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Patent Protection Trend by Local Inventors in Rwanda

BY

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A DISSERTATION/THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN INTELLECTUAL PROPERTY IN THE COLLEGE OF BUSINESS, PEACE, LEADERSHIP AND GOVERNANCE

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Abstract

Patent application and granting in Rwanda is considered among the key elements to achieve a knowledge-based economy. However, there is no data regarding the trend of filing patent applications and the volume of patent grants to local inventors. To understand this phenomenon an explanatory research design was conducted from the population of local inventors in Rwanda. Secondary data from Intellectual Property Office (IPO) in Rwanda comprised of 28 inventors who filled their patent applications from 2014 to 2019 was maintained as the sample size. Suggestions to improve the number of the patent grant and the factors associated with patent grant were also investigated. The results have shown an increase of 7% in patent applications from 2014 to 2019, and an increase of 1 patent grant per year. To further improve this positive trend, inventors have suggested regular training in IP and initiation of IP fund by the Government. The IP Fund should address the low quality of patent applications by assisting inventors with low financial capabilities to hire IP experts to prepare and file their patent applications. The study suggests intensive capacity building for the benefit of local inventors in IP to improve their know-how and financial resources required to make a patentable product.

Key words: Intellectual property, Local inventors, patent applications, patent grant, Rwanda

Declaration page

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

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Dedication

This work is dedicated to my ever caring and lively wife Dr Madeleine Mukeshimana. Thank you for the support.

List of acronyms and Abbreviations

RDB	Rwanda Development Board
IPO	Intellectual Property Office
IP	Intellectual Property
WIPO	World Intellectual property Organization
ARIPO	Africa Regional Intellectual Property Organization
TRIPS	Trade Related Aspects of Intellectual Property Rights
PCT	Patent Corporation Treaty
R&D	Research and Development
RG	Registrar General
SMEs	Small and Medium Enterprises

List of Appendices

Table of Contents

List of Tables

List of figures

CHAPTER 1 INTRODUCTION

1.1 Introduction

Rwanda has enacted intellectual property law (Law on the protection of intellectual property, 2009) and policy instrument (Revised policy on the protection of intellectual property, 2018) that protect intellectual property and safeguard the interests of inventors. Also, Rwanda is a member of the Africa Regional Intellectual Property Organization (ARIPO) (Law authorizing the accession of Rwanda to the African regional intellectual property organization, 2010), and the World Intellectual property Organization (WIPO). Moreover, Rwanda has ratified different international instruments related to intellectual property such as the Patent Cooperation Treaty (PCT) and the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS Agreement). Furthermore, application for patent protection is facilitated by the Intellectual Property Office (IPO) under the Rwanda Development Board (RDB) (Law establishing Rwanda Development Board, 2008). Although a lot has been done in the field of intellectual property, the number of patents by local inventors is still low. This study investigated the trends of patent protection by local inventors in Rwanda between 2014 and 2019. The levels of patent grant, rejection of the patent application, and factors for patent grant and rejection of patent application were investigated.

This study was conducted by collecting secondary data from IPO in RDB and field interviews from local inventors who filed the patent applications in IPO between 2014 and 2019. The low number of patent grant for local applicants was attributed to two factors: a) a low number of inventors who can hire IP Professional to prepare and file a

complete patent application document b) high levels of rejection of patent application due to the lack of knowledge and financial capacities of inventors to prepare a good patent application document.

This chapter discusses the background of the study, the statement of the problem and the objectives of the study. Also, a research question and hypothesis of the study are presented. Moreover, details on the justification of the research, delimitation and limitation are discussed.

1.2 Background of the study

In Rwanda filing a patent application is done by the applicant to the Intellectual Property Office (IPO) which is functioning under the Rwanda Development Board (RDB). According to Article 23 of the Law on the Protection Intellectual Property of 2009 in Rwanda, an applicant must prepare an application that contains a patent grant request letter, a detailed description of the invention, claims, drawings if applicable and an abstract, and proof of filing fee. These requirements for patent applications are in line with the reference established by the roadmap to patent (European Patent Office, 2018).

After receiving a complete patent application document, the receiving office assigns a filing date to the application and checks if all the application requirements are complete. Then, if any requirement is missing, the applicant is invited within 7 days following the receipt of the application to correct. Furthermore, Article 33 of the IP law of Rwanda indicates that the receiving office conducts the formality examination and makes decisions based on the patentability criteria, exclusions from patentability, and clear disclosure of the invention and the claims on the novelty. World Intellectual Property

Organization (WIPO) (2004) has shown that an invention is protected by a patent if it meets the patentability criteria of being a patentable subject matter, involves inventive steps, industrial applicability, new and sufficient disclosure. Also, Article 27 (3) of the TRIPS agreement (1994) contains the provisions that member states must consider as the exclusions from patentability. Those non-patentable subject matters include discoveries of existing products in nature, plants, animals, the production of human and animals by biological techniques, methods of playing games or doing business, diagnostic or treatment methods conducted on animal or human beings, mental performances, and inventions which are contrary to the public order. However, the receiving office may decide to conduct a substantive examination taking into account the related international or specialized agency search report. The decision for examination is in line with WIPO (2004), which indicated that the grant or refusal of a patent on the invention can be done under formality or substantive examination.

Article 34 of the IP law of Rwanda provides that if the requirements for a grant of the patent are satisfied, a patent is recorded in the patent register, the patent grant certificate is offered to the applicant, and the reference number and abstract are made available to the public. However, Article 34 (4°) indicates that a full patent document is not publicly disclosed and that the third party willing to have a copy of the patent is subject to the payment of fees. The rights granted for a patent are territorial. This means that if the right holder wants to have protection in more than one country, he must file the patent applications in an individual country or file international protection through the Patent Cooperation treaty (PCT) and get protection in member countries. A patent is protected

for a fixed 20 year period from the filing date and that period is subject to the maintenance fees paid after every 5 years (Anetta, 2020).

Article 28 (1) of Agreement on Trade-Related Aspects of Intellectual property (TRIPS Agreement) (1994) indicates the right holder has exclusive rights to prevent others from using, selling, importing, offering for sale and making the product of patented invention without his consent, and also, the rights to decide in case of transferring or assigning the rights to the third party and licensing of the patent. Goans (2003) indicated that the protection of invention promotes domestic innovation and boosts economic development. Ilie (2014) also agrees that the rights granted by intellectual property protection give the right holder a return on investment which outweighs the cost invested in making the product available to the users. The protection of intellectual property rights by the patent is an important step for an inventor whose knowledge, effort and investment for technical information disclosure deserve a reward (Jolly, Fletcher, & Bourne, 2012). Also, Himma & Tavani (2008) argue that the absence of the right to intellectual property works strengthens the free riders and jeopardizes inventors' incentives on their works.

Khachatryan & Muehlmann (2017) analysed the factors that determine the successful patent application. The data was collected from the United States Patent and Trademark Office (USPTO), and the variables were granted patents and rejected patents applications. The variables studied were, respectively, filing date, inventor's details, the title of the invention, abstract, description part, drawings, claims, related prior art of the work either still protected or in the public domain. Moreover, the variables such as information on the assignees, international classification number and designated

countries were studied. The findings indicated that a good patent draft document, drawings, reference to the prior art in the public domain, the relationship of the application to the non-patent prior art, and the power of patent agent or attorney to support the patent applications are determining factors to achieve a successful patent application protection.

On the subject of patent application rejection, Lin & Wang (2013) examined the United States Supreme ruling on the KSR International Co. v's case. The case related to the obviousness and non-obviousness of the claimed invention in the Biotechnology patents. The Chi-square test confirmed the significance of the rate of obviousness and non-obviousness considered in two periods i.e. before and after the ruled case. Therefore, the level of obviousness was associated with factors such as broad claims, claiming invention based on structural improvement and ignorance of prior art. Patent rejection due to the inappropriate claim drafting was also confirmed in Top Reasons Why Patents Get rejected, (2019), it was shown the reasons for patent rejection include a poorly drafted claim that lack indication of the nature and scope of protection, drawings which do not depict the content of the description and description which are not distinctive from the prior art. These reasons were also shown by Patel & Lodha, (2020) on the rejection of a patent application PCT/CA2005/001916.

The reasons for rejection shown by the previous studies indicate that the poor preparation of the patent specifications by the applicant leads to the rejection of patent application and a low number of patent grant. The patent applicant equipped with knowledge in IP and preparation of a perfect patent application leads to the positive trend. Moreover, financial support is required in the whole process of invention. The

role of the government to uphold patent grant is requisite. Based on the provisions of Article 34 of the IP law of Rwanda in its first paragraph, a patent application is rejected if it does not contain a request for a patent, applicant identity, description part, and indication of the novelty (MINICOM, 2009). Patel & Lodha (2020) have also shown that a patent application is rejected if the technical effect of the claimed invention forms a part of the public domain.

The low number of patented inventions for local inventors was also indicated by the WIPO (2020) with only 3 patent grants from 23 patent applications for local applicants from 2014 to 2019 in Rwanda. Based on the number of patent grant to the national inventors among 20 countries members of ARIPO (ARIPO, 2020), Rwanda is the second to have a low number of patent grant among 12 countries that have granted at least one patent (Table 1). It is clear that filing patent application by local inventors is limited in Rwanda and that in the patent system, some patent applications are successful and get the protections while other patent applications are not successful.

Table 1 List of member countries of ARIPO that have granted the patents to the local inventors

Country/Year	Sudan	Kenya	Mozambique	Namibia	Zambia	Ghana	Tanzania	Malawi	Uganda	Mauritius	Rwanda	Botswana
2014	0	4	14	0	6	0	0	0	1	0	0	0
2015	195	1	24	12	3	0	0	1	0	0	0	1
2016	163	5	10	14	3	3	0	6	0	0	0	0
2017	165	11	0	7	5	1	0	0	0	0	2	0
2018	180	26	0	0	4	9	6	0	2	0	0	0
2019	131	6	0	5	1	0	5	0	0	3	1	0
Total	**834**	**53**	**48**	**38**	**22**	**13**	**11**	**7**	**3**	**3**	**3**	**1**

Noting the low number of successful patent applications by local inventors in Rwanda this study aims at investigating the underlying factors of this phenomenon.

1.3 Statement of the problem

Rwanda has established IP legal (MINICOM, 2009) and policy (MINICOM, 2018) instruments to guide and facilitate the protection of inventions. Moreover, in 2008 the paragraph 9° of article 3 of the law establishing the Rwanda Development Board (RDB), mandated for the registration and protection of IP rights. These legal and policy instruments and the administrative regime are important tools to strengthen the IP environment and inventors as a whole leading to an increased number of protected inventions. However, based on the published figure only 13.04% of 23 filed patent applications were successful and granted protection.

According to MINICOM (2018), the protection of the invention is considered an important component towards accomplishing the nation's vision of getting to be a knowledge-based economy in Rwanda. However, the protected inventions for local inventors are still limited (Kappos, 2019).

In Rwanda, since 2014 - 2019, only 3 patents were granted out of 23 applications filed by local inventors. There are no clear underlying factors for patent grant to local inventors in Rwanda.

There is a need to study the factors underlying this lower level of patent granting by the IPO in Rwanda.

1.4 Research objectives

1.4.1 General objective

The main objective of this study was to assess the trends of patent protection by the local inventors in Rwanda and recommend improvements.

1.4.2 Specific objectives

The specific objectives of the study were:

(1) To assess filing trend of patent application by local inventors at the IPO in Rwanda from 2014 to 2019;

(2) To determine Patents Granting trend to Local inventors by the IPO in Rwanda from 2014 to 2019;

(3) Examine factors leading to the granting of patents filed by local inventors at the IPO in Rwanda from 2014 to 2019;

(4) To suggest strategies to improve the levels of patents granting to local inventors by the IPO in Rwanda.

1.5 Research questions

In this study, the following questions were answered.

1.5.1 What is the filing trend of patent applications by local inventors at the IPO in Rwanda?

1.5.2 What is the Patents Granting trend to Local inventors by the IPO in Rwanda?

1.5.3 What are factors leading to the granting of patents filed by local inventors at the IPO in Rwanda?

1.5.4 What are the strategies to improve the trend of patent granting to local inventors by the IPO in Rwanda?

1.6 Assumptions/Hypotheses

Granting of patent from the applications filed by local inventors in Rwanda is not associated with filing a complete patent application.

1.7 Significance of the study

This study was conducted to assess the trends of filing patent applications and patent grant by IPO to the local inventors in Rwanda, to determine the factors of patent grant, and to recommend actions to improve the current trend.

Rwanda aims at developing a knowledge-based economy. IP and especially patents are fundamental to achieve this objective. However, patent applications by local innovators are very few and a significant number of those filed are rejected by the IP Office. This study looks at the trends of patent protection (filing and granting) by the local inventors in Rwanda and recommends a mechanism to improve the current. Therefore, the significance of this study is crosscutting:

This study contributed to the academic research by bringing new knowledge on patent protection by the local inventors in Rwanda and by contributing to the requirement to obtain a Master of intellectual property at Africa University.

Understanding the factors of patent grant to the local inventors in Rwanda is essential to the relevant institutions to take strong measures that enhance the number of protected patent applications.

1.8 Delimitation of the study

This study focuses on the Rwanda Patent system and is limited to protected patents during the period 2014 - 2019 as published in the monthly intellectual property journal of Rwanda.

1.9 Limitation of the study

This study was conducted during the COVID 19 pandemic when Rwanda was during lock down, Offices closed and private and public employees were working from home. These conditions caused a delay in the process of getting secondary data from IPO and in conducting a field survey. However, to cope with that situation, emails and telephone calls were used get data from IPO. On the other hand, a questionnaire for data collection was adapted for online use for easy sharing and filling the questionnaire online by the respondents.

1.10. Organization of the study

The study report is divided into five parts. The first chapter presented the study's context, after which the study's issue was stated, and finally the research's goal and

objectives were defined. The research questions were also posed in the first chapter, as well as the nature and limitations of the study.

The second chapter summarized the related literature and clarified the theoretical context that underpins the study, emphasizing the theory's importance to the research issue. The research methodology and suitable research design were specified in Chapter 3, along with the related data collection techniques, instruments, and procedures.

The research methodology and proper research design were described in Chapter 3, along with the related data collection techniques, instruments, and procedures, as well as the population and sampling techniques used in the study. In Chapter 4, the data was analyzed and the study findings were discussed in order to address the research questions in accordance with the specified research objectives.

Finally, the results, consequences, and guidelines based on the study findings and data were discussed in chapter five. During the testing, all AUREC-mandated ethical standards were followed.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter contains previous works done on the filing and protection of patent, and the underlying theory indicated. The previous studies chapter reveal that the protection of invention depends on patentability criteria i.e. novelty, inventive steps and industrial applicability. These criteria are assessed in a patent application document by the IPO. The preparation of a patent application document is a process that requires knowledge and expertise in IP, and finance to secure a good patent application document that can succeed examination by IPO. This success can be achieved if the inventor is equipped in IP and finance or can hire an IP expert to assist in the preparation and filing of a complete patent application. Filing a patent application is a decision taken by the inventor to secure the right on his/her asset present in the invention. Hence, this study is guided by asset protection theory. Through the entire process of invention, inventors know the value of invention and they could decide whether to protect invention or not. Once a decision to protect is taken, the inventor approach IPO to file a patent application to secure the rights and ownership on the protected invention. Hence, the asset protection theory was used to shape the study by responding to the objectives on the trends of filing a patent application and pate grant.

2.1 Theoretical Framework.

This study is related to the asset protection theory. The product which is intended to enter the market is expected to face risks which includes piracy. Hertig & Christman (2010) stated that to cope with risks or threats rising from the assets demand and secure the strategies to derive the benefit, it is necessary to look for asset protection from private or public operators. This theory indicates that an asset has a value that is appreciated even before the protection is sought; and that once an asset and its value are known it is necessary to look for protection at the protection department (Ellis & A. Hertig, 2010). With this theory, the inventor has an invention as an asset and he/she knows the value of his inventor before seeking protection at the IPO.

Inventor spends time and investment to come up with a new product (Alfarraj, 2016). Once the new product is obtained, the owner decides whether it requires protection. In this phase, the inventor reviews regulators and formal requirements. Also, there is a need for a patent agent/attorney who assists inventors to understand the technical features of the invention and drafting of the legal part of the inventions claiming the technical functionality of the invention and to file the patent application to the IPO (Thacker, 2004). Besides, Frietsch & Neuhäusler (2019) have shown that during the application phase, hiring an experienced patent attorney is a factor towards a successful patent application.

Moreover, the filing phase requires financial inputs. For example, Frietsch & Neuhäusler (2019) indicated that hiring a patent attorney is a result of a strong decision due to its high financial requirement. Hence, the applicant with low financial inputs

tends to struggle without looking for advice from either patent attorney or agent and consequently, they draft a poor patent application with a higher probability of refusal.

The new product is protected by applying to the national Intellectual Property Office (IPO) (Article 2 (xii) of the Patent Cooperation Treaty (PCT) 1970, 2001). Upon applying, IPO checks if an application complies with the legal requirements of filing a patent application. In Rwanda, IP law provides the minimum requirements for an application document for the patent to comprise of a letter of request for a patent grant, clear description of the invention, claims of the technical part of the invention, drawings, a summary of the invention, and proof of the payment of filing fee (MINICOM, 2009). According to article 33 of the IP law of Rwanda, a formal examination is conducted on the patent application. However, substantive examinations could be conducted in case there is an international search report and preliminary examination reports

According to article 33 (1) of the (PCT) an application is claimed as an invention if it fulfils all the three criteria namely novelty, inventive steps, and industrial applicability (Patent Cooperation Treaty 1970, 2001). Once these criteria are met under formal and/or substantive examination (WIPO, (2014); EPO, (2010)) by the receiving office (USPTO, 2020), an application becomes an invention and is protected (WIPO, 2020). On the other hand, if the patentability criteria are not met, a patent application is rejected and the invention is not protected.

2.3 Relevance of the Theoretical framework to the study

The framework indicates that the applicant has an important role to ensure that a patent application is prepared and ready for filing to the IPO. However, the role to play by the

inventor in this phase is critical as it requires high technical expertise, fund and knowledge on legal and administrative formalities to prepare an acceptable patent application document. Once an inventor wants to protect an invention, he/she must prepare an application document having the title of the invention, name of the inventor, clear and sufficient description of the invention, present the drawing of invention, including the claims of the invention and a summary of the invention. Moreover, during the preparation of a patent application document, special attention should be made to indicating how your invention brings new technical solutions or is different from the prior art (Regulation of the Minister of economic affairs and commission, 2008). The work of the inventor to prepare a complete application document constitutes the factors for the patent protection as it was assessed under the third objective of the study.

The framework indicates the work of an inventor filed to the IPO to seek protection. This is an important phase of patent protection as it results in the patent grant or rejection of a patent application. The number of patent grants or patent application rejection by IPO contributes to an increased level of patent protection or rejection of the patent application as related to the second objective. Based on the factors considered for eligibility of patent protection and the likely reasons for rejection of the patent application by IPO, a third objective was answered by recommending inventors to concentrate on the factors that have shown to be the pillar of IPO decisions on the patent grant. Hence this theoretical framework is a roadmap to answer all the objectives of the study.

2.4 Motivations of patent protection

Patent protection is an important source of technical information and knowledge that are disseminated to society from the disclosure of the invention. During the term of patent protection, granting a patent is done by IPO in exchange for sufficient disclosure of the invention (Hunter, 2005). This serves to provide the society with new knowledge on the new technology which can serve as the basis to improve their living conditions by utilizing the protected invention with the owner's permission or learning it. Moreover, once the period of protected invention expires, an invention is put in the public domain. Hence, society can freely use, replicate, sell and export inventions to improve their living conditions and largely contribute to economic development (Yang, 2020). Furthermore, research and innovation could be stimulated by patent protection as the society find the potential in the protected IP (Al Kassiri & Čorejová, 2015)

Patented inventions contribute to the development of the country through the diffusion of new technologies from patented inventions. This can be done through licensing of the patent or granting patent exploitation rights to the third party who can produce new products or apply the technology to provide a solution using the technology from the patent (Federal Reserve Bank of San Francisco, 2004). Moreover, patents of local inventors can attract international investors who help implement the technology and produce new products to generate income to the investors (Australian Law Reform Commission, 2010). Income generated can be further invested in research and innovation with positive effects on the national economy and industrial development. Furthermore, even though a patent grants exclusive rights to the patent holder, local adoption of technology and promotion of local production can be done through licensing or joint venture agreement between the owner of the patent and local companies or firms

with the capacity in terms of technology and resources to achieve local production of the outputs from the patented invention (World Health Organization (WHO), 2016).

Inventions of the companies, firms and individual inventors are achieved through the effort of technological development and a considerable amount of initial investment. Kim, Kim & Kim (2018) in their study on the effects of patent protection on the market of the company, have shown that the patent protection is an important contributing factor of the firm's economy. The economic benefits of protecting invention have also been argued by Khan (2020) who indicated that the monopolistic nature of a protected invention by patent grants the financial freedom for the business aspects of the firm. Yang (2020) has shown the importance of patent protection such as to stop the competitor from stealing invention, increase of the profit margin on the patented product, reduced competition, facilitate litigation settlement and widening of the market.

Patent protection provides a mechanism to address acts of unfair competition. Goans (2003) indicated that without the monopolistic nature of the patent, the competitor would infringe the rights of the patent holder and it would be difficult to establish the mediation between the parties. Hence, both consumers will suffer due to confusion in sourcing and differentiating genuine products from infringed products and consequently, the reputation of the company will be harmed. Moreover, according to Australian Law reform commission (2010) patent protection promotes knowledge trading through international licensing of the patent as a way in which local inventors access international marks and recover the investment. Through licensing of the patent to the foreign market, it is clear that the investor will get profit, get international recognition and access to trading at the international market.

Patent protection provides exclusive rights to the inventor to prevent others from selling, making, importing, using and offering for sale a patented invention without his consent (Hunter, 2005). Hunter indicates that the exclusive rights offered by patent offer the right holder the position to practice licensing agreement, enter into contract negotiation and the rights to transfer a patent. Moreover, in applying exclusive rights, the patent protection provides incentives in form of reward to the right holder for the time and investment used to make the invention. Also, the reward to the inventor encourages further innovation and contributes to the social-economic improvement of inventors and society as a whole. Moreover, the protection of invention encourages research on the new technical field to find solutions based on existing technology or new applicable technology. Furthermore, it is important to note that patent protection involves huge investment which needs to return to the investor (Al Kissiri & Cŏrejová, 2015). As it was indicated in the previous literature, patent protection is important not only for the economic reasons but also for the legal perspective for the right holder.

2.5 Factors that enhance patent protection

The success of patent protection is triggered by various factors.

(a) Legal requirements

(b) Conducting prior art search before filing the patent application

(c) Disclosure requirement of the claimed invention

(d) Financial resources

(e) Awareness of IP systems

2.5.1 A patent application that meets legal requirements

A patent application needs to comply with the legal provisions on patentability. In most cases, if an application presents novelty, non-obviousness, usefulness, detailed written description and disclosure requirement, the protection will likely be granted (LexisNexis, 2019).

2.5.1.1 Patentable subject matter

All the new products, methods used in business, processes used in industries, software that executes technical work and some biological inventions are eligible for patent protection, however, artistic works, mathematical methods or formulas, mental acts, schemes, games, and theories are not protected by patent (Queensland Government, 2018). Moreover, section 101 of 35 U.S.C. Section Index provides a list of the categories of the invention that falls under the criteria of patentability. That list includes new manufacture, process, composition of matter and the machine (35 U.S.C. 101: Inventions patentable, 2017).

For example, in industry or business, the process or method of making materials, changing raw materials into products or changing the properties of materials for use are patentable (Upcounsel, 2020). Patenting a new process or process having industrial utility is among the legal provisions of section 101 of the US. Patent and Trademark Office (USPTO) (United States Code Title 35 – Patents, 1953). For example, Amazon has applied for patent protection in 1997 of a process called “Amazon one-click” which

allows the consumers to enter their detailed address and be able to order the goods. The process patent for Amazon - Click was granted in 1999 (Wagner, 1997).

Moreover, under the Patent Cooperation Treaty, a process patent for "Method access control system and process" was granted (International Publication No. WO98/28690, 1998). Inventors upon finding that the process used to accomplish certain business activities constitutes intellectual property assets can choose the protection to prevent others from using the same process without their authorization. However, according to article 18 of the IP law of Rwanda, the granted patent is excluded from patentability. Furthermore, a machine that can perform certain tasks is patentable (United States Code Title 35 – Patents, 1953). This provision allows inventors to protect the machines as long as they can be able to operate and execute certain tasks and also, that the machine as an invention is new, useful and it involves inventive steps.

Patentable subject matter criteria have shown to cause patent rejection and case law appealed into the courts in case inventors was not satisfied with the IPO decision. An example is case law on appeal no 28 in 2018 present in the court of appeal for a rejection of KE/P/2013/001836, where a patent application was rejected by Kenya Industrial Property Institute (KIPI) for claiming the method of doing business. According to KIPI, invention falls under the non-patentable subject matter and was opposed by the applicant. However, after listening to the appellant respondent KIPI decision for rejection was maintained by the court of appeal (Mwaura v. Kenya Industrial Property Institute, 2018). This means that in any case, the criteria of patentability requirement of the invention to be patentable subject matter are considered during the patent

examination and it could lead to a low number of patent grant once inventors are unable to make a distinction between patentable and non-patentable inventions.

2.5.1.2 Non-disclosure of invention until filing the filing date

The non-disclosure of the invention before the filing date, for example in exhibition rooms or presenting them to the potential investor can be detrimental to the non-obviousness nature of the invention before the filing date for the countries where there is no grace period or if the grace period was elapsed before deciding to file the patent application (Queensland Government, 2016). According to the University of Tennessee Research foundation, public disclosure of invention constitutes a disclosure of the invention to the public in a way that someone skilled in the art has captured the details to be able to make it. The act of public disclosure has negative effects for example in the USA when filing a patent is conducted more than 12 months after the public disclosure (Tennessee Research foundation, 2009). This indicated that a patent application filed in a period not exceeding twelve months following the public disclosure will be accepted for patent protection.

During the production stage of a product, making public disclosures about it can be very dangerous. If the risk perception is incorrect, the risk may be even higher. Since competitors are going to use such information to develop similar innovations, inventors and staff collaborating on creating the invention are need to ever be well concerned about the security measures to avoid sensitive information from being made accessible to competitors. This is especially true once the invention is expected to be profitable. As a result, these groups, as well as their bosses, are prone to be cautious of disclosing too much knowledge about their innovations through structured means of contact, such as

the company's website and annual accounts, which are often available to rivals (Saunders, 2010). S

ince sharing sensitive information about their job with relatives and friends through informal means of contact is less likely to be treated as a challenge, inventors, engineers, and employers may be less careful. These parties may be unaware of the danger, especially because such correspondence may be published, registered, and even archived, making them available to people other than the authorized parties. Throughout many countries, this is likely to be perceived a disclosure, and patent offices can use that to look for prior art before deciding whether to award patents on novel inventions (Venugopal, 2018). And if an innovation has already been revealed to a small number of individuals, it may still be new. However, whether there was a reasonable presumption that certain individuals would, or otherwise could, disseminate the information further, the disclosure is called public.

2.5.1.3 Novelty

Patent protection requires an invention to comply with the novelty requirements of patentability. An invention to fulfil this requirement should never be disclosed to the public to constitute an act of prior art by use, publication or oral disclosure before the filing date or elapse of the grace period as per the country's patent law (WIPO International Bureau, 2004).

The novelty requirement or newness criteria of the patentability must be observed by the inventor during all the phases of invention up to filing a patent application to the IPO. Keeping an invention from public exposure will prevent the invention from being known

and becoming an act of prior art. A case law number G1/89 ruled by European Patent Office Boards of Appeal on the invention titled " Polysuccinate esters and lubricating compositions comprising the same" after taking into consideration the prior art, has concluded that the main claim invention lacks novelty (European Patent Office Boards of Appeal, 1990). As the technical aspects of the invention are shown by the main claim, the applicant must consider claiming only the new technical aspects of the invention and leave behind anything that forms part of the prior art.

If an idea is not found in prior art, it is considered novel. Prior art is something that was made available to the public before the patent request was filed, that is still in use, or that was made available by some other means. Marketing the innovation, for example, may include newspaper conferences, press releases, magazines, or public exhibits. Patent applications, including unpublished ones, are considered prior art in the country where the patent is sought. In this case, an innovation that is not yet well recognized could be considered prior art, invalidating a previously filed patent application.

As a result, keeping one's discovery a secret until filing a patent request is critical. The inventor must be aware of all entry points within the corporation and the locations where the technology is being made, as well as ensuring that secrecy agreements are included in arrangements with industrial or business partners.

2.5.1.4 Non-obvious

In a case law of Windsurfing International and Tabur Marine, the four steps test, respectively, Identification of inventive concepts of the claims, ascertain a person skilled in the art and he/her knowledge related to the technical claims of invention at the time

up to the filing date, ascertain a difference between the claimed invention and prior art, choose if the differences exist to identify if they are already known by the person skilled in the art or he/she requires more knowledge to use or to understand were used to investigate the non-obviousness or inventive steps on the refusal decision due to the obviousness of the claimed invention (Windsurfing International and Tabur Marine, 1985). The level of inventive steps or non-obviousness is determined by the fact that a person skilled in the art will need more knowledge to understand the technical functionalities of the invention as compared to the prior art that would not require him/her effort to use or replicate.

An applicant has a way around dealing with non-obvious criteria. Osenga (199) has shown that inventors who want to prove that his invention is non-obvious could before filing an application, provide to the IPO proofs such as evidence on a long period of the need of the product to the market, failed cases that intended to bring the solution to the market, available opportunities for commercialization invention.

The norm of non-obviousness isn't the only source of indeterminacy. Non-obviousness is assessed from the perspective of an individual of ordinary expertise in the craft, not from that of a layperson. This imaginary individual of ordinary talent serves as a benchmark by which an invention's level of creativity is calculated. A non-obvious improvement over the baseline is needed for an invention to be granted a patent. However there is some doctrine that defines an individual of ordinary competence, this concept is largely undefined. The level of ordinary competence, in particular, is often calculated using specious arguments and incorrect perspective (Mandel, 2008). In regard to these indeterminacy issues, the non-obviousness dilemma is exacerbated by the requirement

that lay decision makers evaluate how a given step would be obvious to an individual of ordinary ability

2.5.2 Conducting prior art search before filing the patent application

To conduct the prior art search to ensure that an invention was not previously developed and claimed. This can enhance the likelihood of patent protection (Queensland Government, 2016). Some inventors think that once they are not finding a product on the market, it does not exist and while there may be protected inventions by patent which are stored in the patent database and which are accessible by conducting prior art search (Alexi, 20019). Conducting a prior art search from the time of getting a potential idea that the inventor wants to develop is crucial to ensure the invention complies with formal requirements. Moreover, conducting prior research helps inventors to find related prior inventions and know-how to refine the scope of application to avoid any interference related to the prior inventions (Reed, 2017). The inventors must conduct a prior art search to know what has been done in the area of the technical field of the invention before the filing of a patent application. Quinn (2015) has shown that conducting a prior art search helps to save the application cost that would be spent on an obvious invention. According to Quinn, if prior art search results indicate a unique character inventor could be in a good position to spend the cost on filing a patent application. However, if search results indicate that the product of invention does not present unique features in a view point of existing inventions in the same domain, then there is no way for the inventor to spent money on an application that will not be successful.

The concept of conducting prior art before filing a patent application was also suggested by Osenga, (2020). He has shown that irrespective of the type of technology and experience of the company or inventors, conducting a prior art search helps to ascertain related technologies and the technical aspects protected by closer technologies for the applicant to draft and refine the claims that positions the invention outside of obvious state of art. Based on the highlighted value of conducting a prior art search, an inventor who explored prior art related to his/her invention will cautiously draft the claims closer but out of the limits of the prior art. Hence, conducting prior art is beneficial to the inventor before filing a patent application.

2.5.3 Disclosure requirement of the claimed invention

The fundamental technical part of the invention requires to be disclosed for the person with basic skills in the art to practice it without difficulties. If this requirement is met with the patent application, in return, a reward as patent protection is granted (Krauß & Kuttenkeuler, 2020). The concept of disclosure has also been emphasized by 35 U.S. Code § 112 (a) which indicates that the specifications of a patent should be written clearly and concisely with the full meaning of technical terms to enable any person skilled in the art to interpret, use and or replicate the same invention without difficulties (35 U.S. Code § 112 - Specification, 1952). The legal requirements for invention disclosure, require an inventor to disclose the invention for it to be useful to society. If a person skilled in the art can reproduce the invention in a manner that it is technically claimed, the knowledge of the invention will disseminate into society and hence fulfilling the purpose of disclosure requirement. Moreover, All Answers Ltd (2018)

have shown that a patent is a form of monopolistic right granted to the inventor during the patent protection period in exchange for technical disclosure of the invention. As it is emphasized, an inventor is required to disclose his/her invention when applying for patent protection.

The disclosure requirement of a patent application was also discussed by WIPO, (2004). According to WIPO, an undisclosed patent application has no value and cannot be granted a patent. This brings a question on the degree and how this requirement is met. Article 29 of the TRIPS agreement, has made light on this subject by indicating that a patent application filed in member states is required to be clearly and completely disclosed to enable a killed person in the domain to understand or make it without difficulties (TRIPS, 1995). This provision is a guiding tool of patent examiners in member states of the TRIPS agreement in jugging the level of disclosure of a patent application and to decide whether to pass or reject the patent application.

Disclose of patent applications was considered to enrich the public with new knowledge and teach them how your invention works and in exchange, an inventor is rewarded 20 years of exclusive right to prevent anyone from using the invention without his authorization (Lichtman, Baker & Kraus, 2000). It can be seen the purpose of granting a patent is not only to benefit the inventor but also to bring new knowledge to the public. Hence, a clear and complete self-explanatory patent application is granted protection. The disclosure requirement of patent protection should not only be regarded as a condition for patent protection but in a positive angle as a condition to be rewarded a patent certificate, and unlocking technical and scientific knowledge to the public for both inventor and the public to benefit from protected invention.

2.5.4 Financial resources

Preparation of a patent document for filing requires high commitment, money, and expertise and expertise. The inventor who is financially stable will invest in R&D, pays for administrative related costs, and be able to hire an IP professional to prepare a quality patent application (Krajeck, 2016). Moreover, the preparation of a patent application requires a considerable amount of money that small inventors cannot afford. For example, Quinn (2013) has estimated the cost required to file a patent application in the USA to range between $ 5 and $ 7 thousand for a simple invention and $ 15 thousand for a complex invention to engage a patent attorney in the patent application process. This indicates that inventors who are financially stable will be able to file a good patent application with a high probability of protection.

The financial challenges of local inventors as a compelling factor from getting a protected patent on their invention was also emphasized by Kappos (2019). Kappos has shown that local inventors fail to have protected patent due to the lack of money to hire the IP professional to provide IP assistance in the preparation of a patent application document and consequently, they prepare, file and go through the whole process of patent protection which results into a poor patent application document and/or dropping out the application due to the complex process of patent protection. The financial constraints of local inventors were also shown by WIPO (2003) that patent application and maintenance cost are high for local inventors in developing countries and has negatively affected filing and patent grant. Once an investor fails to pay application fees and think he/she will be challenged in paying maintenance fees inventor may choose not to look for protection.

In patent process, the financial support helps inventors such as the students and other young people with low financial status to advance their inventive ideas into a new patentable product. Young people after university struggle to get necessary financial sources for research and development of their invention. They are also challenged in preparing a patent application document which could be done by an IP patent professional (Kassiri1 & Čorejová, 2015). Financial challenge is a limiting factor of patenting to the startup inventors

2.5.5 Awareness of IP systems

Knowledge of what to protect as intellectual property is critical. In a company, employees must be aware of what is and or should be an IP asset for them to be able to protect it. Also, employees and employers must work together to prevent any disclosure of invention once it is not protected (Behr & slater, 2019). A report by the European Union on the protection and enforcement of IP rights has shown that the lack of awareness is among the changes that prevent inventors of the developing world from protecting inventions and inform IP rights (European Commission, 2020). Based on the literature, inventors either individually, companies or firms are recommended to know the provisions of intellectual property instruments and the rights granted on the protected patents.

IP awareness is bidirectional. On one hand, the governments who have adapted the implementation of IP instruments are the first to take necessary actions to ensure the dissemination of IP knowledge among the nationals. Even though IP is a new domain, IP awareness programs staring from schools especially technical schools can accelerate

knowledgeable people in IP who can promote a positive trend in filing patent application and patent grant (Okada & Nagaoka, 2020).

There are three approaches to raising IPR consciousness among university students (Ong, Yoong, & Sivasubramaniam, 2012). To begin with, these students believe that more material should be accessible on social media sites such as Facebook, personal profiles, and chat rooms. Students will benefit from a user-friendly guide about how to apply for IP, as well as articles on IPR in the media and on the university's website and intranet. Second, active involvement of relevant government agencies and universities can help university students become more knowledgeable of IPR. Finally, talks, seminars, competitions, and IPR preparation are some of the suggested events for increasing IPR knowledge among university students.

Increased patent recognition not only reduces the risk of lawsuits, but it also increases competitive approaches to innovation commercialization. It is important to be mindful of the nature of patents in order to establish long-term business plans for dealing with the various options for patenting. To reduce the possibility of patent lawsuits, inventors should aim to perform a patent check or employ a patent attorney to conduct a patent search before filing for a patent.

2.6 The factors that influence patent application rejection

The patent application process involves the works and prerequisites that are confronted by the inventor who seeks the protection of the invention. Some of the challenges that could lead to patent application rejection are the following.

(a) Non-compliance with formal requirements

(b) Lack of professional support

(c) Lack of local patent professionals

(d) Non-patentable subject matter

2.6.1 Non-compliance with formal requirements.

According to paragraph (a) (4) 35 U.S.C. 111 (PRE-PLT (AIA)): Application 2017, an application for patent protection that fails to provide proof of declaration of inventor and filing fee is rejected from protection (35 U.S.C. 111 (PRE-PLT (AIA)): Application 2017, 2018). This indicates that it is the responsibility of the applicant to ensure that formality requirements are met within the prescribed period of the submission of all the required documents to stand on the safe side. Moreover, Vuria (2019) indicated that missing novelty, obvious concept, and insufficient disclosure of invention are the three reasons that can lead to the rejection of patent protection. Furthermore, improper drafting of the claims and missing relevant drawings may be the reasons for rejection (Trademarkspatentslawyer, 2019). More reason for patent rejection is an invention related to the non-patentable subject matter (Rapacke, 2019). The reason for the rejection of a patent application lacking some of the formal requirements was also reported by Bacher, László & Szecskay. (2003). They have shown that, based on the legal provisions of a country, the examiner can reject the incomplete patent application without examining it once the applicant was informed to complete the formal requirement and failed to act accordingly.

In patent applications, the inventor must consider all the formal requirement details as there various factors that are considered for patent protection.

2.6.2 Lack of professional support.

During the phase of preparation of the patent application, some inventors struggle to prepare a patent application and to present themselves before the IPO due to the limited financial resources to hire professionals in the field. During the process, inventors are tired of the procedure that they are not familiar with, and the patent application doesn't get to the level of success (Kappos, 2019). Inventors with low or no financial input engage in the preparation and filing of the patent application; a work that would normally be done by a patent professional (Quinn, 2016), and consequently, fails to secure patent protection due to the complicated nature of the patent system (World Intellectual property Organization, 2019).

2.6.3 Lack of local patent professionals

For an inventor, hiring a foreign patent attorney is costly. Most countries do not have an established system of patent professionals who assist inventors from the conception of the idea of invention up to the fixation of the product, and help them to draft technical and legal part of the patent application, and represent the interest of the inventors before the IPO (Legal Advantages, 2019). Norwegian Industrial Property Office (2017) has recommended that patent agents or patent attorneys are important for patent protection as they provide IP professional assistance for the preparation of a patent application, complying with important deadlines and required fees. Moreover, the Australian Government (2014) emphasized searching related prior art from patent databases is a complex work that requires a high level of skills which most of the inventors do not have and should be performed by patent professionals. Nyambura-Mwaura (2014)

argues that African inventors struggle for patent protection due to a low number of patent attorneys qualified in technology-related invention.

A draft patent application will be drafted after it has been decided that the invention is possibly patentable. Since the costs of drafting a patent application vary too widely among patent agents and companies, it's always a good idea to do some research before settling on a company or a patent agent/attorney. It is also a good idea to hire a patent agent or solicitor who has a professional experience in the world of innovation. A patent agent who knows the special needs and condition of a startup, in addition to their professional experience, is strongly recommended. A business-savvy patent agent who knows the industry will assist in developing an overall approach that considers not just the technologies and the legislation, but also what is feasible considering the company's finances and long-term objectives (Raffoul & Brion, 2011)

2.6.4 Non-patentable subject matter

Patent protection system excludes some inventions from patentability. Those exclusions include inventions of which their exploitations are contrary to the public order, for example, cloning, modifying human genes, commercial application of human embryo, animal and plant varieties, surgical or diagnostic or therapeutic methods of treatment of animal or human body are not patentable (European Patent Office, 2019).

Referring to the exclusion from patentability, inventors are required to know what is patentable or not patentable. Knowledge of exclusions is important because it will help inventors to work in fields of patentable subject matter and to avoid future rejections and litigations. Non-eligible inventions when filed are rejected from the patentability. For

example, the case law concluded that genetic resources extracted from the human body are not eligible for patentability (Justicia USA Supreme Court, 2013). Another case brought by Gameacount Limited to the Boards of Appeal of the European Patent Office claiming technical aspects of the game of chance where the court dismissed the appeal because the said invention was excluded from the patentable subject matter (Boards of Appeal of the European Patent Office, 2007).

Based on work done by the researchers and the legal provisions related to patent protection it is clear that there are factors that have an impact on patent protection. However, these factors vary depending on national or regional IP laws. Therefore, this study assessed the trend of Patent Protection by Local Inventors in Rwanda focusing on the levels of filing a patent application, protected patents and the factors affecting patent protection.

Summary

This chapter indicated the prior art findings related to the study. It was indicated that this study is built on asset protection theory where the value of an asset is known by inventor who decides to protect it to the intellectual property office by filling a patent application document. However, filing an application does not secure a patent because there various factors that could be associated with patent grant such as non-compliance with formal requirements, lack of professional support, lack of local patent professionals, and non-patentable subject matter. This chapter also indicated the factors that enhance patent protection including by not limited to the legal requirements, conducting prior art search before filing the patent application, disclosure requirement of the claimed invention,

financial resources, and awareness of IP systems. This chapter supplied literatures important to understand prior art related to the objectives of the study.

CHAPTER 3 METHODOLOGY

3.1 Introduction.

This chapter discusses the details of the research design (3.2). Also, the population and sampling are explained in detail (3.3). Furthermore, data collection instruments used in this study are discussed in (3.4) and, the procedure for data collection is described in detail (3.5). Moreover, instruments for data analysis and ethical consideration of the study are presented in, respectively, (3.6) and (3.7) of this chapter.

3.2 Research Design.

This study is in the form of a survey. The Source of data is secondary data compiled by IPO in Rwanda Development Board for the patent application, the patent granted and patent rejected from 2014 to 2019 and data from inventors. The applicants who filed their patents applications at the IPO in Rwanda from 2014 to 2019 were the basis of the study. An explanatory research design method was used. A mixed-method research design or explanatory research is an appropriate method suitable for various ranges of research. This type of research helps to collect a wide range of qualitative and quantitative positive information that wouldn't be collected when other methods are used (Almalki, 2016). Through a debate and conversation words and numbers for, respectively, quantitative and qualitative data are generated at the same time in explanatory research design. This study is an explanatory research design because the researcher needs to collect both qualitative and quantitative data (Figure 1). The results from the analysis of qualitative data were used to clarify and to better interpret the results of quantitative data. Qualitative data such as the factors for patent protection are in form of words that were collected together with quantitative data in form of numbers such as the patent grant, patent applications rejected and filing will be in form of quantitative data.

In this study design, the first objective on assessing the level of filing patent applications and the second objective on assessing the levels of the granting or rejection of patents filed by local inventors in Rwanda from 2014 to 2019 required numerical data because the level of filing, patent grant or patent rejected can be understood as the percentage increase of patent applications in the study period, and patent rejected or granted compared to the number of filed patent applications, On the other hand, the third

objective on the factors leading to the patent grant or rejection and the fourth objective to suggest the strategies for the patent grant will require words answers. To answer to the objective of the study, a different type of questions which includes, closed-ended answer questions where the respondents used a short time to respond, open-ended answer questions where the respondents were free to express their opinions in answering the questions and nominal Questions where the respondents were given multiple options to choose from.

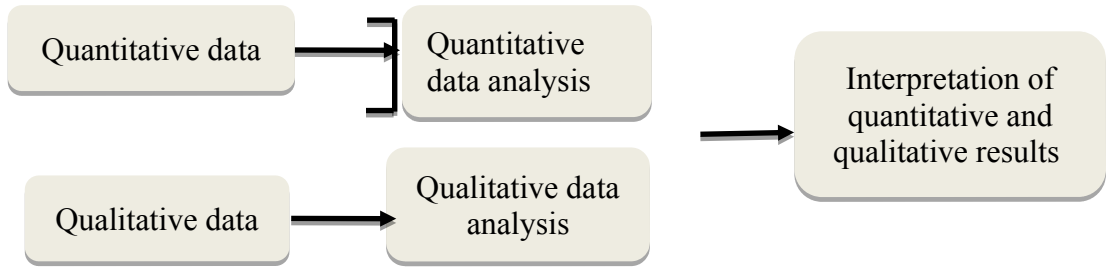

Figure 1 Explanatory design for data analysis

3.3 Population and Sampling.

The population of the study was local inventors in Rwanda. The study sample covered the total number of patent applications filed from 2014 - 2019 to the IPO in Rwanda by the local inventors. Hence, a sample size of 28 local inventors who filed their patent applications at the IPO from 2014 - 2019 were used in this study. The choice of the sample size used in the survey was informed by Baker & Edwards (2012) who have shown the sample size of 12 is appropriate for qualitative research to avoid a big number

that could prevent the collection of the detailed information as the sample size increases. Based on the nature of questions and the need to collect detailed information from the respondents, the use of a large sample size could prevent the researcher from asking for in-depth information.

3.4 Data Collection Instruments.

In this study, the data collection tool that was used is the PatVal-EU survey questionnaire (Gambardella, Giuri, & Mariani, 2005), was modified to the context of the study. This tool consists of sections to collect background information on the invention, research and development that led to the invention, information on the journey of patent protection, challenges and opportunities in patent protection and information on investment. Moreover, patent application records were used as a source of secondary data.

3.5 Data Collection Procedure.

The method for data collection helped the researcher to create a favourable environment for the respondents. Firstly, a letter of approval from Africa University to conduct the study was used to address a request to the Office of the Registrar General (RG) of Rwanda Development Board (RDB) to have access to the data related to the patent applications, to conduct a research on the local inventors in Rwanda, and to give contact addresses of inventors for patents applications filed since 2014 – 2019. Besides, the

office of the RG provided information on the reasons for patent grant and rejections of applications for desk analysis. Due to the COVID - 19 pandemic preventive measure that hindered physical data collection and challenges to send the questionnaires to the respondents, the researcher used an online questionnaire of which the link was sent to each of the respondents to be completed online. However, before sending the questionnaire to the respondent for data collection, telephone calls and a short message was used to communicate the purpose of the research.

3.7 Analysis and Organization of Data.

After collecting the data, raw data were saved as a Microsoft word and saved on google drive. After arranging data the main codes and themes were formed. By using ATLAS. ti, the research has been able to analyze and understand the main factors such as patent grant or rejection of patent and also the suggestion to improve patent grant for the study of the third and fourth objective. On the other hand, quantitative data were analyzed by SPSS for the descriptive and analytical study to test the significance of dependent vis-vis independent variables.

3.8 Ethical Consideration.

3.8.1 Confidentiality

Personal details such as name, age, sex and marital status were not requested. Also, other sensitive information such as income level was out of the scope of discussion. The respondents were informed before the beginning of data collection that no part of the questionnaire will be published with their names, address or name of the company. All

the questionnaires were not shared with the third party except in case the Africa University wants to keep the records.

3.8.2. Informed consent

This study was approved by the Africa University Ethical Community to ensure that it complies with ethical research guidelines. A letter of research approval from the Africa University Research Ethical committee addressed to the Registrar General in the IPO Rwanda Development Board to inform the purpose of the study and to request to facilitate the researcher to get a list of patent applications, patented and rejected patent applications since 2014 - 2019 and address of the inventors, and also to allow the researcher to conduct a study on the local inventors in Rwanda. Before collecting data, the participants in the study were allowed to understand the purpose of the study and to agree to freely participate in the study.

Summary.

This study was conducted in Rwanda to investigate the trends of patent protection by local inventors in Rwanda. The respondents are the applicant for patents filed since 2014 - 2019 in Rwanda. A list of the patent grant, patent applications rejected, and reasons for rejections and a list and address of applicants will be requested from IPO in RDB. The study was conducted on 28 respondents as our sample size. To collect data, a

questionnaire with mixed research questions was used. Furthermore, the questionnaires were completed online by respondents. Before collecting data, telephone calls and short messages were sent to the respondents to inform the purpose of the study. The respondents were allowed to freely respond to the questions and the results from the feedback of the respondents were kept confidential. After the collection of data, Microsoft Excel was used for recording and while STATA and Atlas software were used for respectively, quantitative and qualitative data.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter contains data presentation and analysis (4.2) and interpretation (4.3). Tables and figures were used for data presentation complemented by the text. Moreover, results are presented and discussed to answer the objective of the study.

4.2 Data Presentation and Analysis

4.2.1 Descriptive analysis of key potential factors in the patent application process.

(a) Trends of filing a patent application

Descriptive analysis of the key variables is presented in Table 1. Over six years (2014-2019), a total of 28 applicants submitted their applications for looking patent protection in Rwanda. The applicants were 5 (17.9%) in 2014 and 5 (17.90%) in 2015, 2 (7.1%) in 2016, 3 (10.7%) in 2017, then 6 (21.4%) in 2018 and 7 (25.0%) 2019 (Figure 2).

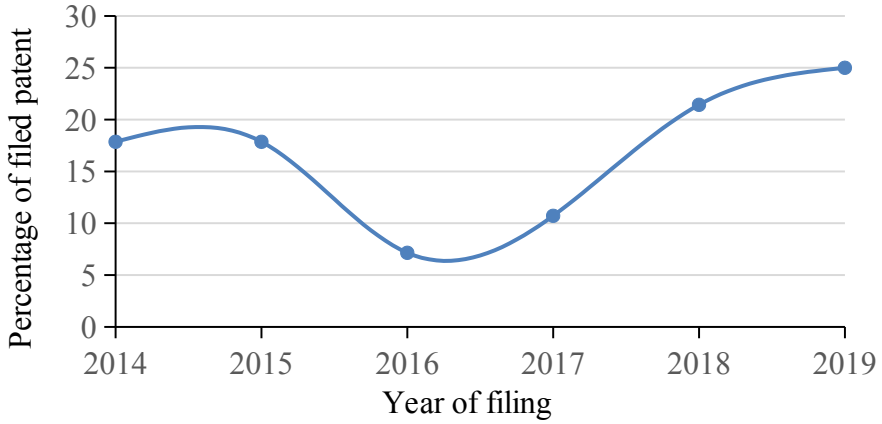

Figure 2 Trends of filing patent application by local inventors from 2014 to 2019

(b) Trends of patent grant

Among the filed applications, 6 (21.43%) were granted for patents, 3 (10.71%) were rejected while 19 (67.86) are still under examination (Figure 3). Among the submitted applications, 16 (57.1%) applications over 28 were received as complete applications. Twelve applicants (42.9%) were called to make corrections in their application documents, whom, only 4 (14.3%) came to do corrections as required (Table 1).

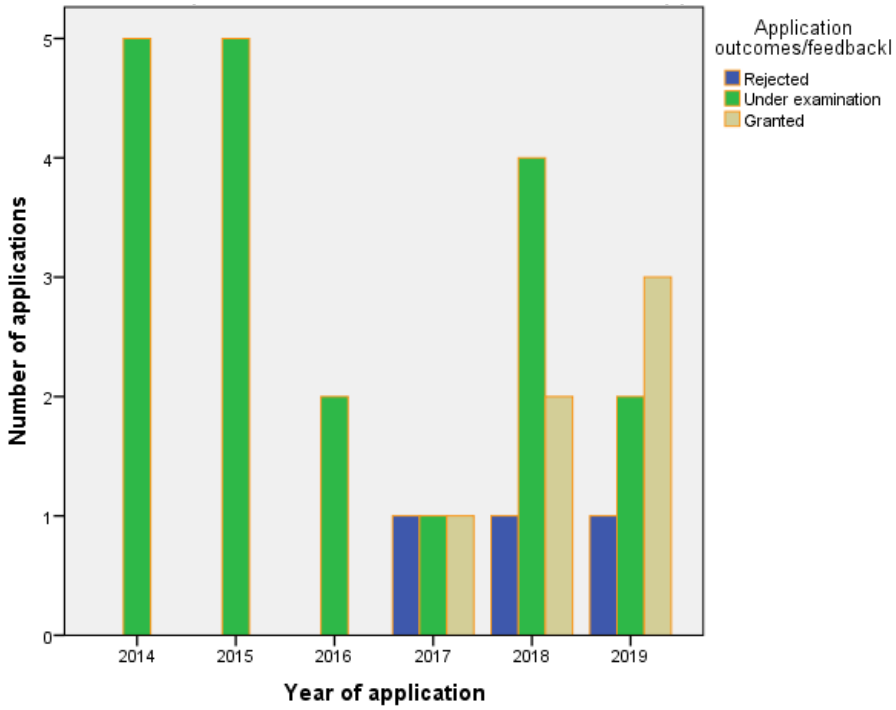

Figure 3 Trends of patent grant to the local inventors from 2014 to 2019

To apply for patents, 11(39.3%), 12(49.3%), & 5 (17.9%) applicants used higher education level knowledge, published patent documents and Inventor's creativity as a source of knowledge respectively.

The applicants had the following type of inventions: Product (10), Machine (8) Method (7), and software (3). The financial source for the application process was from Inventor's funds, Fund from friend and Family, and National R&D fund for 21 (75.0%) 1 (3.6%) and 6 (21.4%) applicants.

Table 2 Key factors in the patent granting

Variable	**Total filed applications**	
	(N)	**(%)**
Year of application		

2014	5	17.9
2015	5	17.9
2016	2	7.1
2017	3	10.7
2018	7	25.0
2019	6	21.4
The inventor filed a complete application		
Yes	16	57.1
No	12	42.9
The inventor was called for making corrections		
Yes	12	42.9
No	16	57.1
Inventor made corrections		
Yes	4	14.3
No	8	28.6
Not necessary	16	57.1
Source of knowledge		
Higher education	11	39.3
Inventor's creativity	5	17.9
Published patent documents	12	42.9
Type of invention		
Product	10	35.7
Machine	8	28.6
Method	7	25
Software	3	10.7
Financial source		
Inventor's fund	21	75.0
Funds from friend and family	1	3.6
National R&D fund	6	21.4

Table 3 Association between patent granting an invention and potential risk factors

Variable	**Total filed applications(N)**	**Granted patent**		
		Frequency n (%)	***X2***	*p-value*
Year of application				
2014	5	0(0.00)	0.457	0.014
2015	5	0(0.00)		

2016	2	0(0.00)		
2017	3	1(16.7)		
2018	7	2(33.3)		
2019	6	3(50.0)		
The inventor filed a complete application				
Yes	16	6(100.0)	-0.42	0.026
No	12	0(0.00)		
The inventor was called for making corrections				
Yes	12	2(33.3)	0.101	0.611
No	16	4(66.7)		
Inventor made corrections				
Yes	4	1(16.7)	-0.051	0.796
No	8	1(16.7)		
Not necessary	16	4(66.7)		
Source of knowledge				
Higher education	11	4(66.7)	-0.405	0.033
Inventor's creativity	5	2(33.3)		
Published patent documents	12	0(0.0)		
Type of invention				
Product	10	4(66.7)	-0.313	0.105
Machine	8	1(12.5)		
Method	7	1(12.5)		
Software	3	0(0.0)		
Financial source				
Inventor's fund	21	6(100.0)	-0.295	0.128
Funds from friend and family	1	0(0.0)		
National R&D fund	6	0(0.0)		

4.2.2 Regression analysis results: Association between patent granting and potential risk factors

To assess if there was a relationship between patent granting an invention and the study variables, the above variables were analyzed initially in a univariate fashion (Table 3). Results from the regression analysis suggested that three variables namely: year of application, inventor filed a complete application, source of knowledge were all possibly associated with application granting (i.e the p-value was less than 0.05).

4.2.3. Factors for patent grant

To assess the opinions of the inventors on the factors for patent grant and what they suggest to improve the number of patent grant, the research has corrected the feedback from the filled questionnaires by the respondents.

4.2.3.1. Reason for patenting

To ascertain the reason that triggers local inventors to patenting, inventors were allowed to indicate what they consider as the reason(s) for filing a patent application to the IPO. The majority of the inventors indicated that they have decided to file the patent application, to prevent it from others who can get it protected, to have full ownership and to have the rights to use and benefit from the invention. Moreover, among the respondents, the reason that they knew other inventors who were working in the same research field was also indicated.

4.2.3.2. Source of knowledge

The research wanted to investigate the source knowledge of the inventor and to determine its association to the patent grant. Most of the respondents indicated

university and secondary school. Moreover, patent documents, published literature and the product on the market have taken second place indicated by the respondents. Furthermore, workshops and conference, own knowledge and positive mindedness are among the source of knowledge indicated by some of the respondents.

4.2.3.3. Preparation of patent application

To investigate the factor for the patent grant, the researcher wanted to know if the preparation of patent application is among the factors that could lead to the patent grant. The majority of respondents indicated that they drafted the patent application and prepared all required documents without any technical assistance from the third party. Moreover, one respondent indicated that he got advice from IPO on the required filing documents and filing procedure.

4.2.3.4. Fulfilled formal requirements during the patent application

To determine the factors for the patent grant, the research has requested the respondent to indicate the formal requirements for a complete patent application by IPO that they have fulfilled by the time of filing their patent applications. Most of the respondents indicated they have fulfilled a request for a patent grant, name and contact address of the applicant, title of the invention, clear and sufficient description and proof of payment of filing fee. A few of the respondents indicated that claims, drawing and abstract components of an application were included.

4.2.3.5. Technology related to the filed invention

The technology field of the invention was investigated to ascertain if it can be a factor for patent grant. Among the respondents, machine and products were the dominant

technology that was claimed for protection. Moreover, method and process were the least filed patent applications indicated by the respondents.

4.2.3.6. Factors indicated by applicants whose inventors were granted

The researcher has determined what successful applicants have made to make their patent applications granted. Most of the respondents indicated that they are skilled in IP and that they know patentable and non-patentable inventions. Moreover, some respondents indicated that they know how to conduct prior art search and have made corrections when they were informed by IPO.

4.2.3.7. Feedback on the rejected patent applications

The patent application does not always lead to the patent grant. In this study, some of the respondents had rejected patent applications. The research was interested to know the feedback that the applicants received from the IPO on the reason for rejection. Most of the respondents indicated that the reason was that the invention is not patentable. Moreover, one respondent added that another reason was that invention is not industrially applicable.

4.2.3.8. Challenges of inventors during the journey of patent application

In studying the factors for the patent grant, the researcher investigated the challenges of inventors during the journey of invention until the filing of the patent application. The respondents have provided their feedbacks of which most of the challenges, were respectively, lack of knowledge on patent protection, inability to find local IP professionals, lack of finance to hire IP professionals, lack of finance for research and

development. Moreover, lack of mentorship and lack of access to information were among the reported challenges by a small number of respondents.

4.2.3.9. Source of finance used by the inventor

The source of finance was considered to be investigated if it could be among the factors that influence patent grant. The researcher has collected feedback from the respondents. Dominant feedback by the majority of the respondents was that inventor was the main source of fund.

4.2.4. Suggestions by inventors to improve patent grant

Inventors who undergo the journey of the invention are the best examples to suggest the points of improvement that can increase the number of patent grant. The respondents have dominantly suggested regular training by IPO to the inventors to build their capacity in IP and IPO to play an intermediate role between IP professionals and inventors. Moreover, they suggested to the government to establish an IP fund to support inventors during the R&D of their inventions. Furthermore, the respondents suggested a closer collaboration between IPO and inventor to ensure timely communication on the required action to the filed applications and the examination status.

4.3 Discussion and Interpretation

Patent granting or rejection of the patent application in Rwanda is a decision of the IP Office (MINICOM, 2009). In granting the patent, IP law Rwanda indicates that formality examinations (i.e form, content, and submission of required documents and payment fee) are conducted by IP Office to decide on the patent application. It is important to note that, these requirements for a patent application should be met by the

applicant. Hence, various factors related to the inventor could contribute to the quality of the requirements of a patent application as the determinants of a decision for a patent grant.

4.3.1 Trends of filing the patent application

The results of this study indicated that the filing of a patent application by local inventors increases by 7% from 2014 to 2019. This trend in filing patent application by local inventor was shown by WIPO (2019) who indicated that the trends in the patent application to the nationals are associated with their behavior to filing application for protection. As indicated by the results, IP awareness among the inventors is still low and this could contribute to the lack of knowledge required to secure IP right by filling an application for protection. However, Kim & Oh (2017) contradict WIPO by indicating that the high work load of examiner and short time for examination are the risk factors for trends of patent application based on the key lesson learnt from Korea who doubled their patent applications from 1999 to 2009 by increasing the number of patent examiners.

4.3.2 Trends of patent grant

The trend of a patent grant from 2014 to 2019 was indicated to affect between 2016. As revealed by the findings, there was no patent granted from 2014 to 2016 while the patent grant was increased by one each year from 2017 which makes a total of 3 granted patent. This number is low compared with other ARIPO member states Malawi (7), Tanzania (11), Ghana (13), Zambia (22), Namibia (38), Mozambique (48), Kenya (56), and Sudan (834). But, Rwanda is on the same trend as Mauritius (3) and Uganda (3) and better than

other ARIPO member with zero granted patent in the same period of the study (WIPO, 2020). WIPO (2019) has shown that the low number of the patent grant is associated with administrative reasons such as delays in process of examination and the capacity of examiners. Hence, zero patent granted from 2014 - 2016 can be associated with delays in the process of patent granting while the increase in the number of the granted patent could be associated with the improved capacity of IPO in Rwanda.

4.3.3 Factors for patent grant

The results from the study have revealed the factors that could be associated with the patent grant. Among the factor studies to find an association between output variable (Patent granted) and factor variables, year of application, the inventor who filed a complete application, and source of knowledge, a bivariate analysis has indicated an association. These results are in line with Office of the registrar General in RDB who indicated that incomplete application is not granted a filing date and that the failure to make correction in 7 days leads to the withdrawal of the application. ORG (20220). However, a multivariate logistic regression analysis was not able to indicate the association of that combined factor to the patent grant due to the small sample size used (Results not indicated).

On the other hand, inventors whose patent applications were granted, have indicated that knowledge in IP related to the patentability of invention, knowledge to conduct prior art search responding to the correction of patent applications were important elements that lead them to success. The findings are in line with Gambardella, Giuri, & Mariani. (2005) in the study on European inventors who have shown the same results on the inventor's source of Knowledge to invent.

Furthermore, based on the feedback that their inventions lack patentability and industrial use criteria as the reasons given by IPO to the applicants whose patent applications were rejected, the probable factors for patent grants are substantive factors rather than formality factors. Hence, a well-trained inventor on the skills required for the preparation of a patent protection, and who has financial means to invest into research and development

4.3.4 Inventors 'suggestions to improve patent grant

The respondents have shown through that the journey of invention, the inventor experience the challenges. The suggestions made by inventors were intended to enlighten their IP knowledge and strengthen financial requirement in research and development. Also, it has been shown by the results, most local inventors use their resources for research and development of their inventions until the filing of the patent application.

The suggestion capacity build of the inventor is built on low knowledge of inventors in preparing a patent application that withstands formality examination. Among the respondent, those who benefited from the training organized by IPO and WIPO indicated that it was the source of knowledge that helped them drafting the patent application. However, "The training on patent drafting organized by WIPO and IPO has not been conducted so far": said the respondent. Thereby, the participant is suggesting an IPO plan for the IP training programs to the inventors and also organize public IP awareness programs to build IP knowledge among the nationals.

Moreover, the intermediate role of IPO between inventors and IP professional was suggested by the respondents. A point raised by the respondents was that during the preparation of the invention they face difficulties in locating IP professionals who can provide advice and assist in preparing patent application document. Hence, suggesting IPO provide indicate IP professional who are eligible to assist the applicants.

The quality of invention is built through research and development which requires high investment to turn ideas into concrete invention. To overcome financial constraint, the respondents suggested the Government of Rwanda introduces an IP fund designed to support inventors to turn their inventive ideas into real patentable inventions. This suggestion is in line with Dang & Motohashi (2014) who have shown that financial subsidies on the patent program increase the number of patent grant.

Closer collaboration between IPO and that applicant was suggested to be improved. This suggestion was risen by most of the applicants whose applications are under examination status. For example, it was found that some respondents who file the applications in 2014 or 2015 are still waiting for the results of the examination in 2021. Hence, timely feedback on the examination status was suggested to improve collaboration and communication.

Summary

This chapter has presented and discussed the findings of the study on the trend of patent protection by local inventors in Rwanda from 2014 to 2019. It was indicated that regarding the trend of filing patent application it has shown an increase. The rate of granted patents stated to increase since 2017. Moreover, the study was able to associate

the factors with patent granting. For example, the study indicated that the year of application, the inventor who filed a complete application, and source of knowledge were associated with the patent grant. Other factors associated factors as testified by successful inventors are knowledge of the inventor in IP, responding to the request for corrections and the knowledge to conduct prior art search.

CHAPTER 5 CONCLUSIONS, SUMMARY AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the findings of the study and also captures the key conclusions on the as study objectives. Moreover, recommendations for further actions are provided for relevant authorities to take necessary actions.

5.2 Discussion

This study has investigated the trends of patent protection by local inventors in Rwanda from 2014 to 2019. The study used two data source, secondary data from IPO in Rwanda and survey data collected from local inventors who filed their patent applications at IPO during the same period. The research instruments used during the survey comprised a questionnaire developed to extract relevant information with the view to answer the objectives of the study.

The results of the study on the trend of filing patent applications suggest that there is an increase in the number of patent applications filed. This trend is associated with the improvement of the behavior of local applicants concerning filing patent applications. It

was also shown that patent grant has increased since 2017 to 2019. The increase of filing a patent application and patent grant is an indication that awareness in IP protection has started to take a good direction.

Moreover, due to the small sample size of local inventors who filed patent applications from 2014 to 2019, multivariate logistic regression analysis used to determine the association between the factors and patent granted did not generate evidence of such association. However, the feedback from successful patent applicants has indicated that Knowledge in IP and collaborating with IPO to correct the applications have contributed to their success in fulfilling examination requirements and grant patents. Finally, important suggestions from the applicants were based on building the capacity in IP, and improved collaboration by IPO and getting Governmental assistance from a special IP fund. According to the respondents, an IP fund can be a government initiative designed to support inventors from research perspectives to the development of real inventions.

5.3 Conclusions

The rate of filing patent application and granting of patent filed by local inventors in Rwanda can be improved through targeted interventions.

The results have indicated that filing the patent application was increased by 7% and that 1 patent grant per year from 2017 to 2019. However, in the regional perspective view, the increase of patent grant is low compared with other member states of ARIPO who had an average of 6 granted patents from 2014 to 2019.

Indicators regarding the year of application, inventor filed a complete patent application, source of finance, type of invention, the inventor was informed to make correction and

inventor has made correction of the application appear to be factors that are determinant in influencing patent grant. The results of the study further indicated that there is an association between the studied factors and patent grant.

The associated factors to the patent grant are born from the side of the inventor and can be alleviated by continuous capacity building of inventors in terms of knowledge and financial support

In terms of the suggestions, inventors suggested more training in IP and initiating IP fund to support the R&D of inventors to turn novel ideas into new patentable products.

5.4 Implications

The results of the study highlighted the status of filing patent application by local inventors and patent grant to the local inventors. Based on the findings, it is clear that patent application by local inventors and patents granted to them are still at low levels. Relevant authorities could use these results for decision-making purposes with the view to strengthen IP in local inventors.

Moreover, IPO in Rwanda should capitalize on the suggestions from the local applicants to take action that will assist in improving collaboration with applicants and assisting inventors to cross the financial barrier that prevents an inventor from turning novel ideas into patentable products.

5.5 Recommendations

Given the results of the study, the following are the recommendations to be considered:

- IPO and stakeholders should plan and support regular IP awareness and training of inventors and small and medium enterprises (SMEs) to vitalize IP culture, legal and policy instruments, and required knowledge to prepare a patent application document.
- The IPO should set up mechanisms to provide feedback to applicants regarding the status of their applications and assist them in correcting or adjusting their applications to reduce the rejection rate.
- IPO should plan regular IP awareness and guidance on administrative requirements for patent applications to improve positive factors for patent grant.
- The government of Rwanda should establish a special IP fund to support startup inventors turning novel ideas into patentable inventions.

5.6 Suggestions for Further Research

This research used a small sample size which affected the results on the factors for patent grant. We suggest a further study covering regional or continental coverage to have a bigger sample size. The study also suggests a comparative study of the patent application and grant to the local inventors between regional office from developed and developing countries.

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Appendix 1

Questionnaire

Section I: Personal Information

Title of patent: ----------

Application number: ----------

Publication Number: ----------

Name of the country in which patent was granted: ----------

Section II: Background of the invention

II. a) why have you decided to patent your invention? (Select each any which is applicable)

i)	To prevent it from others who can get it protected	☐
ii)	To have full ownership	☐
iii)	The target was to be called an inventor	☐
iv)	You knew other inventors who were working in the same research field	☐
v)	To have the rights to use and benefit from your invention	☐

II. b) How many person-months have you been working on your invention up to the time of protection?

i)	Less than 1 person month	☐	v)	13 – 18 person months	☐
ii)	1-4 person months	☐	vi)	19 – 24 person months	☐
iii)	5-8 person months	☐	vii)	25 – 48 person months	☐
iv)	9-12 person months	☐	viii)	More than 48 person months	☐

II. c) What was the source of knowledge that led to your invention. (Choose each which is applicable)

	1	2	3	4	5
i. University	☐	☐	☐	☐	☐

ii.	Secondary School	☐	☐	☐	☐	☐
iii.	Workshops and conferences	☐	☐	☐	☐	☐
iv.	Workshops and conferences	☐	☐	☐	☐	☐
v.	Patents documents	☐	☐	☐	☐	☐
vi.	Published literature	☐	☐	☐	☐	☐
vii.	Products on the market	☐	☐	☐	☐	☐
viii.	Competitors	☐	☐	☐	☐	☐
ix.	My employees	☐	☐	☐	☐	☐
x.	Other sources	☐	☐	☐	☐	☐
xi.	Explain:	☐	☐	☐	☐	☐

II. d) Which in the cases below better indicates the process for the invention that led to your achievement?

i) This invention was the results of your research project at the University ☐

ii) This invention was the results of research and development (R&D) at my company ☐

iii) This invention is related to your job and career outputs that you developed into a patent invention ☐

iv) This invention was the effort of my research skill and creativity, there is not any third party assistance ☐

v) Other cases (Please explain) ---------- ☐

Section III. Level of patent grant

III. a) How many inventions have you filed since 2009 -2020?

i 1 ☐

ii) 2 ☐

iii) Other (Please specify the number): …… ☐

III. b) How many patent protection were you granted since 2009 -2020??

i) 0 ☐

ii) 1 ☐

iii) Other (Please specify the number): …… ☐

III. c) How many of your patent applications were rejected since 2009 -2020?

i) 0 ☐

ii) 1 ☐

iii) Other (Please specify the number): …… ☐

Section IV: Filling for patent protection

IV. a) How have you prepared an application to file your invention to the IPO?

i)	You have a technical team of employees who drafted and prepared the filing documents	☐
ii)	R&D team drafted and filed a patent application	☐
iii)	You drafted a patent applications and prepared all the required documents	☐
iv)	You hired an IP expert to draft a patent application and filing for patent protection	☐
v)	You got advice from IPO on the required documents and the filing procedure	☐
vi)	Other (Please explain)…….....	☐

IV. b) Which of the criteria below have you fulfilled for the application document for patent protection?

i)	A request for a patent grant	☐
ii)	Name and contact address of applicant	☐
iii)	Title of invention	☐
iv)	Clear and sufficient description of the invention	☐
v)	Claims of the technical part of the invention	☐
vi)	One or more related drawings	☐
vii)	Abstract	☐
viii)	A proof of the payment of filing fee	☐

IV. c) What was the technological field is your invention?

i) A new product ☐ iv) Software ☐

ii) A process ☐ v) Method ☐

iii) Biological invention ☐ vi) A machine ☐

Other (Please specify)……. ☐

IV. d) Have you filed a complete application as required by the Intellectual Property Office (IPO)?

i) Yes ☐ ii) No ☐

If no, what was missing from the document?

iii) (Please specify)…… ☐

IV. e) Did the IPO informed you about correcting or completing your patent application?

i) You have been called to make corrections ☐

ii) You have been called to complete the missing documents ☐

iii) You have not been called to make corrections or competing the patent application ☐

IV. f) If you have been informed to make the corrections or complete the missing documents, have you acted accordingly?

i)Yes ☐ ii) No ☐

iii)If no, (please explain): …… ☐

IV. g) If you have been called to make corrections or to complete the missing documents, how long have you took to comply with the request?

i) Less than 1 month ☐ iv) 6 – 9 months ☐

ii) 1 – 3 months ☐ v) 9 – 12 months ☐

iii) 3 – 6 months ☐ vi) More than 12 months ☐

Section V: Key elements considered during the process of patent protection

V. a) If your patent application was granted, what did you do to make it successful?

i)	You hired an IP professional to assist in the preparation and filing application	☐
ii)	Your R&D team knows IP and have prepared and filed patent application	☐
iii)	You are skilled in IP and have prepared, and filed a patent application	☐
iv)	You have secured fund for R&D	☐
v)	You know how to conduct prior art search on related invention	☐
Vi	You know inventions that are patentable and those that are not patentable	☐
Vii	You made corrections and filled missing documents on time	☐
Viii	You were guided by IPO on the required documents	☐
Xi	Your invention was kept secret until it was protected	☐
X	Other (Please specify): ……	☐

V. b) Was your invention granted the protection?

i)Yes ☐ ii) No ☐

V. c) If the patent protection was not granted, do you know why?

i)	You have withdrawn (or left) your application	☐
ii)	You have not made necessary correction to complete an application document	☐
iii)	You were late to make corrections and to submit a complete file	☐
iv)	IPO informed you that invention is not new	☐
v)	IPO informed you that invention is not useful and has not industrial applicability	☐
vi	IPO informed you that your invention doesn't fall under the patentable inventions	☐
vii	If other (please specify): ……	☐

V. d) Challenges during the journey of patent protection (Choose each which is applicable)

i)	Lack of knowledge on patent application	☐
ii)	Lack of finance to for R&D of invention	☐
iii)	Lack of finance to hire IP specialist	☐
iv)	You were unable to locate an IP professional locally	☐
v)	Another competitor was hired my employees	☐
vi)	Your invention was disclosed before patent protection	☐
vii)	Other (Please, specify)	☐

V. e) What is the source of finance used in your invention project to the point of getting a patent?

i)	Government subsidies	☐
ii)	Friends and family	☐
iii)	Investor funding	☐
iv)	Fund from the financial institutions	☐
v)	Funds from national research and development fund	☐
vi)	My own funding	☐
vii)	Another source (please, clarify) ----------	☐

v. f) what do you suggest to be done by IPO or the government to improve the number of patent grant?

……

……

……

……

……

Appendix 2

AUREC Approval Letter

AFRICA UNIVERSITY
(A United Methodist-Related Institution)
INVESTING IN AFRICA'S FUTURE

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

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

Ref: AU1865/21 19 January, 2021

BIENVENU MIZERO
C/O CBPLG
Africa University
Box 1320
Mutare

RE: **ASSESSMENT OF THE TREND OF PATENT PROTECTION BY LOCAL INVENTORS IN RWANDA**

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

The approval is based on the following.

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

- **APPROVAL NUMBER** AUREC1865/21
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** January 19, 2021
- **EXPIRATION DATE** January 19, 2022
- **TYPE OF MEETING** Expedited
  After the expiration date this research may only continue upon renewal. For purposes of renewal, a progress report on a standard AUREC form should be submitted a month before expiration date.
- **SERIOUS ADVERSE EVENTS** All serious problems having to do with subject safety must be reported to AUREC within 3 working days on standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

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

Yours Faithfully

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

Appendix 3

Approval by Authority

Bienvenu MIZERO <mizerob@africau.edu>

Requesting for Intellectual Property data.

Richard KAYIBANDA <richard.kayibanda@rdb.rw> Thu, Jan 28, 2021 at 6:47 PM
To: Bienvenu MIZERO <mizerob@africau.edu>
Cc: Blaise Ruhima <blaise.ruhima@rdb.rw>

Dear Bienvenu,

Mr. Blaise Ruhima, IP Division Manager, will facilitate you to get the needed data. We wish you all the best in this noble endeavor.

Also, we would appreciate if we can get a copy of your final dissertation once completed.

Kind regards

Richard

[Quoted text hidden]