

Researchers Willingness to Submit Their Studies to the Innovation Hub at the National University of Science and Technology

Mukanganise Chiedza Ashley
chiedzaashley08@gmail.com

&

Wutete Obert

Obert.wutete@nuist.ac.zw

National University of Science and Technology

Abstract

The study was undertaken to assess the extent to which NUST researchers are willing to submit their research studies at the NUST Innovation Hub. The goal was to determine whether NUST researchers were aware of the existence of the Innovation Hub and to explore their fears concerning submitting their innovations and inventions at the Innovation Hub. The problem under study was that there was insufficient use of the Hub by NUST researchers; there was a very small percentage of research work submitted at the Innovation Hub by NUST researchers. The research was informed by the use of structured interview guides and questionnaires using the purposive sampling technique to collect data. The study population comprised of the University Registrar as he is the one who oversees policy making in the university, the director for the Research and Innovation Office (RIO), the department that funds research projects in the university, the Pro-Vice Chancellor of Innovation and Business Development, the Director of the Innovation Hub and students and lecturers who are currently working on innovations and inventions at NUST. The study revealed that researchers at NUST are not aware of the existence of the Innovation Hub and the help that comes from registering one's innovation at the Innovation Hub. The study also established the failure by the Innovation Hub to raise awareness about its existence, use and functions. Also notable was the need for the university in liaison with the Innovation Hub to educate their targeted users on how the Innovation Hub functions and the benefits that one can derive from using this facility and also educate users on the issues surrounding Intellectual Property Rights that protect Innovations.

Key Words: Innovation Hub, Intellectual Property Rights

Introduction

The National University of Science and Technology Innovation Hub deals with intellectual property information that is stored in specialized databases. The Innovation Hub does not own the intellectual property information but it provides services that allow for the access and use of the intellectual property information. The intellectual property information that the Innovation Hub holds is in the form of patents. The World Intellectual Property Organisation: Intellectual Property Handbook (2008) defines patents as a form of intellectual property that gives its owner the legal right to exclude others from making, using, selling and importing an invention for a limited period of years, in exchange for publishing and enabling public

disclosure of an invention and these patents are kept in patents databases. The intellectual property that is housed at the Innovation Hub is in the form of innovations that are created by students and lecturers within the university. Patents protect creativity and reward investments made in developing a new invention (The World Intellectual Property Organisation: Intellectual Property Handbook, 2008).

The Innovation Hub is a concept that is fairly new in universities where Innovation Hubs have been introduced. The study will help bring out the role of the Innovation Hub to NUST researchers. Innovation Hubs help improve innovations to make them marketable in industries. The study will also help bring out the extent to which NUST researchers are willing or prepared to submit or surrender their innovations at the Innovation Hub. It will help answer questions and bring out answers to the lack of inventions at the Innovation Hub. The study will also help the Innovation Hub personnel figure out what they can do to be more visible to the NUST community.

This study is aimed at encouraging invention production by NUST researchers. It is aimed at improving the relationship between NUST researchers and the Innovation Hub. The study will also re-introduce the Innovation Hub to researchers as it was previously introduced during its commissioning and outline to them the key roles of the Innovation Hub; its importance to their inventions. Whilst re-introducing the Innovation Hub to the researchers, the study will also explore the researcher's knowledge about the Innovation Hub and also explore the reasons why they are not submitting or taking their inventions and innovations to the Innovation Hub. The re-introduction of the Innovation Hub is to make sure that researchers are furnished with information that explains the role of the Innovation Hub so that researchers have a better appreciation of the key functions and role of the Innovation Hub. The study will also help the Innovation Hub personnel improve their marketing strategies to be more visible to the NUST researchers. It will also help the Innovation Hub identify the reasons behind the lack of inventions at the hub and help them map a way forward to curb this obstacle. This study intends to drive researchers at NUST's interests towards the Innovation Hub highlighting to them the advantages of the Innovation Hub and also it intends to find out reasons why researchers are not willing to submit innovations at the Hub and possibly bring out possible solutions.

Problem Statement

For the Innovation Hub to be fully useful and fulfil its mandate to the university it has to house innovations that are brought forward by NUST researchers. However, it seems as if researchers at NUST are not submitting their innovations at the Innovation Hub. There is no clear defining conclusion of the reasons behind the lack of innovations and inventions at the Innovation Hub. The reason behind the lack of submissions at the Innovation Hub is not entirely known and for the Innovation Hub to continue to function and live up to its mandate it has to have innovations submitted by NUST researchers. The relevancy and functions of the Innovation Hub seem not known to the NUST researchers and this might explain the unwillingness of NUST researchers to completely trust the Innovation Hub with their innovations.

Research Objectives

- i. Are NUST researchers aware of the existence and functions of the NUST Innovation Hub?
- ii. Are NUST researchers willing to submit their innovations and inventions at the Innovation Hub?
- iii. What are the reasons behind the resistance by NUST researchers to submit their innovations at the Innovation Hub?
- iv. Are there inventions or innovations that have not been submitted to the Innovation Hub?
- v. What are the researchers' expectations for them to submit their innovations or inventions to the Innovation Hub?

Review of Related Literature

Innovation Hubs

According to Chirchietti (2016), Innovation Hubs became popular in the 1980s as they provided office space for those who might want to do a startup that is to create innovations and inventions in one place. During the 1990s Innovation Hubs rapidly expanded but during that time they were known as Incubations and they provided value propositions providing business support services aiming to accelerate the learning process of startups (Bruneel et al., 2012). Incubations developed and in the 2000s they were called Innovation Hubs. Chirchietti (2016) defines an Innovation Hub as an organisation that is designed to accelerate the growth of a startup through a compilation of support services including, for example, office space, capital, training and networking possibilities. Chirchietti (2016) also identifies an Innovation Hub as a physical environment that supports startups and individuals at different stages of development. Innovation Hubs offer a space for the improvement of innovations and inventions which is what Chirchietti (2016) called startups.

Innovation Hubs help improve entrepreneurial ideas that are profitable in the industries and they allow for profit, non-profit and hybrid models. Students looking to create an innovation suffer mostly from a lack of resources, Innovation Hubs provide the necessary infrastructure to support the establishment and success of startups (Howells, 2006). Innovation Hubs are designed to create linkages between the entrepreneur and their environment to contribute to the regional economic environment Chirchietti (2016). In addition, the Innovation Hub nurtures an enabling environment where a community of entrepreneurs can grow (de Bastion, 2013). Friederici (2014) states that Innovation Hubs see themselves not as creators or implementers, but as enablers of innovations. It provides a structure for the interaction of people who would not meet each other daily. They create space for informal networking which in turn will help in the creation and development of new ideas and promising business ventures. Innovation Hubs allow for collaboration and nurturing of innovative ideas.

The Role of Innovation Hubs

Innovation Hubs in universities are meant to serve as an integration between the university and the industries. They are characterised as enablers of innovations (Friederici 2014). Innovation Hubs are meant to contribute to the economic growth of the country through the innovations that would have been submitted or presented to the Innovation Hub by researchers within a

university. Innovation Hubs are meant to encourage the generation of ideas and inventions that can be beneficial to the industries and that bring solutions to problems that are faced by industries today. At the same time, Innovation Hubs serve as a nexus point for the local startup community, investors, academia, technology companies and the wider private sector (de Bastion, 2013).

Through Innovation Hubs, investors can come in and choose to sponsor inventions and innovations that they would have deemed as worthy of support. The Innovation Hub introduces the inventor to the market and helps in the promotion of a particular innovation. A researcher can bring an invention to the Innovation Hub and in turn, get help in improving the invention so that it can be acceptable and useable in the industry. The concept of the Innovation Hub is fairly new in universities within Zimbabwe and due to this many researchers are not sure of what the role of the Innovation Hub is within a university. As the Innovation Hub is the centre for knowledge creation and sharing, it attracts a diverse, but like-minded group of people (Friederici, 2014). This encourages the sharing of innovative ideas and also encourages collaboration. As the Innovation Hub attracts diverse people, they have different people coming into the Innovation Hub and submitting economy changing ideas. Another role of the Innovation Hub is to promote startups and entrepreneurship.

Intellectual Property Rights

According to the World Intellectual Property Handbook: Policy, Law and Use (2008), Intellectual Property, very broadly, means the legal rights which result from intellectual activity in the industrial, scientific, literary and artistic fields. Intellectual Property Rights allow creators to safeguard their creations from being reproduced, sold and used without their consent. Intellectual Property Rights protect the creations and ideas of individuals. They help inventors protect that which is their brainchild. They allow creators to gain financially from their creations and also gain recognition for that which they would have created (World Intellectual Property Handbook: Policy, Law and Use, 2008). There is a closure period that is assigned to creations before they can be open for public use and according to the Patents Act Chapter 26:03, in Zimbabwe, the closure period is 20 years. The World Intellectual Property Organisation Handbook (2008) divides Intellectual Property into two categories namely:

- a) Industrial Property which includes patents for inventions, trademarks, industrial designs and geographical indications
- b) The Copyright covers literary works (novels, poems, plays), films, music artistic works (drawings, paintings) and architectural designs.

The National University of Science and Technology uses patents as a way of protecting the Intellectual Property Rights of researchers within the university.

Patents

Hall (2007) defines a patent as the legal right of an inventor to exclude others from making or using a particular invention. Hall (2007) goes on further to say that patents come as an Intellectual Property Right and this right is customarily limited in time, to 20 years from the date of the application submission in most countries. After 20 years, the patented invention becomes open to the public to allow others to use the patent and also improve the patent. The NUST Intellectual Property Policy defines patents as an exclusive right granted for an

invention, which sometimes is a product or a process that provides a new way of doing something or offers a new technical solution to a problem in industry or agriculture. The issued patent grants the owner the right to exclude and prevent others from practising or using the patented invention. Inventions and innovations submitted by researchers to the Innovation Hub are registered as patents to protect intellectual creation and these patents are stored in databases that are called patents databases. According to Singh et al (2016), a patent database is a repository of data that is related to the issued patents and published applications. All relevant data related to patents are the patent number, claims, specification, review and references are collected and maintained in a patent database (Singh et al, 2016). Inventions and innovations submitted at the Innovation Hub are patents protected. Patent protection means that an invention cannot be commercially made, used, distributed, or sold without the patent's owner's consent. These rights are enforceable in a court of law, which holds the authority to stop Patent Infringement (The NUST Intellectual Property Policy).

When registering innovations and inventions as patents some processes and procedures are followed. Researchers might not be aware of the processes and procedures that they should take to register their innovations and inventions as patents and this could explain their resistance or unwillingness to submit their innovations and inventions to the Innovation Hub.

The World Intellectual Property Organisation Handbook (2008) states that for an invention to be patentable, it has to meet certain criteria which include that the invention must consist of a patentable subject matter, the invention must be industrially applicable that is to say it must be useful, it must be an innovation or invention and it must be non-obvious. For an invention to be patented and be protected from unauthorized usage of the patent, the World Intellectual Property Organisation Handbook (2008) outlines the procedures and steps that one has to follow to register his/her invention as a patent through the filing of a patent application.

Procedures in Patenting

According to the World Intellectual Property Organisation Handbook (2008:22), the following are procedures in patenting:

1. When filling out a patent application, there has to be the title of the invention should be included and the technical field in which the invention lies, what the invention relates.
2. There also has to be the inclusion of the background of the invention which will include the problems or difficulties that the invention seeks to overcome. The background should also include what if any, solutions the invention has brought and a clear distinction between current inventions and the previous inventions. The background should also bring out the objective of the invention and what it wants to achieve.
3. The inventor will then need to include a summary of the invention. The summary of the invention speaks to the features of that invention and provides explanations of how the invention and its features can be used to solve a problem.
4. Following the summary of the invention are the illustrations of the invention in the form of drawings if they are appropriate:
 - If the invention relates to some form of the mechanical object for example drawings illustrating a plan, elevation and sectional views of that object could be used. Where the invention is an electrical circuit, drawings can be used effectively to

show the connections between the various elements or components of the circuit and the elements and components should be numbered for ease of reference. Where the invention is in the chemical field, the drawing may be the chemical formula of one or more compounds. Where the invention is metallurgical, the drawing may be a diagram such as a phase diagram of the components. This should be accompanied by a brief description of the actual operation of the invention, a description of how the invention operates will be helpful in the understanding of the invention.

After filling out the patent application, the progress of the application can be followed through the Patent Office where one would have applied. The patent application will then be examined to ensure that the invention is worth patented.

According to the Zimbabwe Patents Act, Chapter 26:03, an application for a patent for an invention may be made by a person claiming to be the inventor of the invention who owns the invention in respect of Zimbabwe or an assignee and when or if the inventor is deceased or has a disability, a legal representative can apply for the patent on behalf of the inventor. The act goes on further and explains that where the inventor is not the applicant, the application should contain a declaration that the applicant believes him to be the inventor. After an application for a patent has been submitted to the Patents Office, it then waits to be examined by the Patents Officer. The application will be examined whether the application, specification and accompanying documents comply with the requirements of the Zimbabwe Patents Act and the validity of the invention. The application will then await consideration upon payment of the application fee. The registrar can refuse to grant the application if the invention is expected to:

1. To endanger public order or public safety; or
2. To encourage offensive, immoral or anti-social behaviour; or
3. To endanger human, animal, or plant life or health; or
4. To promote serious prejudice against the environment.

Patent applications are made for inventors to own their inventions for a specified period for them to gain from the invention either through recognition or through financial gains. The World Intellectual Property Handbook (2008) spells out the processes one has to undertake to fill out an application for a patent and also the Zimbabwe Patents Act also spells out the processes and procedures one has to follow when applying for a patent in Zimbabwe and also the reasons why an application may fail to be granted.

For NUST researchers that want to patent their innovations and inventions, the NUST Intellectual Property Policy (NIPP: 2007) has listed requirements necessary to obtain a patent which are:

1. The first step is to fill out a patent application.
2. The patent application form must include the title of the invention, its technical field, background and description of the invention.
3. Should also include visual materials such as drawings, plans or diagrams to help in the visualization of the invention.

When a researcher comes up with an invention, the university or even that individual can apply for the patent to the Patents Office which is a subsection of the Zimbabwe Intellectual Property Office (ZIPO) (NUST IPP, 2007:7). The NUST IPP also comes up with a list of criteria for inventions or innovations that will be legible for patenting which are that:

1. It must be new and must not have been previously produced or described in any other country or language.
2. It must be inventive, and must not be self-evident. It must carry with it a creative idea and be an advancement in its technical field.
3. It must be practical and exploitable and must be applied in industries, commerce, or agriculture.

Importance of Patents

Today the role of the intellectual property in the educational and research activity of the university has greatly increased and the attitude of society towards the intellectual property identifies the development of a state as a whole (Tolstaya and Suslina, n.d). Tolstaya and Suslina (n.d) go on to say that for an invention to be able to be protected by the law it should be patentable. One major role of patents is to protect an inventor's invention from being used by other people without his/her consent. They help an inventor maintain control over his/her innovation. Patents allow an inventor to gain from his invention either by gaining financially or by gaining recognition for his patent. Patents offer an exclusive right of an invention to the inventor and this "exclusive right" enables the patent owner to recoup development costs and obtain a return on investment in the development of the patented technology (Hunter, 2005). Filing patent applications early helps limit the risk that someone else has obtained (or will obtain) a patent on the same idea so patents act as security to your patent and secure that which you would have patented as your own and thereby limiting the risk of someone else obtaining the same idea as yours.

Patents are also important as they provide licensing opportunities to either companies or individuals. Licensing will grant the patent holder selling rights in which he will be able to sell his patent to other users and get financial gains from that which is their brainchild (Hunter, 2005). A company or an individual may sell a patent to those that will be able to improve that which they would have invented further and those that will be in a financial position to bring those ideas into the market. Patents are important because they allow the investor to obtain licensing to his/her invention and patents protect an invention from unauthorized usage. They help an inventor prevent others from making use of his or her innovation or even selling it on behalf of the inventor.

The Role of Universities in Innovation

Universities are seen as major players in innovation through the production of new workers and scientific results that can be turned into patents and the existence of universities can lead to university-industry knowledge transfer and exchange. Countries and governments that are willing to adapt to the impact of globalization have to identify knowledge-based innovations that they will use to retain growth and prosperity. As traditional carriers of advanced research

and higher education, it is not surprising that universities have been drawn into these recent pushes to promote innovation (Power and Malmberg, 2008).

According to Acs et al (2002), there is a well-proven fact that technology and other forms of innovations and knowledge do seem to spill over locally from universities. This speaks to the role of universities in innovation to say that new, current and fresh ideas and technological innovations come from the universities where they will be adopted in the industries. Universities contribute to a nation's economic growth to a greater extent. Druilhe and Garnsey (2004) note that universities attract a considerable number of students, business visitors and tourists and as such idea generation is maximized. According to Power and Malmberg (2008), because a university is where all different kinds of people meet due to its diversity, idea generations become heightened and increased hence the output becomes also of increased quality. University is also where entrepreneurs emerge and where those with entrepreneurial ideas and skills are trained on how to become good entrepreneurs in the country. Entrepreneurship also leads to innovation and the improvement of a country's economy hence one of the roles of the university is innovation.

According to Druilhe and Ramsey (2004), academic entrepreneurship comes in many forms from startup companies to soft entrepreneurship such as sideline consultancy or publishing and can be a significant revenue source for national revenue. Through universities, many entrepreneurship ideas and skills are generated and enhanced bringing addition to innovations. Entrepreneurship can be important both as a new material force in the country and also as a vehicle for technology transfer (Benneworth and Charles, 2005). Shane (2004) states that in research-intensive sectors such as biotechnology, university spin-offs are more significant and useful in the industry than spin-offs from private research laboratories. Through their education of students, universities can have a very real effect on the local provision of skilled labour (Power and Malmberg, 2008).

After graduation from university, students will be in the working and entrepreneurship environment and they cannot bring out the ideas and knowledge that they would have acquired during their university years thereby contributing significantly to a country's innovation system. Power and Malmberg (2008) note that there also exists a series of immaterial interdependencies between universities and cities/regions. He also states that universities are powerful symbols of learning and expertise and as such the presence of universities or world-famous research institutions can be important to a city or a region's branding, there is often inseparability between the university and its surrounding region. The role of universities in innovation is of greater significance as in universities students get equipped with the knowledge and skills that will enable them to make a difference in the community and nation's economy. Universities train students and enable them with the required skills to contribute towards innovation. Universities play a major role in the contribution to the economy in terms of innovations and inventions and it is important to encourage innovative idea generation among university students. Innovation Hubs act as a centre for sharing ideas, idea generation and innovation improvements hence the need for researchers to submit innovations at the Innovation Hub so that they can be improved and be useful in the economy.

Resistance to submitting Innovations at the Innovation Hub

Roberts and Jimenez (2019) talk about the rejection of innovations as one of the reasons why innovators may not be willing to submit their innovations at the Innovation Hub. The rejection or lack of adoption as Roberts and Jimenez (2019) state, will be rejected by consumers and/or users of the innovation and invention. Reasons for people (consumers) for rejecting an innovation may be because people are slow to adapt to the innovations or because they need to be convinced that the innovation and invention are useful and that they should adopt it (Chirchietti, 2017). Because users of a certain innovation might not be willing to accept and adopt an innovation might be one of the reasons why innovators might be resistant to submit innovations to the Innovation Hub. They would not want to create something that will not be acceptable to the community and users at large. According to Foxall (1994), consumers are predicted to be less likely to try new products or brands and their resulting lack of experience with new products might discourage innovators hence one of the reasons why innovators might resist submitting their innovations and inventions at the Innovation Hub because they fear that their innovations might be rejected and not adopted by consumers. Rejection of innovations by innovation hubs may be because, according to Roberts and Jimenez (2019), the innovation does not carry significant monetary value, or the innovation cannot be patentable. Due to this, investors shy away from submitting their innovations at the innovation hub because their inventions might not carry monetary value but add to knowledge within a community. Other innovation hubs place value on innovations that should be submitted to them for example they say that for them to accept an innovation it should be valuable such that it brings in returns in monetary value (Roberts and Jimenez, 2019). Some innovators would have brought forward innovations that contribute to knowledge generation and not necessarily generate income.

Jalbert, (2000), and Bitler et al (2001) raise the issue of lack of finances as one of the obstacles that the youth may fail to come up with innovative ideas and inventions. This was further supported by Llisterri et al (2006) who stated that young dynamic entrepreneurs face several obstacles to creating and managing their ventures including gaining access to financing, managing cash flow, purchasing appropriate equipment and technology, finding and hiring skilled employees, and entering the market (finding reliable long-term customers) are among the main challenges for new entrepreneurs. The lack of finances can be a hindrance to invention-creation which may result in the lack of innovations at the Innovation Hub. According to Filho et al (2017), the lack of finances may prevent inventions from being converted into innovations. They go on further to say that without money for production, participation in invention fairs becomes a missed opportunity because they say that without the money to produce a prototype, there is no need to attend invention fairs. Inventors and innovators face a lack of financial support and funding which they would want for the purchasing of tools that they would need to build or make a prototype. The lack of creation of innovative ideas might be attributed to the fact that investors and innovators do not have the required tools at their disposal to create inventions and prototypes to be submitted to the Innovation Hub (Filho et al, 2017).

Another reason that may be attributed to the lack of innovations at the Innovation Hub is the lack of awareness of what to do when one wants to submit an innovation at the Innovation

Hub. There may be innovations generated among researchers within an institution but what to do with the innovation after its creation might be a challenge to some as they lack the know-how of what should be done when one has an innovation he/she wants to submit to the Innovation Hub. Giaccone and Longo (2016) talk about communication as one of the key factors that hinder innovation. They mention the lack of communication that is evident between the Innovation Hub and its researchers. It might not have been adequately communicated to an institution's researchers of what steps and procedures they should follow when they want to submit innovations at the Hub. (Chirchiatti, 2017) articulates that researchers might lack knowledge about the new dynamic and concept of the hub and it can be said that researchers do not resist submitting innovations to the Innovation Hub, they simply do not understand what the Innovation Hub does and what it stands for as there has been no communication made to the researchers concerning the Innovation Hub and its functions.

Kahma and Matschoss (2017), bring the suggestion that there might be a rejection of ideas amongst researchers and also a rejection of ideas from the innovation hub. A researcher might bring up an idea or invention and other researchers might reject that idea and that comes as a barrier to innovation. It also translates that maybe researchers are not unwilling to submit their innovations to the Innovation Hub but it may be because they do not have innovations, inventions and ideas at hand that they can submit to the Innovation Hub. It may also be because of self-doubt and lack of confidence and belief in one's invention, fear that the innovation or invention might not be up to the standards of the Innovation Hub and might be rejected. It might also be because of the characteristics of an innovation that might hinder its adoption.

Research Methodology

Research Design

Cooper and Schindler (2006) defined a research design as the plan and structure of investigation of information to obtain answers to research questions. The research design is implemented as a case study and this is a report on a case study that was conducted by the researcher at the National University of Science and Technology (NUST). Creswell (2008) states that the selection of a research design is based on the nature of the research problem or issue being addressed and the audiences in this particular case are the researchers at NUST.

Population of the study

According to Ngulube (2005), one of the major steps in conducting research is defining a population and according to Wegner (1995), a population is any group of individuals that have one or two characteristics in common that are of interest to the researcher. The targeted population for this research is the researchers at NUST comprising both students and lecturers. The study focused on the researchers that are already working on innovations and inventions coming from four faculties in the university that is the Faculty of the Built Environment, Engineering faculty, Applied Sciences and the Faculty of Science and Education. The study also included the Director of the NUST Innovation Hub, the University Registrar, the Director

of RIO and the Pro Vice Chancellor of Innovation and Business Development. Their contributions significantly added value to this research study.

Sampling Technique and Sample Size

According to Gray (2009), sampling is a process of selecting several individuals from the selected targeted population in such a way that the individuals in the sample represent as nearly as possible the characteristics of the whole targeted population. A purposive sampling technique was used for this study. The population was purposively selected and only those that were working on innovations and inventions were selected for this research. Gender and level of study were not taken into consideration during this research because they do not affect the outcome of results and also they provide for a wide range of possible responses. Also, there was a selection of people who contributed to the operations of the Innovation Hub. Included is the Registrar as he oversees all policy-making within the university, the Director of the Innovation Hub who is responsible for all the operations of the Innovation Hub, and the Director of RIO who is responsible for sponsoring research inclined toward innovations or inventions in the university and the Pro-Vice Chancellor of IBD who oversees all research and innovation in the university. The researcher is only targeting one organisation which is NUST and all the respondents will come from that one organisation.

Data collection tools and techniques

The researcher made use of a variety of data collection tools and techniques to get as much information as possible that answered the research questions. Data collection tools that were used include structured interview guides and questionnaires. Data collection techniques allowed the researcher to collect information about the objectives of the study making sure that the collection of data had to be systematic so that research questions may be answered as best as possible. The research instruments were found to be convenient under the coronavirus-induced lockdown. Respondents were able to complete questionnaires online.

Structured Interview Guide

The researcher used structured interview guides for data collection. According to Denscombe (2003), a structured interview is a tightly controlled interview whereby the researcher has a predetermined list of questions to which the respondent is invited to offer limited option responses. Questions in a structured interview guide are premeditated which means that they are thought of well in advance before administering or before developing the structured interview guide (Mason, 2004). According to Hardon, Hodgkin, and Fresle(2004), a structured interview guide allows the researcher to improvise by asking follow-up questions that will be based on the participant's response. They allow the researcher to understand more and ask questions that will help in attaining favourable results. Another advantage of structured interview guides is that they are flexible. A participant can provide answers at any time and at their convenience.

Developing the Structured Interview Guide

Several structured interview guides were developed as they were targeting different respondents from the research population. Structured interview guides were administered to the Registrar, the PVC IBD, the Director of the Innovation Hub and the Director of RIO. They were the only respondents for the structured interview guides. Each interview guide carried

different questions that targeted the position of the participant who was expected to answer specific questions. Whilst developing the interview guide, the position of the respondents was taken into consideration for example the Registrar received an interview guide that had questions relating to policies in the university. He is the one who is in charge of policy-making hence his questions were about policies and the Director of RIO received an interview guide that speaks to research grants and sponsorships of research work in the university. Each interview guide was different and contained questions that were different. The advantage of doing this was that a wide range of questions was covered at the same time allowing coverage relating to the research. The development of questions stood guided by the research objectives.

Questionnaire

A questionnaire is a tool that is used for data gathering and research that consists of a set of questions used to collect information from respondents (Brace, 2008). The questionnaire used to acquire data for this research consisted of open-ended questions that allowed the respondents to give details and explanations in their answers. The questionnaires were administered to lecturers and students that are currently working on innovations and inventions. Questionnaires for students had a different set of questions as opposed to questionnaires for lecturers. This was done to find a wide coverage and/or variety of answers that will contribute positively to the sought information.

Data Collection Procedures

Since respondents were the lecturers, students and some administrative members of NUST it means that data was collected within NUST. A request to carry out research at NUST was sent to the University Registrar in the form of a letter that was obtained from the Department (Records and Archives Management) and was signed by the Department's chairperson. Permission to carry out research at NUST was granted within three working days.

Data collection was gathered through the use of email communications. Questionnaires for students and lecturers were administered using email attachments which they completed and sent back. Structured interview guides were also sent through email communications to the respondents and they completed the interview guide and sent it back to the researcher.

Data Presentation and Analysis Procedures

According to Lacey and Luff (2007), research generates mass data that would be analyzed, described and summarized. The data would be accurately represented through the use of graphs and charts for example bar graphs and pie charts. Data analysis constituted of seeking patterns and relationships within the data that has been collected. Data was sorted, organized and categorized for easy analysis, comparison, interpretation and presentation.

Ethical Considerations

Ethical considerations address those issues dealing with the interests of those people who will be interacted with during the research. This speaks to the observation of the privacy of the participants and the guarantee that any information that will be collected during the research process will not be disclosed to a third party (Fouka, 2011). Information collected was not used anyhow without the consent and knowledge of the participants. In the course of the research, participants were not inconvenienced and forced into answering research questions, they were

voluntarily answering questions at their most suitable time. Authors of publications and articles quoted and referenced in this research were acknowledged using the Harvard referencing style.

Population of the Study

According to Ngulube (2005), one of the major steps in conducting research is defining a population and according to Wegner (1995), a population is any group of individuals that have one or two characteristics in common that are of interest to the researcher. The targeted population for this research is the researchers at NUST comprising both students and lecturers. The study focused on the researchers that are already working on innovations and inventions coming from four faculties in the university that is the Faculty of the Built Environment, Engineering faculty, Applied Sciences and the Faculty of Science and Education. The study also included the Director of the NUST Innovation Hub, the University Registrar, the Director of RIO and the Pro Vice Chancellor of Innovation and Business Development. Their contributions significantly added value to this research study.

Sampling

According to Gray (2009), sampling is a process of selecting several individuals from the selected targeted population in such a way that the individuals in the sample represent as nearly as possible the characteristics of the whole targeted population. A purposive sampling technique was used for this study. The population was purposively selected and only those that were working on innovations and inventions were selected for this research. Gender and level of study were not taken into consideration during this research because they do not affect the outcome of results and also they provide for a wide range of possible responses. Also, there was a selection of people who contributed to the operations of the Innovation Hub. Included is the Registrar as he oversees all policy-making within the university, the Director of the Innovation Hub who is responsible for all the operations of the Innovation Hub, and the Director of RIO who is responsible for sponsoring research inclined towards innovations or inventions in the university and the Pro-Vice Chancellor of IBD who oversees all research and innovation in the university. The researcher is only targeting one organisation which is NUST and all the respondents will come from that one organisation.

Data gathering instruments

The researcher made use of a variety of data collection tools and techniques to get as much information as possible that answered the research questions. Data collection tools that were used include structured interview guides and questionnaires. Data collection techniques allowed the researcher to collect information about the objectives of the study making sure that the collection of data had to be systematic so that research questions may be answered as best as possible. The research instruments were found to be convenient under the coronavirus-induced lockdown. Respondents were able to complete questionnaires online.

Data analysis methods

According to Lacey and Luff (2007), research generates mass data that would be analyzed, described and summarized. The data would be accurately represented through the use of graphs and charts for example bar graphs and pie charts. Data analysis constituted of seeking patterns

and relationships within the data that has been collected. Data was sorted, organized and categorized for easy analysis, comparison, interpretation and presentation.

Recommendations of the study

The research recommends the NUST Innovation Hub adopt marketing and advertising strategies that will increase its popularity in the university. The Innovation Hub is a new concept in the university which is not yet popular among students and lecturers. It was established that students and lecturers in the university lack awareness of the existence of the Innovation Hub. The Innovation Hub personnel were recommended to launch awareness campaigns and to have marketing strategies in place that would market the Innovation Hub and increase its popularity among its users.

The study brought to light issues surrounding the willingness of NUST researchers to submit their innovative work at the Innovation Hub. It was noted that researchers at NUST are not willing to submit their research work at the Innovation Hub. To increase innovations submissions the Innovation Hub was recommended to be more involved in the research work that is being done in the university, to be more encouraging and to motivate researchers by offering an incentive for submitting research work at the Hub.

Personnel working at the Innovation Hub should educate targeted users on the processes and procedures one has to undertake when submitting a study to the Hub. NUST researchers indicated that they do not know the processes and procedures that should be undertaken to submit a study to the Innovation Hub.

NUST has an Intellectual Property Policy that stipulates how patents are used and how innovative work is protected from unauthorized usage. NUST researchers indicated that they are not aware of the existence of the Intellectual Property Rights that are used to protect their work. This study recommends that the Innovation Hub adopt means of interaction with NUST researchers and take time to explain to them issues surrounding the protection of work and Intellectual Property Rights.

Personnel at the Innovation Hub are encouraged to engage with researchers, visit departments in the university that are working on innovative ideas, see the progress that the departments would have made and encourage them to make use of the Innovation Hub citing the importance of the Innovation Hub.

References

- Acs, Z. J., FitzRoy, F. R. and Smith, I. (2002). *High-technology employment and R&D in cities: heterogeneity vs specialization*. *Annals of Regional Science*, 36: 373–386.
- Benneworth, P. and Charles, D. (2005). *University spinoff policies and economic development in less successful regions: learning from two decades of policy practice*. *European Planning Studies*, 13: 537–557

Bruneel, J.; Ratinho, T.; Clarysse, B. and Groen, A. (2012). *The Evolution of Business Incubators. Comparing demand and supply of business incubation services across different incubator generations.*

Chirchietti, N. (2017). *The Role of Innovation Hubs taking start-ups from ideas to business: The Case study of Nairobi, Kenya*: University of Nairobi.

Cooper, D. R. and Pamela S. Schindler. (2006). *Business Research Methods*. Singapore: McGraw Hill.

Creswel, J. (2008). *Research Design: Quantitative and Qualitative Approaches*. Guilford Publications Inc: New York.

De Bastion, G. (2013). *Technology Hubs. Creating space for change: Africa's technology innovation hubs*. Edited by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) Gmb Available online at https://10innovations.alumniportal.com/fileadmin/10innovations/dokumente/GIZ10innovations-01_Technology-Hubs-Brochure.pdf, checked on 3/15/2016. □

Druilhe, C. and Garnsey, E. (2004). *Do academic spinouts differ and does it matter?* The Journal of Technology Transfer, 29: 269–285.

Filho, S., Tahim, E., Serafim, V., Moraes, C. (2017). From invention to Innovation—challenges and opportunities: a multiple case study of independent inventors in Brazil and Peru. *RAI Revista de Administração e Inovação*, 14(3), 20-31.

Foxall, G. R. (1994). *Consumer initiators: both adaptors and innovators*. In *Adaptors and Innovators*, ed. M.J. Kirton, pp. 236–259. Routledge, London.

Friederici, N. (2014). *What is a tech innovation hub anyway?* Available online at <http://cii.oii.ox.ac.uk/2014/09/16/what-is-a-tech-innovation-hubanyway>

Giaccone, C.S and Longo, M.C. (2016). *Innovation-Hub Management for Value Co-Creation: The Centrality of Corporate Policies*. The publication is available to ISPIM members at www.ispim.org.

Gray, R. V. (2009). *Qualitative methods*. [Online]. Available at: <https://www.open.edu> (Accessed 10 June 2020)

Hall, B.H. (2007). *Contribution to The New Palgrave: A Dictionary of Economics*. Second Edition

Howells, J. (2006). *Intermediation and the role of intermediaries in innovation*. In *Research Policy*

Hunter, P.S. (2005). *The importance of patents. Having a directed patent strategy can reduce company costs and increase value*. Patent attorney Foley & Lardner LLP

Jalbert, E. (2000). and Bitler et al, (2001). *Preservation of T cell proliferation restricted by protective HLA alleles is critical for immune control of HIV-1 infection*

Jimenez., A and Roberts., T. (2019). Decolonising Neo-Liberal Innovation: Using the Andean Philosophy of 'BuenVivir' to Reimagine Innovation Hubs. 15th International Conference on Social Implications of Computers in Developing Countries (ICT4D), Dar el Salaam, Tanzania. pp.180-191, ff10.1007/978-3-030-19115-3_15ff. fhal-02281295f

Kahma, N and Matschoss, K. (2017). *The rejection of innovations? Rethinking technology diffusion and the non-use of smart energy services in Finland. Energy Research & Social Science*, 34. 27-36. 10.1016/j.erss.2017.05.024.

Lacey, A. and Luff, D. (2007). *'Qualitative Research Analysis'*, The NIHR RDS for the East Midlands/Yorkshire and the Humber, UK. Longman

Ngulube, P. (2005). *Improving the Quality of Research in Higher Education through Knowledge Sharing and Collaboration: A Case Study*

Power, D. and Malmberg, A. (2008). *The contribution of universities to innovation and economic development: in what sense a regional problem?* Cambridge Journal of Regions, Economy and Society, 1, 233–245 doi:10.1093/cjres/rsn006

Shane, A. (2004). *Academic Entrepreneurship: University Spinoffs and Wealth Creation. Cheltenham*: Edward Elgar.

Singh, V., Chakraborty, K. and Lavina-Vincent, C. (2016). *Patent Database: Their Importance in Prior Art Documentation and Patent Search*. Journal of Intellectual Property Rights. 21.

Tolstaya, A.M. and Suslina, I.V. (n.d). *The role of Patent and Non-Patent Databases in Patent Research in Universities*. National Nuclear University

World Intellectual Property Organisation: Intellectual Property Handbook (2008): *Policy, Law and Use*. Chapter 2: Fields of Intellectual Property Protection Achieved

World Intellectual Property Organisation: Intellectual Property Handbook (2008): *Policy, Law and Use*. Chapter 2: Fields of Intellectual Property Protection Achieved

Zimbabwe Patents Act, Chapter 26:03.