in the innovation process as discussed in the next section.

The first phase is knowledge which occurs when a person is exposed to the innovation and understands its purpose. In relation to this study, its assumed that researchers get knowledge on what IP is when they are educated through various means which includes a series of awareness workshops. The second phase is persuasion which occurs when a person forms a favourable attitude or unfavourable attitude toward the idea. The third phase is the decision-making phase and this occurs when a person participates in activities that encourages one to

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adopt an idea or reject it. The fourth phase is the implementation phase which occurs when a person puts the idea into practice. Lastly, there is the confirmation phase which occurs when a person seeks "reinforcement of an innovation decision that has already been made, but he or she may reverse this previous decision if exposed to conflicting messages about the innovation" (Rogers, 2003). Hence, decision, implementation, and confirmation directly relate to researchers engaging in activities, or following the processes of adoption and practice of IP at universities through the establishment of TTOs and development of IP related policy frameworks.

2.6.1.2 Characteristics of innovations

1. Relative advantage in relation to diffusion is the extent to which an innovation is professed as better than an idea that it surpasses (Rogers, 2003). Relative advantage can be measured economically and socially (convenience and also satisfaction are vital components to be considered). If the perceived relative advantage is high, the adoption rate of an innovation increases (Rogers, 2003). In this study, researchers are more likely to adopt new ideas and put them into practice if there are benefits associated with such behaviour and registering IP benefits the researchers through reaping the rewards and it benefits the institution and the society at large.

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2. Compatibility refers to the extent to which innovations are perceived as being dependable with past experiences and the needs of the target audiences. The researchers have been used to publishing their research outputs and gaining rewards from that behaviour and now there is a need to also consider other avenues of distributing their knowledge and this new way is compatible with their needs as the aim is to get rewards.

3. Complexity in relation to diffusion refers to the extent to which an innovation is stated as problematic to comprehend and use. Therefore, the degree of complexity determines the rate of adoption.

4. Trialability refers to the extent to which an innovation may be tested, new ideas that can be tested have a higher chance of being adopted quickly than those that are indivisible. Thus, an innovation that can be experimented with represents less uncertainty.

5. Observability refers to the extent to which the results of an innovations are observable by others. This encourages others to adopt the innovation (Rogers, 1983). This is important as

the researchers should be aware of other cases where the researchers succeeded in commercialising their IP and those who lost their IP as a result of lack of knowledge. Thus, innovations that are professed by receivers as having a relative advantage, compatibility, trialability, observability are adopted quickly than others (Rogers, 2003).

The underlying assumption of this theory is that diffusion aids people to adopt new ideas however, this theory overlooks whether people have a general understanding of what innovation is. Thus, the starting point is communicating, educating and making people understand and be aware of what innovation is all about. At the core of this study is understanding how people perceive IP. Therefore, the use of workshops to communicate IP messages to researchers can be regarded as new to them as they are used to other forms of communication in particular traditional media i.e radio and television. IP education is relatively new to other researchers as they are used to publishing of research results. They were not aware of the potential IP that emanate from their research projects.

The strength of the theory lies in the fact that it recognises that development does not only require media channels for communication, interpersonal communication is equally important as it can also influence attitudes and behaviours (Mefalopulos, 2008; Morris, 2003; Waisboad, 2000). Another reason could be the fact that diffusion theorists believe that one must not wait for the diffusion of a new idea to reach audiences since it is possible to hasten the adoption rate through planned communication. Therefore, diffusion theory is applicable to the study since the study assumes that diffusion of innovation theory explains the adoption of new ideas or practices by researchers. The theory informs and persuades people to adopt innovations (Mefalopulos, 2008). This relates with the study objectives.

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2.6.1.3 Critique of the theory

Diffusion of innovation theory has its limitations. This theory was previously criticised for its linear way of communication or is based on the transmission model, deterministic and a top-down approach (Morris, 2003; Waisboard, 2000). However, this has been addressed by improving the theory emphasizing that there should be a two-way communication. Similarly, authors such as Airhihenbuwa and Obregon (2000) noted that most theories do not suggest approaches to maintain the adopted behaviour (Bandura, 2001). Therefore, this implies that theories simply encourage people to adopt certain ideas and do not suggest ways of maintaining the new behaviour.

2.7 Legislative policy framework on IP from publicly financed research

The history of IPRs protection in South Africa can be traced to the 1996 White Paper on Science and Technology which emphasised the need for the protection of IP to encourage innovation (Department of Arts, Culture, Science and Technology, 1996). The issue was raised again in the Department of Science and Technology's R&D Strategy in the year 2002; the strategy emphasised the need for a framework for protecting IP that emanates from publicly financed research in South Africa (Department of Science and Technology, 2002). As a result, a framework for the Intellectual Property Rights from Publicly Financed Research was created in 2006 and this framework was approved by Cabinet in May 2007 after the consultation process (Ncube *et al.*, 2014). At the end, this resulted in the enactment of the current IPR-PFRD Act 51 of 2008. The IPR-PFRD Act of 2008 is modelled on the Bayh-Dole Act of 1980 which also protects IP that emanates from federally funded public institutions in the United States.

2.7.1 Intellectual Property Rights from Publicly Financed Research and Development Act, (2008)

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The South African government realised that there was need to protect the country's innovations and drafted laws that addresses such. As a result, IPR-PFRD Act was created in 2008. The primary objective of the Act is "to make provision that IP 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" (IPR-PFRD Act, 2008, p. 5). The assumption is that IP from research and development emanating from publicly funded institutions was not being effectively managed to benefit the society and the country at large. In other instances, IP that emanated from publicly funded research became owned by third parties (Hobololo, 2016). Another challenge was the fact that employees contracts at universities such as Rhodes allowed researchers to be the owners of IP (Hobololo, 2015). All these cases compromised the government from gaining from its R&D. This motivated the government to establish an Act that ensures that the country benefits from IP that emanates from publicly financed institutions.

2.7.1.1 Objects of the Act

The Act established uniform standards which govern IP from all higher educational institutions in the country. To add on, section 2 subsection (a-g) provides other objects of the Act which entails that;

> "a) a recipient of funding from a funding agency assesses, record and reports on the benefit for society of publicly financed research and development;
>
> (b) a recipient protects intellectual property emanating from publicly financed research and development from appropriation and ensures that it is available to the people of the Republic;
>
> (c) a recipient identifies commercialisation opportunities for intellectual property emanating from publicly financed research and development;
>
> (d) human ingenuity and creativity are acknowledged and rewarded;
>
> (e) the people of the Republic, particularly small enterprises and BBBEE entities, have preferential access to opportunities arising from the production of knowledge from publicly financed research and development and the attendant intellectual property;
>
> (j) following the evaluation of a disclosure, researchers may publish their research findings for the public good; and
>
> (g) where necessary, the State may use the results of publicly financed research and development and the attendant intellectual property in the interest of the people of the Republic".

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All these provisions ensure that IP is effectively identified and benefits thereof are used for the greater good of the community. This suggests that the researchers should be aware of these provisions on IP that stems from publicly financed research. In light of this, there have been as series of awareness activities in higher education institutions in the country over the years.

Section 2 subsection (f) states that researchers can only publish their research after evaluation for potential patents. However, the challenge with the Act is that it forbids the disclosure of research that is being inspected for patentability by TTOs and this delays the publishing of knowledge in the public domain i.e knowledge that relates to diseases and also unintentionally reduce the volume of research available for the benefit of the public (Chetty, 2010).

2.7.1.2 Establishment of technology transfer offices at institutions

Section 6 (1) a-b, of the Act also states that within 12 months of coming into effect of the IPR- PFRD Act of 2008 publicly financed institutions must;

> "(a) establish and maintain an office of technology transfer; or
>
> (b) designate persons or an existing structure within the institution to undertake the responsibilities of the office of technology transfer,
>
> (3) Two or more institutions may with the concurrence of NIPMO establish a regional office of technology transfer.
>
> (4) (a) NIPMO may, on terms and conditions determined by it, provide assistance to institutions for the establishment of offices of technology transfer.
>
> (b) the assistance contemplated in paragraph (a) may include
>
> (i) financial assistance;
>
> (ii) co-ordinating the establishment of a regional office of technology transfer, where applicable; and
>
> (iii) development of appropriately skilled personnel for the offices of technology Transfer".

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The other provisions of the Act; subsection 6 (2-4) seeks to ensure the success of the established TTO's in terms of subsection 6(1) in undertaking the mandate of improving researchers' knowledge and practices of IP at publicly financed institutions. The Act acknowledges that certain institutions may not be well capacitated to implement IP on their own, given that the appointed stuff may still need further training to increase their knowledge on IP. As such, the institutions and NIPMO are empowered to join hands and establish a regional technology transfer office. As such, a regional TTO was established in the Eastern Cape and it is managed from the Nelson Mandela Metropolitan University (Alessandrini, *et al.*, 2013).

In another perspective, the Act also anticipated that some institutions might be willing to implement the policy but faced with financial challenges, as such, financial assistance would be made available to them. As a follow through, one would raise a question; When was Fort Hare TTO established? Was it within the 12 months of the act's enactment? If not, what were the challenges? Because financial support was promised together with skills and capacity of appointed personnel. In another perspective, the delayed establishment of TTOs does impact on researchers' level of knowledge of IP.

Looking at the current situation at institutions of higher learning, it is evident that those institutions which did not have TTOs prior to the Act did not establish TTOs within the time frame of 12 months as stated in the Act. Some of those institutions include University of Venda and also University of Fort Hare with the exception of University of Free State and the University of KwaZulu-Natal which established their TTOs within the set time frame. Some universities such as University of Cape Town modified its IP policies to be in accordance with the provisions of the Act (Chetty, 2010).

2.7.1.3 The role of a Technology Transfer Office

Section 7, subsection (2a) of the Act mentions that a TTO has several functions including to;

> "(a) develop and implement, on behalf of the institution or region, policies for disclosure, identification, protection, development, commercialisation and benefit-sharing arrangements
>
> (b) receive disclosures of potential intellectual property emanating from publicly financed research and development;
>
> (c) analyse the disclosures for any commercial potential, the likely success of such commercialisation, the existence and form of the intellectual property rights, the stage of development thereof and the appropriate form for protecting those rights;
>
> (d) attend to all aspects of statutory protection of the intellectual property;
>
> (e) refer disclosures to NIPMO on behalf of an institution;
>
> (f) attend to all aspects of intellectual property transactions and the commercialisation of the intellectual property;
>
> (g) conduct evaluations on the scope of statutory protection of the intellectual property in all geographic territories subject to commercialisation potential of the intellectual property; and
>
> (h) liaise with NIPMO as provided for in this Act".

This therefore imply that TTOs are mandated by the Act to develop and implement IP policies on behalf of an institution that they are operating under. Such policies should cover different stages from the identification, development to the commercialisation of IP. Prior to promulgation of the Act, the majority of South African universities did not prioritise the administration and management of IP as they did not have IP policies. As mandated by the Act, many universities developed institutional IP policies for the protection and management

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of IP developed by staff, students, other visiting researchers using institutional resources and the premises (Ncube *et al.,* 2014). Such universities include University of Free State and University of Fort Hare.

2.7.1.4 The functions of the National Intellectual Property Management office

The South African government through provisions of IPR-PFRD Act, 2008 established the National Intellectual Property Management Office in 2013. Section 9 focuses on the functions of NIPMO and they are listed below;

> "9. (1) NIPMO must promote the objects of this Act, which includes the statutory protection, management and commercialisation of the intellectual property referred to it by a recipient in terms of section 4.
>
> (2) NIPMO must ensure that it has the capacity to consider any intellectual property referred to it by a recipient in terms of section 4, and to deal with it in accordance with this Act.
>
> (3) NIPMO must liaise with the recipients or any other party it deems fit to determine the viability of
>
> a) obtaining statutory protection for the intellectual property referred to it, if it is in the national interest;
>
> (b) concluding any intellectual property transactions; or
>
> (c) commercialisation of such intellectual property.
>
> (4) NIPMO must, furthermore
>
> a) manage information in respect of intellectual property contemplated in this Act, including data concerning the recipients;
>
> (b) provide incentives to recipients and their intellectual property creators, to reward them for proactively securing protection for intellectual property and commercialising it and, generally, for promoting innovation;
>
> (c) provide assistance to institutions with
>
> (i) the establishment of offices of technology transfer and related capacity-building;
>
> (ii) intellectual property transactions;
>
> (iii) commercialisation of intellectual property; and
>
> (iv) any other matter provided for in this Act;

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(d) provide appropriate standards and best practices in consultation with a recipient, without limiting the power of the recipient to act in its own interests in terms of this Act;

(e) develop guidelines for intellectual property transactions involving non-South African entities and persons, and manage the implementation of such guidelines; and

(j) monitor, evaluate and review the obligations of recipients in terms of this Act".

Section 9 subsection 1 (one) of the Act state that NIPMO is the custodian of this Act as it has the responsibility to ensure that all the provisions are uphold. This is why NIPMO is at the fore front in ensuring that universities establish TTOs and creating awareness of IP among researchers at institutions of higher learning.

2.7.1.5 The establishment of the Intellectual Property fund

The Act also enabled the establishment of the Intellectual Property fund as stated below;

"13. (1) There is hereby established an Intellectual Property Fund to be managed by NIPMO.

(2) The purpose of the Intellectual Property Fund is to;

a) provide financial support to institutions for the statutory protection and maintenance of intellectual property rights, subject to subsection (3);

(b) finance any costs incurred by NIPMO for obtaining statutory protection of the intellectual property; and

(c) finance any costs incurred by NIPMO when acting in terms of section 14.

(3) An institution may recover the costs incurred in obtaining statutory protection for the intellectual property contemplated in this Act from the Intellectual Property Fund;

a) to the extent determined by NIPMO; and

(b) on such terms as may be determined by NIPMO".

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This implies that universities have access to resources that they can use in covering costs that result from application of IP protection. The challenge with this Act is that there is no clear amount listed that will be given to universities to cater for their expenses. Studies argue that developing countries face challenges because they do not have adequate resources to fund patents as the process is taxing.

2.7.1.6 Rights of intellectual property creators in institutions to benefit-sharing

The Act also ensures that IP creators at all institutions are rewarded for the innovations that they create while using the resources and the premises of institutions. However, the IP creators will only benefit until the IP rights expires. Both the creator and their heirs are entitled to a share as stated below;

> "10 (2) ((I) at least 20 per cent of the revenues accruing to the institution from such intellectual property for the first one million rand of revenues, or such higher amount as the Minister may prescribe; and
> (b) thereafter, at least 30 per cent of the nett revenues accruing to the institution from such intellectual property.
> (3) The benefits contemplated in subsection (2) must be shared in equal proportions between the qualifying intellectual property creators or their heirs unless otherwise agreed between those creators and the recipient or determined in accordance with institutional policies.
> (4) The benefits to intellectual property creators and their heirs contemplated in subsection (2)(a) must be a first call on the applicable revenue ahead of any institutional distribution.
> (5) The recipient may distribute the balance of the revenues generated by intellectual property as it deems fit, but must apportion part of it for funding, among other things
> (a) more research and development;
> (b) the operations of the office of technology transfer; and
> (c) statutory protection of intellectual property".

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The Act provides for benefit sharing to encourage researchers to create innovations. This provision is important as it secures the IP creator's profits and also provides inventors with incentives to innovate and this will be beneficial to the country's economy (Titu *et al.,* 2018; Suzuki, 2015; Chang, 2008). Ncube *et al.,* (2014, p. 290) also adds that "a lack of clear incentive and benefit sharing formulae were resulting in an environment with little or no motivation for researchers to innovate and commercialise inventions". Therefore, clearly stating the benefits may stimulate innovation among researchers at universities. However, the challenge is that there is need for the TTOs to ensure that potential innovators i.e researchers have relevant information on what they stand to benefit from their innovations. Hence IP awareness initiatives are important.

2.7.1.7 Management obligations and disclosure duties

This section speaks to the management and disclosure of the IP. Sub section 5 (a) emphasise that IP should be protected before disclosure and sub section 5 (e) goes on to state that a public disclosure should be made within a period of 90 days. Sub section 5 (g) also mentions the role of TTOs in managing IP; they should manage revenues from IP transactions, and manage the benefit-sharing arrangements with IP creators. Although the IPR-PFRD Act (2008) enables universities to conduct business (Bailey, 2011), new challenges emerge regarding scholarly publication, researchers should seek permission and also declare their outputs to their TTO before they publish or present their findings at conferences and this complicates and delays the process of publishing research findings for knowledge socialisation (Simelane, 2013). All this is relevant to ensure that the innovator is rewarded accordingly.

5. (1) A recipient must

"(b) provide effective and practical measures and procedures for the disclosure of intellectual property and ensure that intellectual property emanating from any publicly financed research and development is appropriately protected before results of such research and development are published or publicly disclosed by other means;

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(e) ensure that personnel involved with the research and development make a disclosure to it within 90 days or such longer period as may be prescribed, of identification by such personnel of possible intellectual property and before the intellectual property is made public;

(d) assess the intellectual property to determine whether it merits statutory protection and, where appropriate, apply for and use best efforts to obtain statutory protection in its name;

(e) refer disclosures for which it elects not to retain ownership or not to obtain statutory protection to NIPMO within 30 days or such longer period as may be prescribed, of it making such an election;

(f) in the case of an institution, manage revenues due to it from intellectual property transactions and the commercialisation thereof, including managing the benefit-sharing arrangements with intellectual property creators at the institution;

(g) negotiate and enter into intellectual property transactions with third parties on

intellectual property belonging to the recipient;

(h) report to NIPMO twice a year and as provided for in this Act, on all matters pertaining to the intellectual property contemplated in this Act, including all intellectual property from which it elects to obtain statutory protection and the state of commercialisation thereof, in a manner stipulated by NIPMO;

(i) provide NIPMO with full reasons in respect of any intellectual properly that is not commercialised; and in respect of an institution, put in place mechanisms to annually assess, record and report to NIPMO on the benefits for society of publicly financed research conducted in the institution".

The Act also provides that any information relating to the process of identifying and commercialising IP should be well documented and TTOs should report to NIPMO through writing institutional reports. Sub section 5 (i) states that even information on IP that is not commercialised should be provided and all this is done in order to track progress as far as innovation is concerned.

Thus, the Act plays an important role as far as the protection of IP from publicly funded research is concerned as it lays out the guidelines that should be followed and put in place mechanisms to stimulate innovation by ensuring that innovators are rewarded for their hard work. On the other hand, the Act has its weaknesses that needs to be addressed in order to ensure that the country benefits from research outputs of publicly financed institutions. The challenge is that, even though there are laws that protect innovations, there is inadequate and ineffective communication of IP among researchers so there is need to educate them on the value of IP in today's society. There is a need to reset the mind of researchers "from the *'publish or perish'* approach to a mixed *'patent, publish, commercialise'* and *'publish and socialise'* approach" (Ncube *et al.,* 2014) to ensure that a patent application co-exists with a published article and the public will benefit from both the innovation and have access to the knowledge that is placed in the public domain.

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2.8 Chapter summary

This chapter discussed the role played by TTOs at universities. The diffusion of innovations theory which was elaborated by Rogers in 1966 is influential as it explains the diffusion of ideas or practices. The last section of this chapter discussed the policy framework particularly the IPR-PFRD Act 51 of 2008 which protects innovations that emanates from publicly

funded research institutions in South Africa. The framework stipulates the role of TTOs in facilitating the commercialisation of innovations that emanates from publicly financed research. There is a lot that needs to be done to ensure that researchers have adequate knowledge of the importance IP.

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CHAPTER 3: PERSPECTIVES OF INTELLECTUAL PROPERTY

3.1. Introduction

This chapter discusses IP perspectives from both developed countries and developing countries. The case studies that were reviewed in this chapter were intentionally selected using the United Nations (2019) classification to identify countries that are categorised as developed and those that are categorised as developing. Developed countries that were selected are the United States, Japan and Germany. On the other hand, developing countries that were selected in this study include India, Botswana and South Africa. Thus, these case studies present views from many continents in the world, namely, North America, Europe, Africa, Asia. The review was guided by the research objectives; it discusses IP policies, practices of IP in different countries, awareness initiatives and the communication strategies that were employed to reach out to researchers. The discussion is also aimed at demonstrating lessons that can be learnt to enhance the understanding and practice of IP. This is essential to help inform and guide university IP policies and laws for protecting IP from publicly financed institutions in developing countries and by extension UFH.

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3.1 Developed countries

This section discusses case studies from developed countries such as the United States, Japan and Germany.

3.1.1 The case of the United States

Intellectual property is regarded as vital and a well-functioning patent system is vital to the United States (Intellectual Property Enforcement Coordinator Annual Intellectual Property Report to Congress, 2019). This is why, United States has taken measures to ensure that researchers are well informed about IP. Even though universities in the United States are the leading institutions around the world in patenting, the country continues to create awareness of IP. In particular, the Department of Homeland Security has an IPR centre which create awareness and they even extend such activities beyond borders as they are involved in international outreach and training events each year. For instance, in the year, 2017 the Department of Homeland Security's IPR centre conducted 96 awareness events (Intellectual Property Enforcement Coordinator Annual Intellectual Property Report to Congress, 2019, p. 27). This clearly shows that creating awareness of IP and its protection in the United States is

a matter of importance and that creating awareness is not a once off exercise rather it is continuous. There are other emerging researchers which need to be educated and even established researchers need continuous development. The United States Patent's Office Global Intellectual Property Academy was involved in capacity building programs that focused on various types of IP protection i.e trade secrets, copyright policy, patents and the examination of trademarks in 2018 (Intellectual Property Enforcement Coordinator Annual Intellectual Property Report to Congress, 2019, p. 9). United States joins the rest of the WIPO member states in celebrating IP each year by having activities that educate people about the importance of IP. For instance, on the 26th of April 2018, United States embassies and consulates celebrated the day by hosting panel discussions, competitions and workshops on matters relating to IP (Intellectual Property Enforcement Coordinator Annual Intellectual Property Report to Congress, 2019, p. 9). Therefore, creating awareness is relevant to the United States as it positively contributes to increased practices of IP in publicly funded institutions.

United States is a success story in patenting as most universities in the United States have been leading in the number of granted patents as innovation is a key driver of economic growth. Federally funded university inventions in the United States are protected by the popular Bayh–Dole Act (also referred to as the Patent and Trademark Law Amendment Act of l980) which became effective on 1 July 1981 and it was sponsored by two United States senators namely; Birch Bayh and Robert Dole (Howard, 2013). The Act is a legal framework for commercialisation of federally funded university inventions; it enabled scientists, researchers and small businesses in the United States to own their patents and the innovators are rewarded for their innovations (Fisch *et al.,* 2015; Howard, 2013; Sampat, 2009). This Act is touted as the blueprint for the creation of IPR Acts and policies in many countries including South Africa.

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There are several reasons that motivated the enactment of the Bayh-Dole Act. The prior aim of the Act was to enhance "economic growth by efficiently mining the untapped scientific riches of hospitals, laboratories, and universities" (Markel, 2013, p.1). This implies that before Bayh-Dole, there were inventions that were discovered using federal funding but were not being developed and commercialised since the government lacked knowledge on commercialisation. Likewise, the Act was aimed at addressing the deteriorating United States' economic competitiveness due to fierce competition in late 1970s and in early 1980s

(Ezell, 2019). In the year 2002, The Economist termed Bayh-Dole "possibly the most inspired piece of legislation to be enacted in America over the past half-century". This is because the Act changed the technology transfer environment. The Economist also added that the Act "unlocked all the inventions and discoveries that had been made in laboratories throughout the United States with the help of taxpayers' money. More than anything, this single policy measure helped to reverse America's precipitous slide into industrial irrelevance". Thus, implying that the Act stimulated innovation at universities which in turn led to patenting and thus reviving the economy.

In addition, there are other reasons that inspired the enactment of the Act including the fact that there was a need to protect innovations by university researchers such as drugs (insulin) and food-related products (Apple, 1989; Bliss, 1982), to reward innovators for their hard work, by ensuring that universities also benefit from inventions made by researchers affiliated to their institutions and who used their equipment. To add on, another important aspect was "the need to gain control of external 'free riders' entrepreneurs such as those who were accessing inventions made at Massachusetts Institute of Technology without recompensing the institution" (Leydesdorff *et al.*, 2016, p. 257) since the University is one of the first universities to be involved in technology licensing to companies in the United States. This implies that other entrepreneurs saw the opportunities that were emanating from research outputs from the universities and decided to take advantage given the fact that universities lacked knowledge about potential benefits that accrue from their efforts.

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As the Act became widely appreciated, colleges and universities in the United States consequently developed and strengthened the relevant expertise (individuals with scientific, legal, and business backgrounds) needed to facilitate patenting and licensing of their inventions and many institutions established their TTOs during this period (Council on Governmental Relations, 1999) i.e University of Michigan established a Technology Management Office in 1982 and The University of Washington established its TTO in 1983 (United States General Accounting Office Report, 1998). A few universities had their own TTOs before the enactment of the Act (Tornatzky & Rideout, 2014) and such universities include Massachusetts Institute of Technology which established its Technology Licensing Office in 1940 and Stanford University's Office of Technology Licensing which was established in 1970 (United States General Accounting Office Report, 1998). These TTOs facilitate commercialisation of innovations and Technology Licensing Offices which function

as hubs within universities where innovators and industry leaders engage to commercialize inventions and as an extension these offices are now facilitating the creation of companies that will be based in local communities and played a pivotal role in improving the economy (The Innovative and Entrepreneurial University: Higher Education, Innovation and Entrepreneurship in Focus, 2013).

In addition, the United States also have regional Technology Transfer Centres that assists research institutions with small and incapacitated TTOs and those institutions without dedicated TTOs. Such centres include the Massachusetts Technology Transfer Centre, the South Texas Technology Management Centre, and the University of Utah. This enables all institutions to have access to TTOs which facilitate their technology transfer. Thus, the existence of these regional TTOs is of paramount importance in ensuring that no institution is sidelined because they do not have their own dedicated TTOs.

This noticeable and profound success in United States higher education institutions is attributed to the fact that they established TTOs at universities and these TTOs employ well trained personnel and this enables them to generate more licensing income (Conti & Gaule, 2011). There is a professional body of university technology managers called Association for University Technology Managers (Boettiger and Bennett, 2006) and this body assists university technology administrators through education, professional development and advance their role of technology transfer (United States General Accounting Office Report, 1998). As a result of the enactment of the Bahy-Dole Act, the membership of the Association for University Technology Managers significantly increased from 113 members in 1979 to 2,178 in 1999 (Council on Governmental Relations, 1999, p. 3) and more than 3000 institutions are members of the body (Boettiger & Bennett, 2006).

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United States' global leadership in innovation is as a result of robust public and private investments in R&D (Ezell, 2019). For instance, in 2017, biopharma companies contributed significantly to R&D by providing over $2.5 billion to fund university research in the United States (Atkinson, 2018). This injection of capital is of significance to the innovation system as patenting is expensive. In addition, industry-academic partnerships enable the success of the country's innovation system. The Act ensured that there are clear transactions between the industry and academia and enabled inventors to benefit from their inventions. As a result, both the higher education sector and the industry became actively involved in research and they work together to translate inventions into commercial products (Boettiger & Bennett,

2006; Mowery & Sampat, 2005). Therefore, there is a strong industry-university partnership which enables technology transfer to be possible in the United States unlike in many developing countries that modelled their IPR polices on the Bahy-Dole Act.

Furthermore, the Act has been credited for the increase in the number of patents granted to universities and start-up companies created in the United States (Ezell, 2019; Association for University Technology Managers, 2016; Boettiger & Bennett, 2006; Mowery *et al.*, 2001). There were about 390 patents which were awarded to universities in 1980 and the number had increased to 6,680 by 2015 (Association for University Technology Managers, 2016). It is interesting to note that over 2200 companies were created as a result of industry-academic partnerships between 1980 to 2002 only. Ezell (2019) adds that, on average, United States launches about three new start-up companies and at least two new products each day emerging from inventions created by universities and more than 200 new drugs and vaccines are on the market. These inventions created employment opportunities between 1996 and 2015 and boosted the United States' Gross Domestic Product by up to $591 billion and in turn contributed to $1.3 trillion in gross industrial output (Pressman *et al.,* 2015). The statistics evidences that with the establishment of the Act, the number of patents granted to universities have been significantly increasing. This shows that universities in the United States have a positive attitude towards IP and patenting as depicted in table 3.1. However, there was a stagnation and decline in patenting activity between 1998-2008 but the numbers started to rise from 2009 onwards.

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There are arguments that were put forward on the negative implications of the Act. Markel (2013) argue that there is need for the revision of the Act, although patenting rewards companies, scientists and universities, it poses risks i.e high prices limit people's access to life saving technologies or inventions, and people will not share scientific data. Some of the issues raised include the issues of high prices as a result of monopolies, and whether taxpayers would benefit from inventions (Council on Governmental Relations, 1999). Markel (2013) further adds that it is important for all Americans to benefit from the rewards of federally funded biomedical research.

In addition, a study done by Fisch *et al.*, (2015) ranked universities according to the number of Patent Cooperation Treaty applications filled between 2001-2011 as presented in table 3.1. the table shows the number of patents applications filed in different jurisdictions. The table shows the statistics of patents filled at the United States Patent and Trademark Office, in

Europe and Asia. The researcher described the meaning of the abbreviations used in the table so that it is clear to the readers.

Table 3.1 Ranking of the top 20 universities

Rank	University	Country	Number of patent applications filed			
			PCT	USPTO	EU	ASIA
1	Massachusetts Institute of Technology	US	1,733	2,580	791	497
2	Johns Hopkins University	US	1,154	1,563	694	251
3	University of Florida	US	1,059	1,148	387	190
4	Columbia University	US	956	961	342	205
5	University of Tokyo	JP	888	616	636	2,504
6	Stanford University	US	879	1,731	695	266
7	Harvard University	US	803	876	450	240
8	University of Michigan	US	764	1,261	469	254
9	University of Wisconsin	US	746	1,327	713	200
10	University of California	US	744	1,582	414	288
11	California Institute of Technology	US	740	1,436	398	151
12	University of Pennsylvania	US	692	902	488	226
13	University of California	US	646	1,371	373	218
14	Osaka University	JP	640	406	360	1,831
15	University of California,	US	633	1,429	345	237
16	Kyoto University	JP	627	405	331	449
17	Cornell University	US	625	930	386	214
18	University of California	US	619	1,324	355	199
19	Tohoku University	JP	572	526	335	1,074
20	University of Oxford	GB	557	359	1,292	150

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USPTO: United States Patent and Trademark Office,

PCT: Patent Cooperation Treaty,

EU: European Union

Source: Fisch et al., (2015)

Table 3.1 indicates that United States universities are dominating the top 20 with 15 universities on the list, in relation to the number of patents application filed. Universities in the United States such as Massachusetts Institute of Technology, Johns Hopkins University and the University of Florida have the highest number of Patent Cooperation Treaty patent applications in the whole world as all of them filed above 1000 Patent Cooperation Treaty applications. The leading university, Massachusetts Institute of Technology is regarded one

of the pioneers of patenting in universities as its history of patenting dates back to 1905 (Fisch *et al.*,2015). This corroborates with the assumption that institutions established long ago, have more patents than any other recently established universities.

To add on, Stanford University is also regarded as one of the institutions to adopt the entrepreneurial academic model in the early and mid-20th century (Etzkowitz, 2003). This model has also gained momentum around the world as most universities are also adopting this approach of becoming entrepreneurial which also contributes to increased IPR practices. This shows the practice of IP in universities in the United States is very high. Researchers responded positively to the need to protect innovations from federally funded universities.

It is vital to know how United States is currently ranked on the 2020 Global Innovation Index. The Global Innovation Index measures innovation and in 2020, the statistics of 131 countries are included (Dutta et al., 2020). Innovation is analysed based on two indices namely, Innovation Input Sub Index and Innovation Output Sub Index. The Innovation Input Sub Index comprises five enabler pillars that include Institutions, Infrastructure, Human capital and research, Market sophistication and Business sophistication and these pillars define aspects that encourage innovation (Dutta et al., 2020). On the other hand, the Innovation Output Sub Index comprise two pillars namely Creative outputs and Knowledge and technology outputs (Dutta et al., 2020). Figure 3.1 shows the framework of the Global Innovation Index.

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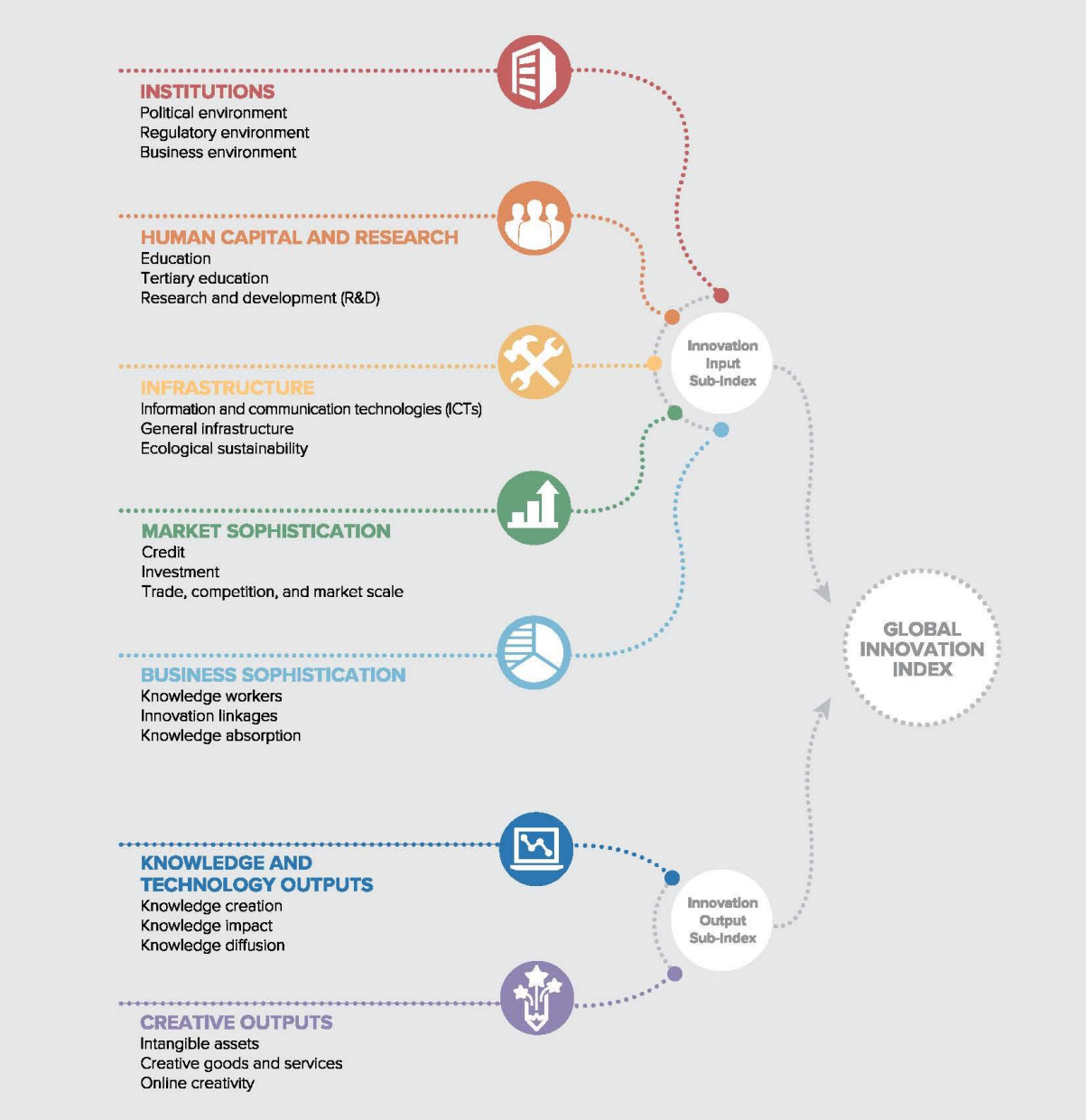

Figure 3.1 Framework of the Global Innovation Index

Source: (Dutta et al., 2020).

The United States is currently ranked number three out of 131 countries on the 2020 Global Innovation Index; this Global Innovation Index measures the economy's innovation performance annually (Dutta *et al.*, 2020). Table 3.2 shows the rankings of United States from 2018 to 2020.

Table 3.2 Rankings of the United States

Rankings of the United States of America (2018–2020)

	GII	Innovation inputs	Innovation outputs
2020	3	4	5
2019	3	3	6
2018	6	6	7

Source: Dutta et al., (2020)

The United States performs better in innovation inputs as compared to innovation outputs in 2020 and this has been the trend since 2018. However, United States' global ranking remained constant but it is higher when compared to 2018. Although one would expect United States to be ranked number one, based on the statistical data, it is ranked number 3. United States does not perform well in innovation outputs.

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Although the Bayh-Dole Act has its weaknesses, it is a success story as many countries who have enacted policies modelled on the Act. Ezell, (2019) stresses that various countries recognise its power in influencing universities in the United States into becoming engines of innovation. Both developed and developing countries such as Malaysia, South Africa, Brazil, Indonesia, China, Philippines and Singapore and Taiwan emulated the Act (Paraskevopoulou, 2013; Zuniga, 2011; Graff, 2007). Table 3.3 shows countries that enacted policies modelled on the Bahy-Dole Act.

Table 3.3 Countries that adopted polices modelled on the Bayh-Dole Act

Country	**Year**	**Policies inspired by the Bayh-dole Act of 1980**
China	1985	State Council on Technology Transfer Regulations
	2002	Ministry of Education and Ministry of Science and Technology joint ruling: university ownership and transfer of intellectual property
Argentina	1990	Law on national research system requires universities and institutes to establish TTOs
	1995	Patent Law: ownership of inventions by employer
Chile	1991	Patent Law: section on university ownership and transfer of inventions
	1996	Patent Law: ownership of inventions by employers with terms of revenue

Country	Year	Policies inspired by the Bayh-dole Act of 1980
Brazil		sharing for public sector employers
	2004	2004 Innovation Law provides incentives for R&D, collaboration, and technology transfer
Mexico	1998	Patent Law: ownership of inventions by employer
	2002	Law on national research system: ownership of inventions to be determined by policy of the institution
	2010	2010 Innovation Law: inventor compensation and TTOs
India	2000	Ministry of Science and Technology ruling: ownership under ministry funding
	2008	Utilization of Public Funded Intellectual Property Bill of 2008
Indonesia	2002	Law on national research system requires universities and institutes to establish TTOs
Russia	2002	Technology Transfer Network
	2003	Patent Law: ownership of inventions made under government contract
	2007-12	R&D in priority fields of science and technology development in Russian Federation
Malaysia	2009	Intellectual Property Commercialization Policy of Research and Development Projects Funded by the Government of Malaysia
Philippines	2009	Technology Transfer Bill: the sharing of revenues between institutions and researchers is governed by employer-employee contract or other related agreements and laws
South Africa	2010	Intellectual Property Rights from Publicly Financed R&D Act: disclosure, IP management, and inventor incentives; the creation of TTOs

Sources : Paraskevopoulou, 2013, Zuniga, 2011, Graff, 2007

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Table 3.3 shows that many countries have emulated the Bay-Dole Act and as a result they decided to protect their innovations by enacting IP policies. All this is indicative of the relevance of IP protection in the 21st century.

3.1.2 The case of Japan

Japan is known for its sophisticated IP structures and strategies to protect IPRs (Hai, 2015; Kleyn, 2010). The country took measures to ensure that IP that emanates from research institutions is protected when they realised that their economy had plunged into a recession (Tankenaka, 2005). In the year 2000, the government acknowledged the role that innovations play in helping to revive the economy from about two decades of economic depression (Bansi, 2016). Japan had investigated a similar case in which United States' economy suffered and was convinced that IPR legislations that encourage technology transfer are critical towards economic revival and recovery. To solve their economic crisis, Japan introduced an IPR commission.

In addition to that, in 1995, the government established Venturing Business Laboratories in Japan's national universities and there were about 45 VBLs in 2004. In 2000, the government took measurers to encourage university spinoffs by relaxing regulations that prevented professors from national universities to serve as board members of the private companies in Japan. Starting from 2001, the government also started assisting national universities to construct incubators on their campuses and by 2004, 23 incubators had been established (Kondo, 2009). These incubators therefore facilitate technology transfer at universities in Japan.

In 1997, the Japan IPR commission published a report in which they expressed the need for promoting inventions from research institutions. Consequently, the Industrial Revitalization Law was passed in 1999 and its aim is to encourage research and promote utilisation of inventions from government funded research (Kleyn, 2010; Tankenaka, 2005). However, the government started funding Technology Licensing Organizations in 1998 (Kondo, 2009). The Industrial Revitalization Law which was passed in 1999 is modelled on the Bayh-Dole Act and it is currently known as "the Japanese Bayh-Dole Act" (Walsh *et al.,* 2008). The government of Japan provides subsidies and rewards patenting by researchers from universities (Nishimura, 2011), the inventor gets 40% while the department the inventor belonged to is rewarded 30% and the university is also rewarded 30% (Kagami 2015, p. 110). As of September 2005, about 41 technology licencing offices had been established and were eligible for public funding. The government also started a program called the University Intellectual Property Rights Management Center in 2003 to assist 34 universities in Japan to establish technology transfer offices (Kondo, 2009). Those TTOs facilitate technology transfer activities.

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Even after all these measures were taken to facilitate technology transfer, it was a challenge to universities as they were not allowed to own enterprises (Watanabe, 2010) and there was need for a shift in policies. This was made possible by the enactment of the Industrial Competitiveness Enhancement Act in 2013 (Watanabe, 2010) which enabled universities to own enterprises. Although Japan universities established TTOs, University of Tokyo is the only university which exclusively own a TTO (Mirai, 2012). The other challenge is that universities do not receive enough funding for their research and the government even reduced the budget allocation by 1% per annum (Bansi, 2016) and this makes it challenging to encourage innovative research without adequate resources.

However, it is interesting to note that there was an increase in patent applications since the enactment of the Industrial Revitalization Law in 1999 (Tankenaka, 2005). This trend continued to increase after the introduction of the National University corporation law in 2004 which enabled universities to be independent from government and allowed universities to have full ownership of inventions that emanate from their research (Kleyn, 2010). Before the enactment of this law, government was responsible for managing IP as universities had limited experience in that regard. This is also because public universities in Japan were formerly part of the government, and staff from these institutions were regarded as civil servants (Bansi, 2016). A law was enacted for Promoting University-Industry Technology Transfer in 2008 and it enabled the establishment of Technology Licensing Offices (TLOs) (Kleyn, 2010). Japan is among the top four universities; United States, South Korea and China and together they account for university patenting in the world (Titu *et al.*, 2018). Most of the patents granted globally belong to Japanese (Bansi, 2016). Japan is ranked 5th on the study in which universities were ranked according to the number of PCT applications filled 2001-2011 as shown in table 3.1 in the previous section that focuses on the United States' case study. As a requirement of the Act, universities set up innovation committees that evaluate innovations prior to the application of a patent and universities filled more than 7 0000 patents successfully commercialised above 5 000 cases of technology transfer contracts (Watanabe, 2010). Even though the Act was similar to the United States' Bayh-Dole Act, it was impossible to achieve the same outcomes because of the differences in economic environment.

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Furthermore, technology licencing offices in Japan are not at institutions only, they are categorised into four types. One of the types is the one established as a corporation based on investments by university professors and researchers and many national universities adopted this type of technology licencing offices (Tankenaka, 2005). The other type is of corporations extending their businesses to start technology transfer (Tankenaka, 2005**)** such as The Tokyo Institute of Technology, a technology licexncing office which is involved in technology transfer. Another type is universities and private sector partnerships such as the Kansai technology licencing office which was established to serve researchers and universities in Kansai region including University of Osaka and University of Kyoto (Tankenaka, 2005). The last type is a technology licencing office based at a university such as the Waseda University technology licencing office.

IP awareness is also considered crucial in Japan. The Japan Patent Office conduct seminars and hold meetings to promote IP and raise IP awareness. These IPR related awareness initiatives are mostly targeted at researchers and public research institutions and encourage universities to have an IP curriculum in all departments (Tankenaka, 2005; Japan Patent Office Annual Report, 2002). The office also conducts seminars targeted at IP managers at both universities and research institutions to train them on technology transfer and on how to deal with infringements of IPR (Japan Patent Office Annual Report, 2002). This is essential for continuous development and understanding of IPR among researchers and other crucial stakeholders. In line with this perspective, several universities evidences, the practice of IPR, by now offering IP related courses particularly to engineering and science students. This indicates that universities have a positive attitude towards IP and are becoming aware of the relevance of IP. The office also provides standard textbooks on industrial property rights to higher education institutions in order to ensure that students acquire basic knowledge on IPR (Japan Patent Office Annual Report, 2002).

Although Japan previously experienced an economic decline, the current information shows that the country's economy is revamped. For instance, Kushida, (2017) notes that a firm called NuProtein, was founded in 2015 by three professors and researchers from Nagoya University, they invented a new methodology to synthesize proteins called Protein Synthesis System 3.0. This is a better method as compared to conventional methods that have been utilizing e-coli which takes two weeks, Protein Synthesis System 3.0. is 14 times faster, 50 times amount of yield, and a greater array of proteins can be easily synthesized.

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In addition, Kushida, (2017) also stated that another company called Preferred Networks was founded in 2014 in Japan by a computer scientist from Tokyo University, the company sells machine learning algorithms and also tools. The top manufacturers such as Toyota and factory robot producer Fanuc have also partnered with Preferred Networks company to jointly develop the systems for factory robotics that will enable robots to learn new movements and also tasks by themselves without being programmed by operators. All these companies are spinoffs and therefore evidences the success of technology transfer activities at universities in Japan.

It is also vital to mention the current ranking of Japan on the Global Innovation Index. According to Dutta *et al.*, (2020), Japan ranks 16th among 131 economies that featured in the

Global Innovation Index in 2020. Table 3.4 illustrates the rankings of Japan from 2018 to 2020.

Table 3.4 Rankings of Japan

Rankings of Japan (2018–2020)

	GII	Innovation inputs	Innovation outputs
2020	16	12	18
2019	15	14	17
2018	13	12	18

Source: Dutta et al., (2020)

Japan performs better in innovation inputs than innovation outputs in 2020 and this has been the trend since 2018. However, Japan's global ranking dropped from number 13 in 2018 to number 16 in 2020. Although Japan is in the top 20, the ranking s dropping each year since 2018, therefore there is need to address challenges that are being faced by different stakeholders in the innovation circle.

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3.1.3 The case of Germany

Global free market forces in late 1980s and 1990s and the shift from industrial society to a knowledge-based society in German led to the realisation that commercialisation of innovations from publicly funded research should be prioritised (Dornbusch *et al.,* 2013; Godt *et al.,* 2007). As a result, in 2001, the Ministry of Education and Research in German initiated a shift in research policy to encourage utilisation of research outputs; to increase the technology transfer activities and commercialisation of research (Dornbusch *et al.,* 2013). The framework for IP that emanates from public universities was changed and Law on Employees' Inventions was amended (Tinnemann *et al.,* 2010) and the amendments were guided by the United States' Bayh-Dole Act of 1980 (Kenney & Patton 2009; Eisenberg & Rai, 2003). Therefore, changes were made to Germany's university system of patent ownership as universities now own patents; before 2002, patents were owned by academics and universities were not receiving revenue from the transfer of technologies (Dornbusch et al., 2013; Tinnemann *et al.,* 2010; Von Ledebur 2009; Goddar, 2005). Researchers can only independently file a patent application if the university decides not to exercise this right (Tinnemann *et al.,* 2010). In addition, in instances whereby private companies finance public

research, involved parties can negotiate patent rights allocation (Geuna & Rossi 2011). Thus, all parties are taken into consideration in IP ownership.

There is a long tradition of university-industry partnerships before the changes in policy framework, due to the fact that researchers filled patent applications on their own, identifying university patents applications and measuring patent activity proved to be a mammoth task (Dornbusch *et al.,* 2013). However, other scholars have found ways of estimating patent activity in Germany. For instance, a study by Dornbusch *et al.,* (2013) provides patent activity statistics in Germany. Figure 3.2 presents statistics on patent applications and granted patents between 1988–2006.

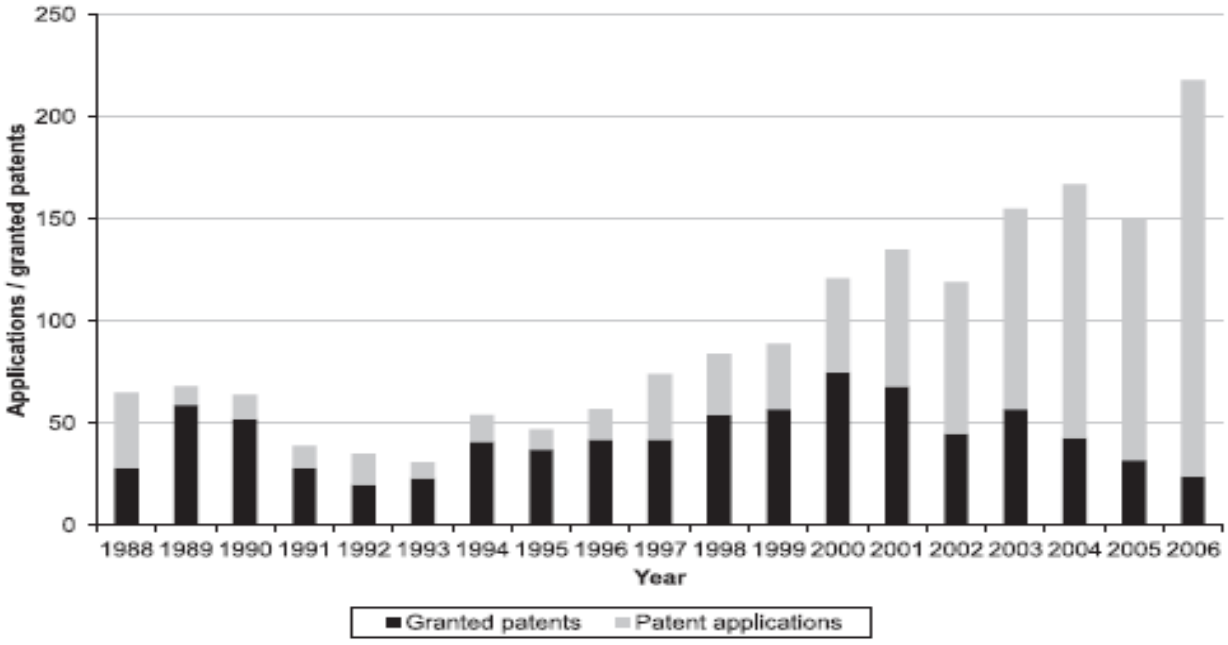

Figure 3.2 Patent applications and granted patents between 1988–2006.

Source: Dornbusch et al., *(2013)*

There is a notable decrease in patent applications by universities between 1989 and early 1990s (see figure 3.2) and Dornbusch *et al.,* (2013) argues that this may be as a result of patent policies of that time. Germany universities and their affiliated institutions submitted many patent applications between 1988 and 2006 and there is a notable increase in patent applications since 2000. This can be attributed to legislative reforms in 2002 as the applications are submitted under the university name (Dornbusch et al., 2013). On the other hand, in the same period, Dornbusch et al., *(*2013) argues that there has been a decrease in

patent applications by non-university PROs between 1989 and early 1990s and this may be as a result of patent policies of that time.

Furthermore, information on the current position of Germany on the 2020 Global Innovation Index is vital to see how the economy is performing in relation to other economies. Among the 131 economies that featured in the 2020 Global Innovation Index, Germany is ranked number nine, the ranking did not change since 2018 as shown on table 3.5.

Table 3.5 Rankings of Germany

Rankings of Germany (2018–2020)

	GII	Innovation inputs	Innovation outputs
2020	9	14	7
2019	9	12	9
2018	9	17	5

Source: Dutta et al., *(2020)*

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Germany usually performs better in innovation outputs as it is ranked number seven in 2020 while in 2019 it was ranked number nine and number five in the preceding year. With regards to innovation inputs, Germany ranks number 14, and this is a decrease in innovation inputs when compared to the preceding year's rank, number 12. Nevertheless, Germany is among the top ten innovative economies.

Universities have their own challenges, for instance most West German universities are not capacitated for technology transfer activities (Von Ledebur et al., 2009). The shift has resulted in an increase in transaction costs due to the fact that a third party "the university" had entered the scene (Von Ledebur, 2009). It is however surprising that there was no increase in patenting activities (Von Ledebur et al., 2009). There are still loopholes in the policy as the law does not mandate publicly funded research institutions to disclose patents on their inventions (Tinnemann et al., 2010). There are also arguments against modelling European IP systems according to the Bahy-Dole Act since the innovation landscape between US and Europe is different (Mowery & Sampat, 2004). There are arguments that the number of patent submissions or granted patents does not indicate an increase or improved commercialisation because patents are not of equal value and at the same time the commercial potential differs. So *et al.,* (2008) substantiate this with evidence from the United

States context which indicates that revenue from commercialisation of research does not outweigh the costs incurred in IP management. This then questions the German policy reforms in 2002. Cuntz, (2008) argues that IP protection for pharmaceuticals may result in significantly high prices for medicines and this consequently affects the overall health of people especially in developing economies which already have limited access to medicines. In the case of German, an increase in IP protection or patenting may hamper knowledge and economic development (Dornbusch et al., 2013). This is because researchers focus on research that brings more revenue instead of conducting research that save lives especially of those with lower incomes.

Statistics from top 25 universities and university affiliated institutions in Germany with regards to number of patent applications that were submitted between 1997 and 2006 shows that number of applications submitted by each institution was quite low, an average of 22 applications per university and affiliated institutes (Dornbusch et al., 2013). However, the results also indicate that the top eight universities accounted for about 60% of patent applications (Dornbusch et al., 2013). There are several factors that influence patent activity of each university and such factors include factors include availability of financial resources, level of R&D funding, the economic environment, royalty distribution practices and the prioritisation of technology transfer activities (Baldini, 2009; Acosta et al., 2009). Thus, the university environment comes into play as far as commercialisation of IP is concerned in Germany.

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Awareness initiatives are important as there is need to educate researchers about the importance of IP protection to the society and even to the whole economy. The results from a review of 15 studies focusing on awareness of IP and perception conducted by the Centre for Intellectual Property Understanding (2019) indicated that there is basic awareness of IP and understanding of its importance. The study recommends that IP awareness and education programs should ensure that IP topics are tailor made to target group, be it science students or law students. There is no available literature on awareness of IP among university researchers.

3.2 Developing countries

This section discusses case studies from developed countries such as India, Botswana and South Africa.

3.2.1 The case of India

India acknowledged the critical role played by IPRs in facilitating the development of economies and took measures to ensure that IP that emanates from publicly funded institutions is protected. The interest on the value of IP in India was evidenced with the establishment of Science and Technology policy in 2003. This policy aims to maximise incentives for generation and protection of IP and enable a policy environment for domestic commercialisation of inventions to serve public interest (Srivastava & Chandra, 2012). This culminated with India's 11th five-year strategic plan that focuses on providing incentives to innovators and commercialisation of publicly funded research so that the government, inventors, investors and public institutions benefit from IP (Srivastava & Chandra, 2012). Consequently, the protection and utilisation of the Public Funded Intellectual Property Bill was introduced in 2008 and it was modelled on the Bayh-Dole Act which was enacted in the United States in 1980. Metaphorically, the Bill has also been labelled the "Indian Bayh-Dole Act".

The aim of the Bill is to increase commercialisation activity at higher education institutions in India (Sharma, 2012). The Public Funded Intellectual Property Bill seeks to "provide incentives for the creation and commercialisation of IP from publicly financed research and it states that the scientist shall be paid a minimum of 30% of net royalties generated from the IP" (Srivastava & Chandra, 2012, p. 124). However, "failure on the part of the scientist to inform the institution, or failure of the institution to inform the government, carries penalties which include fines and the recovery of the grant funds" (Srivastava & Chandra, 2012, p. 124). This implies that creators of IP do not only benefit from being funded for undertaking research endeavours, but also get 30% in rewards. This clearly Acts as a catalyst towards stimulating researchers' interests knowing that they will benefit from their efforts. On the contrary, those who do not follow due procedures and legislative requirements towards recognition of IP emanating from publicly funded are fined and forced to repay the funds. This also facilitated institutions and inventors to comply with the requirements of the Act to ensure that government's resources are efficiently utilised. Ultimately, this resulted in an increase in registration of IP across India.

In another perspective, the provisions of the Bill have also been criticised by researchers. One of the arguments stems from the fact that the Bill does not distinguish between inventions "that should be patented and those that would effectively produce social benefits via

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placement in the public domain" (Sampat, 2009, p. 6). This stresses researchers in that it is up to them and their institutions to identify where their outputs fit in, which moves them in their comfort zones to constantly ensure that they will not be found wanting by the laws as they may be fined. Furthermore, the Bill's clause on strong penalties for those who do not patent their inventions, puts more pressure on researchers or universities to consider patenting as the only important way of ensuring that research benefits the society, patenting for the sake of patenting (Sampat, 2009). However, there were debates on whether the Bill was appropriate for the Indian environment as the country is still a developing country unlike the United States (Bansi, 2016). The United States environment and the Indian environment is different in terms of the university industry collaborations. United States' universities have a strong relationship with the industry unlike Indian universities. Although, there is criticism being levelled for this bill, it provides a lesson for other countries that an effective form of awareness is having such stringent requirements that forces researchers and institutions benefiting from public funds to engage in research activities and register their IP for the benefit of the public good.

India took the initiative to encourage industry-academia partnerships by introducing the *'New Millennium India Technology Leadership Initiative'*, one of the largest public-private partnerships sponsored by the Indian government. It aims to discover and harmonise the strengths of academia-industry and fund innovations in selected niche areas (i.e pharmaceuticals and drugs). To add on, it has funded about 42 projects involving at least 222 academic institutions and 65 companies between 2000 to 2012 (Srivastava & Chandra, 2012). There are other several initiatives that were also introduced to encourage industry-academia partnerships in India.

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Furthermore, India invests heavily, on IP awareness related activities. This is evidenced by existence of various organisations with a key focus on creating awareness of IP. In particular, there are organisations such as the Patent Facilitating Centre which was established by the government in 1995 (Tewari & Bhardwaj, 2018). To date, the Patent Facilitating Centre has organised approximately 450 awareness workshops on IP targeted at universities, industry, policy makers and scientists and individuals. The National Research Development Corporation also creates IP awareness specifically focusing on commercialisation, and the importance and advantages of IP protection to Indian economy (Tewari & Bhardwaj, 2018, p. 17). The Cell for Intellectual Property Rights Promotion and Management partnered with the

industry to conduct 19 IPR awareness road shows in 18 Indian states in 2016. Furthermore, presentations, posters and pamphlets with basic information on IPRs were also used to create awareness (Tewari & Bhardwaj, 2018). The organisation also launched a social media campaign with the theme: *"LetsTalkIP"* which was a success as it received attention from a lot of people who followed the campaign on Twitter, Facebook and You Tube (Tewari & Bhardwaj, 2018, p. 25). The use of social media is thus vital in creating awareness.

In addition, these progressive IP awareness initiatives resulted in the establishment of a National Intellectual Property Rights Policy in 2016. The policy's objectives provide for creation of awareness of IP to all sections of society. This demonstrates an acknowledgement of the crucial role of awareness events in improving the researchers' knowledge and understanding of IP and its protection. The Intellectual Property Rights Cells were also established at universities and one of the aims of the Cells was to further reinforce the continuous awareness on matters relating to IPR. The underlying assumption for awareness activities is that researchers have inadequate knowledge on IP, and that there are minimal activities evidencing IPR related practices in various institutions. Thus, all these initiatives highlight that the country has realised that the society lacks information on IPR especially researchers in academic institutions. All this aims to ensure that people have access to IP information and encourages innovations in the country. Although Indian universities have also ensured that they join the rest of the world universities in patenting, many patentable inventions have failed because the inventor failed to commercialise the invention as a result of lack of knowledge on IP (Tewari & Bhardwaj, 2018). There is a need for the government and the private sector to continue working together to create awareness of IP.

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To understand the attitude of India towards IP and its protection, the researcher assessed the various instructions and actions that were undertaken by higher education institutions. Higher education institutions in India comprise of Institutions of National Importance, universities, engineering institutes, pharma institutes and private universities (Tewari & Bhardwaj, 2018). India has a positive attitude towards IP and its protection, and this is evidenced by the action they took through establishment of Indian Institutes of Technology which are regarded as Institutes of National Importance and Intellectual Property Rights Cells in Universities. The Patent Facilitating Centre established Intellectual Property Rights Cells in Universities with the help of Vice Chancellors of the respective universities, to date there are about 65 Intellectual Property Rights Cells in Universities in 12 states such as Punjab, Rajasthan,

Gujarat and Uttar Pradesh (Tewari & Bhardwaj, 2018). The aim was to ensure that each university has an IPR cell within a few years. These cells play a pivotal role of ensuring public funded research outcomes' compliance with the legislative policy framework through providing information on matters relating to IPR such as searching for patents, IP audit of universities and ensuring that inventions are protected. However, the responsibility of filing and processing of patent applications and maintaining granted patents falls with Patent Facilitating Centre (Tewari & Bhardwaj, 2018).

The yardstick employed to understand the practices of IPR includes assessment of institutions' statistics on patents, and publications. This implies that the higher the number of patents, and publications implies the higher the practice of IP and vice versa. Statistics pertaining to the patents and research articles published from 2010-2016 was analysed for various universities to understand the level of IPR practices. This measure of IPR practice and performance of universities in India, relied on the data from Central universities, State universities and also Private universities (Tewari & Bhardwaj, 2018, p.15) and the results are listed in table 3.6.

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Table 3.6 Research articles and patent profile of Top 10 Universities in India

No	Name of the Institute	Year established	Institution status	Ranking/No of Res. Publications	Ranking/No of Patents Granted	Ranking/No of Patents Published
1	University of Delhi	1922	Central	1/15052	3/26	3/58
2	Indian institute of science	1909	Central	2/10852	1/174	1/359
3	Banaras Hindu University	1916	Central	3/8140	8/3	16/9
4	University of Hyderabad	1974	Central	4/7694	6/5	12/13
5	Annamalai University	1929	State	5/5400	10/1	23/2
6	Gujarat University	1950	State	6/4871	0	24/1
7	Panjab University	1947	State	7/4733	9/2	7/35
8	Aligarh Muslim University	1885	Central	8/4588	9/2	20/5
9	Manipal Academy of Higher Education	1956	Private	9/4444	0	0
10	S.R.M Institute of Science and Technology	1985	Private	10/3509	7/4	5/41

Source: Tewari and Bhardwaj, (2018)

Table 3.6 shows the ranking of universities in India in relation to number of publications made, a typical yardstick for measuring the practice of IPR. University of Delhi was established in 1922, it is ranked number one with a total of registered publications of 15 052 and having been granted only 26 patents. The Institute of Science and Technology was established in 1985 and is ranked number 10 with 3 509 publications and having been granted only four patents. These statistics show a positive performance in relation to publications, on the contrary the number of patents granted shows a grave concern. This implies the universities' core focus is largely on publications than patenting. Furthermore, the results in table 3.6 indicates that Central universities are leading in terms of the number of research publications compared to State and Private universities. The results show that there is need for Intellectual Property Rights Cells to continue creating awareness on IP and encouraging innovations because universities are still focusing on their core aim which is to publish research as indicated by a high number of research publications by universities. This depicts that Indian researchers have the capability to do research but are reluctant to translate their research into patents (Tewari & Bhardwaj, 2018). There is need for more awareness initiatives to encourage patenting in Indian universities.

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In another perspective, other institutions worth looking at are Indian Institutes of Technology (IITs). Those Institutes of Technology are considered as autonomous public institutes of higher education, governed by the Institutes of Technology Act 1961. This Act declares them as institutions of national importance and lays down their powers, duties, and governance framework (Tewari & Bhardwaj, 2018). Their national importance is evidenced by the fact that the Indian Institutes of Technology receive funds from the government and "serve as a pivotal player in developing highly skilled personnel within the specified region of the country/state" (Tewari & Bhardwaj, 2018, p. 87). The Indian government established 23 Indian Institutes of Technology with a mandate of contributing to the nation's growth and they are recognised worldwide as a leader in the field of engineering education and research (Tewari & Bhardwaj, 2018). IITs in India are broadly categorised as first, second and third generation based on the year of establishment (Tewari & Bhardwaj, 2018). Thus, the national prominence given to these institutions motivated the researcher to assess the practice of IP at these institutes. The profile and performance of these institutes according to the total number of research publications and patents granted/published is depicted in table 3.8.

Table 3.7 Research publications and patent profile of Indian Institutes of Technology (2010-2016)

S.No	Name of the Institute	Year founded	Year established as IIT	Research Articles	Patents Granted/ Published
First Generation IITs					
1	Kharagpur	1950	1951	8724	10/171
2	Delhi	1961	1963	7148	56/208
3	Madras	1959	1959	6440	48/376
4	Bombay	1958	1958	6300	100/441
5	Roorkee	1846	2001	6028	1/25
6	Kanpur	1959	1959	5622	44/252
Second Generation IITs					
7	Hyderabad	2008	2009	5398	2/26
8	Guwahati	1994	1994	4205	0/23
9	Dhanbad	1926	2016	2323	¾
10	Varanasi	1916	2012	1432	0/1
11	Indore	2009	2009	902	0/10
12	Bhubaneswar	2008	2009	694	0/8
13	Ropar	2008	2009	627	0/2
14	Patna	2008	2009	597	0/6
15	Mandi	2009	2009	468	0/0
16	Gandhinagar	2008	2008	460	0/4
17	Jodhpur	2008	2008	232	0/3
Third Generation IITs					
18	Goa	2016	2016	29	0/0
19	Tirupati	2015	2015	6	0/0
20	Jammu	2016	2016	5	0/0
21	Palakkad	2015	2015	5	0/0
22	Bhilai	2016	2016	0	0/0
23	Dharwad	2016	2016	0	0/0

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Blue - Good in number of patents-granted (>25)

Red – Average in number of patents-granted (10-25)

Black – Low or Nil in number of patents-granted (<10),

ITT– Indian Institutes of Technology

Source: Tewari and Bhardwaj, 2018

Table 3.7 indicates that the first-generation Indian Institutes of Technology are also concentrating on publications similar to the Central, State and Private universities. However, they are also focusing more on patenting unlike other universities. In particular, Bombay published 441 patents and was granted only 100 patents; Madras published patents 376 and only 48 patents were granted. These huge numbers of published patents are also associated with the years that the Institutes have been in existence. Those that were established in the 1950s-60s have more article publications, together with patent publications. However, third generation Indian Institutes of Technology are yet to produce patents as they were recently established; the latest include Dharwad and Bhilai which were established as Indian Institutes of Technology in 2016. This indicates that India is practising and implementing IPR as indicated by many patents that were granted to universities and research publications. Patent data also imply a positive attitude towards IPR as most Indian Institutes of Technology are involved in patenting but there is need for changing attitudes of researchers so that they do not only rely on publishing their research outputs in journals only but also patent their inventions (Nandagopal, 2013).

It is also important to have information on the Global Innovation Index. India ranks 48th among 131 economies that featured in the Global Innovation Index in 2020 (Dutta *et al.*, 2020). Table 3.8 illustrates the rankings of India from the year 2018 to 2020.

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Table 3.8 Rankings of India

Rankings of India (2018–2020)

	GII	Innovation inputs	Innovation outputs
2020	48	57	45
2019	52	61	51
2018	57	63	57

Source: Dutta et al., (2020)

From table 3.8, it is evident that India performs better in innovation outputs as compared to innovation inputs in 2020. India ranks 45th in innovation outputs, an improvement as compared to the previous years (2018-2019). However, India is faced with a lot challenges that ranges from limited IP awareness initiatives, few universities have established TTOs, lack of skilled personnel to assist with technology transfer and commercialisation, licencing

in India, lack of incentives for innovation, absence of uniform IP policies and this makes it difficult for universities to generate third stream income (Baxter, 2011). Therefore, all these issues should be addressed in order to improve the IP system in India.

3.2.2 The case of Botswana

Botswana is one of the Southern African countries that seeks to improve its IP policies. The country's IP protection framework is influenced by international treaties, for instance, the Industrial Property Act, is guided by international standards of protection for foreign and domestic IP (Ama, 2014). IP law in Botswana is regulated by a combination of common law and statute. Before, 1996, protection of IPR was chiefly through extension of protections granted in the other countries such as United Kingdom and South Africa. The first legislation on IP was the Industrial Property Act enacted in 1996, restructured in 2010, came into force in 2012 (Ama, 2014). The Act deals with the protection of trademarks, patents, industrial designs and utility models and encourages the development of small, micro- and medium-sized enterprises and also to improve the economy. However, the Act does not address issues relating to IP emanating from publicly funded research, including its management and also commercialisation (Ama, 2014). Therefore, there is a need for amendments on the current Industrial Property Act to include IP arising from publicly financed research institutions.

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The Industrial Property Act does not exclude research institutions as it established an IP framework for higher education institutions and the industry although it does not directly speak to relevant publicly financed research. In light of this, the University of Botswana developed an institutional IP policy, which states that all IP generated by its academic community including documents, experimental databases, computer programmes and software will be owned by the university excluding copyright (University of Botswana, 2004). In cases whereby the IP arise from work conducted outside of the university premises, the IP creator retains the ownership unless the university's resources were utilised (University of Botswana, 2004). Section 10 subsection 4 of the Industrial Property Act states that, in the absence of any prior agreement, the IP of an employee belongs to the employer. The Act also recognises that if the IP is protected by a patent, the owner can license it to businesses.

The University of Botswana's IP policy states that the split of profits from commercialisation of IP should be 50% for the inventor and 50% for the university after all costs are deducted (University of Botswana, 2004). At University of Botswana, IP is managed by the office of research and development. The office provides support to the university research community

by assisting in identifying potential IP from research projects, evaluating IP, protecting IP and commercialisation of valuable IP for the benefit of the institution and the South African society (University of Botswana, 2020). However, there are several units within the office; one of the units is a knowledge transfer office which is responsible for training staff on commercialisation, and how to source funding for research (Ama, 2014). The other unit is a project office that is responsible for the management of research funds. Another one is the research commercialisation unit which works with the research community at the university. The unit plays the following roles;

- "creating awareness and training on research commercialisation and its potential contributions to the university's mandate,
- fostering a culture of innovation for the University of Botswana research community as part and parcel of the broad research agenda of the university;
- availing relevant information and materials to researchers on technology transfer and the commercialisation process at University of Botswana in order to support the commercialisation of research;
- assisting in identifying and protecting the IP generated by University of Botswana researchers through a variety of approaches, including patenting, copyrights and trademarks;
- performing due diligence studies and market studies to ascertain the commercialisation potential and potential markets for University of Botswana inventions and innovations;
- promoting and marketing opportunities for technology transfer to potential industry partners;
- negotiating licences with industry partners and other stakeholders for inventions which arise from University of Botswana research; and
- creating strong relationships between the University of Botswana research community and business, government, NGOs and other relevant stakeholders which can facilitate the translation of knowledge into products, policies and services" (University of Botswana, 2008).

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The office prioritises the initial process for determining IP potential at an early stage which helps safe-guarding and preventing possible loss of IP rights from premature public disclosure (University of Botswana, 2020). Thus, the existence of the office is an important step in the process of commercialisation.

3.2.2.1 Science and Technology Policy of 1998.

The government of Botswana introduced the Science and Technology Policy in 1998. The core strategies that the policy articulates include;

- "To develop, adapt and apply appropriate technologies for small, medium and large-scale processing and manufacturing industry
- To promote and develop traditional technologies and encourage their wider diffusion and application
- To create an efficient system for the protection of Intellectual Property Rights (IPR)
- To introduce Science and Technology (S&T) in all education programmes and ensure systematic institutionalization of S&T in the Botswana culture and society
- To develop human resources to implement the Policy and its programme of activities" (Science & Technology Policy, 1998, p. 5)

The Science and Technology policy enabled the establishment of the Ministry of Communication, Science and Technology in 2002 and this ministry established a specialised department of Research, Science and Technology. The department devised the Botswana National Research, Science and Technology Plan that is responsible for facilitating investment in identified scientific research areas (such as Intellectual Property Rights and Indigenous Knowledge System) and science and technology are regarded as significant for the competitiveness and productivity of the country (The Botswana National Research, Science & Technology Plan, 2005). The policy also provides funding needed for knowledge transfer, specialised IPR and commercialisation support, and capacity building programmes to enhance understanding of IPR (Science & Technology Policy, 1998).

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However, Botswana is clearly aware that there is need to improve its publicly funded research environment to stimulate research and innovation (Ama, 2014). There are also incubators and support programmes that support innovation such as the Botswana Innovation Hub in which universities operate in-house incubators (Walwyn, 2018). A new program was introduced in 2018 to support research institutions called the "Technology and Innovation Support Center" and it target academic institution and also research institutions (Selemogo, 2019). Table 3.9 presents the Technology and Innovation Support Center support structure.

Table 3.9 Technology and Innovation Support Center structure

WIPO	**GOVERNMENT AUTHORITY**
• Supports participating governments in preparing project documentation • Helps address training and resource needs • Enables sharing of experiences and best practices among Technology and Innovation Support Centre's	• Identifies national priorities • Assesses user needs • Signs off on project documentation
NATIONAL FOCAL POINT	**HOST INSTITUTION**
• Identifies potential host institutions, assesses their capacities, and support them in joining Technology and Innovation Support Centre project • Act as main intermediary between WIPO and Technology and Innovation Support Centre Host institutions • Coordinates activities of the national Technology and Innovation Support Centre network • Monitors and evaluates Technology and Innovation Support Centre project progress	• Provides admin and Technical staff required to deliver Technology and Innovation Support Centre services • Provides facilities and infrastructure

Source: Selemogo, (2019).

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An innovation fund was created to finance innovation activities (Selemogo, 2019). The Technology and Innovation Support Center is involved in a lot of awareness activities. It plays it's part in "Botswana innovates show" that is hosted on a weekly basis on a private radio station and the aim is to encourage innovation. It also conducts awareness workshops for inventors. The Technology and Innovation Support Center's awareness activities include;

- Human Resource Development Council (HRDC) annual workshops for the inventors.
- Science, Technology, Engineering and Mathematics (STEM) annual program for students, inventors and researchers.
- Women inventors in Business workshops in an effort to empower women.
- Conduct lectures for students in the engineering and fashion and design departments at University of Botswana every year.
- Science Technology and Innovation (STI)Week
- Winter Schools to train people on IP various topics especially 'commercialisation'.

- Continued consultations with Senior Management on different institutions about the centre in an effort to build a strong Technology and Innovation Support Center network.
- Promote the use of patent databases and non-patent databases when conducting awareness campaigns across the country.
- IP awareness for students.
- Participate in Global expos and in different fairs
- Support IP activities by universities and various communities (Selemogo, 2019, p. 6).

The Technology and Innovation Support Center is also involved in capacity building projects; recommending inventors, innovators and researchers to enrol for courses offered by WIPO academy such as patents drafting and search, and also encourages the general public to enrol for Masters' program in IP. In addition, the Technology and Innovation Support Centre is also involved in policy development, it advocates for a National IP Policy, National Institutional Policy that guide IP management in institutions. Lastly, the Technology and Innovation Support Centre hosts competitions such as mathematics and science competition targeted at secondary and senior schools in Botswana, pitch competitions targeted at innovators and also a 24-Hour Hackathon whereby innovators present their solutions in a period of 24hrs.

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However, Botswana has its own challenges when it comes to research and development. Botswana is one of the countries that are below the international mean particularly for most components of science and technology indices. The gross expenditure on research and development is very low, at 0.52% of GDP (The Botswana National Research, Science and Technology Plan, 2005) if compared to least 1% of GDP target as recommended by Southern African Development Community and also African Union (World Bank, 2012). In addition, there is low conversion of research results, limited involvement of the private sector, and very few collaborative partnerships (Monngakgotla, 2007). There are a few legal firms with qualified IP professionals (such as attorneys and licensing professionals) who can assist in the patent application process, in licencing and the settling of disputes that emerge over IPR (Monngakgotla, 2007).

Another challenge is that information on research publications is usually unavailable at country level, however, available information shows that output levels are low for all types of IP and technology demonstrations (Hirko & de Beer, 2019). The role of IP in facilitating

knowledge production and innovation is limited, between 2016 and 2017, only 11 patents applications were filed in the country and among those filled only one application was from a Botswana resident (Hirko & de Beer, 2019). There is also a weak collaboration between the industry and universities (Hirko & de Beer, 2019). Therefore, there is need for awareness activities on the importance of IP and its protection.

The other challenge is that the patent registration system is flawed as the number of patents registered in the country is unknown; the Registrar of companies estimated that there are about 15 up to 30 patents that are registered annually even though the majority of those patents are registered by foreign companies (Monngakgotla, 2007). Thus, this presents a challenge as IP protection that is sought is for IP that originates outside the country. To address these challenges, the Technology and Innovation Support Centre plan advocates for the development of an IP Policy that guides the management and exploitation of IP, and also establishing a regulatory framework to protect loss of IP. It is also important to have information about the position of Botswana in the 2020 Global Innovation Index. According to Dutta et al., (2020), Botswana ranks 89 among 135 economies that featured in the Global Innovation Index in 2020. Table 3.10 illustrates the rankings of Botswana from 2018 to 2020.

Table 3.10 Rankings of Botswana

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Rankings of Botswana (2018–2020)

	GII	Innovation inputs	Innovation outputs
2020	89	84	105
2019	93	80	117
2018	91	74	107

Source: Dutta et al., (2020)

Botswana currently ranks 84th in innovation inputs, lower than last year and lower compared to 2018. As for innovation outputs, Botswana ranks 105th. This position is higher than last year and higher compared to 2018. This position is the same as last year and lower compared to 2018. However, the country is performing better in innovation inputs as compared to innovation outputs. Thus, the country has to create awareness on the importance of IP and its protection and also continue to put measures that encourage innovation among researchers at publicly funded research institutions.

In another perspective, the results from a study conducted by Monngakgotla, (2007) shows that very little is known about IPR by the public and that very little seems to have been done about it. The results from a study conducted by Ama, (2014) shows that researchers at University of Botswana lack knowledge of legal and policy frameworks that govern IP, they are unaware of the content of IP policies, and of research commercialisation. This may hinder IP development and low usage of IPR and the country already has low levels of university patenting by researchers (Ministry of Communication, Science and Technology, 2005). The lack of knowledge regarding commercialisation of IP implies that the IP policies are lacking. The Technology and Innovation Support Centre has also noted that there are challenges that are faced by the country in relation to innovation and those challenges include lack of IP awareness, lack of adequate funding for innovation activities, limited IP expertise and most institutions are hesitant to be involved in the Technology and Innovation Support Centre program (Selemogo, 2019) To improve research and innovation at University of Botswana, there is need for the right academic environment, innovation, education and awareness of IP and an increase in funds allocated for research. There is need for universities to set up dedicated TTOs which are also responsible for creating awareness of existing IP policies.

3.2.3 The case of South Africa

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South Africa is one of the African countries that prioritises innovation and the National System of Innovation ensures that all measures are put in place to improve the economy. The National System of Innovation is "a set of functioning institutions, organisations and policies which impact constructively in the pursuit of a common set of social and economic goals and objectives" (White Paper on Science and Technology, 1996). The National System of Innovation comprises many stakeholders such as the government, industry, academia and society who all work together to drive economic growth and improve lives (Southern African Research and Innovation Management Association, 2015). The National System of Innovation is regarded as the pillar of transforming the country from a resource-based to the knowledge-based one but several weaknesses were identified (Southern African Research and Innovation Management Association, 2015) and in light of this, the Department of Science and Technology developed a ten-year plan (2008-2018) aimed at driving transformation of South Africa into a knowledge-based economy in which economic growth is driven by knowledge production and dissemination (Bansi, 2016). The plan was as a result of the realisation that innovation is the key to scientific and also technological progress and it

should address the country's socioeconomic challenges. The knowledge-based economy is based on innovation, education, information infrastructure, economic and institutional infrastructure (Southern African Research and Innovation Management Association, 2015). The plan emphasised expanding investment in research and development (thereafter R&D) for the successful transition of the country to become a knowledge society. Figure 3.4 represents the South African innovation structure and institutional landscape within public management and higher education institutions.

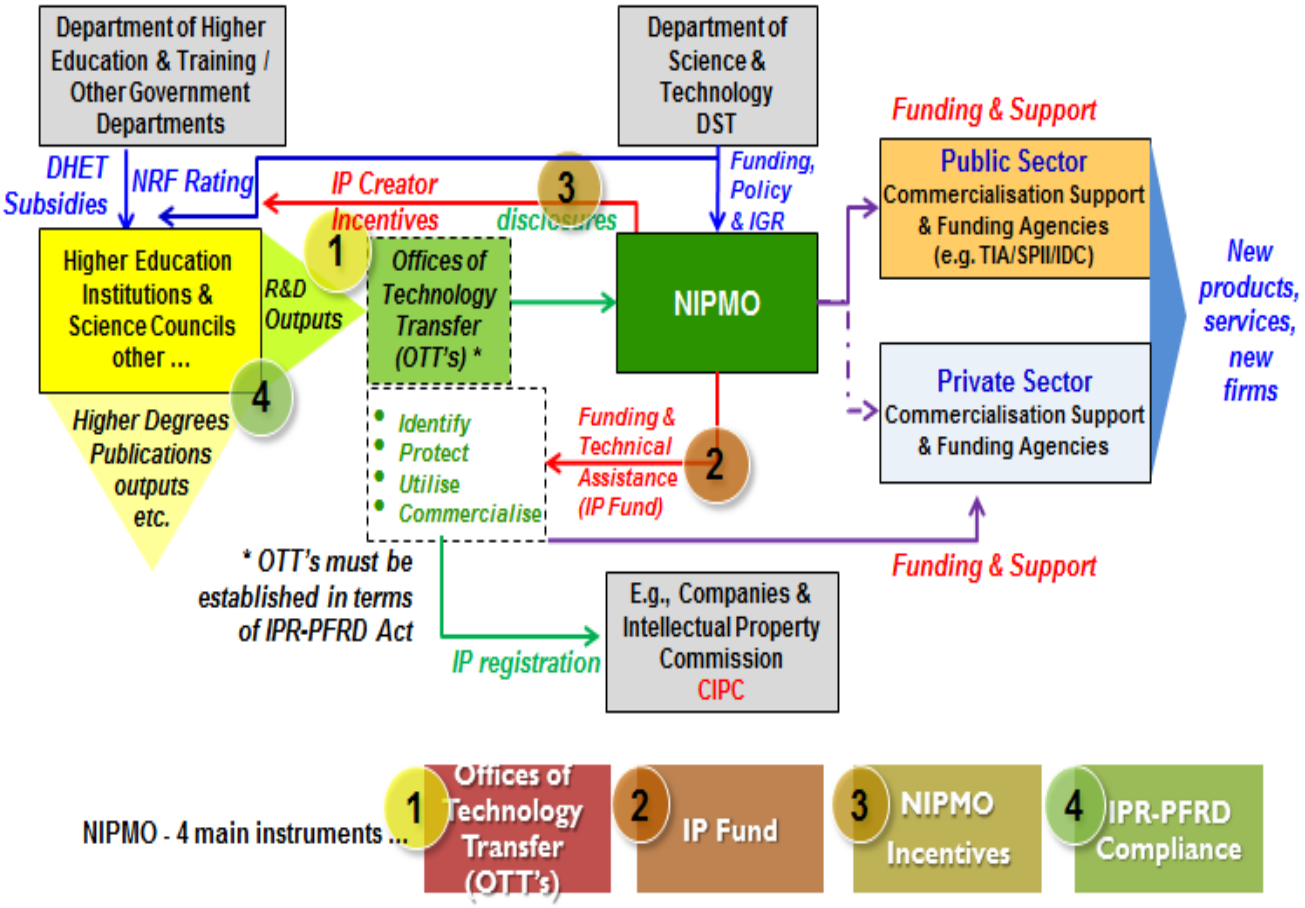

Figure 3.4 Structure of South African innovation landscape

Source: Bansi, (2016).

As highlighted on figure 3.4, there are various stakeholders that play different roles in ensuring technology transfer. For instance, the Companies and Intellectual Property Commission is the upholder of IP legislation and reports directly to the Department of Trade and Industry. The organisation creates awareness of IP among various publics (researchers at universities included). The IPR-PFRD Act (2008) transformed the innovation landscape as it provided guidelines for IP that emanate from publicly funded research (Bansi, 2016). What is

important is to enhance technology transfer as it is central to the whole innovation system. As highlighted on figure 3.4, higher educational institutions receive funding and technical assistance from NIPMO and the Technology Innovation Agency (Bansi, 2016). As mentioned in the previous section, for the success of innovation in South Africa, there are mechanisms that were put in place by the government that facilitate the commercialisation of innovations from publicly financed research institutions. For instance, TTOs were established at universities and they are supported technically and financially by NIPMO which is a custodian of the IPR-PFRD Act (2008). However, not all universities have dedicated TTOs, some are still in the process of establishing such offices which are responsible for commercialisation of university innovation.

South Africa is making strides to improve the economy through innovation. Innovation is regarded as vital in the growth of the economy and the country's competitiveness globally (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017). However, to boost technological innovation, there is need for scientific R&D to be prioritised. This is because there is a link between basic research and innovation. Basic scientific research is pivotal as far as innovation is concerned as it expands ideas that can in turn be translated into new or improved technologies or products or services (Mouton *et al.*, 2019). There are basically three types of R&D comprising basic research, applied research, and experimental development (Organisation for Economic Co-operation and Development Frascati Manual, 2015). Basic research is defined as "experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view" (Organisation for Economic Co-operation and Development Frascati Manual, 2015, p. 29). On the other hand, applied research is "original investigation undertaken in order to acquire new knowledge… directed primarily towards a specific, practical aim or objective" (Organisation for Economic Co-operation and Development Frascati Manual, 2015, p. 29). Experimental development is defined by the Organisation for Economic Co-operation and Development Frascati Manual, (2015, p. 29) as "systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes". All these types of research are important as far as innovation is concerned.

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As stated before, scientific R&D should be prioritised to boost technological innovation. In light of this, the South African government has been playing the role of an "entrepreneurial state" by investing significantly in R&D (South African Science, Technology and Innovation Indicators, 2016). As knowledge becomes an increasingly important part of innovation, the university as a knowledge producing and disseminating institution plays an important role in industrial innovation (Etzkowitz *et al.*, 2003, p. 14). R&D and innovation are key to economic growth (South African Science, Technology and Innovation Indicators, 2016). Countries are encouraged to increase expenditure on R&D and research capacity development, amongst other mechanisms, through the targets set to achieve Sustainable Development Goal 9, in an effort to ensure sustainable industrialisation and innovation. The government provided most funding of R&D in South Africa in 2015/16. Government funding increased by 12.1% from R12.873 billion in 2014/15 to R14.426 billion in 2015/16, representing 44.6% of total R&D funding. Higher education institutions received 51.3% (R7.394 billion) and government institutions received 44.0% (R6.347 billion) of the total government R&D funding. Figure 3.5 shows the public and private funding for R&D in South Africa.

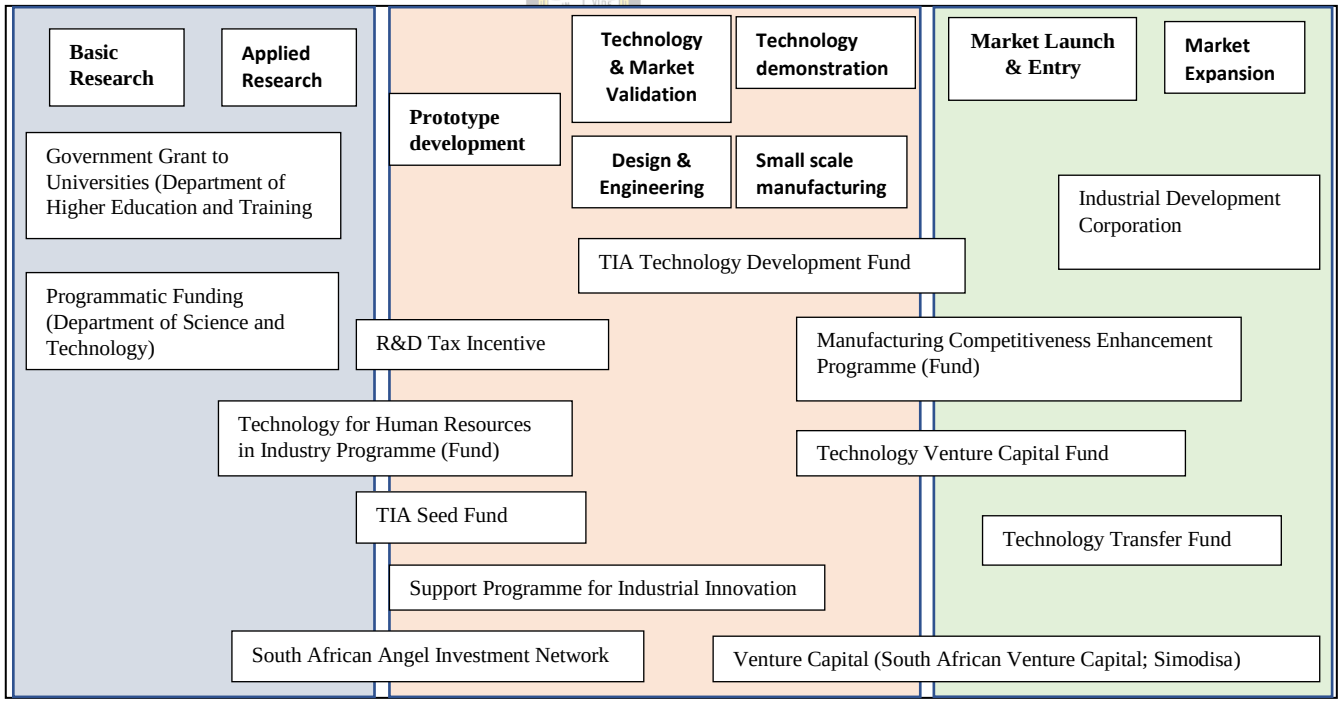

Figure 3.5. Overview of public and private funding for R&D in South Africa

Source: Walwyn, 2018

TIA- Technology Innovation Fund

As shown of figure 3.8, the government is the major funder of R&D in South Africa. In 2016/17, the business and not-for-profit sectors were the smallest recipients of R&D funding from government, receiving 3.6% (R523 million) and 1.1% (R162 million) respectively (South African Science, Technology and Innovation Indicators, 2017). In the years 2015 and 16, The Technology Innovation Agency funded about 101 projects totalling R44.9 million in the higher education sector and five projects totalling R2.5 million in the Small, Medium, and Micro Enterprises, and on average, each project received a total of R450 000 and the rate of success was about 37% (South African Science, Technology and Innovation Indicators, 2016, p. 32). The recently developed African Union Science, Technology and Innovation Strategy for Africa (2024) states that its mission is "to accelerate transition of Africa to a knowledge led, knowledge-based economy" (African Union, 2013). The African Union Science, Technology and Innovation Strategy for Africa 2024 was developed to ensure that science and technology forms an integral part in achieving the African Union's development targets (African Innovation Outlook II, 2014). A wide range of innovations have also been valuable in tackling societal challenges, i.e food security, mobility, health, energy and environmental protection (South African Science, Technology and Innovation Indicators, 2016, p. 45).

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The next important step towards economic growth is to accelerate knowledge transfer and the commercialisation of results emanating from publicly funded research. Against this backdrop, several measures were taken one of which is the establishment of the IPR-PFRD Act (2008) which protect innovations from publicly funded research (for more information see chapter 2). Several approaches were introduced with regards to identifying and managing IP and its commercialisation for the benefit of the country. A survey was also carried out and it is titled "The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014" and this survey assists in defining indicators that the government, stakeholders, including technology transfer practitioners may adopt to measure the capacity, outputs and targeted outcomes and the impact of publicly funded R&D. The survey provides an analysis of technology transfer activity and learning experiences that may inform policy and guide planning at TTOs, their host institutions, NIPMO, the Department of Science and Technology and other stakeholders operating within the National System of Innovation.

In addition, the other approach that was taken to ensure that the government reap benefits from publicly funded R&D was the establishment of NIPMO as per the requirements of the

IPR-PFRD Act (2008). NIPMO has a mandate of overseeing the implementation of the Act on behalf of the South African government, as well as supporting establishment and development of TTOs at institutions (including at public universities in South Africa). NIPMO is mandated to provide administrative support and financial support to capacitate TTOs and ensure that IPRs are protected. Technology transfer offices are also reffered to as technology licensing offices or office of technology transfer and despite the name given to the office, they perform similar activities.

TTOs are vehicles used by public institutions to safeguard returns from IP produced using public funds is protected, managed and in the end commercialised for the benefit of all South Africans (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017). These TTOs have a responsibility to license innovations to firms (Hohmann, 2016) and they are involved in research and regional development functions that have the potential to increase the number of future applications and contribute to economic and social development (Leydesdorff *et al.,* 2016). The technology transfer function can be implemented in several forms; specific individuals selected responsible for performing technology transfer functions, a regional office responsible for providing technology transfer support to more than one institution, and a dedicated technology transfer office that performs technology transfer activities at an institution (e.g at public universities) (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017). The results from the survey of IP and technology transfer at publicly funded research institutions from 2008-2014 shows that lack of awareness among research staff of the importance of disclosing and managing IP, inadequate funding to expand technology transfer operations, for IP registration costs, and for hiring specialists.

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Furthermore, TTOs have since been established at various academic institutions in South Africa as the government have seen the relevance of IPR in today's society. The establishment of a TTO is a legislative requirement, as stipulated by the IPR-PFRD Act (2008). Although the IPR Act came into effect in 2010 in South Africa, technology transfer activities started in the mid-1990s (Alessandrini et al., 2013). One of the universities to establish a TTO is University of Cape Town. However, most universities established their TTOs post 2010 as per requirements of the IPR Act but very few TTOs have achieved

tangible results (de Beer, 2018). Some universities have regional technology transfer offices. These TTOs have a huge responsibility to manage IP from universities at the same time create awareness at host institutions. The establishment of TTOs at universities worldwide indicates that universities have a positive attitude towards IP and are becoming aware of its relevance.

Literature shows that researchers have limited knowledge on IP and conversion of knowledge on IP especially in higher education institutions (Sharma & Kumar, 2018; Companies & Intellectual Property Commission Annual Report, 2018/19; Chudi *et al.*, 2015; National Advisory Council on Innovation, 2012). Ikome and Ikome, (2017) also added that there are inadequate IP awareness activities in South Africa and as a result protecting IP in universities becomes a challenge. In addressing this challenge, the government mandated organisations such as the Companies and Intellectual Property Commission in collaboration with Department of Trade and Industry, Technology and Innovation Agency, NIPMO a specialised unit of the Department of Science and Technology (now referred to as the Department of Science and Innovation), WIPO, TTOs at universities among others have been creating awareness targeting both students and staff at South African universities. The Companies and Intellectual Property Commission established a Creative Industries Division, which also focuses on IP Enforcement, Education and Awareness (Lotheringen, 2014) and one of the objectives is to increase knowledge and awareness on IP Laws through conducting workshops, seminars and exhibitions (Companies and Intellectual Property Commission Annual Report, 2018/19). This is achieved through:

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- “Segmentation of target audiences;
- Constant monitoring of education’s effectiveness and awareness channels;
- Exploration of new channels for education and awareness;
- Continuous assessment of the impact of education and awareness initiatives; and
- Increase in compliance, and continual updating of staff skills and competencies to ensure consistency and relevance of education and awareness” (Companies & Intellectual Property Commission Annual Report, 2018/19).

These awareness activities signify the relevance of IP communication to researchers as they are being conducted at various educational institutions across South Africa. It is thus significant to note that these awareness activities are ongoing as indicated in the Companies and Intellectual Property Commission Annual Report, (2018/19) that one of their strategic

objectives over the strategic period 2017/18 – 2021/22 is to increase awareness and knowledge of IP among various publics. The Companies and Intellectual Property Commission Annual Report (2018/9) shows that the organisation is set on achieving its targets for instance, the 2018/19 annual target of the number of education and awareness events on IP was set at 30 but the organisation managed to conduct about 56 awareness events. This indicates the relevance of IP awareness initiatives; hence, it is important to evaluate such initiatives to find out if they have had an effect on the attitude of target audience and whether their knowledge levels increased. In addition, stakeholders such as the Southern African Federation against Copyright Theft; Adams and Adams; Spoor and Fisher attorneys; Microsoft; Association of Independent Record Companies of South Africa are also creating awareness on IP related matters targeting a wide range of audiences.

Although South Africa established mechanisms to create awareness of IP among researchers, a lot still needs to be done. According to the Department of Trade and Industry, (thereafter DTI) 2017, the draft IP policy phase 1 (one) states that in order to promote a better understanding of IP in the South African community, it is vital to conduct a thorough research to understand opportunities and challenges presented by IP. This imply that there is a gap in knowledge that needs to be filled by tracking progress especially among researchers at higher educational institutions. Authors such as Popova and Nacka, (2017) and Edelman, (2011) argue that there is a knowledge gap on the impact of IP communication on level of awareness among researchers.

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Although universities are playing a key role in the transition from an industrial to a knowledge-based economy through their TTOs by protecting IPR and ensuring the transfer of innovations to the market place, some have succeeded as new academic entrepreneurs were created (Leydesdorff et al., 2016). It is not surprising that very few of these TTOs have achieved tangible results (de Beer, 2018). This is because the success of patenting by universities is determined by several factors namely, a university's entrepreneurial culture, resistance against the model, availability of research funds and other university income, TTO capabilities and economic climate in which the universities are operating in (Rasmussen *et al.,* 2006). Challenges that are faced by TTOs in South Africa include inadequate funding, lack of skilled personnel to assist with technology transfer and commercialisation (de Beer, 2018; Baxter, 2011).

A study conducted by Berger and Rens in 2018 indicates that out of a total of 40,131 patents granted by Companies and Intellectual Property Commission between January 2005 and July 2015, only 4,064 patents were South African patents as shown on figure 3.6.

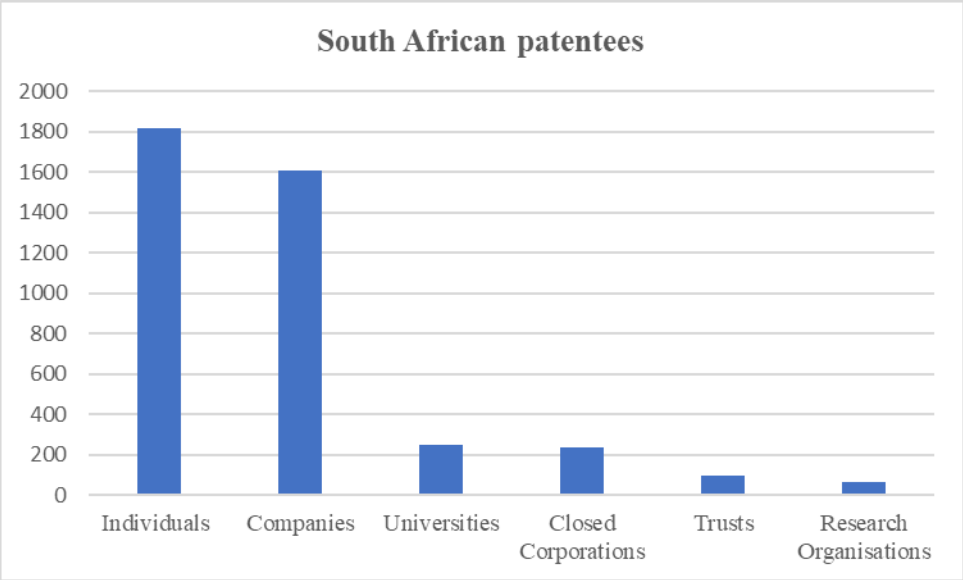

Figure 3.6 South African patentees between January 2005 and July 2015

Source: Berger and Rens (2018)

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The graph above shows that most patentees are individuals accounting for 1820 of all patentees, unfortunately universities only account for 246 patents and research institutions account for 63 patents. This is an indication that there is need for encouraging innovations at universities. Some of the innovations from South African universities are discussed in the next section.

3.2.3.1 Innovations from South African universities

This section discusses some of the innovations that were invented by researchers at public universities. The innovations include Omega Caro-E, Lumkani and Mabu Casing. Omega Caro-E was developed by Spinnler Benadè and Maretha Opperman from Cape Peninsula University of Technology and this health supplement is patented and also protected by trademark (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017, p. 28). Figure 3.7 depicts the image of the supplement.

Figure 3.7 Omega Caro-E health supplement

Source: The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017

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The figure 3.7 shows the image of Omega Caro-E health supplement. The health supplement is a combination of omega-3 oils and the department of Health in Canada also approved the product license authorising the sale of Omega Caro-E in that country (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017, p. 28).

The other innovation is a device called “Lumkani”, a devise that detect fires and in turn save lives. The device was developed by Samuel Ginsberg and Francois Peto from University of Cape Town (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017, p. 28). The device is patented, and trademark protected.

Figure 3.8 Lumkani- a fire detecting device

Source: The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017

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The device uses what is called rate-of-rise of temperature technology to measure the incid fires accurately and it is an effective early-warning system to reduce the damage and destruction caused by fire (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017). Lumkani system utilises low-cost, durable devices which are located within a network of detectors that are within a 40-metre radius of each other and in case of a fire, all devices with that range rings, and this enables the whole community to respond swiftly. In addition, the devices have other advantages, in the case of a fire, they store Global Positioning System coordinates and instantaneously send text-message warnings to community members and the system will also send coordinates of fires to the municipality's emergency response team (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017). This technology resulted in a spin-off company which trades as "Lumkani" and employs about 10 permanent staff and since 2014, the company manufactured and distributed more than 10 000 fire detectors (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017, p. 35).

Furthermore, another innovation was developed at the University of Pretoria and the initial project was funded by The South African Mushroom Farmers Association and the Technology and Human Resources for Industry Programme. The Technology Innovation Agency, the Gauteng Accelerator Programme also played a role by providing development funding to Mabu Casing Soils and currently, its commercial development is funded by the Industrial Development Corporation. Figure 3.9 shows an image of the product's trademark.

Figure 3.9 Mabu Casing Soils

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Source: The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017

The innovation resulted in a spinoff company called Mabu Casing Soils (Pty) Ltd, and it manufactures the soil. The University of Pretoria has filed patents in several countries particularly where there is mushrooms production, the availability of sugarcane bagasse. The company supplies both local and Namibian mushroom producers, but it is currently expanding into the nursery and horticultural industry as well (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017). Mabu Casing Soils was a finalist of the 2015 SA Innovation Awards (The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014, 2017). Although there are many challenges that are faced by universities in the commercialisation process, there seems to be some progress in innovation as indicated by the inventions mentioned above and the spinoff companies that were established as a result. In

addition, it is of paramount importance to have information on the South Africa's position in the 2020 Global Innovation Index. South Africa is currently ranked number 60 out of 131 countries on the 2020 Global Innovation Index; this index measures the economy's innovation performance annually (Dutta et al., (2020). Table 3.11 shows the rankings of South Africa from 2018 to 2020.

Table 3.11 Rankings of South Africa

Rankings of South Africa (2018–2020)

	GII	Innovation inputs	Innovation outputs
2020	60	49	68
2019	63	51	68
2018	58	48	65

Source: Dutta et al., (2020)

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South Africa performs better in innovation inputs than innovation outputs in 2020 (as shown on table 3.11). This year (2020) South Africa ranks 49th in innovation inputs, higher than last year and lower compared to 2018. With regards to innovation outputs, the ranking is the same as the previous year but it is lower when compared to 2018. Generally, South Africa is not performing well as far as innovation is concerned, there is need to improve.

South Africa faces challenges in research and development. One of the setbacks in research is that South Africa invests too little in R&D (Mouton *et al.,* 2019). According to Mouton *et al.,* (2019), the "Gross Domestic Expenditure on R&D (GERD)/Gross Domestic Product (GDP) has remained unchanged at around 0.8% for most of the past fifteen years". When compared to other similar countries (similar sized research systems) such as Malaysia, (1.3%) and Greece (0.97), South Africa is lagging behind. However, South Africa is on top when compared to the rest of Africa where the average GERD was 0.3 in 2015 (Mouton *et al.,* 2019:1). In addition, it is surprising that there is a decline in experimental development funding; 32% of R&D funding was for experimental development but this has declined to 25% in 2015 implying that strategic research areas i.e energy, water, food security and education remain underfunded (Mouton *et al.,* 2019). Businesses have also reduced their

funding to R&D and this places a huge concern and therefore more strategies should be used to have more funding. This has negative effects on innovation as there is need for experimental research to test ideas, assumptions, and gather data to make more informed decisions (Saarelainen, 2020). The government introduced the R&D tax incentive and established the Technology Innovation Agency (Walwyn, 2016) to ensure that there is funding for innovative research. Although there is an increase in investment in research chairs by the National Research Foundation, the funding is not enough (Mouton et al., 2019).

3.3 An analysis of intellectual property systems

This section analyses intellectual property systems of developed countries; Japan, United States and Germany and developing counties; India, Botswana and South Africa. The analysis is guided by the research objectives. The analysis focuses on the importance of legislation, the role of research and development, the role of IP awareness activities, the attitudes of researchers towards IP and all this assists in assessing the intellectual property practices.

3.3.1 The importance of legislation

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There are several lessons emerging from the case studies on IP. In particular, legislative policy frameworks are essential for the protection of IP and development of economies. Each nation should ensure that they create a uniform policy governing the ownership of inventions. Such policies are relevant to ensure that innovators are rewarded for their hard work, and this motivates researchers or scientists to invent. For example, the United States Bahy-Dole Act was instrumental in the increase in number of innovations and spinoff companies as the Act ensured that there are clear transactions between the industry and academia and enabled inventors to benefit from their inventions. The Bayh-Dole Act appears to have solved the need for a technology transfer policy in the United States; it changed the landscape of patenting in the United States by granting ownership of inventions to universities and other institutions conducting government-funded research (Leydesdorff *et al.*, 2016). As a consequence of the introduction of legislation assigning universities the right to patent publicly funded research, there have been an increase in patents awarded to universities i.e from 380 in 1980 to 3088 in 2009 and resulted in commercialisation of new technological advances that impact the lives of many people (Fisch et al., 2015; Gargate & Jain, 2013; Howard, 2013). The Act also became the blueprint of IP policies as all the

countries modelled their IP policies on the Bahy-Dole Act, from the developed countries such as Germany, Japan to developing countries such as India, Botswana and South Africa. All these nations have developed IP regulations to protect IP that emanate from publicly funded research. It is also important for each university to have its own IP policy that speaks to the whole process from the identification of an innovation to commercialisation. From the cases, it is evident that successful universities such as Massachusetts have their own IP policies. Having such polices encourages researchers to be involved in innovative research as they are certain that their woks are protected and at the same time they will be rewarded.

However, adopting the Bahy-Dole Act has been criticised by various scholars. There are arguments that the environment in which the Act was enacted is different from most countries especially developing countries. It is important for developing countries to understand the IPR protection environment in the United States; they should assess whether Bayh-Dole Act has influenced universities to conduct research that has the potential of creating inventions or whether the behaviour of researchers has been influenced by the Act (Boettiger & Bennett, 2006). Mowery *et al.,* (2001) argue that the Bayh–Dole Act was not responsible for the increase in patenting at universities, the effect of the Act was accelerating and magnifying existing trends. One of the argument is that universities in the United States and the industry are actively involved in research and they work together to translate inventions into commercial products, (Boettiger & Bennett, 2006; Mowery & Sampat, 2005) yet this is not the case in developing countries. In most developing countries, innovations occur at university or laboratories which are government owned, lack enough funding, and may struggle to find commercial partners who have resources (Boettiger & Bennett, 2006). Thus, the Act has negative implications for developing countries. The challenge emanates from the fact that developing countries like South Africa and Botswana have borrowed from the Act yet neither the conditions that enabled the adoption of the Act nor the environmental conditions in the context of South Africa are the same (Boettiger & Bennett, 2006). Developing nations have their own challenges which are different from United States. In the context of this study, even though Japan modelled its legislation based on the Bahy-Dole Act, the results were not the same as the environments are different.

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Even though United States is regarded as a success story, making revenue from patenting is a huge challenge for most universities. Drahos and Braithwaite, (2002, p. 12) argue that "underneath the development ideology of IP there lies an agenda of underdevelopment, it is

all about protecting the knowledge and skills of the leaders of the pack". Literature survey indicates that income from technology transfer activities is very skewed, there are very few universities that are making profit from commercialisation as costs exceed revenues (Bulut & Moschini, 2006). Only a few have earned from patenting i.e Stanford University and New York University (Leydesdorff *et al.*, 2016; Geuna & Nesta, 2006). In some cases universities end up suing commercial companies for the loss of patents, for instance, in 2015, Boston university was awarded US$13 million for a patent that resulted in the invention of blue light emitting diodes by Theodore Moustakas and Boston had sued three companies that are based in Taiwan for IPR infringement (Leydesdorff *et al.*, 2016). It is estimated that 40% to 50% of United States' TTOs usually operate at a net loss and the profit often is generated from one of more "blockbuster" patents (Heher, 2004) and this is as a result of the challenge that university IP requires time to mature before it generates income. Therefore, developing countries (Botswana, India and South Africa) that are following the same footsteps should be aware of all these challenges instead of focusing on the successes only.

3.3.2 Research and development

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Prioritising R&D is vital for innovation to thrive. It is important to analyse statistics of the selected case studies to understand the environment that researchers work in. Figure 3.10 shows the statistics on expenditure on Gross domestic expenditure on R&D (GERD) as a percentage for selected countries using data for 2015.

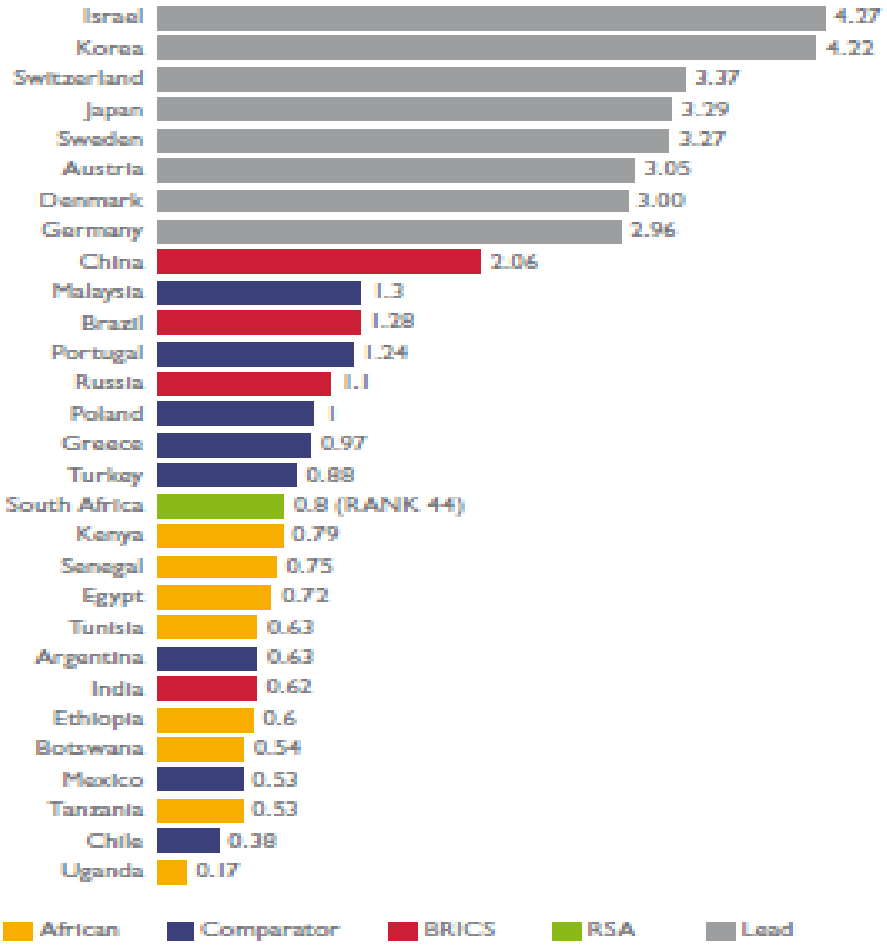

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Figure 3.10 GERD/GDP for selected countries

Source: Mouton et al., (2019)

With regards to the Gross domestic expenditure on R&D (GERD) (which is the total expenditure on R&D within a country), Japan (3.29%) and Germany (2.96%) spend more resources on R&D when compared to developing countries i.e India having (0.62%). However, South Africa spends more money on R&D (0.9%) when compared to Botswana (0.54%). Thus, in the African continent, South Africa is the highest ranked country. It is, therefore, important for developing countries to increase their budget on R&D because innovation emanate from research. The researcher also compared the percentage of GERD by source of funds. There are five categories for measuring the sources of funding for R&D which include the following sectors; the business, government, higher education, enterprise, private non-profit sector. In addition, the other sectors are not distinguished and they are categorised as funding from abroad. However, in presenting the information, the higher education and private non-profit sector were combined into one category as local sources

(Mouton *et al.*, 2019). Figure 3.11 presents the percentage GERD by source of funds for selected countries.

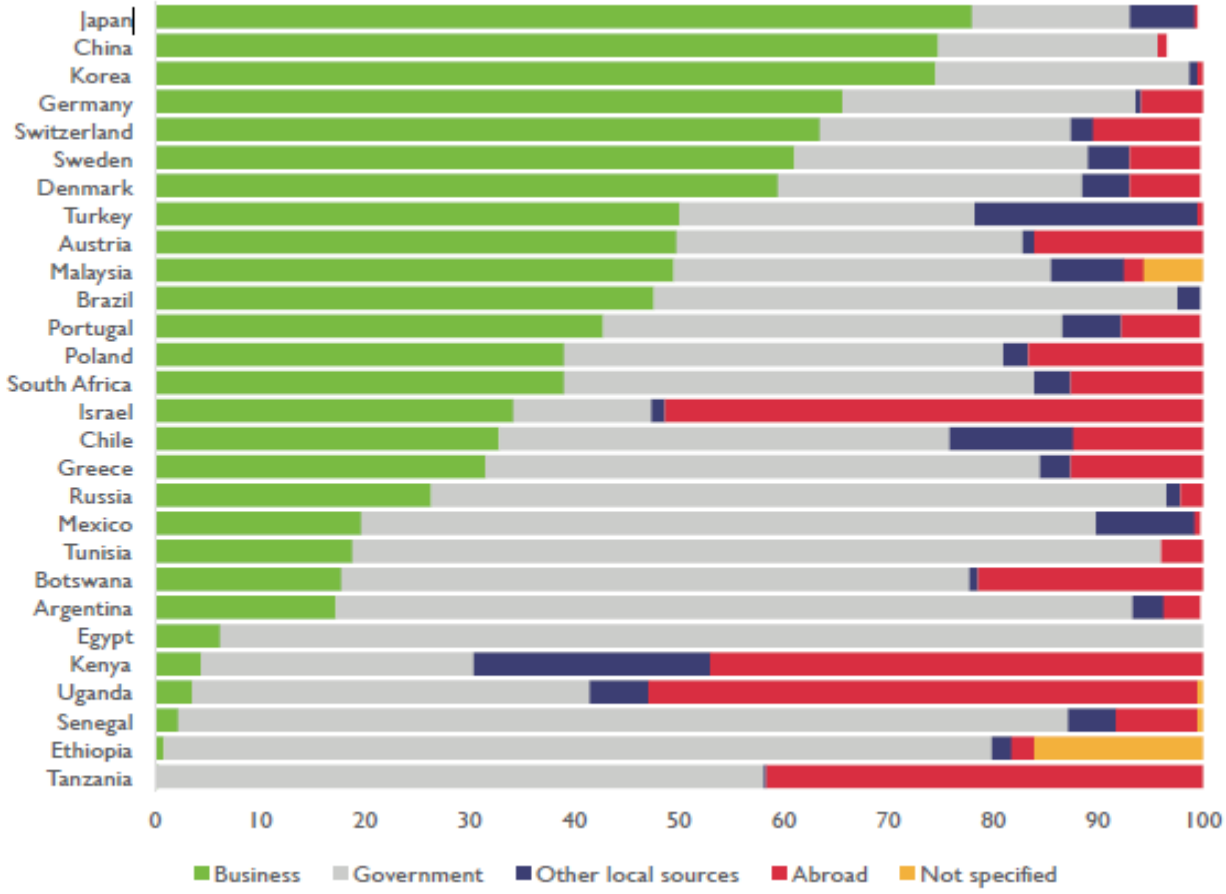

Figure 3.11 Percentage GERD by source of funds for selected countries (2015 or most recent data)

Source: Mouton et al., (2019)

Furthermore, when it comes to the sources of funding for research, the business enterprise sector is the largest funder of R&D in developed countries (between 50% to 78%). In the context of this study, the selected case studies comprise United States, Japan, India, South Africa and Botswana. From figure 3.11 it is evident that the business enterprise sector is the largest funder of R&D in Japan and in Germany while in South Africa and Botswana, most funding for R&D comes from the government. According to Mouton *et al.*, (2019), there was no data for analysing India and the United States and those countries are part of the selected case studies for this study.

In addition, the researcher also analysed data on the number of researchers in thousands. Figure 3.12 shows the number of researchers in thousands for selected countries.

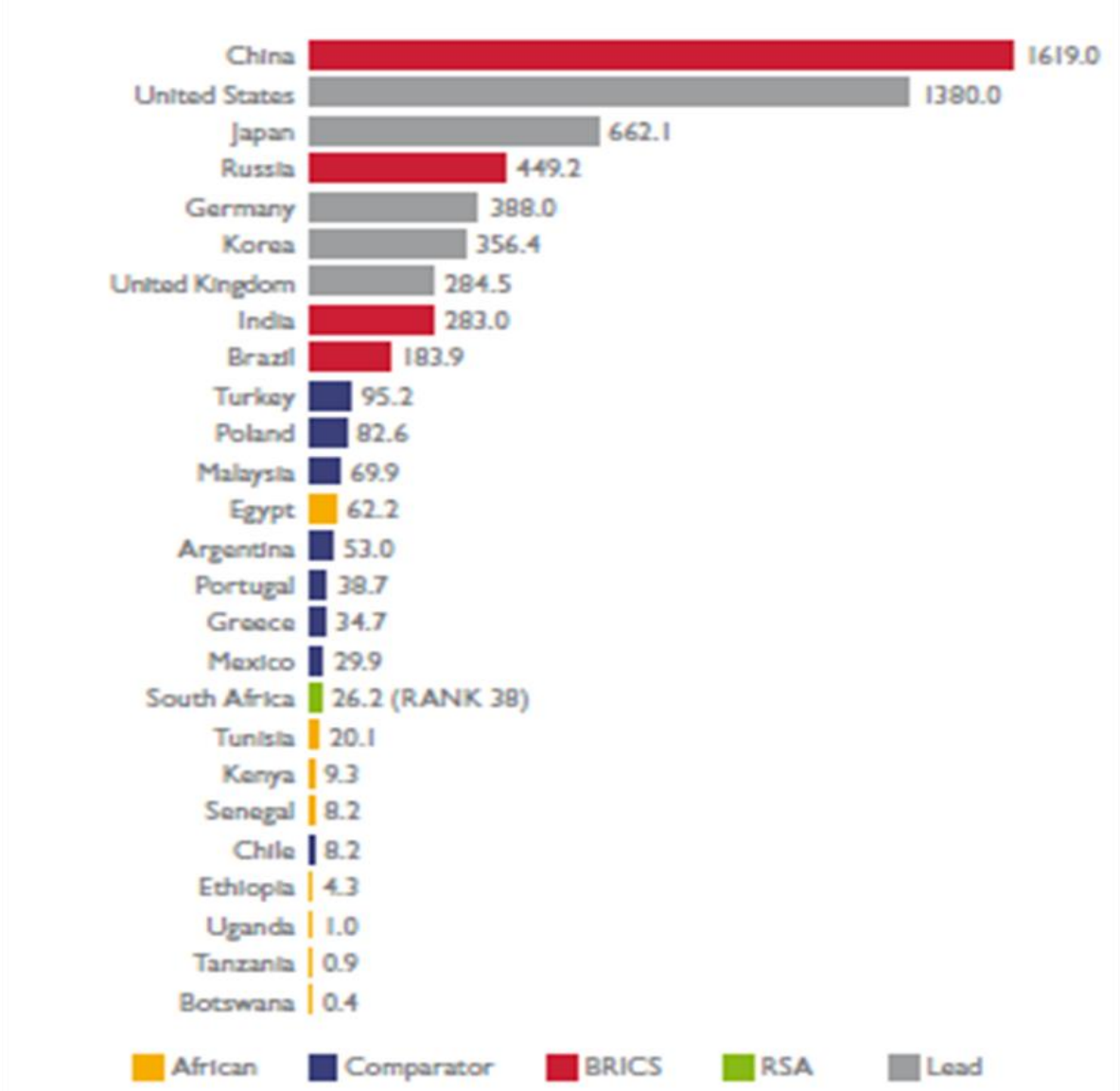

Figure 3.12 number of researchers in thousands for selected countries

Source: Mouton et al., (2019)

The number of researchers in a country is vital for innovation and in this case the researchers in thousands indicator was used. The number of researcher in thousands indicator is regarded as the main R&D personnel statistic that can be used for international comparisons and it can be defined as "the ratio of working hours actually spent on R&D during a specific referencing period (usually a calendar year) divided by the total number of hours conventionally worked in the same period by an individual or by a group" (Organisation for Economic Co-operation and Development, 2015, p. 166). In the context of this study, from the case studies selected

in this study, United States is leading with 1, 380, 000 and a population of 331 million followed by Japan with 662,100 and a population of 126 million, then Germany with 388.000 and 88 million people, India with 283, 000 with a population of 1, 3 billion, South Africa has 26, 200 with a population of 59 million while Botswana is the last country with 400 with a population of 2.3 million. As shown on the figure 3.16, many developed countries have many researchers as compared to developing countries but China, is ranked 1st when it comes to the number of researchers worldwide (1, 619, 000). Nevertheless, South Africa is among the leading countries in Africa following behind Egypt (66, 200) and a population of 104 million. Overall, most African countries are still struggling as they are at the bottom of the table. There is need for African nations to motivate people to conduct research because some of the research may lead to the discovery of inventions that may improve economies and in turn improve lives. As previously stated, to boost technological innovation, there is need for scientific (R&D) to be prioritised. This is because there is a link between basic research and innovation. Basic scientific research is pivotal as far as innovation is concerned as it expands ideas that can in turn be translated into new or improved technologies or products or services (Mouton et al., 2019).

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3.3.3 IP awareness activities

From the analysis of case studies, it is important to note that awareness activities are useful, there is need to continue creating awareness of IP and its protection so that researchers are aware of the relevance of IP. This will play a role in encouraging innovations at universities. It is evident that countries that have been creating awareness on IPR for a long time are the ones who are successful and have a high output in terms of inventions that emanate from universities i.e the United States and Japan. Although these countries are leading in terms of inventions, they continuously create awareness and United States is even now extending its awareness activities across borders. Developing nations should emulate such strategies and change their approach towards IP awareness. India also creates awareness of IP and its protection through organisations such as the Patent Facilitating Centre which has organised a total of 450 awareness workshops targeted at universities, industry, policy makers and scientists and individuals. The National Research Development Corporation also creates IP awareness specifically focusing on commercialisation, and the importance and advantages of IP protection to Indian economy (Tewari & Bhardwaj, 2018, p. 17). The Cell for Intellectual Property Rights Promotion and Management partnered with the industry to conduct 19 IPR

awareness roadshows in 18 Indian states in 2016 and presentations, posters and pamphlets which have basic information on IPRs were used to create awareness (Tewari & Bhardwaj, 2018). Thus, India has taken strides to create awareness.

In addition, South Africa for instance has put on measures to ensure that researchers from publicly funded institutions are educated about the relevance of IP and its protection. Technology transfer offices in collaboration with NIPMO, the Companies and Intellectual Property Commission and other partners are responsible for creating awareness and this is important because various studies argue that researchers have inadequate knowledge of IP and its protection (Sharma & Kumar, 2018; Chudi *et al.,* 2015; Sikoyo *et al.,* 2006). However, this is not the case when it comes to Botswana, there is need for that country to devise strategies to create awareness of IP and its protection as there seems to be less activity in that area evidenced by the absence and unreliable records on registered IP (Hirko & de Beer, 2019).

3.3.4 Intellectual property practices

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There is evidence of increased practices of IPR in developed countries as compared to developed countries. This is evidenced by the number of university inventions in the United States and the fact that United States' universities are leading in the number of patents worldwide. This noticeable and profound success in United States' higher education institutions is attributed to the fact that they established TTOs at universities. United States universities have highly evolved TTOs which have skilled personnel and that makes it easy for them to evaluate patents and to facilitate the whole process of commercialising inventions. Such practices can be a good example for developing nations to emulate in order to increase the number of inventions at the same time creating an environment conducive for creativity i.e India should establish more TTOs at their universities. Developing nations should also strive to employ skilled personnel to facilitate technology transfer at universities.

One of the lessons that emerges is that there should be a good relationship between universities and the industry. This calls for collaborations to ensure that innovations are commercialised. For instance, United States' global leadership in innovation is attributed to robust public and private investments in R&D (Ezell, 2019; Atkinson, 2018). This injection of capital is of significance to the innovation system as patenting is expensive. Both the higher education sector and the industry became actively involved in research and they work

together to translate inventions into commercial products (Boettiger & Bennett, 2006; Mowery & Sampat, 2005). Therefore, industry-academic partnerships contribute to the success of the country's innovation system. In addition, other universities such as Japan are offering IPR courses with shallow focus to certain fields of study such as engineering and science. This is a positive development; however, such a module needs to be made a mandatory course for everyone in all institutions of higher learning and training so that every student learns about the relevance of IP early and it encourages creativity.

One of the emerging lessons learnt from the case studies is the need for attitude change towards innovation. Nandagopal (2013) emphasise that there is need for a change in attitudes, i.e attitude that limits researchers to just publishing their work in journals. It is time to move from the publish or perish attitude and be innovative. Although India established ITTs as early as 19, there isn't much progress in innovation. The researchers in Japan mostly focuses on publishing their results in journals as is the case in most African countries i.e Botswana South Africa is better placed as researchers have also commercialised their innovations, for example, Omega Caro-E and Lumkani, a fire detecting device. Therefore, innovations are important as they save lives.

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3.3.5 The ranking of selected case studies on the global innovation index

From an analysis of the Global Innovation Index ranking of the countries selected in the study, it is apparent that developed countries are highly ranked and therefore are performing well as compared to developing countries. The United States is ranked 3rd in 2020, Germany is ranked number 9, Japan is ranked number 16, India is ranked number 48, South Africa ranks 60 and Botswana is ranked 89. In this case, it is the least innovative country. What is outstanding is India's improvement as it ranked 57 in 2018, 52 in 2019 and even better, 48 in 2020. Thus, among these countries, India's ranking has improved. Other developing countries have also been performing well over the years. For instance, Botswana previously ranked 93 in 2019 but in 2020, the country is ranked number 81. But the gap between developed and developing countries is enormous and there is need for developing nations to improve their economies.

3.4 Chapter summary

The chapter analysed case studies from both developed and developing countries. Developing countries that were included in the study are Japan, Germany and United states, on the other

hand, developing countries that were included in the study are Botswana, India and South Africa. The analysis indicated that developing countries have developed IP systems and they are more successful in commercialising their innovations. They also create robust awareness of IP targeted at various publics even though they have advanced IP systems, this shows that developing countries also need to continue with creating awareness. A lot can be learnt from these case studies, however, there is a need for developing countries to consider the country's financial climate before emulating some of the strategies that are employed by developed countries as the economic environments are different. It has also been noted that there is need to invest heavily in R&D. Comparing the Gross Domestic Expenditure on R&D, countries such as Japan and Germany spend more resources on R&D when compared to developing countries like India, South Africa and Botswana. It is, therefore, important for developing countries to increase their budget on R&D because innovations emanate from research. The analysis revealed that researchers should also be conscientised on the importance of conducting innovative research. Thus, this chapter reviewed case studies from developed and developing countries. The next chapter extensively discusses the research methods that were employed in this study.

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CHAPTER 4: RESEARCH METHODOLOGY

4.1 Introduction

The aim of this research was to analyse intellectual property awareness among researchers at UFH. This chapter is important as it guides the whole process of research from planning to conducting the research and finally writing a report. This section of the research therefore discusses the research paradigms adopted, the research approach that is employed, the research design that is employed, sampling methods that were used to select the respondents and the key informants from the University's Innovation office, methods of data collection and data analysis. The chapter also discusses the ethics that were considered when collecting data and writing the report and the research limitations. All these steps were relevant as they enabled the researcher to realise the study objectives. The first section defines the role that is played by paradigms when conducting research and the following section discusses pragmatic paradigm as the most appropriate paradigm that informs this study.

4.2 Research paradigms

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Each research project has philosophical assumptions that shape the research processes. The term 'worldview' is used to describe these philosophical assumptions and a term that is used synonymously with the term worldview is paradigm (Creswell & Clark, 2018). This study uses the term paradigm. To understand what a research paradigm is, there is need to define the term paradigm. A paradigm is defined as a researcher's worldview; a perspective or thinking or school of thought or set of shared beliefs that informs the meaning or interpretation of research data (Creswell & Creswell, 2018; Kivunja & Kuyini, 2017). There are different paradigms that can be adopted when conducting research and these include positivist or postpositivist, interpretivist or constructivist, transformative and pragmatic paradigm. To differentiate between various paradigms, the researcher summarised the paradigms and presented them in form of a table. Thus, Table 4.1 presents different paradigms that can be adopted in research. The last paradigm highlighted in grey (the pragmatic paradigm) is the appropriate paradigm that addresses the research objectives in this study.

Table 4.1 shows different paradigms that can be adopted in research

Paradigms	Methods	Data collection tools	Language commonly associated with major research paradigms
Positivist/ Postpositivist	"Mainly quantitative	Experiments interviews Tests Observations	• Experimental • Quasi-experimental • Correlational • Reductionism • Theory verification • Causal comparative • Determination • Normative
Interpretivist /constructivist	Mainly quantitative	Interviews Observations Document reviews Visual data analysis	• Naturalistic • Phenomenological • Hermeneutic • Interpretivist • Ethnographic • Multiple participant meanings • Social and historical construction • Theory generation • Symbolic interaction
Transformative	Qualitative methods with quantitative and mixed methods.	Diverse range of tools - need to avoid discrimination. Eg: sexism, racism, and homophobia. Focus group discussion Interviews Brainstorming technique	• Critical theory • Neo-marxist • Feminist • Critical Race Theory • Freirean • Participatory • Emancipatory • Advocacy • Grand Narrative • Empowerment issue oriented • Change-oriented • Interventionist • Queer theory • Political
Pragmatic	Qualitative and/or quantitative methods may be employed. Methods are matched to the specific questions and purpose of the research	May include tools from both positivist and interpretivist paradigms. Eg Interviews, observations and testing and experiments.	Consequences of actions Problem-centred Pluralistic Real-world practice oriented Mixed models

Source: Adapted from Mertens, 2005 and Creswell, 2003

As shown on table 4.1, paradigms are different and the methods of collecting data aligns with a paradigm. For instance, an interpretivist allows researchers to use qualitative methods to collect data. It is apparent to note that the paradigm that the researcher uses determines the methods of collecting data and data analysis methods that should be employed for that

particular research (Creswell & Creswell, 2018; Kivunja & Kuyini, 2017; Mackenzie & Knipe, 2006). This research is informed by the pragmatic research paradigm. Pragmatism allows the researcher to explore more than one paradigm. According to Creswell (2018, p. 10) a pragmatic research paradigm "emphasize the research problem and use all approaches available to understand the problem". Therefore, pragmatic research paradigm provides one with an opportunity for exploring different worldviews; emphasises that the choice of methods for data collection, and analysis is determined by the research problem or research questions that the researcher seeks to address (Creswell & Creswell, 2018; Creswell, 2009; Mackenzie & Knipe, 2006). This study employs a mixed methods design which enables one to use multiple paradigms rather than aligning with one paradigm (Creswell & Clark, 2018; Creswell & Creswell, 2018; Tashakkori & Teddlie, 2003). The study employs both qualitative and quantitative methods to collect data. The aim is to use methods that allows the researcher to achieve the objectives of the study. Hence, this paradigm entails that the practical approach to analyse IP awareness among researchers at UFH is to adopt multiple research paradigms, mixing methods for collecting and analysing data as shown on table 4.2. The researcher noted that it is impossible to use a particular research paradigm since this study uses mixed methods approach. Therefore, pragmatic research paradigm is best suited for this study.

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Furthermore, as stated in the previous section that the research adopted the pragmatic research paradigm, the researcher therefore borrowed from other paradigms. Thus, interpretivist or constructivist paradigm and positivist or scientific paradigm guides this study. Positivism is sometimes referred to as "scientific method" or "science research", is "based on the rationalistic, empiricist philosophy that originated with Aristotle, Francis Bacon, John Locke, August Comte, and Emmanuel Kant" (Mertens, 2005, p. 8) and "reflects a deterministic philosophy in which causes probably determine effects or outcomes" (Creswell & Creswell, 2018; Creswell, 2003, p. 7). This paradigm deals with deductive logic, formulation and testing of hypotheses, offering operational definitions and mathematical equations or calculations, to derive conclusions, provide explanations and to make predictions based on measurable outcomes, explaining relationships among various phenomena and emphasises objectivity (Cresswell & Clark, 2018; Kivunja & Kuyini, 2017; Shah & Al-Bargi, 2013).

Furthermore, interpretivist or constructivist paradigm also guides this study. The interpretivist or constructivist paradigm emerged from the various philosophies; the philosophy of Edmund

Husserl's phenomenology and other German philosophers' study of hermeneutics (Eichelberger, 1989 cited in Merten, 2005, p. 12). The aim of this paradigm is to explore the meanings or views of participants in relation to a study (Creswell & Clark, 2018; Kivunja & Kuyini, 2017; Phothongsunan, 2015; Creswell, 2003). Constructivist paradigm mainly rely on qualitative methods for data collection (Creswell & Clark, 2018; Mackenzie & Knipe, 2006). This paradigm aligns with what the aim of the research as the researcher collected qualitative data by conducting an interview and using a qualitative questionnaire with open ended questions, collected booklets and fliers and all this data was relevant in answering some of the research questions. The application of the interpretivist or constructivist paradigm to the study is demonstrated in table 4.2.

Table 4.2 Summary of the research design

Research objectives	**Paradigm**	**Data collection**		**Data presentation and analysis**	**Outcome**
		Primary	**Secondary**		
(i) To analyse communication strategies used by the Innovation Office in promoting awareness of IP among researchers at UFH.	Positivist/ Post-positivist Constructivist	Open ended Questionnaire and closed ended questionnaire Interview	Journals; Textbooks; Reports, Campaign booklets and fliers	Thematic analysis, Descriptive statistics	Communication strategies used by the Innovation Office to create awareness of IP
(ii) To assess University of Fort Hare researchers' knowledge of intellectual property.	Positivist/ Post-positivist	Closed ended Questionnaire	Articles; Textbooks; Reports	Descriptive statistics	The researchers' knowledge of intellectual property
(iii) To explore the attitude of University of Fort Hare researchers towards intellectual property.	Positivist/ Post-positivist	Closed ended Questionnaire	Articles; Textbooks; Reports	Descriptive statistics.	The attitude of researchers towards intellectual property
(iv) To explore the practices of intellectual property at University of Fort Hare	Constructivist Positivist/ Post-positivist	Open ended questionnaire Interview	Journals; Textbooks; Reports UFH IP policy	Thematic analysis, Descriptive statistics	The practices of intellectual property at UFH.

Source: Author, 2020

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Table 4.2 summarises the research design for this study, it highlights the paradigm, objectives, data collection instruments, methods for data analysis and expected outcomes for the study. In this study, the positivist paradigm is used to guide the 2nd and 3rd research objectives as shown in table 4.2. The researcher matched the research paradigm with the research objectives. The researcher collected quantitative data through distribution of questionnaires with closed ended questions targeted at researchers at UFH, collected qualitative data using an interview and an open-ended questionnaire.

4.3 Research design

A research design is the blueprint for methods that are utilised to collect and analyse data (Kothari, 2014, p. 29). Research designs are basically a type of inquiry within qualitative, quantitative, and mixed method approaches that provide direction for procedures in research (Creswell & Creswell, 2018). It is vital for the researcher to select an appropriate design that best answers the research questions. According to Creswell and Creswell, (2018, p. 105), research designs are "procedures for collecting, analysing, interpreting, and reporting data in research studies". Therefore, the research design selected by the researcher determine data collection methods, methods of data presentation and analysis. The research design adopted for this study is mixed methods design. The design enabled the researcher to combine both qualitative and quantitative methods in collecting data concurrently to address the research objectives. The next section discusses the mixed method design selected for the study and this design aligns with pragmatic paradigm as shown on Table 4.2 in the previous section.

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4.3.1 Mixed method design

The concept of mixed methods originated in 1959 when Campbell and Fiske used multiple methods to study validity of psychological traits and this prompted other scholars to use this method (Creswell, 2003, p. 15). "The use of mixed method was as a result of the fact that they realised that all methods had bias and weaknesses, and the gathering of both quantitative and qualitative data neutralised the weaknesses of each form of data" (Creswell, 2014, p. 140). Synonyms for mixed methods include 'triangulation', 'mixed-model designs' 'qualitative and qualitative methods', 'multi-methods' and recent writings use the term 'mixed methods' (Creswell & Clark, 2018; Denzin & Lincoln, 2018; Creswell & Creswell, 2018). Mixed-methods research is regarded as a key element in the improvement of social science research and is becoming increasingly recognized as the third major research

approach since it incorporates several methods of gathering data, the "third research paradigm" (Johnson & Onwuegbuzie, 2004, p. 15) and "a new star in the social science sky" (Mayring, 2007, p. 1). Thus, scholars now advocate researchers to employ mixed method designs in their studies.

Various authors put forward definitions of mixed method. Clark, *et al.,* (2008, p. 364) define mixed-methods research "as a design for collecting, analysing, and mixing both quantitative and qualitative data in a study in order to understand a research problem". In addition, Creswell and Creswell, (2018) are of the view that mixed methods research involves the collection of both quantitative and qualitative data, integrate the two forms of data, and using diverse designs that can involve philosophical assumptions. Overall, mixed methods research allows the research to borrow from quantitative and qualitative methodologies and integrate the results to get a comprehensive understanding of the research problem. It is therefore important to discuss how quantitative and qualitative research methodologies were used in this study.

Qualitative research methods

According to Denzin and Lincoln, (2018, p. 43), "qualitative researchers study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them". One of the advantages of this method is that a small sample is selected and analysed to explore the participants' perspectives in detail (if dealing with human subjects) (Creswell & Clark, 2018). Qualitative data is open-ended without any pre-determined responses (Creswell, 2014, p. 14). Qualitative research involves a collection of various materials that include documents, case studies, personal experiences, interview data, artefacts, cultural texts and historical texts (Denzin & Lincoln, 2018).

In the context of this study, the researcher collected qualitative data by conducting an interview (a semi-structured interview schedule was used) and a qualitative questionnaire (with open ended questions), collected booklets and fliers, a UFH IP policy document, attendance registers for IP awareness workshops conducted at UFH between 2016 and 2018 and all this data was relevant in answering some of the research questions. However, the researcher had initially scheduled a second interview with one key informant from the Innovation Office but it was cancelled. Due to the outbreak of COVID-19 (Corona virus), gatherings were prohibited, as a result, UFH campuses were closed and communication was only possible through online interaction so the researcher had to re-strategise and find

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possible ways of collecting data. As a result, the researcher resorted to using a qualitative questionnaire and an Electronic Mail (Email) was then used to send a qualitative questionnaire to the key informant to complete.

The data was therefore analysed qualitatively using thematic analysis. However, qualitative research is regarded as deficient because the researcher can be biased and advance his/her beliefs (Creswell & Clark, 2018) and the findings cannot be generalised to the whole group because only a few participants are studied. To add on, qualitative data could not achieve the study objectives and such weaknesses prompted the researcher to use a mixed method approach whereby the researcher collected both qualitative and qualitative data. Quantitative methods that were used were discussed in the following section.

Quantitative research methods

Quantitative research provides for generalisations of study findings. In a qualitative study, the researcher gets a general understanding of the research problem since a large number of people are assessed basing on responses to a few variables (Creswell & Clark, 2018). In this method, emphasis is placed on quantification of constructs (Babbie & Mouton, 2001). Quantitative data tends to be closed ended with pre-determined responses and likewise the questionnaires targeted for researchers at UFH comprise closed ended questions. This research method was used by the researcher to measure the attitude of respondents towards intellectual property and to measure the level of knowledge of respondents with regards to intellectual property and Statistical Package for Social Science (SPSS) and Microsoft Excel (Ms Excel) were used to analyse data quantitatively. In this case, the researcher collected quantitative data using a closed ended questionnaire targeted at researchers at UFH.

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All in all, a mixed-method design has its advantages as it permits the researchers to answer research questions using the most appropriate methods, reduces biases as limitations of one method is offset by the strengths of the other method and above all, a mixed methods design enables a comprehensive understanding of the stated research problem, the method yields additional insight into the research problem, provides sufficient data sources and the researcher has greater confidence in making conclusions (Creswell & Creswell, 2018; Denzin & Lincoln, 2018; Creswell & Clark, 2018; Creswell, 2014). Thus, mixed method design is the most appropriate method adopted in this study.

4.3.1.1 Convergent mixed methods design

Convergent mixed methods design is one of forms of mixed methods design whereby the researcher merges qualitative and quantitative data to provide an exhaustive analysis of the problem identified in the study, as a way of validating research findings from another approach (Denzin & Lincoln, 2018; Creswell & Creswell, 2018). It is also referred to as concurrent or parallel design by other scholars. The researcher collects both qualitative and quantitative data concurrently and then integrates the data and equal emphasis is given to the two data sets (Creswell & Creswell, 2018). Figure 4.1 presents the convergent mixed methods design used in the study.

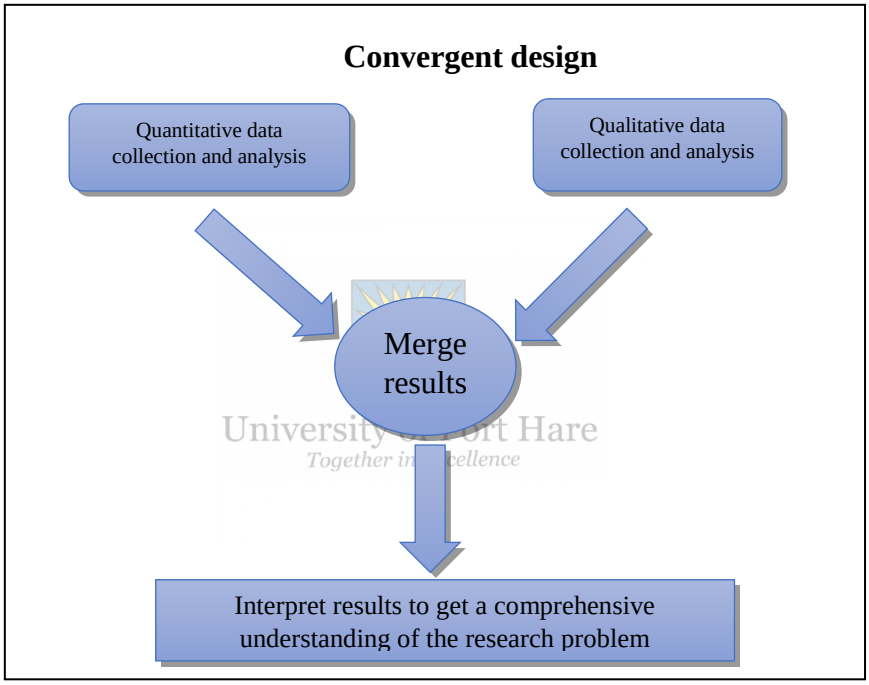

Figure 4.1 Convergent mixed methods design

Source: Adapted from Creswell and Creswell, (2018)

As shown on figure 4.1, the researcher collected both qualitative and quantitative data concurrently, analysed the data separately and then merged the results and lastly interprets the results to get a comprehensive understanding of the research problem. This method has its advantages and some of the advantages include; data collection is done concurrently and this saves time as the researcher does not depend on the results of one data set to inform another set. The other advantage is that each type of data is collected and analysed separately, participants' responses can be compared and researchers can report on statistical trends and at the same time give a voice to the participants (Creswell & Creswell, 2018). Thus, convergent

mixed methods design enabled the researcher to comprehensibly address the research objectives by merging the research results in the analysis section of the study. The design was also easy to implement and it saved time since both forms of data were collected concurrently.

4.4 Study Population

A study population is defined as, "all items under consideration in any field of inquiry…," (Kothari, 2014, p.13) that the researcher wants to draw conclusions (Babbie, 2013). The population of a study is therefore the collection of elements from which a sample is selected (Babbie, 2013). The study population comprises the overall population of UFH teaching staff and postgraduate students because they are the ones who conduct research. The study population is therefore presented in table 4.3.

Table 4.3 Study population

		Total
Students	Masters students	1396
	Honours students	991
	Ph.D students	546
Staff	Lecturers	330
Total Population		**3263**

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Source: Planning and Quality Assurance Department, 2019

The total population of the study comprise lecturers (teaching staff) and postgraduate students; those enrolled for Masters' programmes, Honours programmes and lastly those enrolled for Doctoral programmes at UFH.

4.5 Study sample

The study sample comprises of researchers from all faculties at UFH. To calculate the sample size, the researcher used statistics for the number of students from the Institute of planning at the University. Statistics for the number of teaching staff was from an institutional document (University of Fort Hare Institutional Feedback Report, 2017). The sample size is 412 and it was calculated using the overall population for the study is 3 263. The researcher used Raosoft, an online software to calculate the required sample size with a confidence level of

97% and a response distribution of 50%. Babbie, (2013, p. 142) defines confidence level as "the estimated probability that a population parameter lies within a given confidence interval". On the other hand, confidence interval is defined as "the range of values within which a population parameter is estimated to lie" (Babbie, 2013, p. 142). The study sample therefore comprise researchers (lecturers and postgraduate students) from all faculties at UFH.

4.6 Sampling

According to Sharma, (2017, p. 749) "sampling is a technique employed by a researcher to systematically select a relatively smaller number of representative items or individuals from a pre-defined population to serve as subjects for observation or experimentation as per objectives of his or her study". The main aim is to select a sample which is representative of the whole population.

4.6.1 Types of sampling methods

There are two major categories of sampling, namely probability and non-probability sampling.

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4.6.1.1 Probability sampling

Probability sampling is also referred to as "random sampling" or "chance sampling" and every item has an equal chance of being selected (Kothari, 2014). Probability sampling is the primary method that is used to select large representative samples in social research (Babbie & Mouton, 2001). There are four types of probability sampling namely simple random, systematic, stratified and cluster sampling. Particularly, the researcher employed stratified sampling, a subtype of probability sampling method to select a large representative sample for the study. It was appropriate to use this method because the samples used contained the same variations; there are categories such as lecturers (have same characteristics) and Honours students' group (have same characteristics).

4.6.1.2 Nonprobability sampling

On the other hand, nonprobability sampling is a sampling technique in which the units to be analysed are selected using the judgment of the researcher; the researcher determines the units that are most useful or representative (Kothari, 2014; Babbie, 2013). This differs from

probability sampling in that, some units of the population have a zero chance of selection or the probability of selection cannot be accurately determined. The researcher resorted to using nonprobability sampling methods because they allow one to select respondents that best answer the research questions and it is impractical to use probability sampling to select key informants for the interview and those who responded to the qualitative questionnaire. Subtypes of non-probability sampling are judgemental, snowball, quota and convenience sampling. In this study, two sub-types of non-probability sampling namely purposive and convenience sampling were used to select respondents.

4.7 Sampling procedure

According to Kothari (2014, p. 57) sampling procedure is defined as, "the technique to be used in selecting the items for the sample". The study used probability sampling methods such as stratified sampling and non-probability sampling methods such as purposive and convenience sampling to select respondents for the study. The next section discusses stratified sampling.

4.7.1 Stratified sampling

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Stratified sampling refers to a probability sampling method in which the researcher divides the study population into strata (homogenous sub-groups) and selects the study subjects proportional to each subgroup (Sharma, 2017; Wagner *et al.*, 2012). Stratified sampling is "a method for obtaining a greater degree of representedness decreasing the probable sampling error". Stratified random sampling was be used to select the respondents for the questionnaires. The strata comprise lectures and postgraduate students. About four strata were identified namely (i) Lecturers, (ii) Masters students, (iii) Honours students and (iv) Ph.D students. The representative sample for each of the identified strata will be proportional to the total population size. For instance, to calculate the required sample size for Lecturers; total number of lecturers divided by the total population x total sample size (330/3263x412=42). The researcher focused on lecturers and postgraduate students because they are the ones conducting research which might produce IP.

After calculating the number of people that must be selected in each stratum, the researcher then employed convenience and purposive sampling to select the respondents of the questionnaires. So, in this study, stratification assisted the researcher in knowing the number of people that the researcher should select and target when distributing questionnaires. This

was done to ensure that the sample is representative of the whole population since the aim was not, for instance, to select a particular lecturer but any lecturer who was available and willing to participate in the study. Stratified sampling enabled all subgroups of the population to be fairly represented. Table 4.4 illustrates the distribution sample for the study.

Table 4.4 Sample distribution

Parameter	**Total population**	**Total population sampled**	**Percentage of population sampled**
Masters	1396	176	43%
Honours	991	125	30%
Ph.D	546	69	17%
Lecturers	330	42	10%
Total	**3263**	**412**	**100%**

Source: Author, 2020

Figure 4.4 illustrates the total population in each subgroup, the total population sampled and the percentage of population sampled. The subgroups comprise Masters students, Honours students, Ph.D students and Lecturers at UFH. The response rate for the questionnaires is presented in the next chapter.

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4.7. 2 Purposive sampling

In purposive sampling, the researcher uses his or her experience, and knowledge to select respondents that best answers the research questions (Wagner *et al.*, 2012). The researcher thus selects the sample that provided information which is relevant to the study. Purposive sampling was used to select the key informants for collecting qualitative data; one participant was selected for the interview and one participant was also selected for responding to the open-ended questionnaire. The Innovation Office manager was the key informant who responded to the questionnaire while an IP and Innovation officer responded to the interview. These key informants are the only personnel who are knowledgeable on IP as there are only three staff members at the Innovation office. The other staff member is an intern. Purposive sampling is less expensive and serves time since this method can be implemented quickly.

In addition, this type of sampling was also used to select respondents for closed ended questionnaires, the aim was to select respondents from certain groups such as postgraduate

students; Honours, Masters, Ph.D students. Lecturers were also another target group at UFH. On the other hand, this technique is not a scientific method of selecting a sample because the population units to be sampled may be affected by personal prejudice or bias of the researcher. The researcher may establish predetermined conclusions by including those items in the sample which conform to his or her beliefs. However, the advantages outweigh the disadvantages by far and personal prejudice can be dealt with by being objective and adhering to the objectives of the research.

4.7.3 Convenience sampling

After using stratification to calculate the number of respondents to be selected, the researcher then also used convenience sampling to select individuals to respond to the questionnaires. Convenience sampling is a method of sampling in which the researcher uses respondents who are readily available (Wagner *et al.,* 2012). Synonyms for convenience sampling are 'haphazard sampling' and 'accidental sampling' (Babbie, 2013). This study uses the term 'convenience sampling'. Together with purposive sampling, these methods were the most appropriate to select the respondents for closed ended questionnaires, the aim was to select respondents from certain groups such as postgraduate students; Honours, Masters, Ph.D students as stated in section 4.4 of this chapter. Lecturers were also another target group at UFH. The researcher targeted student residences, in classrooms and at the student centre. Convenience sampling was chosen because it is less expensive and saves time since this method can be implemented quickly.

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4.8 Reconnaissance

The researcher attended two workshops on IP which were held at UFH in 2017 and in 2018 at Alice Campus. The first workshop was held on the 7th of June, it was facilitated by presenters from the Companies and Intellectual Property Commission and National Intellectual Property Management Office. The second workshop was a Lunch Hour Talk on IP themed 'Innovation – improving lives' and it was facilitated by Dirk Hanekom, a Patent Attorney at Adams & Adams Law firm in South Africa. The researcher developed interest on IP and this prompted the researcher to conduct research on IP. Attending these workshops helped the researcher to familiarise with the research topic and learn more on the relevance of IP at research institutions and to the South Africa's economy at large. During these workshops, the researcher had an opportunity to interact with other researchers, for the

discussions, it was apparent that some of the students were not aware of IP issues and were attending for the first time. The researcher observed that the sessions were informative and interactive as both lecturers and students were participating in tasks that we were given. The question and answer sessions became longer than planned as more questions were being posed on the how IP is related to research.

4.9 Data collection

This section discusses the secondary and primary data collection tools that were adopted in this study as informed by the research paradigm and research design. Data for this study was obtained from both primary and secondary sources.

4.9.1 Secondary data collection

Secondary data refers to data that is already available; this data would have been collected and analysed by someone else (Gravetter & Forzano, 2018; Kothari, 2014). Secondary data for this study was sourced from both published and unpublished secondary sources. Published data was sourced from journals, conference papers, books, reports and publications of various organisations. Unpublished data was sourced from unpublished reports, dissertations and government documents and Innovation Office materials. The researcher only used reliable and valid data to address the objectives of the study.

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The researcher collected secondary data from the UFH Innovation office. One of the documents that was emailed to the researcher is the IP policy document for UFH. The document was analysed using thematic analysis to understand the role of the policy in regard to IP developed by researchers. Other materials such as attendance registers filled by researchers during for IP workshops between 2016 and 2018 booklets and fliers created by the World Intellectual Property Organisation, National Intellectual Property Management Office, Companies and Intellectual Property Commission and the Innovation Office were collected from the office and those materials are used to create awareness. The attended registers were analysed (see chapter 5).

In addition, the researcher collected data from the internet; researcher also downloaded information on UFH innovations that are in the process of being commercialised. Information on the two innovations; the Sun Wheel Planter technology and Stress Tolerant Maize Variety

technology is available on the following website: https://www.innovationbridge.info/ibportal/?q=content/sun-wheel%C2%AE-planter.

4.9.2 Primary data collection

Primary data is regarded as data that is collected by the researcher which is, "afresh and for the first time, and thus happen to be original in character" (Kothari, 2014, p. 95). Primary data for this study was collected using interviews and an interview schedule was created (see Appendix 5) and questionnaires (see Appendix 4 and 6). These methods are discussed in detail below.

4.9.2.1 Key informant interviews

Interviews were used to gather primary data. Interviews are common methods of collecting qualitative data in the field of human and social sciences as they are employed in social work, sociology, communication and psychology disciplines (Denzin & Lincoln, 2018). An interview is regarded as a valuable source of information and it is defined as "a two-way conversation and purpose interaction in which the interviewer asks the participant (the interviewee) questions in order to collect data about the ideas, experiences, beliefs, views, opinions, and behaviours of the participant". Therefore, it is important for the researcher to create a conducive atmosphere to enable a meaningful conversation by providing a flexible conversational structure that enables interviewees to raise questions and concerns freely (Denzin & Lincoln, 2018).

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There are basically three types of interviews namely, a semi-structured interview, a structured interview and an unstructured interview (Brinkmann & Kvale, 2015; Wagner, 2012) but this research used a semi-structured interview. In this study the researcher created an interview schedule that contain questions that addresses the research problem and this enabled the researcher to ask relevant questions, control the discussion and in turn save time. Some of the question in the interview schedule contains questions such as; (i) Where does the funding come from? (ii) Whom do you think should be the target audience for IP communication? The interview was conducted at the Innovation Office where the key informant is stationed. Thus, the interview was conducted in an environment that was comfortable to the interviewee. The purpose of the interview was for the researcher to gain a better understanding of the role of the UFH Innovation Office in creating awareness of IP among researchers. The researcher first sought consent from the interviewee and it was granted

before conducting the interview. The interviewer also allowed the researcher to record the interview which was then transcribed within 48 hours.

4.9.2.2 Questionnaires

Questionnaires were also used to collect both qualitative and quantitative data. Generally, there are three primary methods of administering questionnaires to a study sample which include self-administered questionnaires; surveys administered through interviewers in face-to-face interaction; and the last one is the surveys conducted through telephone or a mobile phone (Babbie, 2013, p. 245). In this case the respondents completed the questionnaires by themselves as they are literate and they are graduates who can comprehend the questions without any assistance. Babbie and Mouton (2001) add that self-administered questionnaires are appropriate for respondents that are literate. The researcher designed the questionnaire (with close ended questions) using guidelines from previous studies. Some of the closed-ended questions that the researcher asked the respondents is shown on Figure 4.2.

Use the following scale to answer the following question

1= not at all familiar	2= Slightly familiar	3= Somewhat familiar	4= Moderately familiar	5= Extremely familiar

8. How familiar are you with the following Intellectual property legislative policy frameworks in SA?

1	Intellectual Property Rights from Publicly Financed Research and Development Act, 2008 (IPR-PFRD Act)	1	2	3	4	5
2	IP Laws amendment Act 2013	1	2	3	4	5
3	Copyright Act 98 of 1978	1	2	3	4	5
4	Plant breeders' rights Act of 1976	1	2	3	4	5
5	Designs Act 195 of 1993	1	2	3	4	5
6	Trademarks Act 194 of 1993	1	2	3	4	5
7	Patents Act 57 of 1978	1	2	3	4	5

Figure 4.2 Sample of closed ended questions

Source: Author, 2020

As shown on figure 4.2, the respondents are supposed to respond by selecting answers from responses provided on a 5-point Likert-scale (*1=not at all familiar, 2= Slightly familiar to 5=extremely familiar*). Closed ended questionnaires allow the respondents to select an answer from the list already provided by the researcher. This approach provides greater uniformity of responses and response are easily processed than open-ended questions (Babbie, 2013). The responses were analysed using SPSS and Ms Excel.

The first questionnaire (appendix 6) has closed ended questions and it was targeted at the UFH research community that comprise postgraduate students (from Honours level to Ph.D level) and lecturers (teaching staff). The researcher used convenience and purposive sampling to select the students to complete the questionnaires; the researcher with the help of two research assistants, distributed questionnaires by visiting places of residences, the classrooms and the student centre a place where students relax and buy food. In some instances, the researcher would leave the questionnaire with respondents and then go back to collect them from their residences on a different day. Some of the questionnaires were distributed through WhatsApp and Electronic mail (Email). The research assistants also visited lecturers' offices to distribute questionnaires and some were sent to their email address using (Email) and some emailed back their responses, while the majority were not interested as they never responded. Their email addresses were retrieved online using the UFH university page. About 412 questionnaires were distributed to researcher, however, not all questionnaires were returned (more information on the response rate is given in Chapter 5).

The second questionnaire has open ended questions and it was targeted to the Innovation Office personnel at UFH. In this case, the respondent was asked by the researcher to provide his or her own answers and this enables the researcher to gather in-depth data (Babbie, 2012). A sample of the schedule that was used by the researcher is presented in figure 4.3.

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Section B: Communication strategies used to promote the IPR awareness campaigns

9. What is the relevance of knowing about IP?

10. Which modes of communication are used to create awareness of IP?

11. Whom do you think should be the target audience for IP communication?

.

Figure 4.3 Sample of open-ended questions
Source: Author, 2020

As shown on figure 4.3, the researcher used open-ended questions to collect qualitative data using a questionnaire. This questionnaire was emailed to the key informant, together with the ethical clearance certificate and a consent form for participation and a brief introduction of the researcher and the aims of the research. The respondent signed the consent form and emailed it back to the researcher before completing the qualitative questionnaire. The reasons

why the researcher used a qualitative questionnaire to collect data is that the researcher had initially scheduled a second interview with one key informant from the Innovation Office but it was cancelled. Due to the spread of Corona virus, gatherings were prohibited, as a result, UFH campuses were closed and communication was only possible through online interaction so the researcher resorted to using a qualitative questionnaire and an Electronic Mail (Email) was then used to send a qualitative questionnaire to the Innovation Office personnel to complete.

4.10 Validity of research instruments

Validity describes "a measure that accurately reflects the concept it is intended to measure" (Babbie, 2013, p. 191). The researcher conducted a pilot study to validate the research instrument. The researcher distributed about 10 questionnaires to researchers to check if the instrument measures what it actually measures; if the questions are relevant to the research and if the questions can be easily interpreted by the respondents. The researcher then edited the questionnaire so that it answers the research questions before the final distribution. The researcher also discussed the questions that were prepared for the interview schedule and the open-ended questionnaire with colleagues to ensure that the questions are relevant to the aim of the study.

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4.12 Data analysis methods

Data analysis is defined as the "computation of certain indices or measures along with searching for patterns of relationship that exist among the data groups" (Kothari, 2004, p. 122). It is important for the researcher to prepare collected data for analysis but this process is determined by the type of data collected (Hesse-Biber & Leavy, 2011). One of the ways of preparing for qualitative data analysis is to transcribe the data, in this study the researcher started by transcribing an interview recording and scanning the UFH IP policy document, IP booklets and leaflets. Primary data that the researcher gathered using closed ended questionnaires was cleaned and processed before analysis.

4.12.1 Qualitative data analysis

This section discusses the methods that were used to analyse qualitative data. Qualitative data analysis refers to all forms of analysing data gathered using qualitative methods (Babbie & Mouton, 2001). Primary data which was collected for this study include an interview

transcript and open-ended questionnaire. The responses were then analysed qualitatively using thematic analysis. In addition, the researcher also collected secondary data that include the UFH IP policy document, IP booklets and fliers. Thematic analysis was also employed to analyse secondary data collected by the researcher. Steps that were followed in conducting thematic analysis are discussed in the next section.

4.12.1.1 Thematic analysis

Thematic analysis is rapidly being recognized as a very unique and valuable method as it provides techniques of systematically coding and analysing qualitative data (Braun & Clarke, 2020, p. 37). Thematic analysis is defined by Braun and Clarke (2020, p. 37) as "a method for systematically identifying, organizing, and offering insight into patterns of meaning (themes) across a data set". This method involves the process of searching for patterns of meaning in data sets and this process enables the researcher to be able to make sense of meanings and experiences (Braun & Clarke, 2020) and it was relevant for the study because it aided the researcher to identify data patterns from interview transcripts.

It is vital for the researcher to explain the process that guided thematic analysis to enable readers to judge the quality and relevance of the research findings (Wagner, *et al.,* 2012). When conducting thematic analysis, several patterns can be identified across data sets but it is vital to focus on identifying those that addresses the objectives of the study. The researcher employed both deductive and inductive approaches when coding and analysing the data. An inductive approach is a bottom-up approach and themes derive from the data rather than from preconceived ideas from literature (Braun & Clarke, 2020). A deductive approach on the other hand is a top-down approach whereby the researcher has concepts or ideas that they want use for coding that were identified in previous studies (Wagner, *et al.*, 2012). Those ideas guide the process of searching for themes in data. The researcher employed these two approaches because it is unrealistic to rely on either approach alone, however, in this study, deductive approach was more dominant.

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Braun and Clarke (2020) identified phases that researchers can follow when using thematic analysis. The steps include (i) familiarise with content (ii) producing initial codes in order to organise the data into meaningful groups (iii) search for potential themes (iv) review and refine potential themes (v) naming themes and (vi) writing a research report. The researcher followed these steps to come up with themes and they are discussed in detail below.

(i) Familiarise with content

The first step in conducting a thematic analysis is familiarizing with the data. The researcher started by transcribing the interview recording, stopping regularly to repeat the interview audio recording until the correct information was captured. The researcher also gave copies of the transcript to colleagues to cross-check the information before analysing. After this, the researcher started familiarising with the content on the transcript, by actively reading and rereading the data, highlighting and jotting down vital points that may be relevant in creating themes later.

The research went through the same process by analysing qualitative data on open ended questionnaire, the UFH IP policy, the booklets and leaflets that were used to create awareness. Active reading and rereading of the data was done; this process was important as it enabled critical thinking and potential items of interest were highlighted and a few comments were written in a notebook. At the end of this process, the researcher had familiarised with data.

(ii) Producing initial codes

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The next step in conducting a thematic analysis is data coding; a systematic analysis of data was done to generate codes but they were not conclusive on the meaning of data sets. The systematic analysis involved a thorough reading of data and then identifying information that is potentially relevant to the research objectives before coding. Braun and Clarke (2020) notes that codes provide a concise summary of data, describe the content, and also provide an interpretation of data. Data was therefore organised into groups, in this case data was grouped according to whether it carries similar meanings. Thereafter, the search for patterns of data began and notes were jotted down. Table 4.2 illustrates how coding was done in this research. An example of an interview transcript extract is given and the codes that were generated.

Table 4.5 An example of coded transcript

Transcript	**Codes**
"We don't have a lot of IP awareness programs but we try and do at least 3 or 4 awareness workshops every year of which it's not going to enough, we are a young TTO and we don't have many types of	• At least 3 awareness programs each year • Few awareness programs • Recently established TTO without experience

campaigns unlike other universities which have disclosure campaigns i.e UNISA, UP Stellenbosch, Cape town, the Vaal".	

Source, Author, 2020

As shown on table 4.5 data, the researcher was able to generate codes from the interview transcript. Codes are "the building blocks for themes, larger patterns of data underpinned by a central organising concept- a share core idea" (Clarke & Braun, 2017, p. 297). At the end of this step, the data was successfully coded and those codes are relevant in theme formation in the following step.

(iii) Searching for potential themes

In this step, the aim is to shift from codes to themes. Braun and Clarke, (2006, p. 82) stated that a theme "captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set". The process of generating themes begins by reviewing the codes in order to identify similarities and overlaps between the previously identified codes. So broader issues are identified from the codes. In the context of the study, some codes clustered around few awareness programs and methods used to create awareness such as conducting workshops and using social media. Braun and Clarke, (2020) emphasize that in this process, the researchers generate themes and not discover themes. The researcher also explored the relationship between identified potential themes and how those themes tell a story about the data that relates to the study objectives. This process was used in analysing all types of qualitative data that was gathered for this study. At the end of this step, a table containing the candidate themes was created.

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(iv) Reviewing and refining potential themes

The fourth step involved looking for potential themes relating the data to the study objectives. Identified themes were reviewed and refined several times until they were matching with the research objectives. The initial table that was created in the previous step (step iii) was then scrutinized to ensure that it fits the data set by continuously reviewing and refining the data. Aspects that were taken into consideration include finding what each theme is about, whether there are any sub-themes and how the theme relates to the objectives of the study. At the end, some themes were reconstructed while some were discarded as they could not identify with the whole data set.

(v) Defining and naming themes

This step involves defining and naming themes that were identified. According to Braun and Clarke, (2020), this step "involves selecting extracts to present and analyse and then setting out the story of each theme with or around these extracts". In this step, the researcher defined the identified themes by clearly stating the meaning in each theme, main themes and subthemes were therefore identified. At the end, the main themes and sub-themes were named in relation to the study objectives. The researcher ensured that the themes were concise, catchy and informative as suggested by Braun and Clarke, (2020). Some of the themes identified in qualitative data from an analysis of qualitative responses include the effectiveness of IP communication strategies, target audience for IP communication, and the reasons for the establishment of the Innovation office. The themes that were identified from the analysis of the UFH IP policy document are; the development of the UFH IP policy, ownership of IP, IP covered by the UFH IP policy and sharing revenue from commercialisation of IP. Some of the themes that were identified from the IP materials used to create awareness are branches of intellectual property, the importance of the UFH IP policy and IP ownership types.

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(vi) Writing a report

This is the step in which a report of the themes that were identified and are related to the research objectives is written in an analytical manner. Themes are regarded as "key characters in the story we are telling about the data…[because] each theme has an 'essence' or core concept that underpins and unites the observations, much like characters have their own psychological makeup and motivations" (Braun & Clarke, 2018, p. 108). The themes were discussed in the analysis section taking into consideration other arguments raised in literature (in chapter 2 of the study) Thus, the researcher was guided by these six steps to come up with themes for the study.

4.12.2 Quantitative data analysis

The researcher collected primary data using closed ended questionnaires targeted at researchers at UFH. The data that was gathered using questionnaires was cleaned, processed and analysed and presented in the form of tables, pie charts and graphs using Statistical Packages for Social Sciences software (SPSS) and Microsoft Excel (Ms Excel). To analyse the data using SPSS, the researcher used descriptive statistics as discussed in the next section.

The researcher also collected secondary data such as attendance registers that contain statistics of researchers that attended IP awareness workshops at UFH between 2016 and 2018 and this enabled the researcher to have statistics on the number of people that attended workshops. The attended registers were also analysed to determine the category of people who attended workshops and to find out which faculties are attending the workshops as well. This measures the researcher's attitudes towards IP. This data was presented in form of tables for analysis. Descriptive statistics analysis was conducted from questionnaires responses entered on SPSS.

4.12.2.1 Descriptive statistics analysis

Descriptive statistics is defined by Babbie and Mouton (2001, p. 459) as "a method for presenting quantitative descriptions in a manageable form". Descriptive statistics also helps to describe and also summarise data graphically and numerically (Wagner *et al.,* 2012). To analyse data from open ended questionnaire responses, the researcher used descriptive statistics; in particular used 'mean', that is the average of the responses given on a particular question. Authors such as Boone and Boone (2012) recommends the use of descriptive statistics such as mean to measure central tendency and also standard deviation to measure the variability of responses on the questionnaire such as Likert scale. In this study, a Likert scale was adopted and therefore, it was appropriate to measure central tendency and variability using the mean and standard deviations. These descriptive statistics were adopted to determine the views of the respondents on each item of the measurement construct with regards to each objective. It is important to point out that mean was not used to analyse data on all the questions on the questionnaire as some questions did not use a Likert scale. The analysis was guided by the research objectives.

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4.13 Ethical considerations

This study involved interacting with human beings and in such instances, there are principles that the researcher needs to adhere to. The term ethics comes from a Greek word called "ethos" which means character and therefore ethics involves issues that have to do with morality (Leavy, 2017). Morality is about knowing what is acceptable and what is unacceptable or what right and wrong when dealing with humans, the researcher therefore has an ethical responsibility to protect participants' human rights during research (Gravetter & Forzano, 2018; Tustin *et al.,* 2005, Patton & Cochrane 2002; Burns & Grove, 2003). Research ethics are concerned with the proper conduct of researchers and ethical issues must

be considered at each stage of research. There are ethical issues that may arise in research because dealing with other human beings is complex as conflict may arise (Mouton & Babbie, 2001).

4.13.1 Obtaining an ethical clearance certificate

The researcher followed established research protocol by first requesting institutional approval and as a result an ethical clearance was obtained from the University of Fort Hare Research Ethics Committee (UREC) before data collecting commenced (see Appendix 1). A letter requesting for permission to conduct interviews at the University's Innovation Office was written. The other ethics that were considered by the researcher are discussed in the next section.

4.13.2 Informed Consent

It is important to get consent from the participants before they agree to participate in the study, this ensures that both the researcher and the participants are protected (Leavy, 2017; Wagner *et al.*, 2012). Firstly, the researcher asked for permission from the respondents and provided sufficient information about the researcher and the purpose of the research in order for the respondents to make an informed decision on whether they want to participate or not. This is because participants have the right to agree or disagree to participate in the study. Secondly, the researcher obtained written informed consent from participants. The researcher used a guideline from University of Fort Hare Research Ethics Committee to draft the letter. The researcher requested each participant to sign a consent form before filling in the questionnaires (see Appendix 3). The participants included lecturers, students and key informants from the Innovation Office at UFH. In light of this, the researcher also sought consent from the interviewee before conducting the interview.

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4.13.3 Privacy and confidentiality

When conducting research, the researcher should consider the privacy of the respondents. After data collection, the researcher ensured that the names of the respondents are not included in compiling the research report. The researcher did not ask participants to provide their personal information on both qualitative and quantitative questionnaires to ensure that they are protected.

4.13.4 Objectivity

The researcher presented the findings as accurately as possible and as fairly as possible. Fourie (2009, p. 34) is of the view that "ethics deal with giving credit where credit is due". Therefore, the researcher cited all the sources that were consulted to avoid plagiarism. The final research report was submitted on Turnitin for similarity check (see Appendix, 8).

4.13.5 Harm

When conducting research, it is vital for the researcher to ensure safety of the participants. Research participants are supposed to be protected from harm (Gravetter & Forzano, 2018; Leavy, 2017; Wagner *et al.*, 2012). The researcher ensured that the participants are unharmed; physically, psychologically, and emotionally. There is a need for the entire research process to be evaluated to ensure that there is no harm to study participants (Leavy, 2017). The researcher did not in any way force people to participate in the study or to continue with the filling of questionnaires when they felt uncomfortable. The researcher ensured that interviewee was comfortable throughout the interview session. Thus, the researcher ensured that the participants were unharmed in any way during data collection.

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4.14 Limitations of the study

One of the limitations was the issue of language; the researcher is not really familiar with the dominant IsiXhosa language spoken by most of the participants. The researcher solved this by seeking help and was assisted by two research assistants who are fluent in IsiXhosa. The researcher had initially scheduled a second interview with one key informant from the Innovation Office but it was cancelled. Due to the spread of Corona Virus, gatherings were prohibited, as a result, UFH campuses were closed and communication was only possible through online interaction so the researcher resorted to using Electronic Mail (Email) to send a qualitative questionnaire to key informants from the Innovation office. This allowed the researcher to collect data that was supposed to be collected through an interview. At the end, the researcher was able to achieve the set objectives. The other limitation is of literature on IP awareness activities, to deal with this scarcity, the researcher reviewed general literature on IP not focusing specifically on IP awareness. The other challenge was of communicating with those who deal with IP awareness at the Companies and Intellectual Property Commission and at the National Intellectual Property Management Office, they were unresponsive to

emails or telephone calls and this was difficult since the researcher could not afford to travel to their offices to make an appointment since the study is self-sponsored.

4.15 Chapter summary

This chapter is relevant to the study as it discussed the process that was followed by the researcher in order to answer the research questions. This study employs a mixed methods design which enables one to use multiple paradigms rather than aligning with one paradigm. In light of this, the researcher used constructivism and positivism approaches which guided the choice of methods for data collection, and analysis with the aim of exhaustively understanding the research problem. The researcher therefore carefully planned the whole research process to achieve the set research objectives. Thus, the chapter discusses the research design, sampling methods, methods for collecting and analysing data, and ethical considerations. At the end of this chapter, the researcher discussed the limitations of the study and how they were addressed. The following chapter comprehensively analyse qualitative and quantitative data.

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CHAPTER 5: DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

5.1. Introduction

This chapter analyses, presents and interprets collected data to analyse intellectual property awareness among researcher at UFH. This chapter analyses both qualitative and quantitative data. Primary data was gathered using a structured interview with one key informant from the Innovation Office at UFH, a qualitative questionnaire with open ended questions was also used to collect data from the key informant from the Innovation Office as well. The researcher decided to differentiate the key informants; the key informant who participated in the interview is referred to as "Participant A" and the participant who responded to the qualitative questionnaire is referred to as Participant B". The researcher also used questionnaires with closed ended questions to collect data from researchers at UFH. Secondary data was gathered from materials collected from the Innovation Office and at IP awareness workshops such as booklets and fliers. The researcher also requested the UFH IP policy document from the Innovation Office and the document was sent to the researcher through Electronic mail (Email).

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Thematic analysis was used to analyse qualitative data while Statistical Package for Social Sciences (SPSS) and Microsoft Excel (Ms Excel) were used to analyse quantitative data. Data analysis was guided by the study objectives which sought to;

- To analyse communication strategies used by the Innovation Office in promoting awareness of intellectual property among researchers at University of Fort Hare.
- To assess University of Fort Hare researchers' knowledge of intellectual property.
- To explore the attitude of University of Fort Hare researchers towards intellectual property.
- To explore the practices of intellectual property at University of Fort Hare.

The analysis starts with qualitative data and the second section analyses quantitative data guided by the above research objectives.

5.2 QUALITATIVE DATA ANALYSIS

This section of the chapter analyses qualitative data gathered from; (i) a structured interview with one key informant from the Innovation Office at UFH (ii) an open-ended questionnaire

directed to the second key informant from the Innovation Office at UFH. The researcher had initially scheduled a second interview with one key informant from the Innovation Office but it was cancelled. Due to the spread of Corona Virus, gatherings were prohibited, as a result, UFH campuses were closed and communication was only possible through online interaction so the researcher had to re-strategise and find possible ways of collect data. As a result, the researcher resorted to using a qualitative questionnaire and an Electronic Mail (Email) was then used to send a qualitative questionnaire to the Innovation Office personnel to complete. The data that was gathered was analysed using thematic analysis. Qualitative data was coded into different themes that achieve the above research objectives. The researcher also collected secondary data from the Innovation office, IP awareness workshops held at UFH and online. The data that was collected include the UFH IP policy document, IP booklets and leaflets used by the Innovation Office to create awareness of IP. The data was presented in form of tables, and pictures.

5.2.1 An analysis of communication strategies used by the Innovation Office to create awareness of intellectual property among researchers at University of Fort Hare

5.2.1.1 The methods used to create awareness

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The analysis of qualitative data shows that the Innovation Office uses workshops as a method to create IP awareness among the University research community. The following verbatim from the interview with one Innovation Office personnel supports this assertion:

> *"We don't have a lot of IP awareness programs but we try and do at least 3 or 4 awareness workshops every year of which it's not going to be enough, we are a young TTO and we don't have many types of campaigns unlike other universities which have disclosure campaigns i.e UNISA, UP Stellenbosch, Cape town, the Vaal".*
>
> (Participant A)

This shows that at UFH, they mainly have awareness workshops only as compared to other institutions which have other campaigns like the disclosure campaigns. One may argue that awareness workshops only are not enough to promote awareness among researchers. Diffusion of innovations theory emphasise that information is communicated through a channel or interpersonal communication. The channel that is used to communicate with the target audiences in this case is workshops and researchers are educated about the relevance of IP when conducting research and they will influence other researchers to change their perceptions about IP. According to Rogers, (2003) diffusion of innovation include both

planned and unplanned spread of ideas; unplanned spread of ideas is referred to as the spontaneous spread of new ideas. In the context of this study, this theory is applicable because the planned spread of ideas occurs through awareness activities and the unplanned refers to the spread of the awareness messages through social interaction between researchers. Therefore, this study has shown a reliance on workshops to communicate IP information with the target audience.

In addition, the analysis of responses on the qualitative questionnaire show that there are several ways that are used by the Innovation Office to reach out to the target audiences. Participant B mentioned that;

> *"IP awareness sessions are conducted using workshops, interactive discussions with IP experts, sometimes and the use of surveys to understand the level of understanding from the audience. This helps shape the type of workshop, event or training that one has to conduct to ensure that people are aware of IP. Small visits to faculty researchers, or research groups to conduct five minutes presentations on IP".*
>
> (Participant B)

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To add on, participant B mentioned that they sent out surveys to those who have attended a particular workshop asking whether the workshop was informative and they have suggestions on what can be improved. They conduct surveys at the end of each workshop using Emails and some of the results are that most researchers request for more workshops that are interactive.

The interactive discussions with IP experts are mostly conducted for a short period, for example, a 30 minutes session that was held on 26 May 2016 (see figure 5.1 below) and the main speaker was Tumelo Mashabela, an attorney at Mashabela Attorneys. The consultation session was held at UFH premises and the Innovation Office was responsible for organising the session. The participant also stated that these IP attorneys are paid with funding from NIPMO. All this shows that the Office is making strides to create awareness through various methods although this is not enough. Figure 5.1 shows an example of a poser inviting the University community to a 30 minutes consultation session.

Figure 5.1 Workshop posters

Source: UFH Innovation office

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Apart from the above activities, participant B also mentioned that they use other platforms to engage with the University community for the participant said,

> *"currently, social media platforms are implemented using the University main page. However, plans to have LinkedIn page for spreading more awareness are on the pipeline. Further, interviews on local radio are other means the Office engage and would significantly make use of."*

(Participant B)

The participants (A and B) also mentioned that there is much that should be done to improve communication of IP since they do not have many platforms that they use to share information. For instance, the participant from the interview said that,

"We don't have a website so most of the information you are going to find it on WIPO website".

(Participant A)

This indicates that there is need for the Innovation Office to create a website to enable researchers to access information related to IP and upcoming events will be advertised on the platform as well. Apart from the website, the Office should increase their presence on social media by having, for example, a Facebook page, and a twitter account that they can use to reach out to the University community.

Furthermore, in order to invite and to encourage the University community to attend the IP awareness workshops, the Innovation Office creates and designs posters that are displayed at notice boards on all three university campuses: Bisho, East London and Alice campus. These posters are also sent to the University institutional emails so that they reach out to many researchers. Those posters inform the University community of IP awareness workshops that will be held at the institution at a particular date and time and these workshops are mainly held at the Alice and East London campus. Each year the Office ensures that there are IP awareness programs to keep researchers informed and to encourage them to be innovative. Figure 5.2 shows the posters that are created and designed by the Innovation Office to invite researchers to attend IP workshops.

Figure 5.2 Workshop posters

Source: UFH innovation office

As shown on figure 5.2 IP awareness workshops are held several times each year at UFH and the Innovation Office also partners with NIPMO and Technology Innovation Agency when hosting such workshops. From the posters above it is evident that the target for the workshops is researchers, the first poster states *"Intellectual Property Awareness: What every researcher needs to know",* the poster also highlights that the workshop specifically target academics, postgraduates and postdoctoral fellows. The date and time are clearly indicated and this means that the workshop started in the morning and ended in the late afternoon and this allows time for interactions among researchers. The Office invite experts to the workshops i.e attorneys such as Tumelo who have information that can assist researchers regarding IP. A sample of the programme for one of the IP workshops that are conducted at UFH is shown on figure 5.3.

Innovation Office
excellence through innovation

Programme

Start	End	Topic/activity	Description
08h30	09h00	**Registration (Coffee/Tea)**	
09h00	09h45	***Module 1: Introduction to Intellectual Property*** 1. Patents 2. Copyrights 3. Designs 4. Trademarks 5. Plant Breeders' Rights 6. Trade Secrets	This section will outline the common forms of IP. Patents and the patenting process will be discussed in detail, including costs and timelines. The issues of patenting vs. publishing will be discussed. Using patents as a source of information for research will be briefly touched upon. A work group exercise will be undertaken.
09h45	10h30	Practical Examples / Scenarios	
10h30	10h45	**Tea/Coffee Break**	
10h45	12h00	***Module 2a: IP Ownership*** 1. IPR Act 2. IP ownership - University IP Policy	This section will cover the effect of the IPR Act on relationship between researchers and funders; IP ownership and practical examples / scenarios
12h00	13h00	***Module 2b: IP Identification and its Role in Research*** 1. Generating and evaluating IP 2. IP issues in research	This section will focus on how researchers can identify IP arising from their research. It will also focus on the issues that researchers need to be aware of, such as IP in contract research projects, confidentiality, etc.
13h00	14h00	***Lunch***	
14h00	15h30	***Module 3: IP Utilisation and Commercialisation*** 1. Various Commercialisation Models 2. Licensing of IP – Dos and Don'ts 3. Practical Examples / Scenarios	An overview of the commercialisation of intellectual property that is generated from research and development activities.

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Figure 5.3 IP workshop programme

Source: UFH innovation office

The workshop covered many topics that ranges from types of IP such as patents, copyrights, designs, trademarks, trade secrets and plant breeders' rights. Issues of IP ownership, how IP is identified, the role of IP in research, utilisation and commercialisation of IP are also discussed. The workshop organisers also involve participants in a few activities to engage them in IP issues. The Innovation Office also celebrates world IP day with the rest of the world on 26 April each year. Figure 5.4 shows some of the posters that are designed to invite researchers to such events.

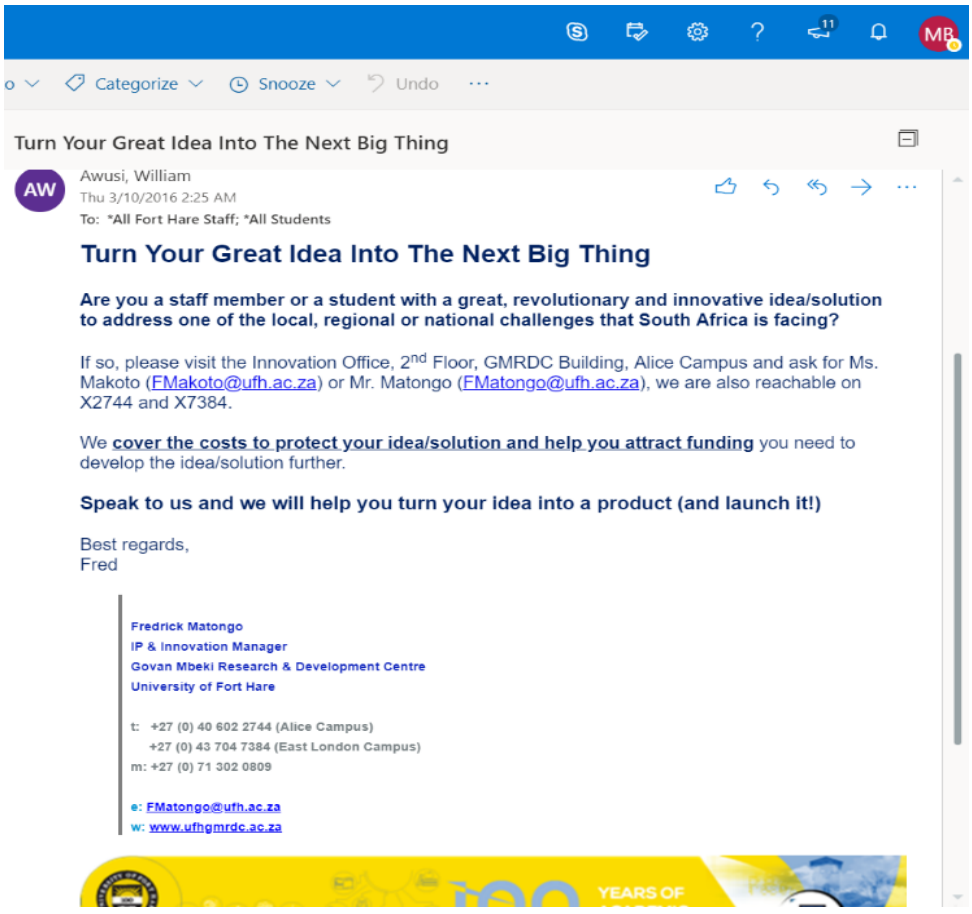
Figure 5.4 World intellectual property day posters

Source: UFH innovation office

The day is celebrated by several universities in South Africa as well. Each year there will be a theme that is focused on. In 2018, the theme was "Powering change: women in innovation and creativity" as shown on figure 5.4, UFH invited several speakers to inspire other women to be creative and such speakers included Prof K. Motaung who is a research scientist, entrepreneur and an assistant Dean (Postgraduate studies, Research, Innovation and Engagement Faculty of Science at Tshwane University of Technology. She developed an

anti-inflammatory cream that can relieve muscle and join aches. In 2019, the theme was "Reach for Gold: IP and Sports" as shown on figure 5.4 and the aim of the day was to celebrate IP in sports by creating awareness of innovations that are created to use for sporting activities and also how IP affects sports and how to protect your IP.

The Innovation Office also uses Electronic mail (Email) to communicate and to inform students and researchers at UFH about upcoming IP awareness workshops or events at the institution and encourages them to attend and participate as well. The posters on figure 5.4 are also sent to institutional Emails to inform the University community about upcoming workshops on IP. Some of the Emails that were sent to the institutional Emails were aimed at informing the university community about the existence and functions of the Innovation office, the details included in one of the emails were as follows,



Turn Your Great Idea Into The Next Big Thing

Awusi, William
Thu 3/10/2016 2:25 AM
To: *All Fort Hare Staff; *All Students

Turn Your Great Idea Into The Next Big Thing

Are you a staff member or a student with a great, revolutionary and innovative idea/solution to address one of the local, regional or national challenges that South Africa is facing?

If so, please visit the Innovation Office, 2nd Floor, GMRDC Building, Alice Campus and ask for Ms. Makoto (FMakoto@ufh.ac.za) or Mr. Matongo (FMatongo@ufh.ac.za), we are also reachable on X2744 and X7384.

We **cover the costs to protect your idea/solution and help you attract funding** you need to develop the idea/solution further.

Speak to us and we will help you turn your idea into a product (and launch it!)

Best regards,
Fred

Fredrick Matongo
IP & Innovation Manager
Govan Mbeki Research & Development Centre
University of Fort Hare

t: +27 (0) 40 602 2744 (Alice Campus)
+27 (0) 43 704 7384 (East London Campus)
m: +27 (0) 71 302 0809

e: FMatongo@ufh.ac.za
w: www.ufhgmrdc.ac.za

Figure 5.5 Sample Email

Source: UFH innovation office

As shown in figure 5.5, an Email is also used to inform about the importance of IP in their research and to encourage them to Email or call or visit the Innovation Office if they have ideas that are innovative or if they feel that there is a possibility of IP in their research projects. From the interview that was conducted, the participant mentioned that the University community is becoming more aware of their existence and the relevance of IP. This in way implies that the methods of communication that are being used are somehow effective in reaching out to potential IP creators. It is therefore important for the Innovation Office to continue creating awareness.

In addition, the interview participant stated that they target all faculties when it comes to creating awareness. The following excerpts illustrates this assertion:

> *"Chances are that guys from law they don't know about IP unless its embedded in their modules, but we try and reach out to all disciplines regardless of whether they are sciences or humanities".*
>
> *"The focus on researchers as much as we do reach out to students but we reach out to them, we try to reach out to researchers because they are the ones doing research and the ones which we hope that there is going to be outputs, IP within their research. Students mainly undergraduates don't generate IP".*
>
> *(Participant A)*

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The excerpts imply that all disciplines are capable of creating IP so everyone should be given an opportunity to be educated on the relevance of IP to the South African community. So, the Innovation Office is doing away with the general belief that IP is for lawyers and scientists, the other disciplines do not contribute anything. However, the Innovation office's target audience for IP communication is mainly researchers from all disciplines since they are the ones who conduct research that may result in IP and the office manages IP from research that is conducted using public funds.

5.2.1.2. Materials used to create awareness

The researcher also collected data that is used to create awareness of IP. The researcher presents a sample pamphlets or brochures, leaflets or fliers that are used to educate researchers about various forms of IP. Pamphlets and brochures containing IP information are used to create awareness. Pamphlets usually contain educational information and the

information will be on a single subject. They have a varied number of pages, some of the pamphlets contain single sheets printed on both the front and back side. A brochure is usually a small magazine or a small booklet and it covers a wide range of topics and it contains promotional messages and they can be referred to as flyers. They can have a varied number of pages, some of the pamphlets contain single sheets printed on both the front and back side. The researcher went on to analyse the materials using thematic analysis. The researcher started by categorising the materials, the categories are as follows;

- Materials created by WIPO
- Materials created by NIPMO
- Materials created by CIPC
- Materials created by UFH Innovation office

After categorising the materials, the researcher discussed the themes that are in each category and at the end compared the themes.

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5.2.1.2.1 Materials created by WIPO

There are many organisations that partnered with UFH Innovation Office to create awareness of IP among students and researchers. UFH Innovation Office is also guided by other international organisations such as World Intellectual Property Organisation (WIPO) on IP matters. WIPO has many booklets on IP related issues. Such booklets are intended for the general public for them to understand IP. The Innovation Office also distributes booklets from WIPO that inform and educate researchers about IP related matters during IP workshops that they conduct through the course of the year. A sample booklet on understanding copyright and related rights is shown of figure 5.6.

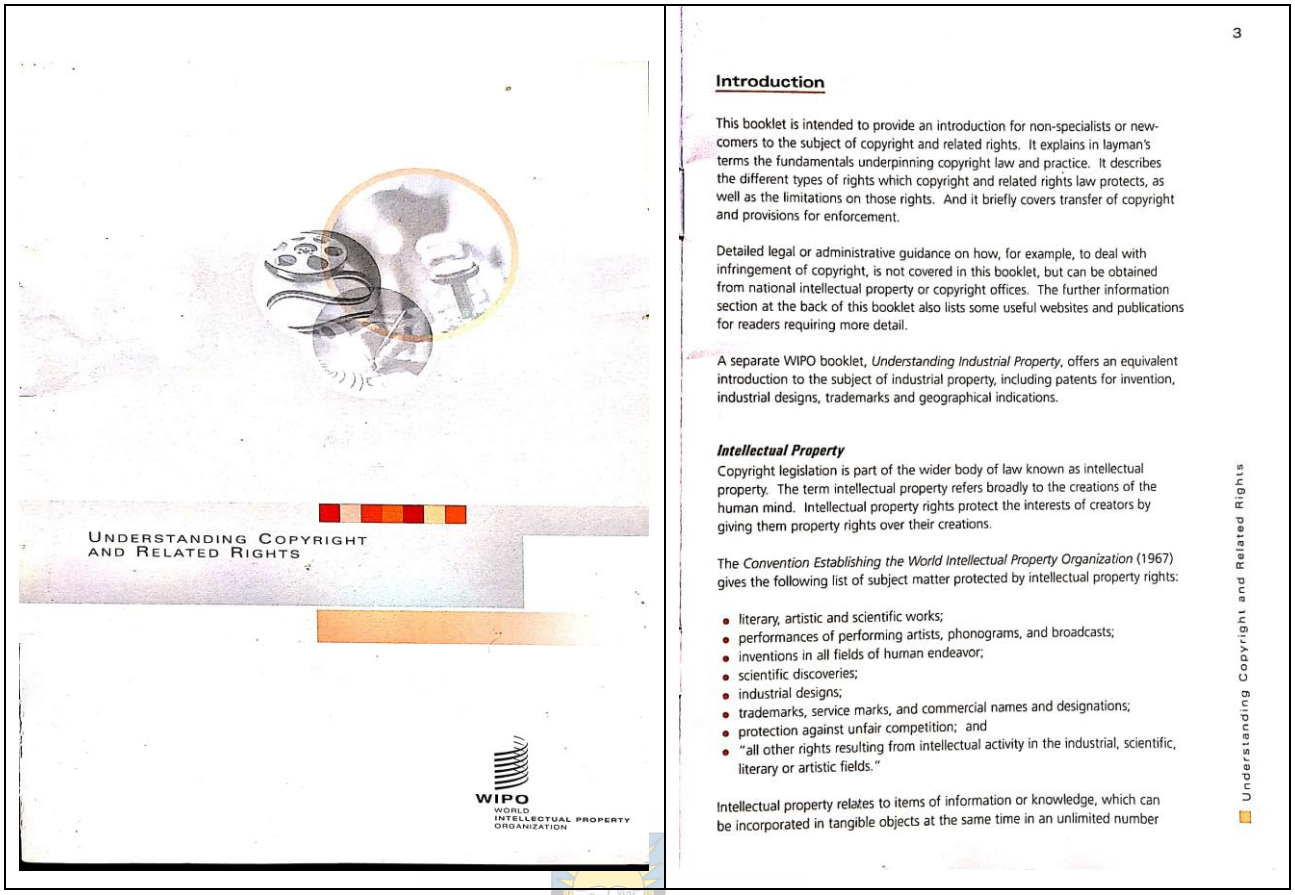

Figure 5.6 WIPO booklets used to create awareness

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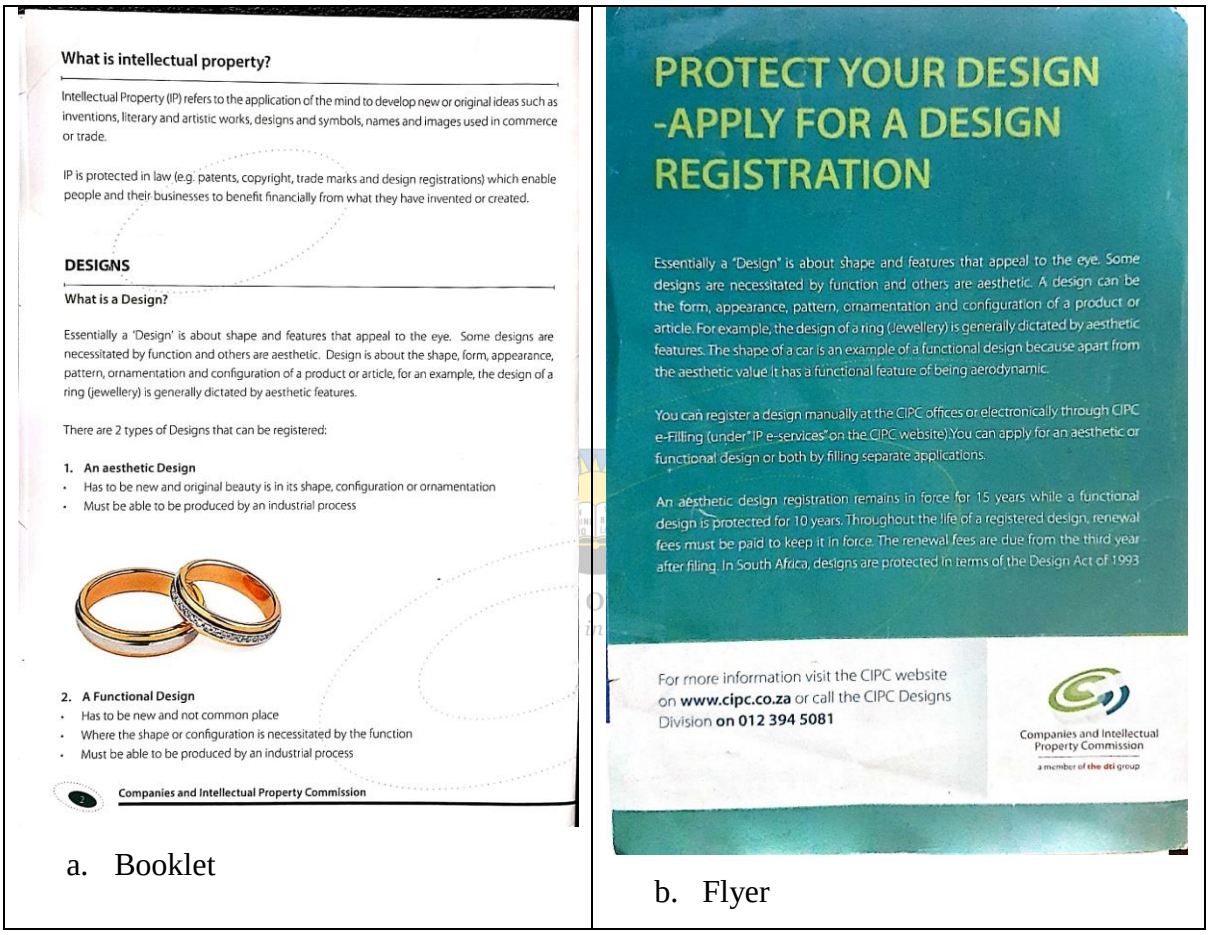
Source: WIPO

The themes that are dominant in the IP booklets created by WIPO are branches of intellectual property, the branches of IP such as industrial property and copyright are discussed. The other theme is of "understanding copy right" the focus is on defining what copy right means and the items that fall under copy right of that are copy right protected. Definitions of what copyright are given in simpler terms to make everyone understand what it entails. Sourcing such booklets shows that the Innovation Office is playing a pivotal role in ensuring that researchers have all the information that they need on IP. However, the focus of their booklets is on all IP issues including copyright which this research did not focus on. This information is distributed to researchers during IP workshops even though it has nothing to do with patenting. This question the aim of the Innovation office, is this information relevant to patenting or they are distributing such material because they want to create general awareness of IP.

5.2.1.2.2 Materials created by CIPC

Furthermore, CIPC has created several booklets and flyers on IP information that are intended for the general public including researchers. The aim is to ensure that everyone has access to important information. Such booklets are distributed to researchers at IP awareness workshops that are held at UFH. Samples of booklets and flyers that they created are shown on figure 5.7.



a. Booklet

b. Flyer

Figure 5.7 CIPC materials used to create awareness
Source: CIPC

Figure 5.7 shows a sample booklet and a flyer that is used to spread IP information by CIPC. The themes that emerge from their materials include how to protect a design of an invention; this theme covers issues on types of designs, and specifically on steps that can be taken to protect a design of an invention that one creates. Before one protects an invention, they should understand what a design is, likewise information on the flyer also defines in brief what a design is and mentioned two types of designs that is a functional design and an aesthetic design.

The other theme that is prevalent in the booklets created by CIPC is of the importance of intellectual property protection. When discussion this, the information provided is generally about all types of IP such as patents, industrial design, trademarks, copyright and geographical indications. Each type is discussed in simple English and examples are provided and pictures are included as well to clearly illustrate what each type of IP is all about. For instance, when discussing patents, an example of a jean is given and they stated that the zipper is a patented invention.

The CIPC also created and designed booklets that tell a story in order to make people understand the world of IP and such booklets are distributed to researchers at IP awareness workshops that are held at UFH. The booklets feature cartoon characters and a sample of the booklets is illustrated on figure 5.8. The CIPC created story booklets to simplify IP information so that even a layman can understand what IP is all about as shown on figure 5.8 there are two types of IP that are shown and they are both explained in a humorous way to make it interesting to the reader and at the end the aim is to spread information.

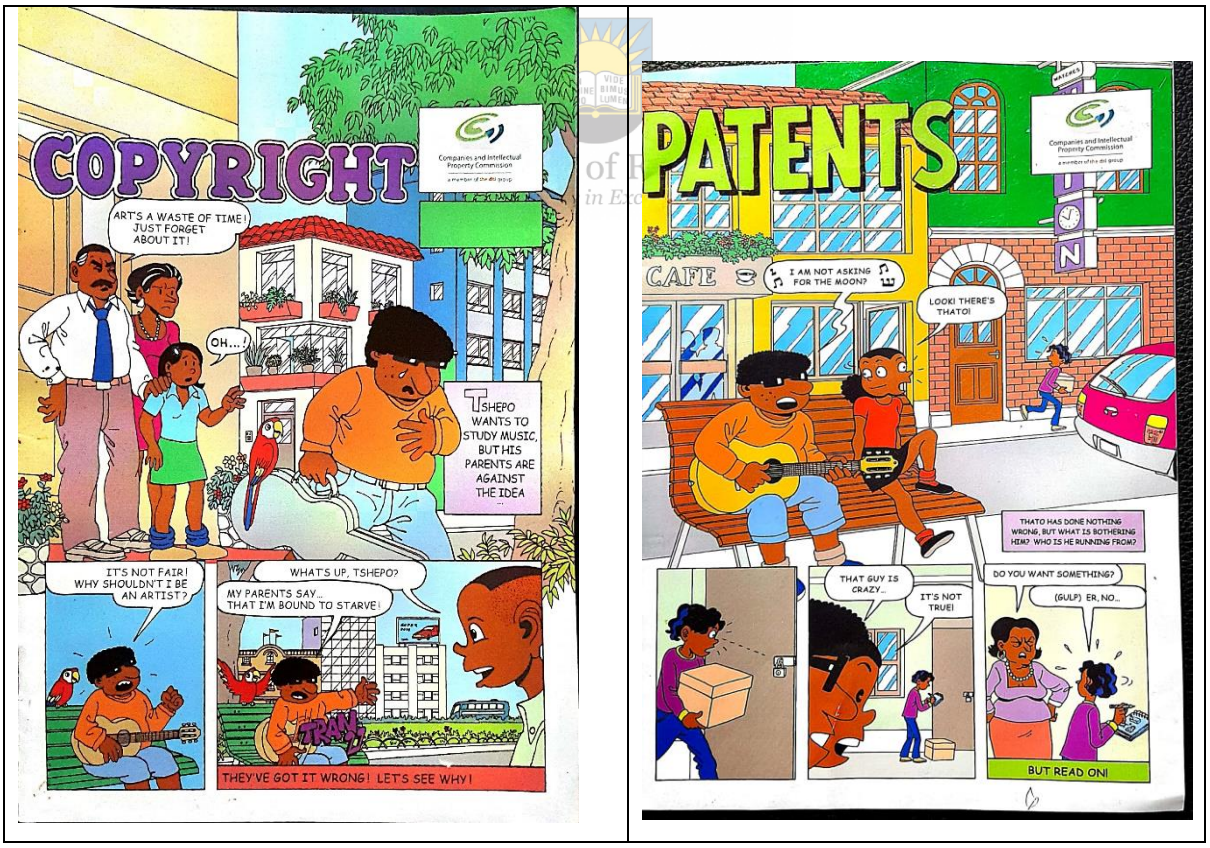


Figure 5.8 CIPC booklets used to create awareness

Source: CIPC

The other theme is “anyone can be an inventor” this emerges in the booklet that talks about patents and features the story of Thato who is portrayed as a crazy boy but he invented a bulb horn that he fixed on a bike so that it makes the same sound just like the motorbike. There are some lessons in the story, the story teaches people that anyone can be an inventor and an invention can be of any shape and size and the examples shown include a pencil and a money clipper. What is apparent is that in order to invent, one can look at problems and find solutions to those problems. This is relevant to researchers as they need to be innovative however, the problem is that this piece of writing is a comic book which may be targeting children, there is need to design and distribute such information to the appropriate age group. The Innovation Office maybe be at fault as well as they distribute such information to researchers without assessing the relevance of the material to the target audience.

The other theme that emerges from the booklets is of the importance of copyright to artists this emerges through storytelling, there is a story of a boy named Tshepo who wants to study music but his parents think it is a bad idea as he will not afford to make a living. Then they came across a woman who enlightened them that it is possible for one to be artist by claiming copyright on intellectual creations such as songs, dances and poems. The artist will then be able to make a living through his or her creations. Thato is given a booklet on copyright so that he learns more and share the information with his parents. Therefore, it is important for one to have adequate knowledge on IP information so that they reap rewards from their creations. Copyrighted works are not the major focus of this study but these booklets are part of the materials that are distributed to researchers during IP workshops. The question becomes whether this has relevance to researchers especially the fact that information is presented in the form of a comic book which is probably targeted at children. Information on copy right is important but this information seems to be irrelevant to researchers as the focus is on research that has the potential to produce innovations.

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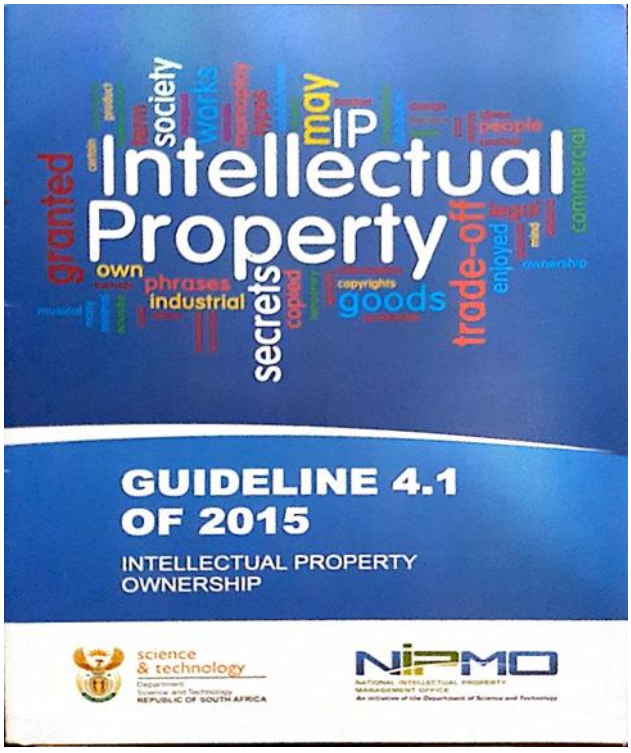
5.2.1.2.3 Materials created by NIPMO

Organisations such as NIPMO play a critical role by creating IP awareness to universities in South Africa. Figure 5.9 illustrates booklets and flyers that are meant for creating awareness. Such booklets are also distributed to students and staff at IP workshops that are held at UFH.



a. booklet

b. flyer

Figure 5.9 NIPMO materials used to create awareness

Source: NIPMO

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The organisation creates and design small booklets i.e a sample booklet shown on figure 5.9 containing information on IP ownership and it has about 23 pages. The booklet is meant for researchers, students and anyone who is interested in knowing about IP ownership. The guideline is written 4.1 of 2015 implying that there are other booklets that have information on other aspects of IP. However, from these materials, there are themes that emerge. One of the themes that is central is "intellectual property ownership". This focuses on three categories of IP ownership options which are (i) default position in which IP that results from publicly financed research shall be owned by the researcher if requirements of co-ownership are not met. (ii) Co-ownership provision; in this case a private entity can become a co-owner of IP that emanates from publicly funded research undertaken at an institution and (iii) Full cost arrangement, in cases whereby R&D is undertaken at an institution on a full cost basis, the parties are free to negotiate ownership of IP since the research will not have received public funding. Thus, this is clearly explained.

In addition, another theme that emerges is “the role of NIPMO”. The fliers contain information about the organisation itself and the role that it plays in managing IP that emanates from publicly funded institutions such as UFH. NIPMO assists the TTOs in their role of managing IP and creating awareness at universities, UFH Innovation Office included. Figure 5.8 also illustrate a flyer that was printed by NIPMO to inform various publics about the role played by NIPMO. The information is clear and it informs the researchers of the relevance of the organisation when it comes to R&D that emanates from publicly financed research.

5.2.1.2.4 Materials created by UFH Innovation office

UFH Innovation Office also creates its own IP materials to distribute to the University community that includes staff and students. Figure 5.10 shows the material that is used by the Innovation Office to create awareness on IP matters.

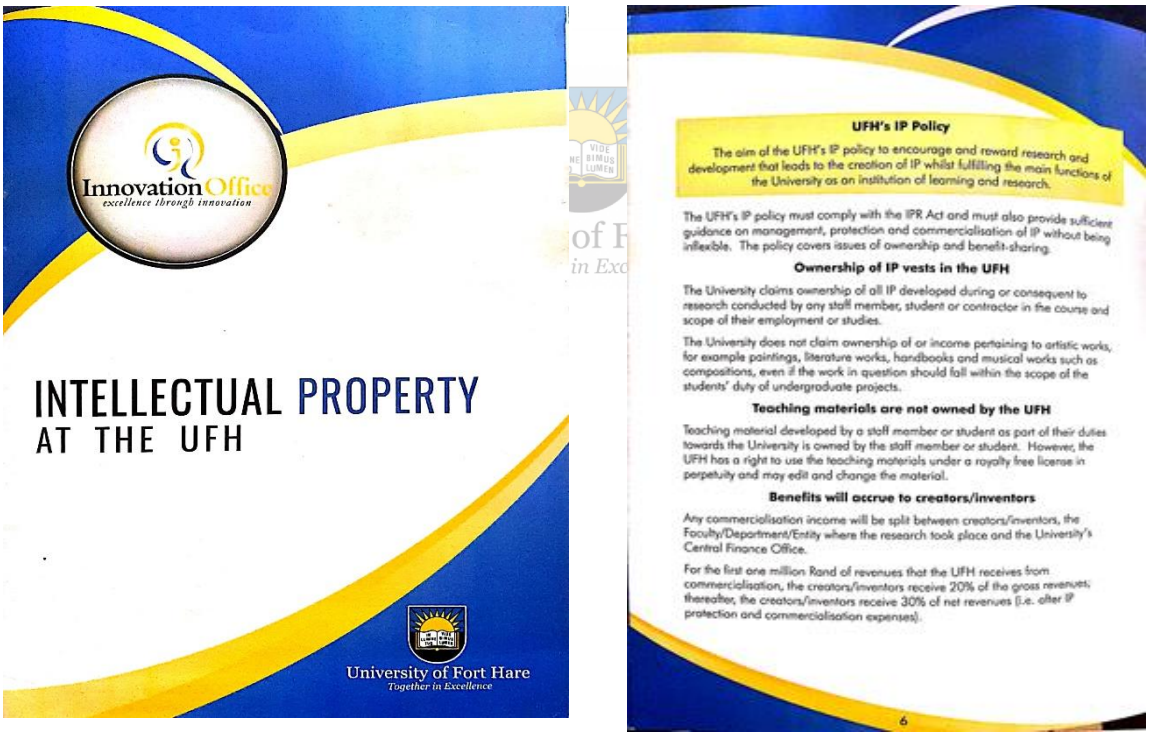

Figure 5.10 UFH booklets used to create awareness
Source: UFH Innovation office

The Innovation Office has an IP policy that protects IP from Fort Hare community as shown on figure 5.10. The Office distributes such booklets during awareness workshops that they conduct each year targeted at researchers and also students. These booklets are also available

at the Innovation office. From the analysis, it is evident that the theme that emerge from the booklets created by the Innovation Office is "the importance of the IPR-PFRD Act (2008) and of the UFH IP policy". The information that is covered include the key provisions of the UFH IP policy which is guided by the provisions in the IPR-PFRD Act (2008). The other issue is of ownership of inventions and the commercilisation process at UFH as stated in the UFH IP policy. The issues are not clearly spelt out as there is no order in the way the issues are presented in the booklets. The following diagram presents the themes that were presented in the IP booklets that are distributed to researches by the Innovation office.

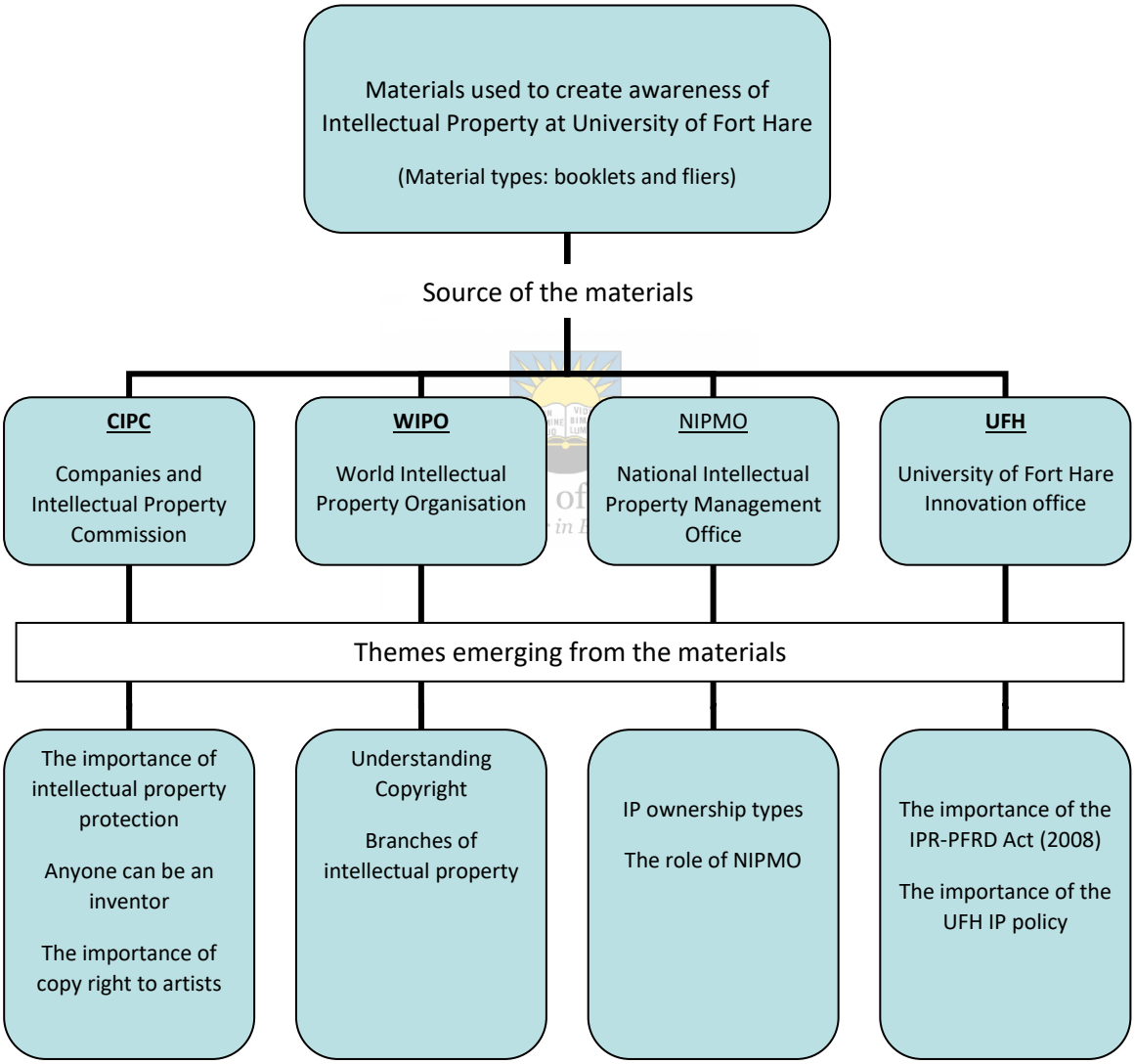

Figure 5.11 Themes emerging from IP booklets

Source: Author, 2020

It is important to note that the themes identified from the IP awareness material created by the CIPC, NIPMO, WIPO and UFH Innovation Office does not imply that the functions and

horizon of the responsible organizations are limited to such. However, this reflects the contents from the IP awareness materials made available to researchers at UFH. It can be noted that a variety of information was shared to broaden the researchers understanding of IP. The key themes that emerged are illustrated in figure 5.11. The themes cover different aspects of IP and therefore it is vital for researchers to have access to different materials to broaden their understanding of IP. From the analysis, it is apparent that booklets that are created by NIPMO, CIPC and WIPO are crafted in an orderly manner, they are of high quality and the information is clearly written unlike the material created by the Innovation office. The booklets from the Office are of poor quality and they can be easily damaged, the information is not clearly spelt out as it is not written in an orderly manner. The booklets from the Office only covers the IPR-PFRD Act (2008) and the UFH IP policy provisions, they do not have booklets that cover other aspects of IP hence the need to supplement with material from other organisations. One can note that although the material from other organisations is important, the Office has to scrutinise the material and verify if it is age appropriate and if the content is relevant to the target audience. The Office should therefore create material on patenting so that researchers understand its importance.

It is evident that collaboration between different organizations will assist in broadening the understanding of IP among researchers as they will be exposed to different critical aspects of IP. Conversely, working in silos in creating IP awareness limits the full potential benefits for researchers. In light of this, it is crucial that the UFH Innovation Office continues to work with other organizations in promoting IP awareness to ensure that researchers' understanding of IP can be broadened.

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5.2.1.3 Target audience for IP communication

There was a question on the target audience for IP awareness communication. Participant A also mentioned that;

> *Everyone is a target audience, many would think science and engineering are the main target, but everyone has the potential to develop IP. Others have innovative ideas that have potential to produce IP in natured properly. Therefore, from undergraduates, postgrads, post-docs, university staff (academic and non-academic) and visiting researchers.*
>
> (Participant A)

The above statement is indicative of the fact that everyone has the role to play in innovation. The whole University community has the potential to create IP and therefore everyone ranging from postgraduates, academic and non-academic staff, postdoctoral students and even visiting researchers are regarded as the target audience for IP communication. From the interview, it is evident that the whole University is the target audience for IP communication, this however raises a question on whether all University staff particularly the administration staff are involved in R&D that may result in innovation. Such an approach causes a lot of confusion and this is probably the reason why the awareness materials are not directed to a specific audience since they contain general information on IP.

5.2.1.4 The effectiveness of IP communication strategies

With regards to the effectiveness of the current IP communication strategies, participant A mentioned that,

> *"They are effective as a number of people attend these workshops, however, others just reserve seats and not attend as they feel it's not really important to them or does not affect them. However, I believe when it comes to the University, research staff should be compelled to attend at least one or two IP session per annum, this will ensure that everyone has a basic understanding of IP. Then, more knowledge can be built up from that".*
>
> (Participant A)

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Thus, the participant believes that their methods of communication are effectives as there are quite a number of people who attend IP workshops. The statistics from the analysis of attended registers for two different workshops show that about 58 people attended an IP workshop on the 23rd of April 2018 in and 84 people attended the other workshop on the 7th of June 2017. In addition, the Office conducts surveys after each workshop to assess the effectiveness of their workshops in creating awareness, the responses indicate that most people are not completely satisfied with the mode of communication, they require more awareness events to understand IP issues. However, the responses also indicate that there is a need for the University to make it mandatory for the research staff to attend at least one or two workshops on IP that are conducted by the Innovation office. The participant also mentioned that the Office and the stakeholders e.g NIPMO and the CIPC are collaborating to create awareness. However, that can never be enough, IP awareness sessions are further

required in our communities, basic education institutions and so forth. Therefore, more still needs to be done to encourage people to attend these workshops.

5.2.2 An analysis of the practices of intellectual property at University of Fort Hare

This section analyses the practices of IP at UFH. The section starts by discussing the role of the Innovation Office at UFH as it facilitates commercialisation of innovations from the University community that emanates from publicly funded research. The researchers also analyse the IP policy and whether it is being put into practice.

5.2.2.1 Responsibilities of the Innovation office

(i) The establishment of the UFH Innovation office

A dedicated technology transfer office (TTO) was established at UFH and it is referred to as the Innovation office. This Innovation Office is commonly referred to as technology transfer office. The first question that the researcher asked the key informant from the Innovation Office is related to the year that the Office was established. The response is given below.

> *"The Innovation Office was established in 2015 according to agreement between National Intellectual Property Management Office (NIPMO) and UFH. However, functions of the innovations office began long before UFH established its own Technology Transfer Office (TTO). UFH was part of the Eastern Cape (EC) Regional Technology Transfer Office which compromised of Walter Sisulu University, Rhodes University, Nelson Mandela Metropolitan University and UFH".*
>
> (Participant B)

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Thus, the Office was established in 2015 and it has been functioning for five years. The other important point that was made is that technology transfer activities had already started at UFH before the establishment of the dedicated office in 2015. The participant mentioned that the office has three staff members; the IP and innovation manager who has a Masters' degree, IP and innovation officer who has a Masters' degree as well and an IP intern has a degree. The participant refused to disclose detailed information on the qualifications of the staff.

(ii) The role of the UFH Innovation Office

Another question that the researcher asked is about the reasons why the Office was established. Participant B had this to say;

"The establishment of the office was in line with the research strategy that the university was undertaking. Further, progress and impact from the Eastern Cape Regional Technology Transfer influenced the university into taking intellectual property seriously and means of generating third income stream. However, the overall purpose was the result of IPR-PRFD Act (2008) which required all public funded institutions to establish offices of technology transfer".

(Participant B)

From the above responses, it is apparent that the Innovation Office was established as a response to the requirements of the IPR-PFRD Act (2008). The Eastern Cape regional office that was managing IP from four universities namely Walter Sisulu, Rhodes, Nelson Mandela Metropolitan University including UFH. The University itself was also aligning its mission with conducting research that has in impact on peoples' lives. The researcher asked the key informants at the Innovation Office to respond to the qualitative questionnaire on the role that the office plays in commercialisation of innovations from the research community. The following verbatim answers this question;

"The Innovation Office is the technology transfer function of the University of Fort Hare (UFH). Our main objective is to promote and facilitate the protection and commercialisation of UFH's intellectual property arising from the institution's research activities. We are also mandated to perform quite a number of other services, constant marketing of our office, conduct IP awareness as well as promoting/cultivate culture of entrepreneurship amongst student and researchers. We also participate in regional, provincial and national innovation platforms. In the past five years of our TTO establishment our staff visited different international innovation offices as a way of benchmarking and improving our offerings."

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(Participant B)

Therefore, the Office plays a pivotal role in ensuring entrepreneurial culture at UFH just like other TTOs at other universities. The participant stated that the Office has an annual plan for awareness activities and they also have a strategic plan and they report to the Dean of Research at UFH. The participant mentioned that "the Innovation Office is mandated by the University to provide information all IP transactions, number of submitted invention disclosures, funding applications submitted, funding attracted and number of commercialized inventions." The responses indicate that the Office is reluctant to provide clear information on their activities.

(iii) Sources of funds

Technology transfer offices cannot function without funds and the researcher asked the participant about where the Office receive the funds that are required. Participant B stated that;

> *"NIPMO funds the establishment of TTO, but on the agreement the university agrees to absorb the office when the funding agreement comes into an end. Currently the office is absorbed by the university and NIPMO still supports the office through funding for other activities and operational".*

(Participant B)

The responses indicate that the National Intellectual Property Management Office, which is a custodian of the IPR-PFRD Act (2008) is the principal source of funding for the Innovation office, however, there is an agreement on the period of funding, and after the lapse of that period, the University will be the sole provider of funds for the day to day operation of the office.

(iv) IP awareness initiatives

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The study analyses IP awareness among researchers and therefore it is important for the researcher to understand the dynamics of the communication strategies. A question which asked participant B about the role of the Office in creating awareness was posed and the participant answered by saying that;

> *"the Innovation Office is responsible for such, all personnel within the office have a duly role to arrange and support all campaigns run by the innovation office".*

(Participant B)

The Innovation Office is therefore responsible for creating awareness of IP among researchers at UFH and the participant also said that awareness activities are not a once off activity; they are continuous *"there are several events within a year. These include world IP day, IP awareness sessions for departments, researcher's day"* (Participant B). This implies that each year, the Innovation Office continuous to create awareness. The researcher also asked the participant about the relevance of knowing about IP and the response is that,

> *"IP is one of the crucial assets that one needs to be aware of, as it is defined as creation of minds, meaning anyone has the ability to generate a potential IP. IP is crucial for innovation and invention, which has the potential of having an economic and social impact. Many individuals have given away their IP within out even*

knowing and some have signed off rights to their inventions without realising the impact the invention will have in future if not now".

(Participant B)

Therefore, one can conclude that having knowledge of IP is vital for personal gain, the University and the country at large also benefits because everyone has the ability to generate IP that has commercialisation potential.

In addition, the participant stated that they have a budget for awareness activities however, it is not a strict budget as the Office can use funds from many sources, i.e from NIPMO and the University. Such statements may indicate that the Office does not carefully plan for these awareness events, there should be a certain limit to using funding, and they should have a budget. However, the Innovation Office faces challenges; the participant stated that many stakeholders do not turn up for the organised IP awareness events.

5.2.2.2 An analysis of the UFH IP policy

From the IP policy document, it is apparent that the institution was mandated by the IPR-PFRD Act 51 of 2008 to develop an IP policy. There were steps that were taken that resulted in the enactment of that Act. In 2006**,** a framework for protecting IP that emanates from publicly financed research in South Africa was created by the Department of Science and Technology (DST) and this framework was later revised, a bill was developed and became the current IPR-PFRD Act 51 of 2008. The analysis of the qualitative responses on the questionnaire answered by one key informant from the Innovation Office also is indicative of the fact that the UFH policy is guided by the IPR- PFRD Act (2008).

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Universities have their own IP policies that are informed by the Intellectual Property Rights from Publicly Financed Research and Development Act (2008). The IP policies from the universities ensures that IP is identified, protected and commercialised using different means of commercialisation, while ensuring that IP creators are rewarded and acknowledged. This policy also aligns with the research policy of the University. The aim of the policy is to provide both the staff and students at the institution with a framework for the management of their IP and ensuring that the University, inventors and South Africa benefits from IP which is developed by staff and students (UFH IP policy, 2017). One of the objectives of the policy is to transform innovations into products and services in order to promote the growth of the economy.

(i) The development of the UFH IP policy

The IPR-PFRD Act 51 of 2008 instructs publicly financed institutions to create its own IP policy and as such UFH developed its own IP policy to comply with the provisions of the Act (UFH IP policy, 2017). The participant mentioned that the UFH IP policy was developed by "the *Legal team of the university in consultation with the innovation office, research office, and public participants (university staff members)"* (Participant B). However, the participant also added that *"the Innovation Office is responsible for recommending amendments to the policy to ensure no loopholes are identified on the policy. These recommendations are presented to the DVC of research and later tabled at management and council as they have to sign them off"* (Participant B). Therefore, the academic community, the legal team, the council and the Innovation Office are responsible for the creation of the UFH IP policy and making amendments when necessary.

(ii) IP covered by the UFH IP policy

The university's IP policy covers inventions that can be registered and also non-registrable inventions, all forms of IP that include trademarks, copyrights, trade secrets, designs, plant breeders' rights (UFH IP policy, 2017). The policy is guided by the following legislations,

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- "The IPR-PFRD Act 51 of 2008
- Plant Breeders' Rights Act, 15 of 1976
- Patents Act, 57 of 1978 (as amended in 2005)
- Copyright Act, 98 of 1978
- Trademarks Act, 194 of 1993
- Designs Act, 195 of 1993
- Counterfeit Goods Act, 37 of 1997" (UFH IP Policy:4).

These legislations protect all types of intellectual property regardless of whether it is from publicly financed institutions or from individuals. The IPR-PFRD Act 51 of 2008 is the one that protects IP from publicly funded institutions such as UFH. This Act was modelled on the Bahy-Dole Act of 1980 which protects federally funded innovations in the United States.

(iii) Ownership of IP

In terms of ownership of IP, the UFH IP policy states that the University retains ownership of IP created by both the University staff and registered students. However, there are exceptions

that can be made, for instance, a provision is made in the IPR-PFRD Act (2008) that IP can be co-owned if the research is conducted using the University's resources or if there is IP creation (UFH IP Policy, p. 6). At Massachusetts Institute of Technology, the IP policy states that IP that is developed by staff, visitors and students using the Universities' facilities and resources is owned by the University (Titu *et al.,* 2018) At Harvard university, the inventor owns IP from an incidental invention (Titu *et al.,* 2018). This is different in other universities i.e at Victoria University of Wellington in New Zealand students usually own IP that they create in their studies but this is not exclusive because there are cases in which students and researchers are required to have an IP contract with the institution (Titu *et al.,* 2018). The IP policy at the University of Waterloo, in Canada states that IP is owned by the creator except in well-defined situations (Titu *et al.,* 2018). The type of IP covered by these policies is not mentioned. Thus, these IP policies are different depending with the university, so the UFH IP policy has provisions that are in line with the IPR-PFRD Act (2008).

(iv) Sharing revenue from commercialisation of IP

The UFH IP policy mentions that all the parties should be considered in the sharing of revenue generated from the commercialisation of IP. The distribution of revenue is shown on table 5.1

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Table 5.1 Revenue distribution

Who		**How much**
Inventors	<R1 million revenue	20% after expenses
	>R1 million revenue	30% after expenses
Balance split between		
Faculty		43%
University of Fort Hare		43%
Technology transfer office (Innovation office)		14%

Source: UFH IP policy, 2017.

However, in the event that a non-academic staff creates IP, an administrative structure is used to guide the sharing of revenue (UFH IP policy, 2017). In addition, "if the revenues are in the form of shares or equity in a juristic person, the intellectual property creators shall be entitled to 30% of the University's portion of such shares or equity" (UFH IP policy, 2017, p. 14). The participant also attests that IP creators benefit from their inventions, the participant noted that "*There is a benefit section on the policy that ensures that IP creators are to be rewarded*

from their creation". Although the University has an IP policy, it is not guaranteed that it is being implemented. Participant B stated that, *"Implementation and enforcement of the policy is another thing that the Innovation Office is responsible for. The office has shortage of staff, which meant implementation and enforcement of the policy was not strong, however, plans to ensure enforcement are underway".* Thus, the Innovation Office is attesting to the fact that there are challenges that are faced in the implementation of the policy because of shortage of personnel.

5.2.2.3 IP products

The aim of the Innovation Office is to identify IP and facilitate the commercialisation of IP from publicly funded research. The researcher asked whether they receive IP from all disciplines and participant A had this to say:

> *"You have to understand the kind of IP which we normally receive in this office, most of the time we don't get a lot of stuff from humanities, we get a lot of staff from sciences".*
>
> (Participant A)

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This indicates that researchers from the sciences are the ones who are contributing most unlike researchers from other disciplines such as humanities at UFH. Regarding whether the Innovation Office has tangible IP products, the participant stated that are still in the process of commercialising their products since the office has been in existence for a few years.

> *"Other universities such as University of Pretoria (UP), Stellenbosch university have tangible IP products that you can see on the market so which means if they are producing such things which means they must have done a lot of IP awareness campaigns because their offices are probably now they are 10 years and ours is only less than 5 years".*
>
> (Participant A)

However, there are other innovations that are in the process of being commercialised. For instance, there is the Sun Wheel Planter technology and Stress Tolerant Maize Variety technology. More information on the innovations is given in table 5.2.

Table 5.2.UFH innovations

Innovation	**Description**	**Sector**	**Technology readiness**
Stress Tolerant Maize Variety Technology	Higher Yield Maize Food security is an huge challenge for the smallholder farming sector, particularly in the Eastern Cape province, an area where maize production is expansively susceptible to main stresses which include the issue of drought, low soil fertility and pH, and diseases that leads to low maize yields. The situation is aggravated by high inputs costs, mostly maize seed costs, which all contributes to low yields and the results in poor profitability of maize. An inexpensive, open pollinated variety (OPV) of the maize (ZM1523) has been screened which suits the semi-arid environments of the province.	Agriculture, hunting and related services	Technology readiness level 7 Licencing
Sun Wheel Planter	The technology is a coulter which has a finger wheel design that can penetrate mulch, untilled soil in order to deposit seeds and also fertilizer. This prototype was designed and developed in order to overcome the distinctive challenges that are experienced with conventional planters such as the plugging of fingers in wet conditions, the issue of depth control and also seed covering. This technology plays an important role in modernising traditional agriculture methods.	Agriculture, hunting and related services	Technology readiness level 7 Sales

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Source: https://www.innovationbridge.info/ibportal/?q=content/sun-wheel%C2%AE-planter

Table 5.2. shows that those innovations are not yet commercialised but are on level 7 of readiness. They will soon be on the market and such innovations can be used as practical examples to motivate other researchers at UFH to be innovative.

5.3 QUANTITATIVE DATA ANALYSIS

This section of data analysis presents, interprets and analyse quantitative primary data that was gathered from questionnaires distributed to researchers at UFH. The aim of the research was to analyse IP awareness among researchers at UFH. SPSS and Ms Excel were used to analyse the quantitative data from questionnaires. This section starts with the presentation of information on the response rate for the questionnaires (table 5.3). This is followed by the descriptive statistics' analysis for respondents' demographics, and the other sections analyse

data from questionnaire responses guided by the research objectives (see the introduction section). In the analysis section, the researcher provided the actual number of respondents along with the percentages so that readers are able to relate with them accurately.

5.3.1 Response rate for the study

Before proceeding with qualitative analysis, it is imperative to present information on the response rate to understand the distribution statistics and know if the number of responses is adequate for analysis. The response rate for this study is presented in Table 5.3.

Table 5.3 Response rate for the study

Category	**Frequency**	**Percentage (%)**
Number of questionnaires distributed	412	100
Number of questionnaires returned	390	95
Number of questionnaires used for analysis	**369**	**90**
Response rate	**369**	**90**

Source: Author, 2020

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It is important for the researcher to indicate the response rate for the questionnaires that were distributed to the study respondents to ensure that the results are representative of the whole population. Table 5.3. shows that the researchers distributed a total of 412 questionnaires to the study respondents and a total of 390 questionnaires were filled and returned. Out of 390 questionnaires returned, only 369 were used for analysis. This is because some of the questionnaires were not completely filled as they had incomplete sections and unclear responses. The response rate as shown on the table is 90%. Authors such as Welman *et al.*, (2011) recommends that the response rate should be above 60% to ensure that the results are truly representative and useful. The response rate is an indicator of the representedness of collected data in a survey and a high response rate reduces bias, increases efficiency (Welman *et al.,* 2011). In this study, the response rate is way above 60%, thus, this is significant in getting useful and meaningful results that are representative of the views of researchers at UFH with regards to the importance and role of IP.

5.3.2 Descriptive statistics analysis for respondents' demographics

This section is a presentation and analysis of demographics of the study respondents.

5.3.2.1 Gender of respondents

To understand the proportion of female and male respondents, the researcher analysed the respondents' gender. Figure 5.12 presents the gender of the respondents.

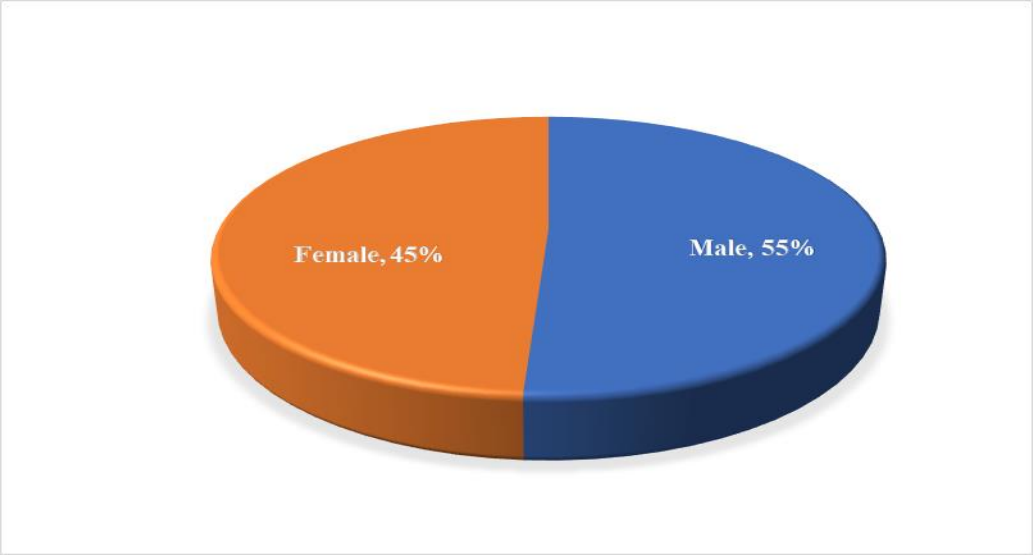

Figure 5.12 Gender of respondents

Source: Author,2020

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From Figure 5.12, it can be seen that the majority of the respondents are males 200 (55%) while 165 (45%) of the respondents are females. These results portray that there are more male postgraduate students who participated in this study as compared to females at UFH. However, UFH statistics show that there were more females (7 617) as compared to males (6 214) (Statistics on post-secondary education and training in South Africa report 2016, p. 109). In addition, overall in South Africa a large proportion of students enrolled in higher education institutions in 2016 were females (344 528) while 293 454 were males. Statistics on post-secondary education and training in South Africa report 2016, p. 13). These statistics are not in line with this study and this can be explained by the fact that the researcher is targeting only postgraduate students not the whole student population.

5.3.2.2 Age of respondents

To understand the age groups of postgraduate students, the researcher analysed their age. The age groups of the respondents are presented in figure 5.13

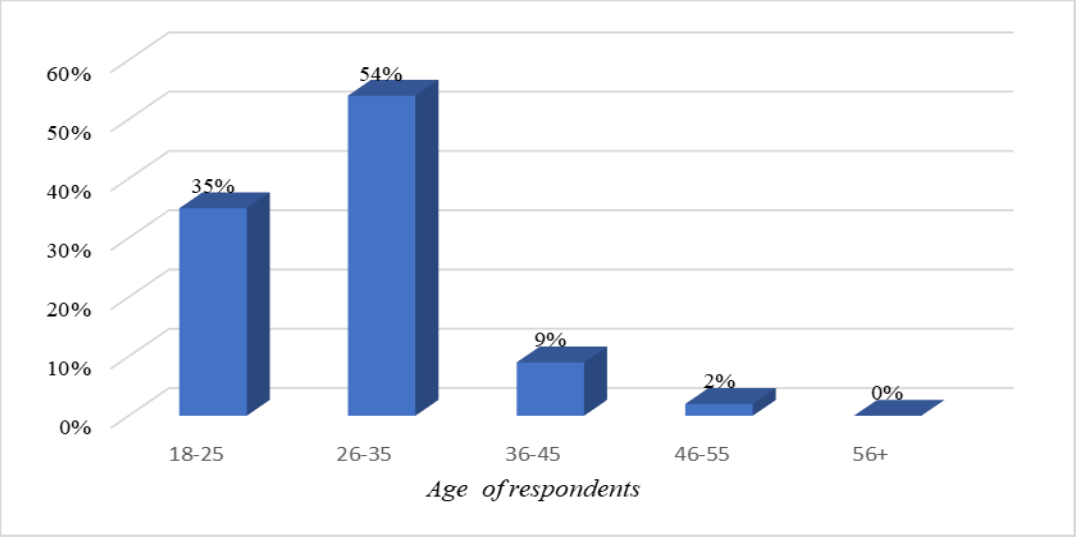

Figure 5.13 Age of respondents

Source: Author,2020

As indicated in figure 5.13, 198 (54%) of the respondents were aged between 26 to 35 years, 128 (35%) were aged between 18 to 25, at least 31 (9%) were aged between 46 to 55 and none of the respondents were above 56 years. The statistics reflected in figure 5.10 show that the youth are the dominant age group at institutions of higher learning. The results are also indicative of the fact that the youth are the most dominant age group in the country (Statistics South Africa, 2011).

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5.3.3 Affiliation of the respondents with the university

The respondents were asked to state their affiliation with the University and their responses are shown on Figure 5.14.

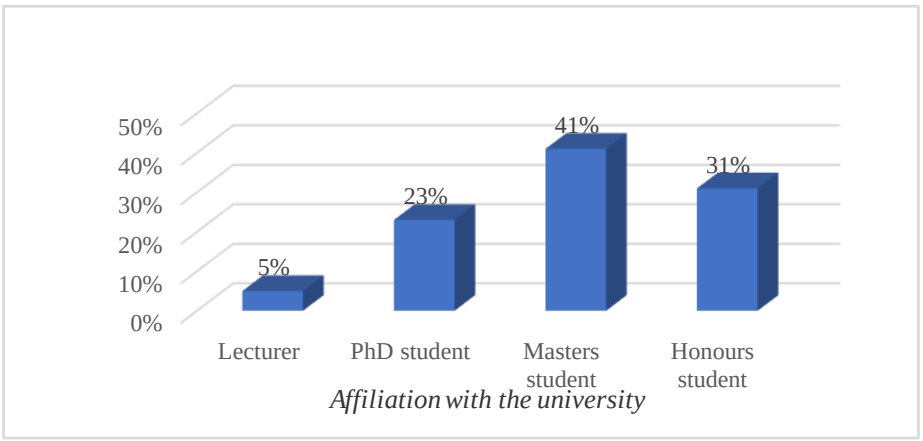

Figure 5.14 Affiliation of the respondents with the university

Source: Author,2020

As shown in figure 5.14, most of the respondents are Masters' students 149 (41%) and 114 (31%) of the respondents are Honours students. Only 20 (5%) of the study respondents are lecturers at UFH. The statistics are in line with the University statistics, the University postgraduate community has many Masters' and Honours students as compared to PhD students. Statistics on post-secondary education and training in South Africa report (2016, p.15) indicates that 91 866 (5.9) students enrolled for post graduate, below Master's level below at public higher education institutions, 57 290 (9.4%) students enrolled for Master's degrees and approximately 21 510 (2.3%) students enrolled for Doctoral degrees. These statistics shows that there are many students that enrol for Honours degrees as compared to other postgraduate degrees such as Master's and Doctoral degrees. As for the teaching staff, the researcher distributed questionnaires to a few lecturers that were representative of the total teaching staff population at UFH. The next section presents and discusses the study findings in relation to the objectives.

5.3.4 Communication strategies used to create awareness of IP

This section discusses the communication strategies that were used to create awareness of IP among researchers at UFH.

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5.3.4.1 Modes of communication used to create awareness (Question 11)

To reach out to the target audience, there is need to use many channels to create awareness. The researcher asked the participants to state whether the modes of communication (on figure 5.15) were used to reach out to the target audience. Their responses are presented on figure 5.15.

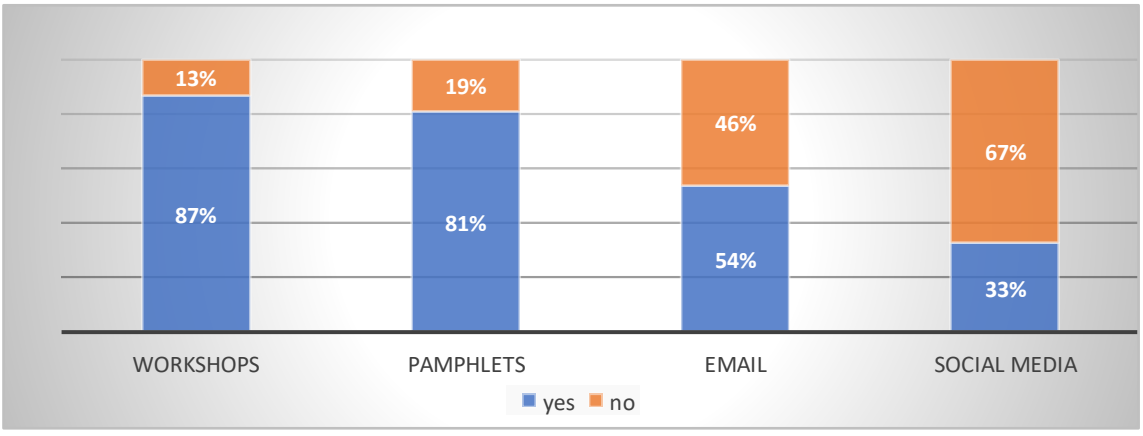

Figure 5.15 Modes of communication used to create awareness

Source: Author,2020

Figure 5.15 presents the views of the respondents regarding modes of communication which were used to create awareness. The results show that most of the respondents agree that workshops 369 (87%), pamphlets 299 (81%) and Email 198 (54%) were used to reach out to them. On the other hand, most respondents 246 (67%) stated that social media was not used to reach out to them. A literature survey shows that workshops are mainly used to create IP awareness among various publics across the globe, from the developed countries to the developing countries (Tinao *et al.*, 2018; Popova & Nacka, 2017; European Union Intellectual Property Office, 2017; Maritz, 2013; Villasenor, 2012). Thus, the UFH Innovation Office is also using workshops as the main mode of communicating with the target audience.

5.3.4.2 Modes of communication effective in creating awareness (Question 12)

The respondents were asked to state the modes of communication that they think are effective in creating awareness. The respondents' views are presented on table 5.4

Table 5.4 Modes of communication effective in creating awareness

Modes of communication used to create awareness	Mean	Std. Deviation
Workshops	3.10	1.704
Magazines	2.94	1.691
Radio	3.26	1.753
TV	3.13	1.673
Social media	3.79	1.463

Source: Author, 2020

Table 5.4 shows that the respondents agree that social media is the most effective mode of communication to create awareness (mean= 3.79 SD=1.463). However, the SD shows the differences in response towards the mean, which implies that other respondents views that social media is not only the most effective mode of communication in creating awareness. Other respondents are neutral in regard to workshop, magazines, radio and TV (mean=3). Thus, social media is regarded as the most effective method to create awareness. Literature indicates that communication strategies depends on the type of awareness and the target audience (Rice & Atkin, 2013; Hunter, 2012; Stephenson *et al.*, 2009; Rensburg & Cant, 2003). Social media is mostly used by the new generation and it is thus important to consider using social media to communicate with the target audience.

5.3.4.3 Attributes necessary to achieve a successful IP awareness (Question 13)

The motive behind an awareness event is to ensure that the target audience is reached and the objectives of the awareness event are achieved. Therefore, there is need to ensure that certain factors are taken into consideration. In light of this, the respondents were asked to state the extent to which they agree that the stated attributes (listed on table 5.5) are necessary to achieve successful IP awareness events. Their responses were presented on table 5.5

Table 5.5 Attributes necessary to achieve a successful IP awareness events

Attributes necessary to achieve a successful IP awareness	Mean	Std. Deviation
Implementing clear messages	2.95	1.687
Targeting relevant audiences	3.07	1.678
Maximising media exposure	3.07	1.685
Promoting negative consequences	3.41	1.621
Promoting positive consequences	3.26	1.603

Source; Author, 2020

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The results shown on Table 5.5 show that respondents agree that there are attributes that are necessary to achieve successful IP awareness events and these include implementing clear messages, targeting relevant audiences, maximising media exposure and promoting both positive and negative consequences (mean=3). Thus, the respondents' views demonstrate that all these attributes are necessary for the success of awareness events. Although these attributes are important for the success of awareness events, there are other factors that should be taken into consideration. A survey of literature indicates that for awareness events to be effective, they should be characterised by application of theories and models, laborious evaluation, messages crafted to address the objective of the event, broadcasting or dissemination of awareness messages over sustained periods, and accompanied with persuasive incentives (Noronha, 2013; Rice & Atkin, 2013; Syme *et al.*, 2000). Thus, awareness activities should be carefully planned.

5.3.4.4 Target audience for IP communication (Question 14)

The respondents were asked to indicate the target audience of IP messages. From the analysis, it is apparent that researchers, scientists, engineers, students, lecturers and lawyers are perceived to be the target audience for IP communication at UFH. However, a lot of

researchers regard scientists 324 (88%) as the most relevant target of IP communication followed by lecturers 313 (15%), engineers 307 (83%), students 262 (72%), researchers 251(69%) and on the other hand, lawyers are regarded as the least target group for IP communication 205 (56%). Figure 5.16 presents statistics for the target audience for IP communication.

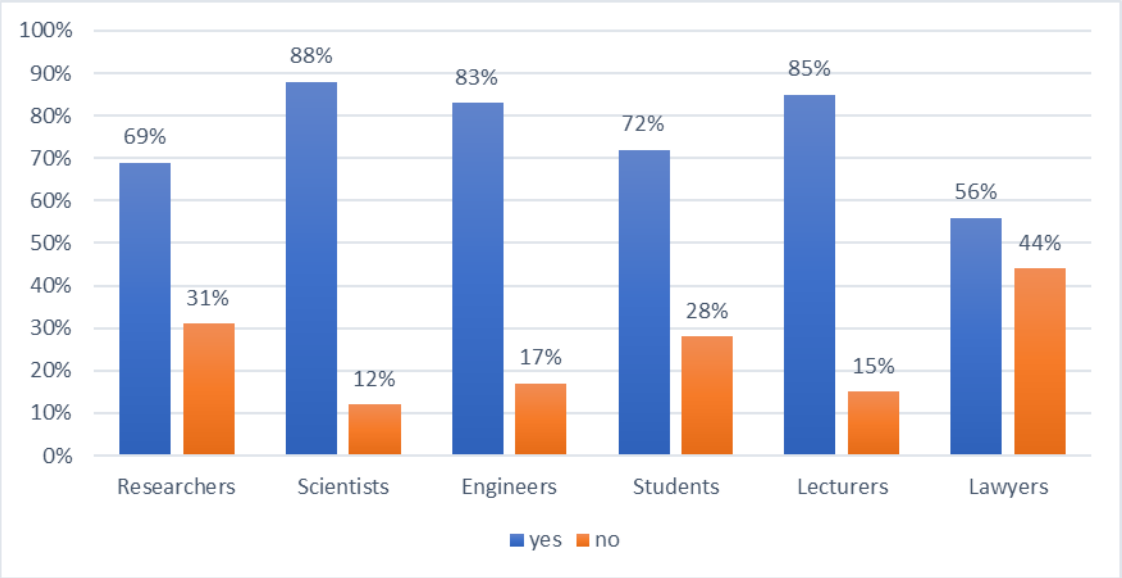

Figure 5.16 Target audience for IP communication

Source: Author, 2020

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Figure 5.16 shows that respondents indicated that researchers, scientists, engineers, students, lecturers and lawyers should be the target audience for IP communication. This means that all these people should be the target for IP messages as they are role players as far as innovation is concerned.

5.3.4.5 Responses on whether the government is doing enough to create awareness (Question 15)

The South African government has a responsibility to create awareness about IP since innovation is important for the success of the country. There is need to know the respondents' views on whether the government is doing enough to create awareness of the relevance of IP. The respondents' views on that regard are shown on figure 5.17

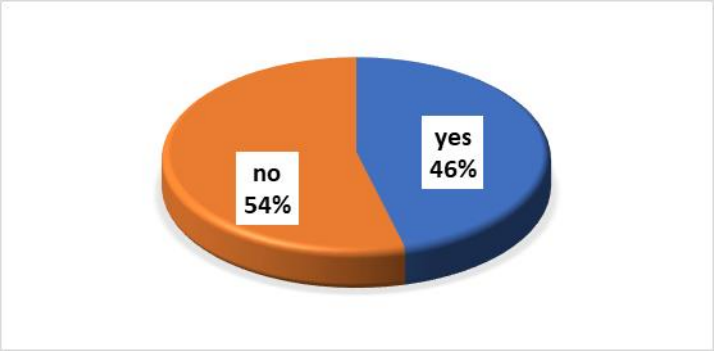

Figure 5.17 Responses on whether the government is doing enough to create awareness
Source: Author, 2020

Figure 5.17 indicate that most respondents 200 (54%) state that the government is not doing enough to create awareness. However, approximately 169 (46%) of the respondents stated that the government is doing enough to create awareness. There is need for the government to come up with other strategies to continue creating awareness. This is because countries with advanced IP systems such as the United States continue to create awareness of IP (Intellectual Property Enforcement Coordinator Annual Intellectual Property Report to Congress, 2019). IP awareness is also considered crucial in Japan. Japan Patent Office conducts seminars and hold meetings to promote IP systems and raise IP awareness. These IPR related awareness activities are mostly targeted at researchers and public research institutions and encourage universities to have an IP curriculum in all departments (European Union Intellectual Property Office, 2017; Japan Patent Office Annual Report, 2002; Tankenaka, 2005). Thus, the South African government should continue creating awareness of IP among researchers at publicly funded research institutions.

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5.3.5 Knowledge about intellectual property

5.3.5.1 Awareness of intellectual property terminology (Question 4)

It is vital that researchers are aware of various terms used to describe IP. One of the objectives sought to determine the UFH researchers' knowledge about IP. To determine the level of awareness of intellectual property terminology, the respondents were asked to indicate their understanding on a five-point Likert scale *(1=not aware, 2=slightly aware, 3=somewhat aware, 4=moderately aware and 5=extremely aware).* The results are presented in Table 5.6.

Table 5.6 Awareness of intellectual property terminology

Awareness of intellectual property terminology	Mean	Std. Deviation
Patents	2.00	1.466
Trade secrets	1.97	1.267
Legal term	2.04	1.473
Originality	1.85	1.300
Rights	2.28	1.574
Ideas	2.85	1.626
Copyright	2.49	1.024
Licencing	1.41	.863
Protection	2.85	1.660
Creations	2.91	1.661
Design rights	1.92	.977
Trademarks	2.59	1.384
Plagiarism	3.49	1.399

Source: Author,2020

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The results presented in Table 5.6 shows that some of the respondents are slightly aware of the following terms: patents, trade secrets, legal term, originality, rights, copyright, protection, design rights (mean ranges from 1.85 to 2.49; SD ranging from 0.863 to 1.574). There is a difference on the SD because of the difference in views in relation to their awareness on the listed IP terminologies. This shows that terminologies with low SD people's responses do not differ much with the mean. Whereas, those with high SD values show that people's responses differ much from the mean, which indicates differences of awareness in IP terminologies. On the other hand, the respondents are not aware of the term licencing since it has a (mean = 1.41 SD=863) and they are somewhat aware of terms such as ideas, plagiarism and creations (mean = 3). The average mean is 2.36 and this implies that in general, UFH researchers are slightly aware of IP terminology. This means that there is a need for more IP awareness initiatives to conscientise researchers on the value of IP.

5.3.5.2 Advantages of knowing about intellectual property (Question 5)

There are advantages that researchers can have if they have knowledge on IP. The respondents were asked to indicate the extent to which they agree or disagree that knowledge about IP benefits them in several ways. The results are listed in Table 5.7

Table 5.7 Advantages of knowing about intellectual property

Advantages of knowing about IP	Mean	Std. Deviation
To gain recognition for my ideas	4.27	1.038
To reference correctly	4.35	.964
To allow me to exploit my ideas	4.23	.546
To ensure that others gain recognition for their ideas	4.61	.590
To enable me to educate others about the importance of IP	4.55	.570

Source: Author,2020

The results presented in table 5.7 shows that the respondents strongly agree that knowing about IP ensures that inventors gain recognition for their ideas (mean = 4.61 SD=0.590) and also enables one to educate others about the importance of IP (mean = 4.55 SD=0.570). The results on table 5.7 illustrates low SD differences from the mean values, an indication that the respondents agree that knowing about IP has the following advantages; gaining recognition for ideas, enables one to reference correctly and motivates one to exploit his/her ideas (mean ranging from 4.23 to 4.35 and SD ranging from 0.546 to 1.038). Thus, the responses indicate that all the respondents agree that knowledge of IP is relevant. Having knowledge about IP is important for both the citizens because there is ample evidence to support the need for people to have adequate knowledge on IP so that they are innovative and at the same time innovations benefit the country (Jajpura *et al.,* 2017; Boateng, 2015; Lakhan & Khurana, 2007).

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5.3.5.3 The relevance of intellectual property (Question 6)

The respondents were asked to indicate the extent to which they agree with several statements with regards to the relevance of IP. Table 5.8 illustrates the respondents' views.

Table 5.8 The relevance of intellectual property

The relevance of intellectual property	Mean	Std. Deviation
It is vital for innovators to be rewarded because it encourages innovation	4.43	.624
IP drives technological progress and economic growth	4.49	.500
IP profits benefits local economies	4.41	.540

IP creates jobs	4.16	.551
IP encourages creativity	4.58	.590
IP deserves the same respect and protection as other tangible goods	4.43	.618
The government should educate people about IP	4.50	.600
Strong IPR laws are needed to protect innovations	4.46	.617

Source: Author,2020

Table 5.8 illustrates that most respondents agree that IP is important in several ways; it encourages innovation, it drives technological progress and economic growth, IP profits benefit local economies, creates jobs, IP deserves the same respect and protection as other tangible goods, strong IPR laws are needed to protect innovations (the mean ranges from 4.16 to 4.49 and SD ranging from 0.500 to 0.624). The respondents strongly agree that the government should educate people about IP (mean 4.50 SD 0.600) and IP encourages creativity (mean= 4.58 SD=0.590). The low SD values shows that there are no huge differences between responses and the mean values, this is an indication that the respondents value IP and its protection for the benefit of the society. Noar, (2006) adds that targeted and strategically executed communication activities can have small effects to moderate effects on the knowledge, and beliefs of the target audiences.

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5.3.5.4 Familiarisation with intellectual property types (Question 7)

The respondents were asked to indicate their familiarity with IP types and provide their responses on a Likert scale (1=not at all familiar, 2=slightly familiar, 3=somewhat familiar, 3=moderately familiar and 5=extremely familiar). Table 5.9 shows the responses.

Table 5.9 Familiarisation with intellectual property types

Familiarisation with intellectual property types	**Mean**	**Std. Deviation**
Copyright	2.83	1.769
Patents	3.08	1.733
Trademarks	2.93	1.552
Trade secrets	2.08	1.522
Industrial designs	1.95	1.300

Source: Author,2020

Table 5.9 shows that the respondents are somewhat familiar with types of IP such as copyright, patents and trademarks (mean=3). Respondents' responses also indicate that they are slightly familiar with trade secrets and industrial designs (mean=2). The average mean=3, this implies that generally, the respondents are somewhat familiar of intellectual property types. These differences in mean is also reflected in table 5.9 by the high SD values (1.300-1.769), an indication that there are differences in familiarization with types of IP between the respondents. This implies that other are familiar and other respondents are not familiar with the different IP types. This warrants the need for continuous awareness activities aimed at educating the researchers on IP (Intellectual Property Enforcement Coordinator Annual Intellectual Property Report to Congress, 2019).

5.3.5.5 Familiarisation with intellectual property legislative policy frameworks (Question 8)

Having knowledge about laws that protects intellectual property rights (IPRs) is important in safeguarding the interests of innovators and ensuring that they are rewarded for their inventions. The respondents were asked to indicate their familiarity with IP legislative frameworks and the results are presented by table 5.10 below.

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Table 5.10 Familiarisation with intellectual property legislative policy frameworks

Familiarisation with intellectual property legislative policy frameworks	Mean	Std. Deviation
IPR-PFRD Act of 2008	2.53	1.713
IP laws amendment Act 2013	1.48	.995
Copyright Act 98 of1978	1.37	.804
Plant breeders' Act 15 of 1976	1.47	.981
Designs Act 195 of 1993	1.39	.897
Trademarks Act 194 of 1993	1.34	.756
Patents Act 57 of 1978	1.45	1.022

Source: Author,2020

The respondents are somewhat familiar with the IPR-PFRD Act of 2008 **(**mean=2.53 SD=1.713) as compared to other laws that protect other types of IP. Table 5.10 illustrates that the respondents are not at all familiar with other legislative frameworks such as IP laws amendment Act 2013, Copyright Act 98 of 1978, Plant breeders' Act 15 of 1976, Designs

Act 195 of 1993, Trademarks Act 194 of 1993, and Patents Act 57 of 1978 (the average mean=1.4). Likewise, the average mean with regards to familiarisation with IP legislative policy frameworks is 1.6 and average SD value 1,024 shows a huge difference between responses from the mean. This implies that the level of familiarisation with IP legislative policy frameworks differ between the respondents. Looking at the current situation at institutions of higher learning, it is evident that those institutions which did not have TTOs prior to the Act did not establish TTOs within the time frame of 12 months as stated in the Act (Chetty, 2010). Some of those institutions include University of Fort Hare and this explains why most researchers are not aware of the legislative policy frameworks since the TTO was established in 2015 and the policy became effective in 2017.

5.3.6 Attitude of researchers towards intellectual property (Question 9)

5.3.6.1 Awareness activities effects on attitude towards intellectual property

To find out if IP awareness activities changed their attitude and perceptions about IP, the respondents were asked to state their views and their responses are shown on figure 5.18

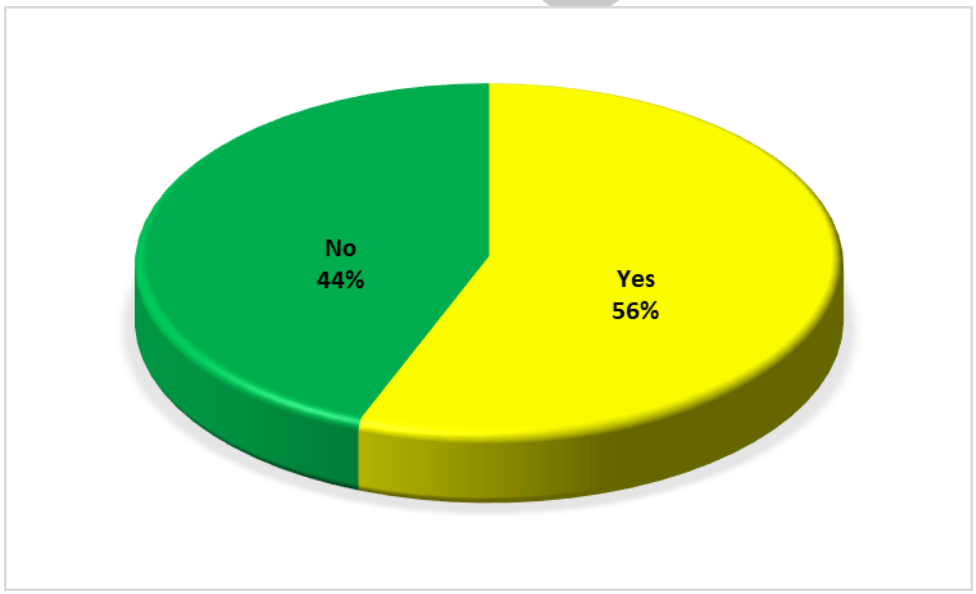

Figure 5.18 Awareness activities' effects on perceptions about IP

Source: Author,2020

The results presented on figure 5.18 shows that the majority of the respondents 205 (56%) stated that the awareness activities changed their attitude towards IP while only 161 (44%)

stated that their attitudes were not influenced in any way by the awareness workshops. Noar, (2006) adds that targeted and strategically executed communication events can have small-to-moderate effects on the attitudes and behaviour of the target audiences. However, this is not always the case as there are some audiences who do not regard the objectives of the Innovation Office as important. Diffusion theory also emphasise that communication has an important role in motivating attitude and behaviour change, the role of opinion leaders is emphasized. The theory argues that diffusion results in spread of ideas/information. So, in this study the opinion leaders (those who attend IP awareness workshops) can spread information about IP to fellow colleagues and in that way, they motivate others to respect IP and also start contributing to research that has innovation potential.

5.3.6.2 Activities that influence attitude towards intellectual property

To understand whether the attitude of researchers towards IP is influenced by certain activities, the respondents were asked to indicate the extent to which they agree or disagree with the activities listed on table 5.11 in relation to IP. Their responses are presented in Table 5.10.

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Table 5.11 Activities that influence attitude towards intellectual property

Activities that influence attitude towards intellectual property	**Mean**	**Std. Deviation**
Attending IP awareness workshops	4.38	.946
Reading or studying IP material	2.58	1.080
Educating others about the importance of IP	4.52	.787
Reading the UFH IP policy	2.59	1.075
Sharing IP information through social media	4.15	.642

Source: Author,2020

The results presented in table 5.11 illustrates that the respondents strongly agree that educating others about the importance of IP (mean=4.52 DS=0.787) influences the attitude towards IP. The respondents also agree that attending IP awareness workshops (mean= 4.38 SD=0.946) and sharing IP information through social media (mean=4.15 DS=0.642) influences their attitude towards IP. The respondents are neutral in regard to other activities such as reading or studying IP material, reading the UFH IP policy (mean average= 3). Thus, differences in SD values towards the mean values, indicates that the respondents views differ

the types of activities that can influence their attitude towards IP awareness among researchers. However, most of the respondents are of the view that educating others about the importance of IP, attending IP awareness workshops and sharing IP information through social media influences their attitude towards IP.

5.3.6.3 Responses on the need to protect intellectual property (Question 10)

The need to protect IP has caused many countries to create legislations that protect the rights of inventors since IP is regarded as important for the growth of the economy (Titu *et al.*, 2018; Jayadev & Stiglitz, 2017; Jajpura *et al.*, 2017; Mlambo, 2017; Grobbelaar & De Wet, 2016; Hobololo, 2016; Boateng, 2015; Nwabachili et al. 2015). Therefore, the researcher asked the respondents on whether protecting IP is necessary. Figure 5.19 presents the respondents' views.

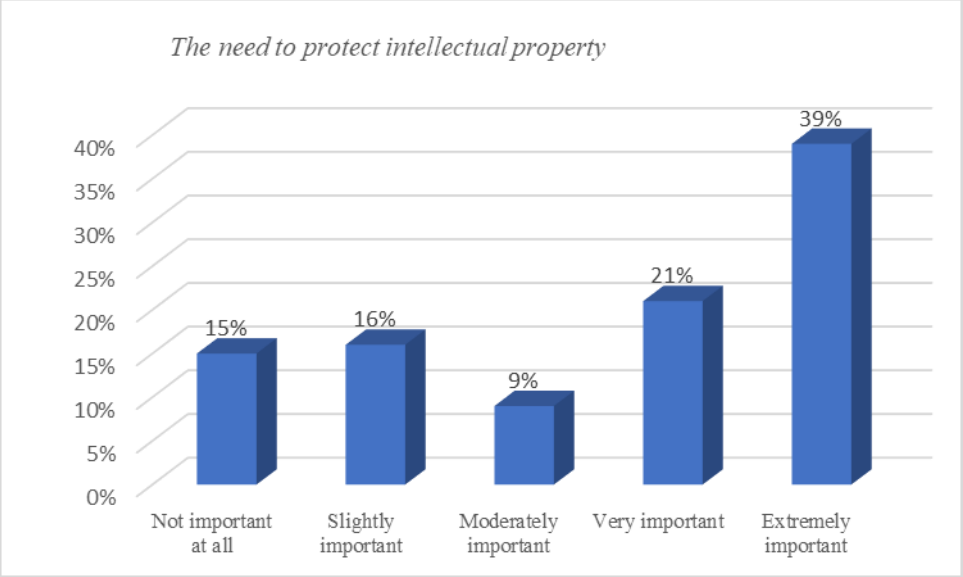

Figure 5.19 Responses on the need to protect intellectual property

Source: Author, 2020

The results on figure 5.19 show that 144 (39%) of the respondents' state that IP protection is extremely important for the economy, the other 76 (21%) also states that it is very important. On the other hand, 32 (9%) state that protecting IP is moderately important while 60 (16%) state that it is slightly important. However, a few respondents 56 (15%) state that protecting IP is not important at all. The results suggest that most respondents state that protecting IP is very important for the growth of the economy.

5.3.7 Practices of IP at University of Fort Hare

5. 3.7.1 Awareness of the UFH IP policy (Question 17 and 18)

It is important for each university to have an IP policy and at the same time, the University community that includes, students, lecturers etc should be aware of the policy so that they know the importance of innovations to individuals, the University and the country at large. In light of this, the respondents were asked to indicate if they are aware of the UFH IP policy. Their responses on whether they are aware of the existence of the UFH IP policy document are presented in Figure 5.20.

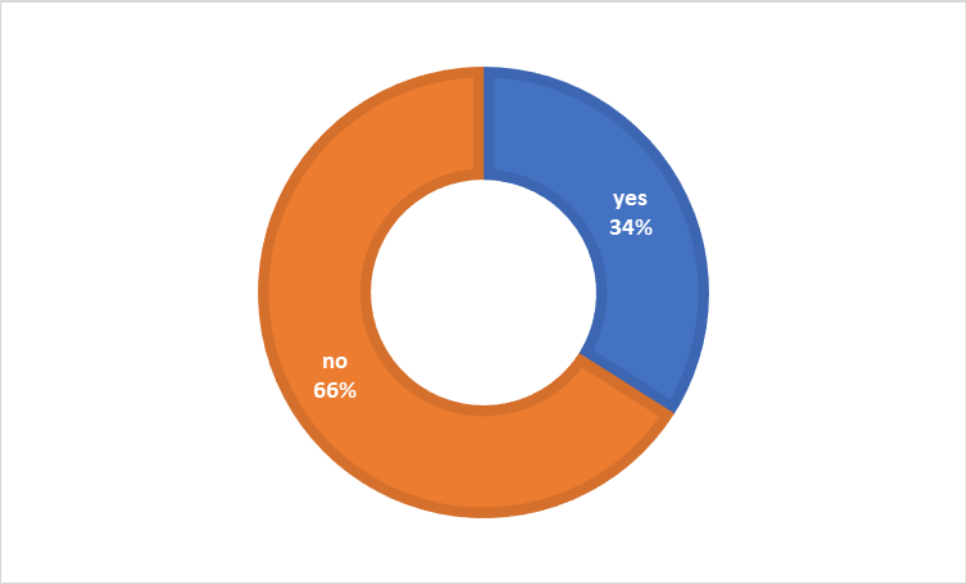

Figure 5.20 Awareness of the UFH IP policy document

Source: Author, 2020

Figure 5.20 shows that only a few respondents 123 (34%) are aware of the UFH IP policy while the rest of the respondents 240 (66%) are not aware of the existence of such policy at UFH. This is ample evidence of the need for more awareness in initiatives at UFH. The UFH IP policy (2017, p. 3) states that "all interested parties at UFH are encouraged to familiarise themselves with this IP Policy and to ensure that all research and its associated activities that may give rise to IP are in compliance with this policy". The question that arises is how one can familiarise with the policy that is not readily available.

A further probing question was asked directed to those who indicated that they were aware of the existence of the policy and they were asked to state their source of the information. The responses are illustrated in figure 5.21.

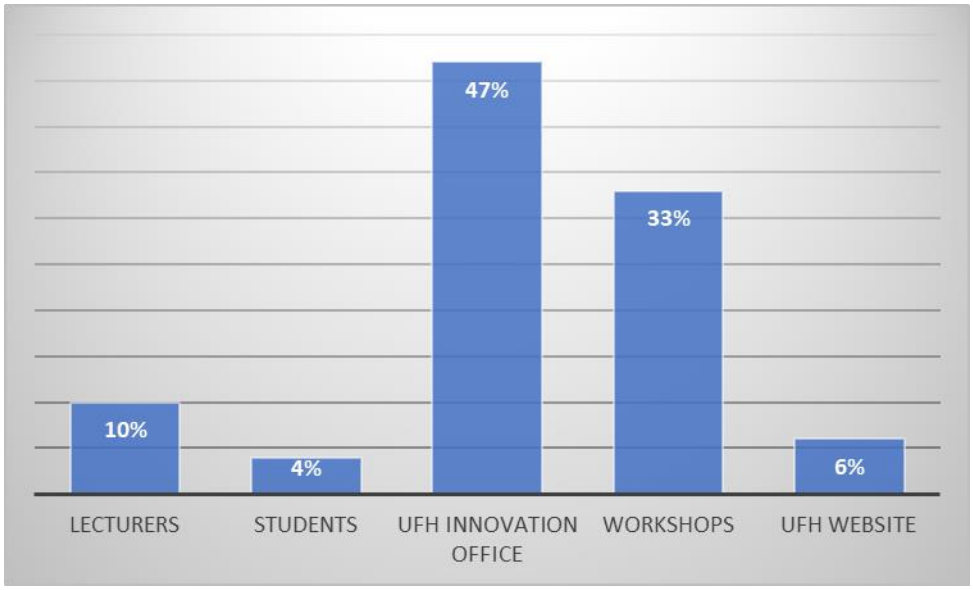

Figure 5.21 Sources of information

Source: Author, 2020

The results presented on figure 5.21 indicate that most respondents 173 (47%) heard about the UFH IP policy from the institutional Innovation office, while other respondents 122 (33%) stated that their source of information was the IP awareness workshops hosted by the Innovation Office and other partners. 37(10%) of the respondents however stated that their source of information was their lecturers or fellow lecturers in the case of those who are lecturers themselves. A few respondents cited other students 15 (4%) and also the UFH website 22 (6%) as their sources of information. The conclusion that can be drawn from these findings is that the UFH Innovation Office is the major source of information to most respondents regarding the UFH IP policy.

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5. 3.7.3 Reasons for creating an institutional intellectual property policy (Question 20)

The respondents were asked to indicate the extent to which they agree that the mentioned reasons for creating a university IP policy and their responses were indicated on a Likert scale *(1=strongly disagree, 2=disagree, 3=neutral, 4=agree and 5=strongly agree).* Their responses are shown on table 5.12.

Table 5.12 Reasons for creating an intellectual property policy

Reasons for creating an intellectual property policy	Mean	Std. Deviation
To protect the interests of inventors	3.71	1.354
To protect the interests of the country	3.02	1.549
To protect the interests of the University	2.99	1.559

Source: Author,2020

Table 5.12 shows that the respondents agree that an institutional IP policy is needed to protect the interests of inventors (mean=3.71 SD= 1.354). However, the respondents are neutral when it comes to the need to protect the interests of the country and the University (mean=3). The mean results therefore imply that the respondents agree that the interests of the inventors should be protected. However, the high SD values presented in table 5.12, shows huge variability from the mean values, an indication that respondents had different views or understanding regarding the rationale for creating an intellectual property policy. It is important that awareness campaigns be promoted so that researchers can be well educated about the rationale for creating IP policies, how they can benefit and be protected by such policies.

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An analysis of the attendance registers

The researcher analysed data from attendance registers which were obtained from the Innovation office. The registers were for the IP workshops that were held on the 7th of June 2017 and on the 28th of April 2018. Data from the attendance registers was presented in form of tables. Table 5.13 presents statistics of those who attended the IP workshop which was held at Alice campus on the 23rd of April 2018.

Table 5.13 Statistics of those who attended IP workshop

Date of attendance	Designation (Student-Hons, Msc, PhD, Lecturers & Stakeholders)	Faculty/ Organisation	Total attendance
23 April 2018	Honours (13) Masters (14) PhD (13)	• Science and Agriculture • Social Sciences and Humanities • Management and commerce	58

	Lecturers (12) Stakeholders (6)	• Govan Mbeki Research and Development Centre • Technology Innovation Agency	

Source: Author,2020

As indicated on table 5.13, there are about 58 people who attended the IP workshop and among them included about three stakeholders from Technology Innovation Agency and other three stakeholders from the Govan Mbeki Research and Development Centre at UFH. The data indicates that students from Honours to Ph.D level attended the workshop, however, only students and lecturers from three faculties attended the workshop, except those from other faculties such as Law, Education and Health Sciences.

The researcher also analysed data from an IP workshop that was held on the 7th of June 2017. This workshop was attended by many students from undergraduate students to Post-doctoral students and a few staff members. There were about three lecturers from the faculty of Science and Agriculture, one lecturer from Management and Commerce and also one lecturer from Social Sciences and Humanities. The other stakeholder was a delegate from National Intellectual Property Management Organisation. Undergraduates are also showing interest in IP related matters. Students and staff who attend these workshops are mainly from Science and Agriculture, Social Sciences and Humanities, and Management and Commerce. However, in this workshop only one Ph.D student from the faculty of Education attended the workshop.

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Table 5.14 Statistics of those who attended IP workshop

Date of attendance	**Designation (Student-Undergrad, Hons, Msc, PhD, Post-doctoral, Lecturers & Stakeholders)**	**Faculty/Organisation**	**Total attendance**
7 June 2017	Undergraduates (9) Honours (6) Masters (34) PhD (30) Post-doctoral (1)	• Science and Agriculture • Social Sciences and Humanities • Management and Commerce • Education	84

	Lecturers (3) Stakeholders (1)	• National Intellectual Property Management Organisation	

Source: Author,2020

When it comes to students, about 48 were from the faculty of Science and Agriculture, 17 from Social Science and Humanities and only 14 from Management and Commerce. This implies that majority of the students who attended the workshop are from the faculty of Science and Agriculture, this may be attributed to the fact that this faculty has been actively involved in innovation as they even have innovations that are in the process of being commercialised and these are the Sun Wheel Planter technology and Stress Tolerant Maize Variety technology. However, a few lecturers attended this workshop.

5.4 DISCUSSION OF STUDY FINDINGS

This section critically discusses research findings focusing on both qualitative and quantitative data analysis. The previous section presented and interpreted data in addressing the study objectives that were outlined in the first chapter. The discussion of findings is thus guided by the study objectives.

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5.4.1 An analysis of communication strategies used to create awareness of intellectual property

The research findings show that at University of Fort Hare, the Innovation Office employs various communication strategies to create awareness of intellectual property among researchers. Workshops are mainly used followed by the other methods which include social media posts, email communication, distributing booklets and fliers that contain IP information, interactive discussions with IP experts, and small visits to faculty researchers, or research groups to conduct five minutes presentations on IP. The findings also points to the fact that these strategies are not enough, the analysis shows that the Innovation Office has plans to have a LinkedIn page for spreading information about IP and they are considering radio interviews on the community radio station to engage with the UFH research community. This is a good idea considering that there is a community radio station, Forte

FM that is located on Alice campus, at the University and its target audience includes the UFH community.

A literature survey shows that workshops are mainly used to create IP awareness among various publics include researchers across the globe, from the developed countries to the developing countries (Tinao *et al.,* 2018; Popova & Nacka, 2017; European Union Intellectual Property Office, 2017; Maritz, 2013; Villasenor, 2012; Gimenez, *et al.,* 2012; Ong *et al.,* 2012; Cheema *et al.,* 2011; Lakhan & Khurana, 2007). However, other strategies can used be used to create awareness.

An analysis of quantitative data indicated that the study respondents agree that social media is the most effective modes of communication to create awareness apart from workshops, magazines, television and radio programmes. The respondents indicated that researchers, scientists, engineers, students, lecturers and lawyers should be the target audience for IP communication. This means that all these people should be the target audience for IP messages as they are role players as far as innovation is concerned. Literature survey indicate that, to reach the target audiences and maximise their chances of success, awareness events use different modes of communication including, brochures, newspapers, posters, social networks such as Facebook, and Twitter, websites and traditional media i.e tv, radio community-based outreach, making use of special occasions, events, and discussion groups (Hunter, 2012; Wakefield *et al.,* 2010; Coffman, 2002). Therefore, it is imperative for the Innovation Office to also engage with researchers on social media platforms since it is mostly used by the new generation which is also a target audience for IP communication. Online communication has become vital especially in this period where the world if fighting coronavirus 2019 (COVID-19) and physical distancing has become the order of the day. COVID-19 has resulted in loss of lives; about 900 000 people lost their lives worldwide (World Health Organisation, 2020). Thus, engaging with the audiences using social platforms is thus vital in the information age.

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The respondents were asked to indicate whether the government is doing enough to create awareness of IP among researchers. The majority of the respondents stated that the government is not doing enough to create awareness. The CIPC also substantiate these views by arguing that there is low education and low awareness of IP and conversion of knowledge to IP, particularly in higher education institutions (Companies and Intellectual Property Commission Annual Report, 2018/19). This is attributed to the fact that researchers have

inadequate knowledge of IP and this has resulted in loss of potential benefits that could have been gained by the country from research outputs of publicly financed institutions (NACI, 2012). Although the government has put measures in place such as the establishment of TTOs at research institutions that are responsible for ensuring that researchers have adequate information on IP. There is still a lot that must be done. Responses from qualitative data analysis show that the Innovation Office has less than five years as it was established in 2015 and it is therefore trying its best using resources on its disposal to create awareness and it is supported by the government through National Intellectual Property Management Office (NIPMO), an organisation that is responsible for assisting Technology Transfer Offices (TTOs) with funding and technical assistance when required and other stakeholders such as the Companies and Intellectual Property Commission (CIPC), an agency of the department of trade and industry which also creates awareness of IP and registration of IP and Adams and Adams, a law firm which constantly send its lawyers to present during IP workshops at UFH. The Innovation Office is short staffed as there are only three staff members and they indicated that they have plans to recruit more staff in 2021.

There is need for the government to come up with other strategies to continue creating awareness. This is because countries with advanced IP systems such as the US continues to create awareness of IP (Intellectual Property Enforcement Coordinator Annual Intellectual Property Report to Congress, 2019). IP awareness is also considered crucial in Japan. Japan Patent Office conduct seminars and hold meetings to promote IP systems and raise IP awareness. These IPR related awareness events are mostly targeted at researchers and public research institutions and encourage universities to have an IP curriculum in all departments (European Union Intellectual Property Office, 2017; Japan Patent Office Annual Report, 2002; Tankenaka, 2005). Thus, creating awareness requires inputs from various stakeholders and it is not a once off strategy, it is a continuous process that may take several years. In light of this, the Innovation Office should continue creating awareness by employing several communication strategies to ensure that the target audience are aware of the need to protect their IP and to be innovative.

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5.4.2 An assessment of University of Fort Hare researchers' knowledge of intellectual property.

An analysis of quantitative responses shows that UFH respondents are slightly aware of IP terminology that include patents, trade secrets, legal term, originality, rights, copyright,

protection, design rights, ideas, plagiarism and creations (the average mean =2). However, the respondents agree that knowing about IP has the following advantages: gaining recognition for ideas, enables one to reference correctly and motivates one to exploit his/her ideas (average mean = 4). In addition, most respondents agree that IP is important in several ways; it encourages innovation, it drives technological progress and economic growth, IP profits benefits local economies, creates jobs, IP deserves the same respect and protection as other tangible goods, strong IPR laws are needed to protect innovations. Thus, the responses indicate that all the respondents agree that knowledge of IP is relevant. Having knowledge about IP is important for both the citizens because there is ample evidence to support the need for people to have adequate knowledge on IP so that they are innovative and at the same time innovations benefit the country (Jajpura *et al.,* 2017; Boateng, 2015; Lakhan & Khurana, 2007). This means that there is a need for the Innovation Office to continue creating awareness to conscientise researchers on the value of IP.

Furthermore, it is apparent to know whether respondents have knowledge of intellectual property types such as copyright, patents and trademarks, trade secrets and industrial designs. The average mean=3, this implies that generally, the respondents are somewhat familiar of intellectual property types. In addition, the respondents were asked if they are familiar with intellectual property legislative policy frameworks such as IPR-PFRD Act (2008), IP laws amendment Act 2013, Copyright Act 98 of1978, Plant breeders' Act 15 of 1976, Designs Act 195 of 1993, Trademarks Act 194 of 1993, and the Patents Act 57 of 1978. The analysis indicated that the respondents are not at all familiar with other legislative frameworks such as IP laws amendment Act 2013, Copyright Act 98 of 1978, Plant breeders' Act 15 of 1976, Designs Act 195 of 1993, Trademarks Act 194 of 1993, and Patents Act 57 of 1978 (the average mean=1.4) but they are somewhat familiar with the IPR-PFRD Act (mean=2.53). Looking at the current situation at institutions of higher learning, it is evident that those institutions which did not have TTOs prior to the Act did not establish TTOs within the time frame of 12 months as stated in the Act (Chetty, 2010). Some of those institutions include University of Fort Hare and this explains why most researchers are not aware of the IP legislative frameworks including IPR-PFRD Act of 2008 since the TTO was established in 2015 and the policy became effective in 2017. IPR-PFRD Act of 2008 is important as it protects innovations from publicly funded research and ensure that innovators are rewarded for their inventions. A conclusion that can be made is that UFH researchers have inadequate knowledge of intellectual property and IP legislative frameworks.

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5.4.3 An analysis of the attitude of University of Fort Hare researchers towards intellectual property.

An analysis of responses from questionnaires indicate that the respondents are of the view that educating others about the importance of IP, attending IP awareness workshops, and sharing IP information through social media influences their attitude towards IP. The results suggest that most respondents are of the view that protecting IP is very important for the growth of the economy. The researcher also asked the respondents on whether the IP awareness workshops conducted by the Innovation Office changed their attitude and perceptions towards IP and the analysis of the results is indicative of the fact that the most respondents specified that the awareness workshops changed their attitude and perceptions towards IP.

However, measuring the effectiveness of communication activities is not a simple process. Measuring the changes in audiences' knowledge, attitude and behaviour is the goal of any communication event (Tench & Yoemans, 2009). Although communication plays a pivotal role in motivating attitude and behaviour change, other critics (Kinghorn, 2008; Coffman, 2002) contend that information alone is not adequate to influence behaviour change. Slater (1999) adds that using communication to change human behaviour is a huge challenge. Hence it is unrealistic to conclude that the changes in behaviour of the target audiences is entirely influenced by communication since there are many factors at play. It is very difficult to attribute social change to one intervention (Kinghorn, 2008). Thus, a lot of factors come into play that can influence the attitude and behaviour of audiences. Diffusion theory also emphasise that communication has an important role in motivating attitude and behaviour change, the role of opinion leaders is emphasized. The theory argues that diffusion results in spread of ideas/information. So, in this study the opinion leaders (those who attend IP awareness workshops) can spread information about IP to fellow colleagues and in that way, they motivate others to change their attitude towards IP. The statistics from attendance registers of the UFH community that attend IP awareness workshops indicate that a lot of researchers attend the workshops and that is a positive feedback. This may imply that researchers generally have a positive attitude towards intellectual property.

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5.4.4 An analysis of the practices of intellectual property at University of Fort Hare.

The realisation that innovations are critical to the development of a country's economy has led to the need to protect IP from universities and put in place mechanism for commercialisation and this led to the emergence of entrepreneurial universities world-wide. Technology Transfer Offices (TTOs) have been established at universities and these TTOs are responsible for creating awareness of IP and transferring innovations from researchers at universities to the market-place (Walwyn, 2018; Abrams *et al.*, 2009; Leydesdorff and Meyer, 2006; Etzkowitz, 2003). In light of this, South African universities were mandated by the IPR-PFRD Act of 2008 to establish TTOs and UFH managed to establish its TTO which is referred to as the Innovation Office in 2015. Although the Innovation Office was established in 2015, an analysis of qualitative responses indicate that technology transfer activities had already started at UFH before the establishment of the dedicated office as UFH was part of the Eastern Cape (EC) Regional Technology Transfer Office together with Walter Sisulu University, Rhodes University (RU), Nelson Mandela Metropolitan University (NMMU). It has become important to analyse the practices of IP at UFH to understand if researchers are conducting research that has potential for commercialisation.

The researcher first asked the respondents if they were aware of the existence of the UFH IP policy document. An analysis of responses shows that the majority of respondents are not aware of the existence of such a policy at UFH. This is ample evidence of the need for more awareness initiatives at UFH. The UFH policy (2017, p. 3) states that "all interested parties at UFH are encouraged to familiarise themselves with this IP Policy and to ensure that all research and its associated activities that may give rise to IP are in compliance with this policy". The question that arises is how one can familiarise with the policy that is not readily available. The Innovation Office does not have a website where researchers can access the policy and it is also not available in printed version anywhere else even at the library. The statement also imply that it is the responsibility of researchers to familiarise with the policy yet there are upcoming researchers who are not well versed in IP issues and therefore would need the Innovation Office to take a proactive role and educate them. This implies that most researchers are not aware of the existence of the UFH IP policy.

The few respondents who were aware of the existence of the policy were asked to indicate their source of information and most of them indicated that their source of information was the IP awareness workshops hosted by the Innovation office. The respondents also agree that the interests of the inventors should be protected and as such an IP policy is relevant. The conclusion that can be drawn from these findings is that the UFH Innovation Office is the

major source of information to most respondents regarding the UFH IP policy and it is the responsibility of the office creating awareness about the policy. Titu *et al.,* (2018) adds that TTOs should raise awareness on the importance of IP and the protection of IP.

Regarding whether the Innovation Office has intangible IP products, the analysis indicated that the Innovation Office still in the process of commercialising products since the Office has been in existence for a few years. Some of the inventions that are in the process of being commercialised include the Sun wheel planter technology and Stress tolerant maize variety technology. They will soon be on the market and such innovations can be used as practical examples to motivate other researchers at University of Fort Hare to be innovative.

Innovation begins with research and UFH receives funding from the department of education to fund research activities since it is a public university. This implies that research at UFH should be prioritised since it can result in innovations. The institution already established an Innovation Office that is responsible for identifying potential innovations and facilitate the commercialisation of such innovations that emanate from publicly funded research. With regards to the Gross domestic expenditure on research and development (R&D) (GERD) (which is the total expenditure on R&D within a country), South Africa spends more money on R&D when compared with its African counterparts but when compared to the rest of world, developed countries such as United States and Japan spend more resources on R&D. It is, therefore, important for developing countries such as South Africa to increase their budget on R&D because researchers also conduct research that have commercialisation potential and some of the innovations are already in the market.

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5.5 Chapter summary

This chapter analysed, presented and interpreted collected data on intellectual property awareness among researchers guided by the research objectives. What can be noted is that the Innovation Office mainly utilises workshops to disseminate messages to the target audience, however, they also distribute materials such as booklets, and fliers which contain information on IP. The findings suggest that researchers generally have little knowledge on IP, but they have a positive attitude towards IP. The evidence from this study implies that it is difficult to suggest that communication activities have had an effect in increasing innovations at University of Fort Hare. The analysis however suggests that the Innovation Office has been playing an important role of creating awareness and educating researchers about the relevance of IP in research. The research highlights that UFH has an IP policy, but most

researchers are not aware of its existence thus, there is need for intensive awareness activities. The policy emphasizes the importance of rewarding researchers as an incentive for their innovation. South Africa should increase their spending on research and development (R&D) to encourage quality research that have commercialisation potential. The next chapter is therefore the last chapter of the study and it concludes the research by explaining how the set objectives were achieved, suggest recommendations, discusses the study limitations and suggest areas for further research.

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6. CHAPTER 6: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

6.1 Introduction

This is the last chapter of the study and the aim of the chapter is to summarise the findings of the study, to provide recommendations based on the findings and to make conclusions. It is of utmost importance to highlight that the significance of awareness activities in improving the knowledge, attitudes and practices of IP has long been recognised, the South African National Advisory Council on Innovation (NACI) (2012) reiterated the need for a paradigm shift in approaches to IP awareness strategies to protect the South African public investments in research and development. This is attributed to the problem that scientists and researchers have inadequate knowledge of IP and this has resulted in loss of potential benefits that could have been gained by the country from research outputs of publicly financed institutions (NACI, 2012). The paradigm shift is evidenced by new approaches that were adopted to increase IP awareness which include the establishment of the National Intellectual Property Management Office (NIPMO) in 2013 and Technology Transfer Offices (TTOs) at universities. The underlying assumption underpinning this paradigm shift is that previous awareness strategies did not yield meaningful results in terms of improving researchers' knowledge on IP. In light of this, University of Fort Hare also established its TTO, to give effect to the legislative requirement on creating awareness. This then raised the broader question on the effectiveness of the new approaches to create awareness and improve knowledge of IP. Therefore, this study provide answers to this question by analysing intellectual property awareness among researchers at University of Fort Hare, a comprehensive university located in the Eastern Cape province.

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The objectives of the study were as follows;

- To analyse communication strategies used by the Innovation Office to create awareness of intellectual property among researchers.
- To assess University of Fort Hare researchers' knowledge of intellectual property.
- To explore the attitude of University of Fort Hare researchers towards intellectual property.
- To explore the practices of intellectual property at University of Fort Hare.

To understand how the researcher achieved the above-mentioned objectives, a brief background of how the research was conducted is necessary. This study was conducted

between 2017 to mid-2020. The study sought to analyse IP awareness among researchers at UFH and the target population for this study was (i) researchers from the institution, the researchers comprise academic staff, and postgraduate students and (ii) key informants from Innovation office. Pragmatic paradigm informs this study and the researcher employed a mixed method design to collect and analyse data. Primary data was gathered using questionnaires and an interview. To selects the respondents, the researcher used purposive and convenience sampling methods; about 412 closed ended questionnaires were distributed to UFH researchers and about 390 questionnaires were returned. However, only 369 were suitable to use for analysis. Purposive sampling was used to select key informants, two key informants from the Innovation Office participated in the study. The researcher interviewed one key informant from the Innovation Office and used a qualitative questionnaire to collect data; the Innovation Office manager responded to the questionnaire.

Secondary data was gathered from materials collected from the Innovation Office and at IP awareness workshops such as booklets and fliers. The researcher also requested the UFH IP policy document from the Innovation Office and the document was send to the researcher through Electronic mail (Email). The researcher utilised thematic analysis to analyse qualitative data while Statistical Packages for Social Sciences (SPSS) was employed to analyse quantitative data in the form of descriptive statistics. Tables, pie charts and graphs were generated using Microsoft Excel and SPSS. The next section presents a summary of key research findings for the study.

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6.2 Discussion of Key Research Findings

This section discusses the key findings from the study with respect to the research objectives.

6.2.1 Communication strategies used to create awareness of intellectual property

The study sought to analyse communication strategies that were used to create awareness of intellectual property. The research findings show that the UFH Innovation Office in collaboration with NIPMO, an organisation that is responsible for assisting TTOs with funding and technical assistance when required and the Companies and Intellectual Property Commission (CIPC), an agency of the department of trade and industry which also creates awareness of IP and registration of IP and other stakeholders such as Adams and Adams, a law firm which constantly send its lawyers to present at IP workshops at UFH using various communication strategies to create awareness of intellectual property among researchers. The

Office hosts at least 3 (three) IP workshops each year, and other methods which include social media posts, email communication, distributing booklets and fliers that contain IP information, interactive discussions with IP experts, and small visits to faculty researchers, or research groups to conduct presentations on IP. Previous studies by (Tinao *et al.*, 2018; Popova & Nacka, 2017; Maritz, 2013; Villasenor, 2012; Gimenez, *et al.,* 2012; Ong *et al.,* 2012; Cheema *et al.,* 2011) shows that conducting workshops is the most effective method to create IP awareness among various publics including researchers across the globe. Likewise, the UFH Innovation Office followed that route as they are also a member of the World Intellectual Property Organisation (WIPO) which also guide member states on how to create IP awareness. However, there are other strategies can be used to create awareness. The findings also points to the fact that these strategies are not enough, the analysis shows that the Innovation Office has plans to create a LinkedIn page for spreading information about IP and they are considering radio interviews on the local community radio station, Forte FM to engage with the UFH research community.

An analysis of quantitative data indicated that the study respondents perceive researchers, scientists, engineers, students, lecturers and lawyers as the target audience for IP communication. The Innovation office's responses corroborate with the respondents' perspective, the office attests that they target all university researchers including students from all faculties in their awareness activities. This is attributed by the fact that anyone is capable of creating IP. Therefore, the target audiences were clearly defined because the workshops target researchers at a public institution that receive public funding since the IPR-PFRD Act of 2008 protects innovations from publicly funded research institutions in South Africa. Literature indicates that communication strategies depends on the type of awareness and the target audience for awareness, so to reach the target audiences and maximise the chances of success, communicators use different modes of communication that include but not limited to newspapers, posters, social networks such as Facebook, and Twitter, websites and traditional media i.e tv, radio, newspaper features, community-based outreach, making use of special events, and discussion groups (Rice & Atkin, 2013; Hunter, 2012; Wakefield *et al.,* 2010; Stephenson *et al.,* 2009; Rensburg & Cant, 2003; Coffman, 2002). Therefore, it is imperative for the Innovation Office to also engage with researchers on social media platforms since they are mostly used by the new generation which is also the target audience for IP communication. Online communication has also become vital especially in this period where the world is fighting coronavirus disease 2019 (COVID-19) and social distancing has

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become the order of the day. Thus, engaging with the audiences using social platforms is vital in the information age. In light of this discussion, the objective of this study was achieved as the communication strategies that are employed in IP awareness activities were highlighted and analysed.

6.2.2 University of Fort Hare researchers' knowledge of intellectual property

The study was set out to assess University of Fort Hare researchers' knowledge of intellectual property. An analysis of quantitative responses shows that the respondents generally lack knowledge of IP terminology that include patents, trade secrets, legal term, originality, rights, protection, design rights, ideas, plagiarism and creations. In addition, the findings indicate that respondents have knowledge of major intellectual property types such as copyright, patents and trademarks, trade secrets and industrial designs. Furthermore, the results show that the respondents are not familiar with most intellectual property legislative policy frameworks such as IP laws amendment Act 2013, Plant breeders' Act 15 of 1976, Designs Act 195 of 1993, Trademarks Act 194 of 1993, and the Patents Act 57 of 1978 but they are somewhat familiar with the IPR-PFRD Act (2008). Looking at the current situation at institutions of higher learning, it is evident that those institutions which did not have TTOs prior to the Act did not establish TTOs within the time frame of 12 months as stated in the Act (Chetty, 2010). Some of those institutions include University of Fort Hare and this explains why most researchers have inadequate knowledge on IP legislative frameworks including the IPR-PFRD Act of 2008 since the TTO was established in 2015 and the UFH policy became effective in 2017. The IPR-PFRD Act of 2008 is important as it protects innovations from publicly funded research and ensures that innovators are rewarded for their inventions. A conclusion that can be made is that UFH researchers have inadequate knowledge of intellectual property types and IP legislative frameworks.

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In addition, although the respondents have inadequate knowledge of intellectual property types and IP legislative frameworks, they agree that IP is important in several ways; it encourages innovation, it drives technological progress and economic growth, IP profits benefits local economies, creates jobs, IP deserves the same respect and protection as other tangible goods, strong IPR laws are needed to protect innovations. Having knowledge about IP is important for both citizens because there is ample evidence to support the need for researchers to have adequate knowledge on IP so that they are innovative and at the same time innovations benefit the country (Jajpura *et al.*, 2017; Boateng, 2015; Lakhan &

Khurana, 2007). Noar, (2006) adds that targeted and strategically executed communication strategies can have positive effects on the knowledge, and beliefs of the target audiences and that is important. Diffusion theory propounded by Rogers put forward the argument that behaviour change can be seen from how people respond to new ideas or to different ideas or behaviour being introduced (Rice & Atkin, 2013) and diffusion can assist in spreading ideas among researchers since they are potential adopters (those who attend IP workshops) who may influence other potential adopters to consider, valuing IP, the importance of innovations and to be part of change in developing innovations that will in turn be commercialised for the benefit of society. Diffusion in this case plays a role of spreading IP information. Considering the points discussed, it is possible to conclude that researchers at University of Fort Hare have inadequate knowledge of intellectual property types and IP legislative frameworks but they regard the protection of IP as important as it encourages innovation, it drives technological progress and economic growth and therefore strong Intellectual property rights (IPR) laws are needed to protect innovations.

6.2.3 The attitude of university of Fort Hare researchers towards intellectual property.

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One of the objectives of the research was to explore the attitude of researchers towards intellectual property. An analysis of responses from questionnaires indicate that the respondents are of the view that educating others about the importance of IP, attending IP awareness workshops, and sharing IP information through social media influences their attitude towards IP. The results suggest that most respondents agree that protecting IP is very important for the growth of the economy. The researcher also asked the respondents on whether the IP awareness workshops conducted by the Innovation Office changed their attitude and perceptions towards IP and the analysis of the results is indicative of the fact that most respondents specified that awareness workshops changed their attitude and perceptions towards IP.

However, measuring the effects of the awareness initiatives on the changes in audiences' knowledge, attitude and behaviour is not a simple process (Tench & Yoemans, 2009). Slater (1999) adds that using communication to change human behaviour is a huge challenge. Hence it is unrealistic to conclude that the changes in behaviour of the target audiences is entirely influenced by communication activities since there are many factors at play. It is very difficult to attribute social change to one intervention (Kinghorn, 2008) because there are many factors that can influence the attitude and behaviour of audiences. The statistics from

attendance registers of the UFH community that attend IP awareness workshops indicate that a lot of researchers attend the workshops and that is a positive feedback. This may imply that researchers generally have a positive attitude towards intellectual property. From the outcome of the investigation on whether IP awareness activities changed attitudes and perceptions about IP, it is possible to conclude that the workshops had an effect on the respondents' attitude and perceptions about IP.

6.2.4 The practices of intellectual property at University of Fort Hare

The study was set out to analyse the practices of intellectual property at University of Fort Hare. The University of Fort Hare has taken the entrepreneurial route by joining other South African universities in putting in place mechanisms for commercialisation by establishing a Technology Transfer Office (TTO) in 2015 (the UFH's TTO is referred to as an Innovation office). TTOs are responsible for transferring innovations to the marketplace (Walwyn, 2018; Abrams *et al.*, 2009; Leydesdorff & Meyer, 2006; Etzkowitz, 2003). An analysis of qualitative responses indicate that technology transfer activities had already started at UFH before the establishment of the dedicated office as UFH was formerly part of the Eastern Cape (EC) Regional Technology Transfer Office together with Walter Sisulu University, Rhodes University (RU), Nelson Mandela Metropolitan University (NMMU). After its establishment, the Office facilitated the creation of an institutional IP policy and the policy became effective in 2017. The analysis indicated that the majority of respondents are not aware of the existence of such a policy at UFH. This is a major setback in innovation as researchers should have adequate knowledge of IP, and how the instructional IP policy safeguards the interests of innovators and whether they are rewarded for their outputs. Another setback is that the Innovation Office does not have a website where researchers can access the policy and it is also not available in printed version anywhere else even at the library. The question that arises is how one can familiarise with the policy that is not readily available. Therefore, the Innovation Office should take a proactive role in educating researchers about the UFH IP policy and make the policy available at all University's communication platforms.

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An analysis of the UFH IP policy indicated that the policy covers inventions that can be registered and also non-registrable inventions, all forms of IP that include trademarks, trade secrets, designs, plan breeders' rights (UFH IP policy) and it is informed by the IPR-PFRD Act 51 of 2008 that protects IP from publicly funded institutions. When it comes to sharing

revenue, the UFH IP policy states that all the parties (the inventor/s, the faculty, the University and Innovation office) should be considered in the sharing of revenue generated from the commercialisation of IP (UFH IP policy, 2017). In terms of ownership of IP, the UFH IP policy states that the University retains ownership of IP created by both the University staff and registered students. However, there are exceptions that can be made, for instance, a provision is made in the IPR Act that IP can be co-owned if the research is conducted using the University's resources or if there is IP creation (UFH IP policy, p. 6). Gargate, and Jain, (2013) adds that for an IP policy to be effective, it should create an encouraging environment for Research and Development. The UFH policy rewards innovators and this creates a conducive environment for research and development. Although the University has an IP policy, there is no guarantee that it is being implemented. Thus, the Innovation Office is attesting to the fact that there are challenges that are faced in the implementation of the policy because of shortage of personnel.

An analysis of responses indicates that researchers at UFH are practicing IP as they are also conducting research that has commercial potential and the Innovation Office is still in the process of commercialising products since the Office has been in existence for a few years. Some of the inventions that are in the process of being commercialised include the Sun wheel planter technology and Stress tolerant maize variety technology. They will soon be on the market and such innovations can be used as practical examples to motivate other researchers at University of Fort Hare to be innovative. Conducting research impacts on the number of innovations that are registered at UFH and the number of such innovations with commercialisation potential. Innovation begins with research and UFH receives funding from the department of education to fund research activities since it is a public university. This implies that research at UFH should be prioritised since it can result in innovations. In addition, South Africa is currently ranked number 60 out of 131 countries on the 2020 Global Innovation Index (GII) (Dutta *et al.,* (2020). Therefore, UFH should play its role to contribute to improving innovation in South Africa. IP practises should be promoted at UFH by encouraging researchers to conduct research that has commercialisation potential.

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6.3 Conclusion to the study

This study contributes towards filling a knowledge gap, on the role that communication play in enhancing researchers' knowledge on IP. The Department of Trade and Industry, 2017, the draft IP policy phase 1 (one) echoes that to promote a better understanding of IP in the South

African community, it is vital to conduct a thorough research to understand opportunities and challenges presented by IP. A major baseline study was conducted on IP entitled "The South African Survey of Intellectual Property and Technology Transfer at Publicly Funded Research Institutions: Inaugural Baseline Study: 2008-2014". However, this study did not focus on a critical evaluation of the role played by universities in creating awareness, demonstrating a knowledge gap. In addition, this study is a first of its kind not only in the South African context but in Africa as well. Previous studies on intellectual property were conducted in developed countries leaving a knowledge gap in the global south. To bridge this knowledge gap, the researcher contributes to knowledge by achieving the set objectives.

The researcher sought to analyse communication strategies used in intellectual property awareness activities. The conclusion that can be drawn from findings on communication strategies used to disseminate IP messages is that the Innovation Office in collaboration with the Companies and Intellectual Property Commission (CIPC), National Intellectual Property Management Office (NIPMO) and Adams & Adams mainly use workshops as their communication tool. Therefore, this study has shown a reliance on workshops to communicate IP information with target audiences although other strategies such as IP presentations to faculty researchers, use of social media, distribution of IP booklets and fliers. The workshops are targeted at all researchers and students from all faculties, the Innovation Office is doing away with the general belief that IP is for lawyers and scientists, yet all disciplines are capable of generating IP.

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One of the objectives was aimed at assessing University of Fort Hare researchers' knowledge of intellectual property. As previously stated in chapter 1, conducting awareness activities at universities indicated a paradigm shift to new approaches to educate researchers on the importance of IP. A broader question was raised on the effectiveness of those new approaches in increasing awareness. Although the Innovation Office creates awareness of IP at UFH, the results of this study demonstrated that researchers still have inadequate knowledge on all forms of IP such as patents, trademarks, trade secrets and industrial designs and IP policy frameworks such as the IPR-PFRD Act including the UFH institutional IP policy. The researcher sought to explore the attitude of University of Fort Hare researchers towards intellectual property to determine the root cause of the setback. From the investigation, it is apparent that IP awareness activities did not completely change the attitudes and perceptions about IP, but most researchers are aware of the importance of IP to

the economy. The results are in line with the assumptions of diffusion of innovation theory, the theory explains that the second phase in diffusion is persuasion and, in this phase, an individual form a favorable or unfavorable attitude toward an idea. Therefore, in this case, after exposure to awareness messages, the researchers respond by forming an attitude towards IP. The evidence from this study implies that IP awareness activities had an effect on the researchers' attitude and perceptions about IP as the researchers perceive IP as important.

In relation to the intellectual property practices at University of Fort Hare, it is evident that UFH value IP and in responding to the requirements of the IPR-PFRD Act, of 2008, the university established its technology transfer office that is responsible for facilitation of commercialisation of research outputs and educating researchers about the importance of IP and the commercialisation process. There are about two innovations that are in the commercialisation process namely; the Sun wheel planter technology and Stress tolerant maize variety technology. Such innovations can be used as practical examples to motivate other researchers at University of Fort Hare to be innovative. In terms of research publications, the University is lowly ranked, there is need for improvement in research publications. Conducting research should be prioritised as innovations emanate from research findings. Knowledge generation is undeniably significant with regards to innovation, therefore, the relationship between research and commercialisation should be recognised to facilitate South Africa's transition from a resource based to a knowledge-based economy.

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Therefore, the findings from this study bridged the knowledge gap (identified in chapter 1) through tracking progress and providing empirical evidence on knowledge, attitudes and practices of IP at UFH. In addition, the study itself served as an IP awareness initiative at UFH. The study will in turn help policy makers in making an informed decision whether to find other strategies of increasing awareness to ensure that researchers are well informed about the importance of IP to their socio-economic wellbeing, the University and the economy of South Africa. Thus, the research also serves as a baseline study for the University and other audiences, by providing empirical evidence useful in making reflections on the success of the IP awareness initiatives and existing policies in institutions of higher learning.

To sum up the conclusion, the researcher suggests a conceptual model of innovation communication flow at higher education institutions. The model is presented in figure 6.1.

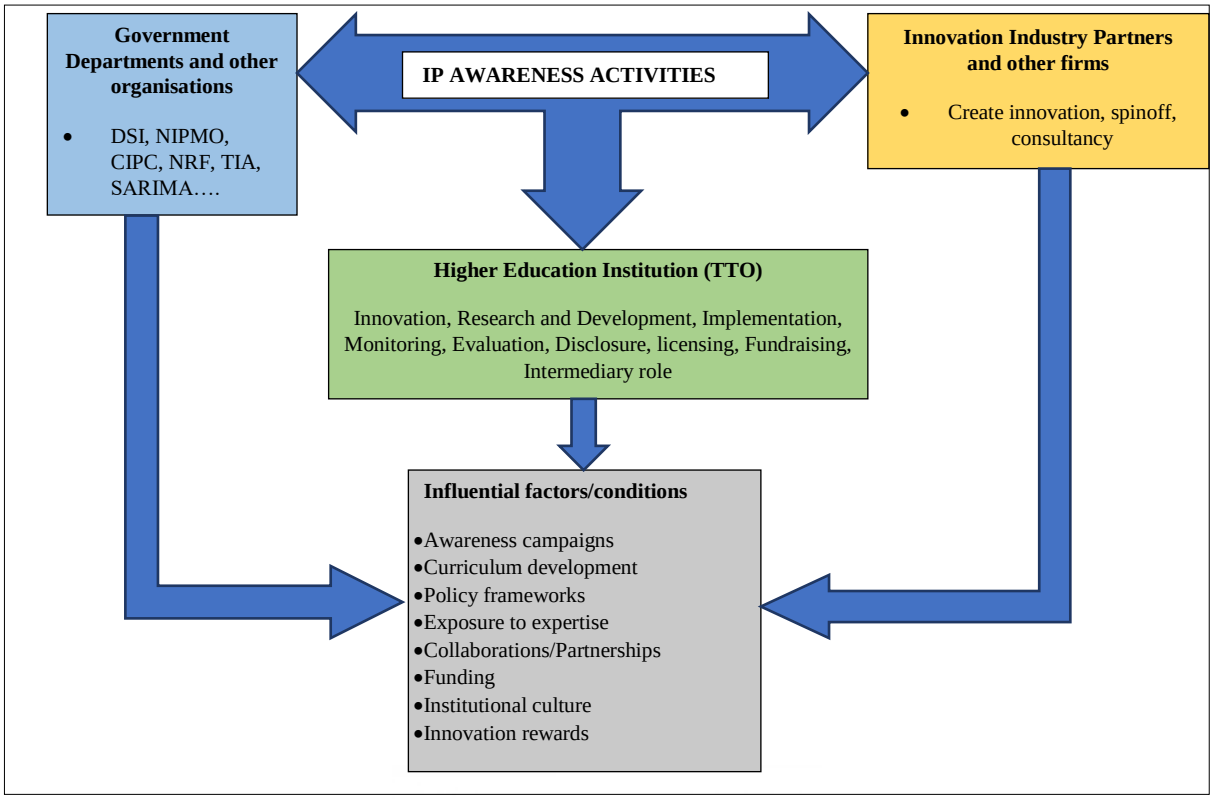

Figure 6.1 Conceptual model of innovation communication flow

Source: Author, 2020

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Figure 6.1 illustrates the role that should be played by various stakeholders in enabling a conducive environment for innovation to thrive at higher education institutions. IP awareness initiatives should take a centre stage as they play a pivotal role in educating researchers on the role and importance of intellectual property and its protection to individuals, the university and the economy. The government as a key stakeholder created an enabling environment for commercialisation by the establishment of the IPR-PFRD Act of 2008 which recognise the role of innovators and clearly stipulates that they should be rewarded for their innovations. The Act enabled the establishment of NIPMO which is the custodian of the Act and supports TTOs financially and improves the capacity of these TTOs. The CIPC also play a pivotal role as it collaborates with university TTOs, and of the government organisations such as NIPMO to create awareness. However, for the success of technology transfer at universities, there are influential factors (as shown of figure 6.1) that play a vital role. As stated before, the government, the higher education institution and the industry should ensure that all those conditions are met to facilitate the technology transfer process.

6.5 Recommendations

This section presents the recommendations that were drawn from the study conclusions.

6.5.1 The need to improve communication strategies

The study recommends that although the CIPC in collaboration with NIPMO and the UFH Innovation Office have been creating awareness of IP using mostly workshops as a tool to communicate with the target audience, there is need to integrate other communication platforms such as social media. The Innovation Office should create a website to enable researchers to access information related to IP and upcoming events will be advertised on the platform as well. There is need for the government to come up with other strategies to continue creating awareness. This is because countries with advanced IP systems such as the United States and Japan continues to create awareness of IP even though their researchers have been successful in registering university patents and many companies emerged as a result.

For awareness events to be effective, they should be characterised by the application of theories and models, laborious evaluation, messages crafted to address the objective of the event, broadcasting or dissemination of messages over sustained periods, and accompanied with persuasive incentives. The Innovation Office should therefore consider using ideas from communication models such as the "interactive communication model" which allows interaction between the communication planner and the audiences and the needs of the target audiences are placed at the centre of communication. Thus, it is imperative for communication activities to be carefully planned so that they are able to achieve the objectives of the planner.

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6.5.2 Intellectual property modules should be incorporated in the curriculum

The study also recommends the university and the government to consider incorporating IP modules in the curriculum of all disciplines from the social sciences, arts, health sciences, agriculture and even engineering so that every student or researcher has the knowledge of IP and how it affects people's lives. There is need to instil a culture of valuing innovations and creating innovations for the IP system to benefit the researchers themselves, the universities, the industry and the government at large.

6.5.3 The need for communicators to have evaluation tools

The study recommends communicators to develop a tool to evaluate their workshops from the onset so that they are able to improve the strategies they use and to ensure that they are reaching the intended audience and have an impact on the audiences.

6.5.4 The government should increase expenditure on Research and Development

With regards to the Gross domestic expenditure on research and development (R&D) (GERD) (which is the total expenditure on R&D within a country), South Africa spends more money on R&D compared with its African counterparts but when compared to the rest of world, developed countries such as United States, Germany and Japan spend more resources on R&D. It is, therefore, important for developing countries such as South Africa to increase their budget on R&D to increase research incentives to encourage researchers to conduct research that have commercialisation potential.

6.6 Limitations of the study

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There were a few limitations faced by the researcher. One of the limitations was the issue of language. The researcher is not really familiar with the dominant IsiXhosa language spoken by most of the participants. The researcher solved this by seeking help and was assisted by two research assistants who are fluent in IsiXhosa. The researcher had initially scheduled a second interview with one key informant from the Innovation Office but it was cancelled. Due to the spread of Corona Virus, gatherings were prohibited, as a result, UFH campuses were closed and communication was only possible through online interaction. The researcher had to devise other strategies for collecting qualitative data, as a result, the researcher alternatively used a qualitative questionnaire to gather data. The researcher resorted to using Electronic Mail (Email) to send a qualitative questionnaire to the key informant from the Innovation Office to complete; the key informant completed the questionnaire and emailed it back. The other limitation is of the scarcity of literature on studies on researchers' knowledge of IP, to deal with this challenge, the researcher instead reviewed literature on IP awareness activities. In addition, the researcher faced challenges in accessing literature on IP awareness case studies especially African case studies as most African countries are not well versed in IP issues and few articles with limited data are available. The other challenge was of communicating with those who deal with IP awareness at the CIPC and at NIPMO they were

unresponsive to emails and telephone calls; this was difficult since the researcher could not afford to travel to their offices to make an appointment since the research is self-sponsored.

6.7 Areas for future research

The researcher recommends that there is still scarcity of studies on researchers' knowledge of IP especially in the global south. Therefore, a similar study can be done on the role that these awareness activities play in changing behaviours of researchers in the African context. In addition, more studies can be conducted on technology transfer activities at universities in South Africa. Research can also be conducted to explore the knowledge that researchers at all South African universities have on IP, comparisons can be made between historically black universities and traditional universities that have been practising IP for a long time. This will highlight areas that need improvement.

6.8 Chapter summary

This is the last chapter of the study and the aim was to provide a summary of research findings guided by the study objectives. The chapter highlighted how the researcher achieved the set objectives of the study. Conclusions were made and the researcher suggested recommendations to improve IP communication strategies. In addition, limitations of the study were outlined and measures that the researcher took to address the limitations were stated. The last section of the chapter presented the proposed study areas for future research on analysing communication activities of TTOs and IP practices at universities.

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Appendix 1: Ethical clearance certificate

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ETHICS CLEARANCE
REC-270710-028-RA Level 01

Project Number:	OSU031SMOW01
Project title:	**An evaluation of Intellectual Property awareness campaigns at University of Fort Hare, Alice Campus.**
Qualification:	PhD in Communications
Principal Researcher:	Betina Mawokomayi
Supervisor:	Prof O.O. Osunkunle
Co-supervisor:	N/A

On behalf of the University of Fort Hare's Research Ethics Committee (UREC) I hereby grant ethics approval for OSU031SMOW01. This approval is valid for 12 months from the date of approval. Renewal of approval must be applied for BEFORE termination of this approval period. Renewal is subject to receipt of a satisfactory progress report. The approval covers the undertakings contained in the above-mentioned project and research instrument(s). The research may commence as from the 13/11/19, using the reference number indicated above.

Note that should any other instruments be required or amendments become necessary, these require separate authorisation.
Please note that the UREC must be informed immediately of

- Any material changes in the conditions or undertakings mentioned in the document;

- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research.

The Principal Researcher must report to the UREC in the prescribed format, where applicable, annually, and at the end of the project, in respect of ethical compliance.

The UREC retains the right to

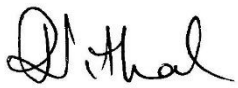
- Withdraw or amend this approval if
  - Any unethical principal or practices are revealed or suspected;
  - Relevant information has been withheld or misrepresented;
  - Regulatory changes of whatsoever nature so require;
  - The conditions contained in the Certificate have not been adhered to.

- Request access to any information or data at any time during the course or after completion of the project.

Your compliance with DoH 2015 guidelines and other regulatory instruments and with UREC ethics requirements as contained in the UREC terms of reference and standard operating procedures, is implied.

The UREC wishes you well in your research.

Yours sincerely



Professor Renuka Vithal
UREC-Chairperson
13 November 2019

Appendix 2: Letter requesting for permission to conduct interviews

Ms Mawokomayi
University of Fort Hare
Faculty of Social and Human Sciences
Department of Communication
Private Bag X1314
Alice, 5700

2 March 2020

The Innovation Office manager
University of Fort Hare
Private Bag X1314
Alice, 5700

Dear Sir/Madam

University of Fort Hare
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RE: REQUEST FOR PERMISSION TO CONDUCT INTERVIEWS AT THE INNOVATION OFFICE

I am a Ph.D in Communication student at the University of Fort Hare under the department of Communication. I am conducting a research entitled "**An analysis of Intellectual Property awareness among researchers at University of Fort Hare, Alice**". I kindly request your permission to conduct interviews with key informants which includes the Innovation Office manager and an IP officer. The interviews will be recorded and they are to be carried out only once.

I am looking forward to a positive response.

Supervisor: Dr Osunkunle

Yours faithfully,

Mawokomayi Betina.

Appendix 3: Research confidentiality and informed consent form

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Ethics Research Confidentiality and Informed Consent Form

I, Mawokomayi Betina, a Ph.D student in the Department of Communication at the University of Fort Hare is conducting a research entitled "An analysis of intellectual property awareness among researchers at University of Fort Hare".

Please understand that you are not being forced to take part in this study and the choice on whether to participate or not is sorely up to you. If you decide not to take part in this survey, you will not be affected in any way. If you decide to participate and, in the end, decide not to continue responding to the questionnaire, there will also be no penalties and you will NOT be prejudiced in ANY way. Confidentiality will be observed professionally.

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I will not be recording your name anywhere on the questionnaire and no one will be able to link you to the answers you give. Only the researchers will have access to the unlinked information. The information will remain confidential and there will be no "come-backs" from the answers you give. If possible, once I have completed this study, I will try to inform you of what the results are and discuss my findings and proposals around the research and what this means to the community at large.

INFORMED CONSENT

I hereby agree to participate in research entitled "An evaluation of Intellectual Property awareness at University of Fort Hare"

I understand that I am participating freely and without being forced in any way to do so.

I also understand that I can stop this interview at any point should I not want to continue, and that this decision will not in any way affect me negatively.

I understand that this is a research project whose purpose is not necessarily to benefit me personally.

I have received the telephone number of a person to contact should I need to speak about any issues which may arise in this interview.

I understand that this consent form will not be linked to the questionnaire, and that my answers will remain confidential.

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I understand that if possible, feedback will be given to my community on the results of the completed research.

……..

Signature of participant **Date**:……..

I hereby agree to the tape recording of my participation in the study

……..

Signature of participant **Date**:……..

Appendix 4: Questionnaire for the Innovation Office manager

Section A: Introduction (Information about the role of the Innovation Office)

1. When was the office established at UFH?

2. Why was the office established?

3. Where does the funding come from?

4. What languages do you publish your brochures in?

5. Who is responsible for creating awareness? Is it the Innovation Office or NIPMO?

6. Who arranges the campaigns?

7. Are the campaigns a once off activity or they are continuous?

8. Do you also use other platforms to get the message across? e.g social media

Section B: Communication strategies used to promote the IP awareness campaigns

9. What is the relevance of knowing about IP?

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10. Which modes of communication are used to create awareness of IP?

11. Whom do you think should be the target audience for IP communication?

12. Do you think the Innovation Office or the government is doing enough to spread the information about IP?

13. Do you think the current methods of IP communication are effective i.e. the IP campaigns? Do you think researchers have adequate knowledge on IP because of the campaigns?

Section C: IP policy practice at UFH

14. Which regulations guide IP in universities?

15. Who developed the UFH IP policy?

16. Is the UFH IP policy beneficial to the creators?

17. Is the policy easy to understand?

18. Do you think that the policy is being put in practice at UFH?

19. Have you identified any changes in knowledge and in interest among researchers as a result of the campaigns?

20. Are there any inventions or innovations that have been developed by researchers at UFH? If they are there, which ones and at what stage of commercialisation are they at?

21. Are there any inventions that were done by postgraduate students on their own or lecturers on their own?

22. If you have any statistics on the inventions, or workshop attendance or research publications or any documents that I can use in my research, I would appreciate it.

23. What other issues of relevance do you want to bring to my attention?

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Appendix 5: Interview guide

Section A: Introduction (Information about the office)

1.When was the office established at UFH?

2. Why was the office established?

3. Where does the funding come from?

4. What languages do you publish your brochures in?

5. What is the relevance of knowing about IP?

6. Which modes of communication are used to create awareness of IP?

7. Whom do you think should be the target audience for IP communication?

8. Do you think the Innovation Office or the government is doing enough to spread the information about IP?

9. Do you think the current methods of IP communication are effective i.e. the IP campaigns?

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Appendix 6: Questionnaire for researchers

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QUESTIONNAIRE FOR RESEARCHERS Questionnaire number

My name is Mawokomayi Betina, a PhD in Communication student in the Faculty of Human and Social sciences at University of Fort Hare. I am undertaking a research entitled "**A critical analysis of intellectual property awareness campaigns at University of Fort Hare, Alice, South Africa**". This study is being conducted because it is a requirement to complete a PhD in Communication. I humbly request, for your objective assistance by completing this questionnaire. Your responses will be solely used for academic purposes only and information collected will be treated with utmost confidentiality.

Instruction: Please complete the following questions by **ticking** [✓] or [✗] **cross** on your response.

SECTION A: DEMOGRAPHIC INFORMATION

1.Gender

1	Male		2	Female	

2.Age group

1	18-25		2	26-35		3	36-45		4	46-55		5	56 +	

3. What is your affiliation?

1	Lecturer		2	PhD student		3	Masters student		4	Honours student	

SECTION B: KNOWLEDGE ABOUT INTELLECTUAL PROPERTY

4. Indicate your level of awareness of the terms below in relation to "intellectual property"
Use the following scale to answer question 4

1= not aware	2= Slightly aware	3= Somewhat aware	4= Moderately aware	5= Extremely aware

1	Patents	1	2	3	4	5
2	Trade secrets	1	2	3	4	5
3	Legal term	1	2	3	4	5
4	Originality	1	2	3	4	5
5	Rights	1	2	3	4	5
6	Ideas	1	2	3	4	5
7	Copyright	1	2	3	4	5
8	Licencing	1	2	3	4	5
9	Protection	1	2	3	4	5
10	Creations	1	2	3	4	5
11	Design rights	1	2	3	4	5
12	Trademarks	1	2	3	4	5
13	Plagiarism	1	2	3	4	5

Use the following scale to answer question 5 and 6

1= strongly disagree	2= disagree	3= neutral	4= agree	5= strongly agree

5. To what extent do you agree or disagree that knowing about Intellectual Property (IP) helps with the following?

1	To gain recognition for my ideas	1	2	3	4	5
2	To reference correctly	1	2	3	4	5
3	To allow me to exploit my ideas	1	2	3	4	5
4	To ensure that others gain recognition for their ideas	1	2	3	4	5
5	To enable me to educate others about the importance of IP	1	2	3	4	5
6	Other reasons, (specify) …	1	2	3	4	5

6. To what extent do you agree with the following statements with regards to the relevance of IP?

1	It is important for innovators to be rewarded because it encourages innovation	1	2	3	4	5

2	IP drives technological progress and economic growth	1	2	3	4	5
3	IP profits benefit local economies	1	2	3	4	5
4	IP creates jobs	1	2	3	4	5
5	IP encourages creativity	1	2	3	4	5
6	IP deserves the same respect and protection as other tangible goods	1	2	3	4	5
7	SA government should be proactive in educating people about the need to respect IP	1	2	3	4	5
8	Strong IPR laws are required to protect innovators	1	2	3	4	5
9	Other reasons, (specify) …	1	2	3	4	5

Use the following scale to answer the following question

1= not at all familiar	2= Slightly familiar	3= Somewhat familiar	4= Moderately familiar	5= Extremely familiar

7. How familiar would you say you are with the following types of Intellectual Property protection?

1	Copyrights	1	2	3	4	5
2	Patents	1	2	3	4	5
3	Trademarks	1	2	3	4	5
4	Trade secrets	1	2	3	4	5
5	Industrial designs	1	2	3	4	5
6	Other reasons, (specify) …	1	2	3	4	5

Use the following scale to answer the following question

1= not at all familiar	2= Slightly familiar	3= Somewhat familiar	4= Moderately familiar	5= Extremely familiar

8. How familiar are you with the following Intellectual property legislative policy frameworks in SA?

1	Intellectual Property Rights from Publicly Financed Research and Development Act, 2008 (IPR-PFRD Act)	1	2	3	4	5
2	IP Laws amendment Act 2013	1	2	3	4	5
3	Copyright Act 98 of 1978	1	2	3	4	5
4	Plant breeders' rights Act of 1976	1	2	3	4	5
5	Designs Act 195 of 1993	1	2	3	4	5
6	Trademarks Act 194 of 1993	1	2	3	4	5
7	Patents Act 57 of 1978	1	2	3	4	5

SECTION C: ATTITUDE OF RESEARCHERS TOWARDS INTELLECTUAL PROPERTY

Use the following scale to answer question 9

1=strongly disagree	2=disagree	3=neutral	4=agree	5=strongly agree

9. To what extent do you agree that the following enhances researchers' attitude in relation to IP?

1	Attending IP awareness workshops	1	2	3	4	5
2	Reading or studying IP pamphlets	1	2	3	4	5
3	Educating others about the importance of IP	1	2	3	4	5
4	Reading the UFH IP policy	1	2	3	4	5
5	Sharing IP information through social media	1	2	3	4	5
6	Others, (specify) …	1	2	3	4	5

10. To what extent do you think it is important to protect intellectual property rights?

1	extremely important	

2	very important	
3	Moderately important	
4	Slightly important	
5	not at all important	
6	Other reasons, (specify) …	

SECTION D: COMMUNICATION STRATEGIES USED TO PROMOTE THE IPR AWARENESS CAMPAIGNS

11. Which modes of communication were used to create awareness of IP at Fort Hare?

	Modes of communication	Yes	No
1	Workshops		
2	IP material		
3	Newspapers		
4	Social media		
5	Other reasons, (specify) …		

Use the following scale to answer question 12 and13

1=strongly disagree	2=disagree	3=neutral	4=agree	5=strongly agree

12. To what extent do you agree that the following modes of communication are more effective in creating awareness of IP?

1	Workshops	1	2	3	4	5
2	Magazines	1	2	3	4	5
3	Radio	1	2	3	4	5
4	TV	1	2	3	4	5
5	Social media	1	2	3	4	5
6	Other reasons, (specify) …	1	2	3	4	5

13. To what extent do you agree that the following attributes are necessary to achieve a successful IP awareness campaign?

1	Writing clear and meaningful messages	1	2	3	4	5
2	Targeting relevant audiences	1	2	3	4	5
3	Maximizing media exposure	1	2	3	4	5
4	Communicating the negative consequences of not knowing about IP	1	2	3	4	5
5	Communicating the positive rewards of knowing about IP	1	2	3	4	5
6	Other reasons, (specify) …	1	2	3	4	5

14. Whom do you think should be the target audience for IP communication

	Target audience	Yes	No
1	Researchers		
2	Scientists		
3	Engineers		
4	Students		
5	Lecturers		
6	Lawyers		
7	All members of the university		

15. Do you think the government is doing enough to spread the information about IP?

1	Yes		2	No	

16. What other strategies do you think can be employed to enhance IP awareness?.....

SECTION D: PRACTICES OF IP POLICY AT UFH

17. Are you aware of the UFH IP policy document?

1	Yes	
2	No	

18. If the answer is YES, where did you hear about the Policy?

		Yes	No
1	Other Lecturers		
2	Students		
3	UFH Innovation office		
4	Workshops		
5	UFH website		
6	Other, (specify) …		

19. If the answer is NO, whom do you think is responsible for creating awareness of the Policy?

		Yes	No
1	Other Lecturers		
2	Students		
3	UFH Innovation office		
4	NIMPO/Government		
5	UFH website		
6	Other, (specify) …		

20. To what extent do you agree that the following are the reasons for creating an intellectual property policy?

Use the following scale to answer question 20

1=strongly disagree	2=disagree	3=neutral	4=agree	5=strongly agree

1	To protect the interests of inventors	1	2	3	4	5
2	To protect the interests of the country	1	2	3	4	5
3	To protect the interests of the university	1	2	3	4	5
6	Other reasons, (specify) …	1	2	3	4	5

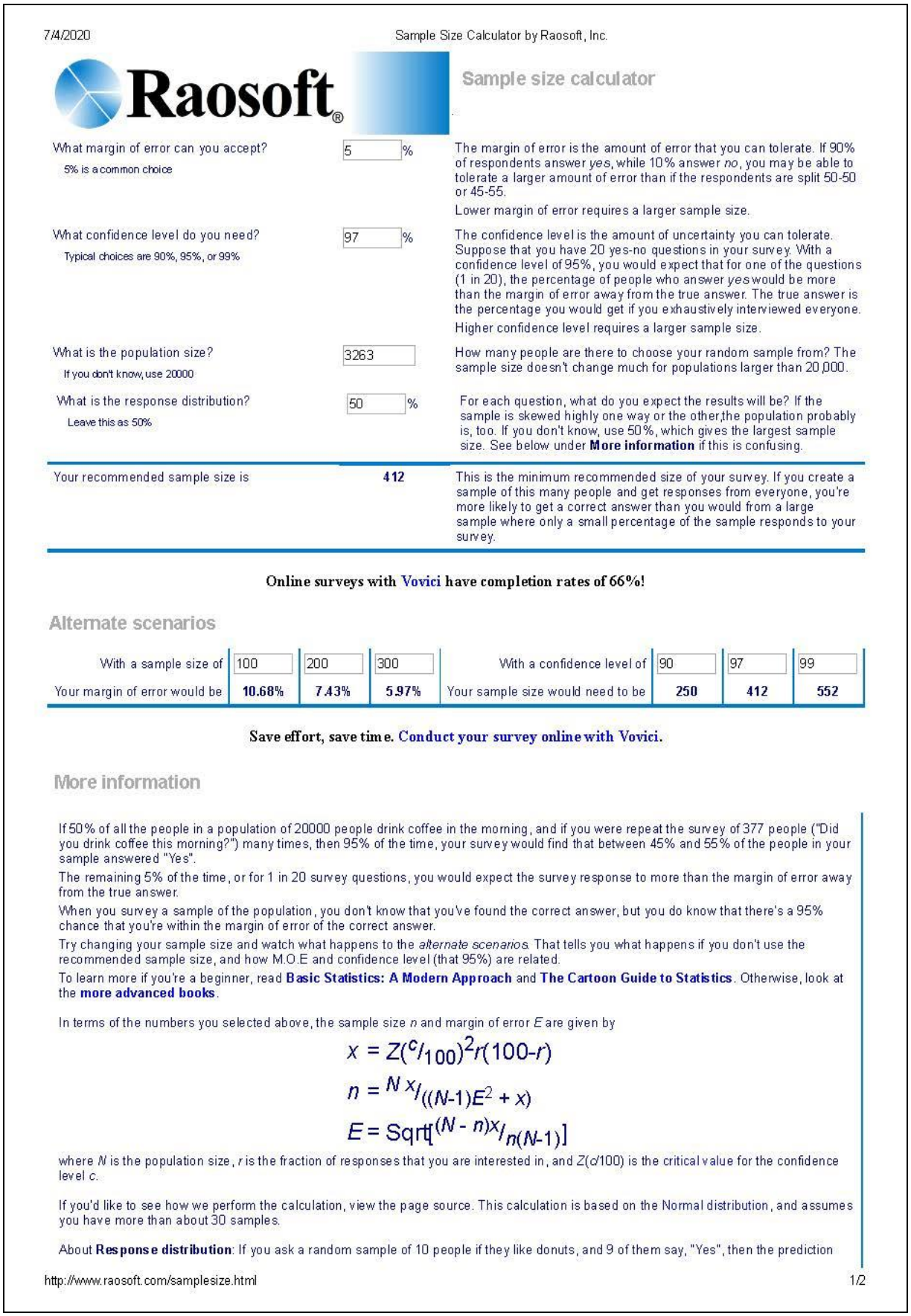
21. Are there any inventions or innovations that you have developed/ you are developing?

.....

22. Do you have other relevant issues that you would want to bring to my attention?

.....

Appendix 7: Raosoft sample size calculator



7/4/2020 Sample Size Calculator by Raosoft, Inc.

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Sample size calculator

What margin of error can you accept? 5% is a common choice	5 %	The margin of error is the amount of error that you can tolerate. If 90% of respondents answer *yes*, while 10% answer *no*, you may be able to tolerate a larger amount of error than if the respondents are split 50-50 or 45-55. Lower margin of error requires a larger sample size.
What confidence level do you need? Typical choices are 90%, 95%, or 99%	97 %	The confidence level is the amount of uncertainty you can tolerate. Suppose that you have 20 yes-no questions in your survey. With a confidence level of 95%, you would expect that for one of the questions (1 in 20), the percentage of people who answer *yes* would be more than the margin of error away from the true answer. The true answer is the percentage you would get if you exhaustively interviewed everyone. Higher confidence level requires a larger sample size.
What is the population size? If you don't know, use 20000	3263	How many people are there to choose your random sample from? The sample size doesn't change much for populations larger than 20,000.
What is the response distribution? Leave this as 50%	50 %	For each question, what do you expect the results will be? If the sample is skewed highly one way or the other,the population probably is, too. If you don't know, use 50%, which gives the largest sample size. See below under **More information** if this is confusing.
Your recommended sample size is	**412**	This is the minimum recommended size of your survey. If you create a sample of this many people and get responses from everyone, you're more likely to get a correct answer than you would from a large sample where only a small percentage of the sample responds to your survey.

Online surveys with Vovici have completion rates of 66%!

Alternate scenarios

With a sample size of	100	200	300	With a confidence level of	90	97	99
Your margin of error would be	**10.68%**	**7.43%**	**5.97%**	Your sample size would need to be	**250**	**412**	**552**

Save effort, save time. Conduct your survey online with Vovici.

More information

If 50% of all the people in a population of 20000 people drink coffee in the morning, and if you were repeat the survey of 377 people ("Did you drink coffee this morning?") many times, then 95% of the time, your survey would find that between 45% and 55% of the people in your sample answered "Yes".

The remaining 5% of the time, or for 1 in 20 survey questions, you would expect the survey response to more than the margin of error away from the true answer.

When you survey a sample of the population, you don't know that you've found the correct answer, but you do know that there's a 95% chance that you're within the margin of error of the correct answer.

Try changing your sample size and watch what happens to the *alternate scenarios*. That tells you what happens if you don't use the recommended sample size, and how M.O.E and confidence level (that 95%) are related.

To learn more if you're a beginner, read **Basic Statistics: A Modern Approach** and **The Cartoon Guide to Statistics**. Otherwise, look at the **more advanced books**.

In terms of the numbers you selected above, the sample size n and margin of error E are given by

$$x = Z(^{c}/_{100})^{2} r(100-r)$$

$$n = {}^{N\,x}/_{((N-1)E^{2} + x)}$$

$$E = \mathrm{Sqrt}[{}^{(N - n)x}/_{n(N-1)}]$$

where N is the population size, r is the fraction of responses that you are interested in, and $Z(c/100)$ is the critical value for the confidence level c.

If you'd like to see how we perform the calculation, view the page source. This calculation is based on the Normal distribution, and assumes you have more than about 30 samples.

About **Response distribution**: If you ask a random sample of 10 people if they like donuts, and 9 of them say, "Yes", then the prediction

http://www.raosoft.com/samplesize.html 1/2

that you make about the general population is different than it would be if 5 had said, "Yes", and 5 had said, "No". Setting the response distribution to 50% is the most conservative assumption. So just leave it at 50% unless you know what you're doing. The sample size calculator computes the critical value for the normal distribution. Wikipedia has good articles on statistics.

How do you like this web page? ○ Good as-is ○ Could be even better

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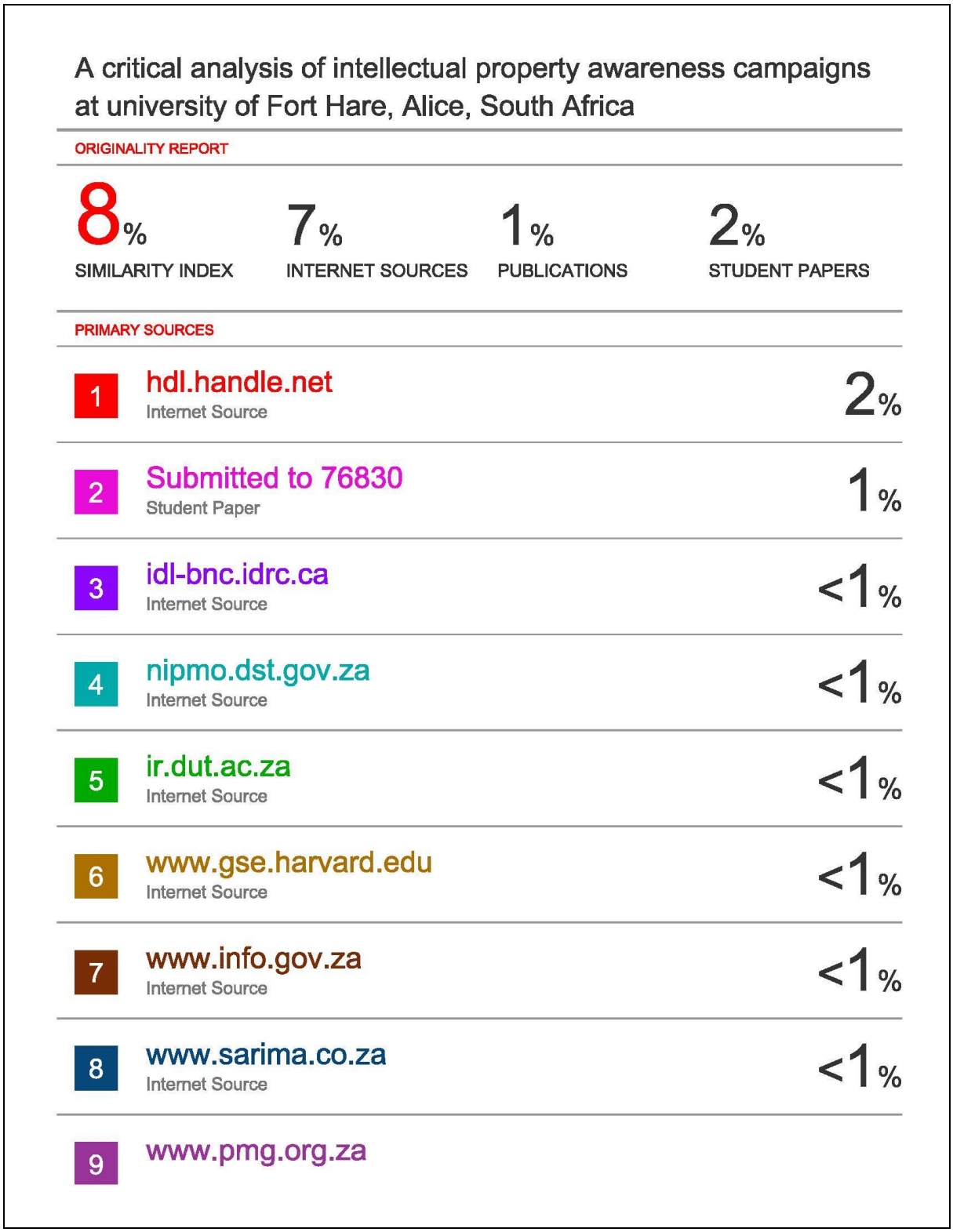
Appendix 8: Turnitin report



A critical analysis of intellectual property awareness campaigns at university of Fort Hare, Alice, South Africa

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Appendix 9: Editing Letter

moreblessing.moffat@gmail.com

Date: 26/03/2021

RE: TO WHOM IT MAY CONCERN

This letter serves to confirm that I have edited the thesis titled:

An analysis of intellectual property awareness among researchers at University of Fort Hare, Alice, South Africa

By

Mawokomayi Betina

Student No: 201608375

I carefully read through the thesis, focusing on grammatical errors and spelling mistakes.

Please do not hesitate to contact me for any queries.

Yours Sincerely,

Mr. Frank Moffat

PhD Candidate, University of Venda, South Africa

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March 26, 2021

University of Fort Hare

This letter serves as an editing certificate for **Betina Mawokomayi (201608375)** for the thesis title: **"An analysis of intellectual property awareness among researchers at University of Fort Hare, Alice, South Africa."** Having received the work for editing, we have identified and corrected all grammatical and technical errors in the thesis and we certify it free of errors.

Yours faithfully

M. Gunduza
Publisher/Editor