

Research Article

UTILIZATION OF INTELLECTUAL PROPERTY SYSTEMS AS A TOOL TO PROMOTE INNOVATION IN UGANDA'S PUBLIC ACADEMIC INSTITUTIONS: A CASE STUDY OF MAKERERE AND KYAMBOGO UNIVERSITIES

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ABSTRACT

Intellectual property (IP) protection is critical for promoting innovation in academic institutions. However, IP awareness and utilization remains low at Uganda's Makerere and Kyambogo Universities despite their strong research and innovation potential. This study assessed the level of IP utilization as a tool for fostering creativity and innovation at these universities. The research employed a quantitative approach, collecting data through surveys of students, staff and alumni. Findings revealed high levels of innovation participation, but very limited IP registration across patents, trademarks, copyrights and industrial designs. Key barriers included lack of knowledge about registration procedures and high associated costs. While general awareness of IP rights was moderately high, specific understanding of application processes was lacking. To address these challenges, the study recommends regular IP awareness campaigns, implementing online registration systems, increasing IP expertise, and providing financial incentives. Integrating IP education in university curricula, establishing technology transfer support, and developing customized IP policies are also proposed. Continuous monitoring of IP performance metrics can help strengthen management practices. Overall, the research highlights the need for concerted efforts to build IP capacity and promote commercialization of academic innovations in Makerere and Kyambogo Universities. Leveraging IP more effectively can contribute to Uganda's transition into a knowledge-based economy driven by science, technology and innovation.

Keywords: Intellectual Property (IP), Innovation, Creativity, Makerere University, Kyambogo, University, IP Commercialization, Technology Transfer, Uganda.

INTRODUCTION

Intellectual property (IP) protection plays a vital role in promoting innovation and technology development globally. IP refers to creations of the mind, such as inventions, literary and artistic works, designs, symbols, names and images used in commerce (WIPO, 2012). The key types of IP include patents, copyright, trademarks, industrial designs, geographical indications and trade secrets. Strong IP regimes incentivize inventors and creators by providing them with exclusive rights over their innovations for a limited period, enabling them to recoup investments and earn returns from commercializing their work (WIPO, 2011). Academic and research institutions like Makerere and Kyambogo universities in Uganda are the major sources of new knowledge, technologies, and creative works that can benefit from IP protections (Czarnitzki, Hussinger and Schneider, 2011). To find suitable solutions for the current problems, there is a need for creative and innovative problem-solving and problem management ways (Siyana, 2015). In Uganda's public academic and research institutions, the ability to continuously innovate has become a survival criterion (Quinn and Cameron, 2013). Quality and top entrepreneurial graduates are being created, causing Ugandan academic institution rankings in Africa and the globe at large to skyrocket, indicating a significant improvement over prior year. According to the most recent World institution rankings, Makerere University is Africa's fifth-best institution and the top in East Africa, out of 1,500 universities in 93 countries and regions throughout the world (CGTN Africa, 2020).

According to the rating, the important performance areas included teaching, research, knowledge transfer, and international vision (CGTN Africa, 2020). The conditions of innovators at Makerere and Kyambogo Universities, as well as in Uganda as a whole, have substantially improved as a result of increased investment in research; the provision of incubation centers that are open to students; and, ultimately, the availability of government funds for innovators like Makerere University Research and Innovations Fund (Mak-RIF) (Makerere University, 2020). This encourages students' ongoing participation in innovation and creativity, as well as the invention of new ideas and the development of new technical solutions to local problems (Quinn and Cameron, 2013).

As a result, innovation should be recognized as a company's primary goal (Elena and Orietta, 2006). Innovation creates value. Pure science and experimentation have inherent value, but for something to be considered an innovation, it should provide tangible benefits to individuals, organizations, or society as a whole. This could be through improving efficiency, reducing costs, enhancing products and service (Elena and Orietta, 2006).

In the developing world, leveraging IP in academic settings has emerged as an important strategy for driving innovation, technology transfer, and economic growth (Kamil, 2003). However, many public universities face challenges in effectively using IP policies and systems (Rothaermel, Agung and Jiang, 2007). In Uganda specifically, IP awareness and utilization remains relatively low across public universities like Makerere and Kyambogo despite the potential benefits (INNOCENT, 2023). Recent studies have highlighted the

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need for targeted strategies to build IP capacity and promote commercialization in Ugandan academia (Christopher and Mwai, 2023).

This study aims to examine how IP systems can be better leveraged to foster innovation and development outcomes in Uganda's public universities. The study will focus on Makerere and Kyambogo Universities as leading public institutions at the center of Uganda's academic research and training. An in-depth analysis will be undertaken to understand the existing barriers, knowledge gaps, and cultural factors that may limit IP effectiveness on campuses (Kariuki and Omukubi, 2017).

The research will investigate potential best practices from other developing countries that can be adapted to the Ugandan context. The findings will provide evidence-based recommendations for how IP policies, support systems, and organizational structures at Makerere and Kyambogo can be enhanced to create a culture of innovation (Siegel, Waldman and Link, 2004). This has the potential to boost IP activity, technology transfer, and commercialization of academic research for wider economic and social benefits in Uganda. The study ultimately seeks to demonstrate how IP utilization in public universities can be an important tool for driving innovation in Makerere and Kyambogo universities.

Problem Statement

Uganda has recently experienced an increase in inventions and innovation centers in academic institutions (Mulumba *et al.*, 2017). However, these figures do not match the number of IP applications and registrations reported by Makerere and Kyambogo Universities, as well as Uganda as a nation. According to the Uganda Registration Service Bureau's annual report for 2021, two patents were granted from 15 applications filed, three utility models were granted from 19 applications filed, and 17 industrial designs were granted from 76 applications filed in total for the 2020/2021 financial year, with none of the applications coming from Makerere or Kyambogo University (URSB, 2021). This shows that there are obstacles to the implementation of efficient intellectual property regimes in these academic environments. Further investigation is needed to understand why IP activity is so minimal.

Objectives of the Study

The purpose of the study is to assess the level of utilization of IP as a tool for promoting innovation in Makerere and Kyambogo Universities. The specific objectives are to:

- To assess the status of innovation and IP registration in Makerere and Kyambogo Universities.
- To assess level of IP and IP application processes awareness by innovators and researcher in Makerere and Kyambogo Universities
- To determine the challenges faced by innovators and researcher in Makerere and Kyambogo Universities in acquiring IP rights.
- To propose solutions for the challenges identified in (iii).

Scope and Limitation of the Study

This research aims to address a significant knowledge gap on IP utilization and management at major Ugandan universities, taking Makerere and Kyambogo as case studies. Prior literature indicates that effective IP policies and capacity are lacking in many African universities to translate research into innovations (Rens, Prabhala and Kawooya, 2006). This paper generate empirical data to guide

evidence-based policies and practice. The focus aligns with Uganda's national development goals as outlined in Vision 2040 to transition into a knowledge-based economy driven by science, technology, and innovation (GoU, 2017). As leading academic institutions mandated to produce IP assets, Makerere and Kyambogo have a key role in achieving these national objectives. However, there is limited research on how these universities currently leverage IP to deliver on their innovation mandates.

This study will produce concrete recommendations to enhance IP utilization, benefiting university administrators in evaluating and improving their IP management systems. By identifying challenges, motivations and best practices, it will help prioritize interventions to increase patenting, licensing, spin-off formation, and research commercialization. The findings will also inform policymakers on regulatory reforms needed to incentivize IP protection and technology transfer. Overall, the research will catalyse actions across academia, government, and industry to optimize IP systems to stimulate innovation, contributing to Uganda's economic prosperity and global competitiveness.

LITERATURE REVIEW

Concept of intellectual property

Many innumerable researchers, reviewers, and different philosophers in academia and business discourse have deliberated and described Intellectual property (IP) over the years as works or inventions that are created because of human creativity. These properties are identified as patent, copyright, trademark, trade secret, industrial design, and utility models (Atim and Das, 2010).

The need to protect intellectual property became a reality during the initiation of the monopoly system in 1623. The World Intellectual Property refers to different types of intellectual property right as described below (WIPO, 2016): Patent as a form of IP protection gives an exclusive right to patent holders for inventing a new product or process that may be able to solve a technical problem in the field of technology. The period of protection is a maximum of 20 years but it may differ from jurisdiction to jurisdiction. In a case where a product does not meet some patent requirements then there is an option of protection as a utility model of which the period of protection may be far less than that of a patent.

On the other hand, industrial design is defined as an ornament of an article. It may consist of three-dimensional features that appeal to consumers of goods and services. Copyrights laws grant authors exclusive rights over their artistic and literary work such as the novel, poem, advisements, photographs, drawing, and many others if they are original. Trademark is any form, or combination of words, letters, and drawings that may be able to distinguish goods and services of one entity from another. The rights holder of a trademark excludes others from using the registered trademark and the protection is 10 years subjected to renewal after 10 years as per Uganda Trademark Act, 2010

IP and Innovation

Intellectual property stimulates innovation; however, the degree to which it does so differs depending on the Intellectual Property Rights. Patents and industrial design, for example, provide you the power to prevent others from using your invention without your consent. Trademarks, on the other hand, identify and distinguish items in the market from those created or sold by others (Humphries, 2016).

Intellectual property must be considered as a vital tool in the process of transforming today's ideas into valuable assets tomorrow. Innovation permits firms to keep reinvesting in the next generation 11 of innovation since it is a continuous cycle of product discovery, development, and commercialization (OECD, 2016).

WIPO (2016) reported that IP protects all of the processes that transform ideas into valuable products and assets; thus, protection begins as early as the idea stage. The clever and effective use of these available top-ranked IP regimes by inventors, creators, and designers increases the competitive edge of enterprises or businesses by facilitating growth and success in reaching the marketplace. Furthermore, intellectual property (IP) provides financial opportunities for commercialization, such as sales, licensing, and strategic corporate alliances, which can be reinvested in future R&D efforts in new technologies and product development (WIPO, 2016).

Zammit (2018) also argued that Innovations have a better chance of reaching the market if the three basic tools of IP protection (patents, designs, and trademarks) are used strategically and efficiently. At each stage of the innovation cycle, activities overlap, and IP protection is considered over the processes. It is vital to protect trade secrets throughout the invention process, and once you have reached the R&D stage, patents and design applications can be used to protect functional and aesthetic aspects, respectively. The trademark protects the product and brand by allowing customers to easily recognize specific products on the market, which is critical during the life cycle of the patent and especially after the patent has expired in order to maintain market share as competitors enter the market (Zammit, 2018)

IP in academic institutions (universities)

Intellectual property (IP) protection provides incentives for innovation by giving creators exclusive rights over their inventions and works (WIPO, 2018). For universities with a mission to create and disseminate knowledge, IP management is a strategic priority to translate research into economic and social benefits (Annabel and Grant, 2006). Several studies emphasize the need for deliberate IP policies and capacity building in African universities to leverage IP tools for innovation. Oguamanam (2017) notes that most IP in African universities is not secured, leading to loss of potential commercial value. A survey across Eastern and Southern African universities found low patenting rates and weak IP infrastructure (Ncube *et al.*, 2017). The study recommends integrating IP in academic programs and establishing technology transfer offices to boost IP protection and commercialization.

Ray and Saha (2011) also argued that patent and trademark law amendments Act, which were enacted in the United States in 1980 to primarily target universities, non-profits, and other small businesses, can enable the commercialization of privately or self-funded inventions and research programs, thus becoming a revenue stream for both the universities, faculty, and researchers or inventors. Furthermore, because everything that exists now was once someone's innovation, innovation has become a part of us and our lives. As a result, measuring innovation is necessary and equally important. In a university that involves teaching or research, innovations arise from research activities, whereas new products, processes, and services lead to innovation in companies or enterprises. (Ray and Saha, 2011).

Bonda (2019) stated that measuring the results of the research, for example, publications, patents and disclosures can quantify the research in a specific university apart from the capital invested in it

(the research). It is also equally vital to protect these intellectual assets coming out of this university research. Thus, the provision of a clear matrix to measure innovation by determining the number of patents or publications whereby proprietary rights are covered by patents and general knowledge coming out of the university research is covered by the publication. IP acts as a backbone in the process of licensing which is a key potential revenue stream for the university. According to university rankings, today innovation and research are the first key factors considered (Bonda, 2019).

IP Management Frameworks in Universities

Effective IP management entails clear institutional policies defining ownership, benefit sharing, disclosure procedures, and IP commercialization strategies (Krattiger *et al.*, 2007). Policy guidelines should cover patents, trademarks, copyright, and trade secrets. Krattiger *et al.*, propose IP management models suited for universities in developing countries, with variations in centralization, income distribution, and roles of technology transfer offices.

Siegel *et al.*, (2004) examine IP approaches across US universities, highlighting the importance of customized strategies based on institutional priorities. Recommended best practices include streamlining procedures, incentives for disclosing inventions, and supporting academic entrepreneurs (Siegel, Waldman and Link, 2004).

Monitoring and Evaluating University IP Performance

Measuring IP activities provides vital data to evaluate the effectiveness of IP management practices (OECD, 2016). Indicators include IP disclosures, patent applications, license deals, license income, and spin-off companies (AUTM, 2021). Surveying stakeholders gives qualitative insights into enablers, challenges, and areas needing improvement.

WIPO (2017) provides an IP assessment toolkit for universities to audit their IP management systems. The audit covers all aspects from policy frameworks, administration procedures, commercialization support and available skill sets. Regular assessment helps universities to continuously strengthen their IP capacity (WIPO, 2017)

Innovation in Makerere and Kyambogo Universities

Makerere and Kyambogo Universities are Uganda's most prestigious universities, with significant contributions to the country's research, innovation, and education sectors. They recognize research as a key component of institutional and national development. Spencer (2020) argues that the emphasis on research originates from the recognition that in a worldwide economy, knowledge development, innovation, and effective utilization are recognized as critical sources of growth and competitiveness.

The repositioning of Makerere and Kyambogo Universities as research-led universities demands the development of an environment and capacities for knowledge development, innovation, and application (Spencer, 2020). Some of the recent technologies that have been developed in Makerere and Kyambogo universities are showed in Table 1 and Table 2 respectively (Kyambogo University, 2019).

Table1. Innovations in Makerere University

Name	Description	Year	IP Protected
Lyzapay	Mobile application platform that gives both financial literacy and access to capital to business owners in Uganda	2004	No
FootMo Kit	Hand-held device that detects Foot and Mouth Disease in livestock in hard to-reach and under-served areas through early disease detection	2018	No
AIDS-Tech	A portable point of care diagnostic test that detects HIV drug resistance mutations in patient blood samples within 120 minutes, with an estimated sensitivity of 80-90%	2003	No
Gastro-Bag	An innovation with developed and tested low-cost silo-bag for treatment and management of Gastrochisis using locally available materials in Uganda	2012	No
Automated Ambu Bag System	An automated system designed to provide controlled ventilator support to patients with respiratory failure	2017	No
The Rescue Cot	This innovation is to improve patient safety through the reduction of body movements and detecting the patient's critical condition	2015	No
Kiira EV	The highly-publicised electric car, which uses simple battery electric vehicle powertrain consisting of an Energy storage bank, energy converter and an electric motor	2011	Yes(Utility model)

Table 2. Innovations in Kyambogo university

Name	Description	Year	IP Protected
Baby incubator	The improved low-cost baby incubator	2011	No
Egg incubator	Low-cost electronic egg incubator locally made from basin, blanket, electric bulbs, wire mesh and portal fans	2017	No
Electrocardiogram	Machine for monitoring the heart beats in hospitals	2016	No

Intellectual property and its use in Uganda

Uganda has a number of local intellectual property laws and statutes that protect various categories of IP. To begin with, the Industrial Property Act of 2014 establishes the registration and protection 16 of patents, utility models, and industrial designs. Second, the Trademark Act of 2010 for trademark registration and protection, the Copyrights and Neighboring Rights Act of 2006 for the protection of literary and artistic works, and the Trade Secrets Protection Act of 2009 for the protection of confidential information in commercial transactions if disclosure would jeopardize the person's honest commercial practice.

The Geographical Indications Act of 2011 allows for the registration of geographical indications as well as the protection of product identity for products created and connected with a unique geographical area. Finally, the Plant Variety Protection Act of 2014 protects plant breeders' exclusive rights and offers remedies in the event of infringement. The legal rights linked with creative endeavour or the IP laws mentioned above govern commercial reputation and goodwill laws (Muhangi, 2018). According to Stiglitz (2008), the IP regime's intent to a society's innovation system is primarily incentive provision through the provision of permission to innovators to be able to restrict the use of their works, as well as imposing charges on reckless use of their works, and finally enjoying returns.

According to WIPO (2019), Uganda had just 103 patent applications owned by Ugandans, with only 10 of those applications being granted/registered. Uganda has made tremendous progress in improving intellectual property rights administration and management. Even though these laws exist, the majority of them are deficient in key areas. Even if the recognition of an exclusive license similar to the trademark owner was requested in the UK Trademark Act of 1994, the Trademark Act of 2010 contains a missing aspect of a licensee continuing action of infringement and how (WIPO, 2019). Furthermore, the Industrial Property Act of 2014, as stated in Section 8(3) (f) of the Act, removes pharmaceutical or health-related inventions from protection, which can directly hinder scientific research in the least developed countries. With the pressing need to

promote IP and economic development in LDCs like Uganda, there is a strong case to be made for valuing the protection of all inventions, regardless of kind, as long as they meet the patentability conditions. Article 66 of the TRIPs agreement allows LDCs to apply that extension to their domestic laws (Muhangi, 2018). Uganda lacks guidelines for enacting critical/vital laws such as the Plant Varieties Act of 2014, which protects plant variety rights in Uganda, and the Geographical Indications Act of 2013, which protects locally created items in relation to the region.

The statistics indicated in the Table 3 and illustrated in Figure 1 are for registration performance in two current financial years (FY 2018/2019 and FY 2019/2020) according to (URSB, 2020).

Table 3: IP Application performance in Uganda

IP ITEMS	FY 2018/2019	FY 2019/2020
Copyright Applications	109	163
Industrial Design Applications	136	109
Patents Applications/Patent annuities	13	8
Utility Models Applications	23	24

As demonstrated in Table 3, patents account for the smallest percentage of all intellectual property applications. Only 21 patent applications were received in the last two fiscal years, accounting for less than 1% of all applications submitted; 2% of the applications were copyrighted, 1% of Utility model applications, 2% of Industrial design applications, and 95% of trademark applications, as shown in Figure 1. According to URSB (2020), these figures show how little the general public is concerned with intellectual property, primarily patent issues, which has an effect on how they perceive patent law and rights.

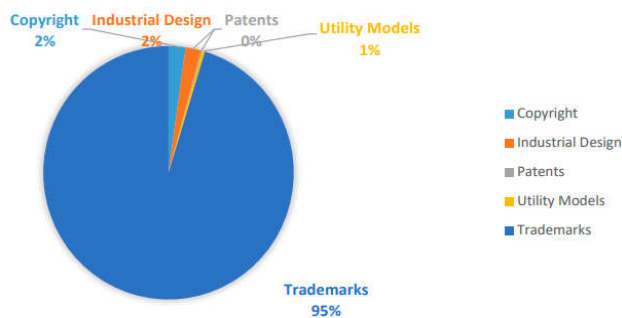


Figure 1: Pie-chart showing IP application performance

Patent applications constituted less than 1% of the total number of applications received by URSB, Uganda's main Intellectual Property Office (IPO) in the two current financial years (FY 2018/2019 and FY 2019/2020) (URSB, 2020).

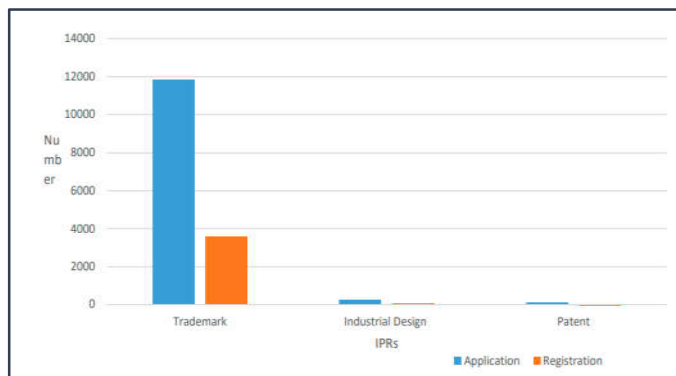


Figure 2: Bar graph showing IP registration performance

Figure 1 and Figure 2 demonstrates that more than two-thirds of patent applications in the two most recent financial years did not qualify for grant or registration, based on the number of applications received and IPRs for example patents registered.

Gaps in Literature

While extensive research exists on IP management globally including in developed country contexts, empirical studies on university IP utilization in developing countries including Uganda remain quite limited. This research aims to fill this knowledge gap by systematically assessing IP use, outputs and outcomes at major Ugandan universities. The findings will enrich understanding of IP leverage for innovation specific to the Ugandan and regional context.

METHODOLOGY

Study area

The research was conducted at Makerere and Kyambogo Universities, two leading public universities located in Kampala, Uganda and key centers of research and innovation in the country. Makerere University, founded in 1922, is Uganda's largest and oldest institution of higher education. It has a vision to be "the leading institution for academic excellence and innovations in Africa", with a current student population of over 40,000. Makerere was selected given its position as the premier university in Uganda and its strong focus on research, producing 64% of national research outputs.

Kyambogo University, established in 2003, is the second largest university in Uganda located in Kampala. It envisions being "a center of academic and professional excellence in Science and Technology", with a current enrolment of over 23,000 students. Kyambogo was chosen due to its specialized mandate in science, engineering and technology education, positioning it at the frontier of innovation. In practically all of the schools/faculties on different campuses/branches, Makerere and Kyambogo Universities provide innovation and incubation hubs for innovators, inventors, entrepreneurs, and other researchers. They are all part of the university strategy that supports the achievement of the University Research and Innovations Policy and the University's Research Agenda by leveraging them to participate in Development Research Uptake initiatives. This is done to improve research capacity and production, as well as to increase Makerere and Kyambogo Universities' contributions to the world of knowledge and innovation.

Research design

The design approach of the study was a quantitative study design approach. This enabled the gathering of accurate and reliable data it is in numerical form. Survey research which involved the use of questionnaires was used because it allows faster distribution of multiple questions to a wide population and data analysis is simple. The questionnaires were designed using google forms. Hard copy and Google questionnaires were distributed to students and alumni physically and through social media and purposively to staff through their emails. Quantitative data was collected from students, staff and alumni from Makerere and Kyambogo Universities for three months.

Source data and population of the study

Both primary and secondary data were used in this study. Questionnaires were used to gather primary data. Data for this study were mostly gathered from the target population using questionnaire that was administered both online and face-to-face. The research

project included an estimated target group of 800 participants, which included all students, staff, and alumni from Makerere and Kyambogo universities

Sample Size and sample Techniques

For the quantitative data, a formula for cross-sectional studies by Kish Leslie (1965) was used to determine the sample size:

$$\text{Formula: } N = \frac{Z^2 * P(1-P)}{d^2} \quad \text{Equation 1.1}$$

Where: N = required sample size, d =5% (Maximum error the investigator is willing to allow), Z=1.96 (Standard normal value corresponding to 95% confidence level) and P= prevalence of IP and innovation in Makerere and Kyambogo Universities = 39.2% (Charan and Biswas, 2013)

$$N = \frac{1.96^2 * 0.392 (0.608)}{0.05^2} = 366 \text{ participants}$$

From the formula, 366 is the scientific required sample size. A total of 413 questionnaires were received after distribution, with 35 from the staff, 130 from alumni, 140 from students physically interviewed during the innovation expo, and 108 attended to the online google form.

Data Collection

The google form questionnaire were distributed to respondents by sharing a link on social media groups and purposively shared to university staff through their emails. In addition, 125 students were directly interviewed during the fifth Entrepreneurship student's expo held at Makerere University Kampala. Data was also collected physical using the same questionnaire presented on the google form. Purposive sampling techniques were employed for the quantitative data. This was because questionnaire tend to cover a larger population in a short period.

Data Analysis

Statistical Package for the Social Sciences (SPSS) was chosen as tool for data analysis in order to attain the desired results. The findings were presented in tables, graphs and pie chart, with the study questions arranged in a logical and chronological order. This method was chosen for analysis since it provides an efficient and organized way to manage large and complex data sets and perform advanced statistical analysis, making it an essential tool for M&E professionals

DATA ANALYSIS AND PRESENTATION

Data Analysis

Background of Respondents

The survey received a total of 413 responses, comprising 238 male (57.6%) and 175 female (42.4%) participants. The majority of respondents were students (60.3%), followed by alumni (31.5%) and university staff (8.2%). In terms of age distribution, 47.5% were between 16-25 years, 43.3% were 26-35 years, and the remaining 9% were 36 years and above. Respondents represented a diverse range of professional backgrounds, with the highest shares from business (37.3%), IT/computer science (29.3%), and engineering (18.4%) disciplines, Figure 3.

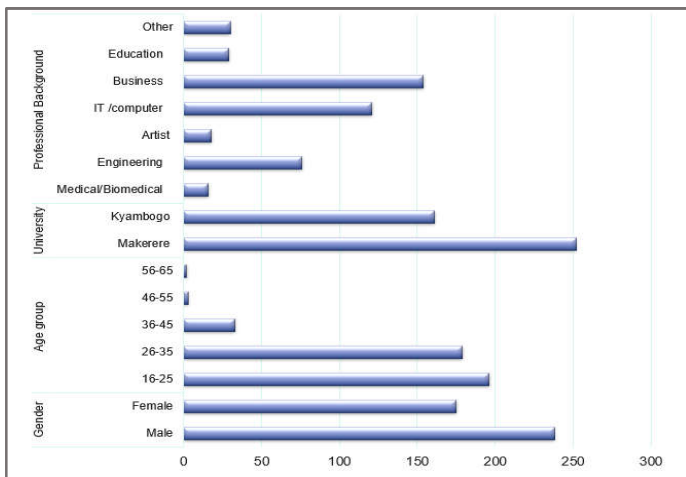


Figure 3: Respondent background

Awareness of IP, Application Processes and Status of Innovation and IP Registration

The findings reveal a high level of participation in innovation activities, with 84% of respondents indicating involvement in developing innovations. The key innovation categories included physical/patentable products (35.8%), software (27.1%), books/articles (20.8%), and services (20.1%). The major sources of these innovations were observing current problems (50.4%), reviewing existing systems (30.8%), and leveraging available literature (6.5%). However, registration of intellectual property rights was found to be very low. Only 9% of respondents had obtained copyright registrations, while patents (3.1%), trademarks (1.7%), and industrial designs (0.5%) had even lower uptake. The main limitations cited were lack of knowledge about registration procedures (67.3%) and high costs involved (32.2%), rather than issues around ownership, Figure 4.

The study assessed the level of awareness around intellectual property rights and registration procedures. Overall, 79% of respondents indicated familiarity with IP concepts, with copyrights (74.1%), patents (56.4%), and trademarks (52.5%) being the most well-known forms of IP. However, specific knowledge of IP application processes was found to be very limited, with only 18% of participants stating they were conversant with the procedures, Figure 4.

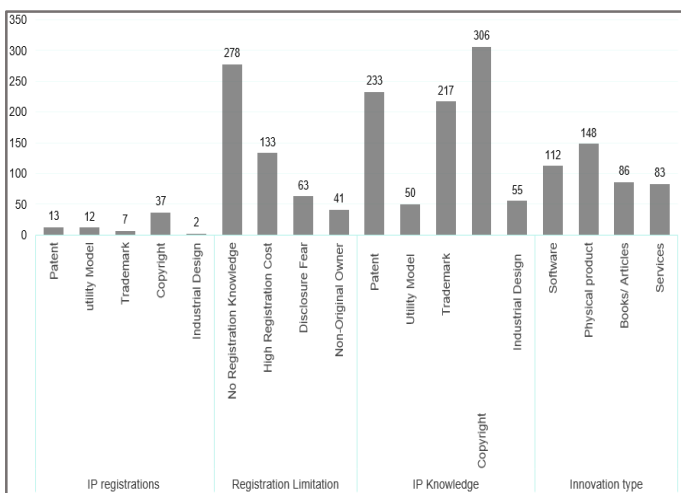


Figure 4: IP registrations, registration limitations, IP knowledge and innovation type

Challenges in Acquiring IP Rights and proposed solutions

Key challenges faced by innovators and researchers in securing IP protections included lengthy registration processes (26.4%), high costs (22%), and lack of technical expertise (19.4%). Other issues mentioned were privacy concerns (13.3%) and complex legal requirements, Figure 5.

To address the barriers in utilizing IP systems, respondents suggested several interventions. These included regular IP awareness campaigns (68%), establishing online IP application platforms (43.8%), increasing the number of IP experts (36.8%), and providing innovation funding to offset registration costs. Other recommendations were integrating IP education in university curricula and facilitating testing/piloting of innovations in public systems, Figure 5.



Discussion of Results

The status of innovation and IP registration

The study found that participation in innovation activities was relatively high, with 84% of respondents indicating they had been involved in developing innovations. However, IP registration was very low across patents, trademarks, copyrights, and industrial designs. The most common limitations cited were lack of knowledge about registration procedures and the high costs involved. This aligns with literature showing minimal IP applications from Ugandan universities despite high innovation potential (URSB, 2021). The national Intellectual property office also confirms low patenting rates in Uganda (Muhangi, 2018).

Awareness level of IP and IP application processes

Overall awareness of the major types of IP rights was moderately high, with copyrights, patents, and trademarks being the most well-known. However, specific knowledge of the IP application and registration processes was very limited, with only 18% of respondents indicating they were conversant with the procedures.

Challenges faced in acquiring IP rights

The key challenges identified in acquiring IP rights were the lengthy procedures, high costs, and lack of technical expertise to navigate the system. To address these barriers, the respondents recommended regular IP awareness campaigns, online registration systems, increasing the number of IP experts, and providing financial support. The findings align with previous studies showing that while African universities are generating innovations, weak IP systems limit their ability to translate these into commercialized products and services countries (Ncube et al., 2017).

The data indicates that despite growth in innovation activities, Makerere and Kyambogo are yet to develop the IP infrastructure and capacity needed to fully capitalize on research outputs. The lack of knowledge on how to leverage IP tools implies missed opportunities to protect and derive value from academic creativity and inventions. The issues around costs and complex procedures also discourage researchers and innovators from pursuing IP protections. Overall, there appears to be a significant gap between innovation outputs and IP utilization.

Proposed solutions for identified challenges

Targeted efforts are required to enhance IP literacy, streamline administrative processes, build expertise, and provide incentives. Integrating IP in university curricula and establishing technology transfer support systems can boost utilization as noted in literature (Siegel, Waldman and Link, 2004). Makerere and Kyambogo also need customized IP policies outlining ownership rights, benefit sharing and commercialization strategies as done in other developing countries (Krattiger *et al.*, 2007).

Regular monitoring and evaluation of IP performance using metrics like disclosures, patent filings and license deals will help the universities measure progress and continuously improve their IP management practices. More research is also needed to understand the specific cultural and institutional factors influencing IP leverage within the Ugandan academic context.

SUMMARY AND CONCLUSIONS

Summary

This study examined the utilization of intellectual property (IP) systems as a tool to promote innovation in Uganda's leading public universities, Makerere and Kyambogo. Through a survey of 413 students, faculty and alumni, the research assessed the status of innovation and IP protection, stakeholder awareness, key challenges, and potential solutions.

The findings reveal a high level of participation in innovation activities across the universities, with respondents engaged in developing software, physical products, books/articles, and service innovations. However, the registration of intellectual property rights was found to be remarkably low. Only 9% of innovators had obtained copyright registrations, while patents (3.1%), trademarks (1.7%), and industrial designs (0.5%) had even fewer filings.

The main barriers inhibiting greater IP utilization were a lack of awareness about registration procedures (67.3% of respondents) and the high costs involved (32.2%). While general knowledge of IP concepts like patents, copyrights and trademarks was moderately high, specific understanding of application processes was very limited, with only 18% of participants indicating familiarity. Other key challenges cited were the lengthy and complex legal requirements, privacy concerns, and insufficient technical expertise to navigate the IP systems. To address these issues, respondents recommended regular IP awareness campaigns, establishment of online filing platforms, increasing the pool of IP experts, and providing innovation funding to offset registration costs.

Conclusion

The study found that while innovation participation was high, the registration of intellectual property (IP) rights such as patents, trademarks, copyrights, and industrial designs was very low. The

primary barriers were a lack of knowledge about registration procedures and high costs. This suggests a significant gap between innovation outputs and IP protection, limiting the potential for commercialization.

The research concludes that while general awareness of intellectual property rights was moderately high among innovators, their specific knowledge about the application procedures was notably low. Copyright, patents, and trademarks were the most familiar types of IP rights. There is a clear need for efforts to enhance innovators' expertise in navigating the formalities of IP application and registration. The study identified key challenges in acquiring IP rights, including lengthy and complex procedures, high associated costs, and a lack of technical expertise. These obstacles discourage and prevent researchers and innovators from pursuing IP protections. Addressing these challenges requires targeted strategies to bridge knowledge gaps, reduce costs, and simplify administrative processes.

In response to the challenges identified, the research suggests several solutions. These include IP awareness campaigns, the implementation of online registration systems, increasing the availability of IP experts, and providing financial incentives to encourage IP protection. Additionally, education in intellectual property, streamlined registration procedures, expertise development, and incentives can collectively enhance the protection and utilization of IP. Customized institutional IP policies and monitoring systems are also recommended to strengthen IP management.

In summary, the research highlights that despite a high level of innovation at Makerere and Kyambogo Universities, the level of intellectual property (IP) activity remains significantly low due to barriers such as costs, knowledge gaps, and administrative complexities. The study emphasizes the need for concerted efforts in training, system reforms, and policy frameworks to enhance the use of IP for commercialization and to realize its potential economic impact in these academic institutions.

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