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UTILIZATION OF INTELLECTUAL PROPERTY SYSTEM IN INCOME GENERATING UNITS IN JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, KENYA

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ABSTRACT

Purpose: This research sought to investigate the extent to which Jomo Kenyatta University of Agriculture & Technology (JKUAT) is utilizing Intellectual Property System (IPS) in Income Generating Units (IGUs). It further explored the identifiable IPRs existing in IGUs and evaluated the existing Intellectual Property Rights (IPRs) in the management of IGUs

Methodology: The study adopted a qualitative and quantitative research paradigm. This study targeted all 600 students and staff members within JKUAT IGUs; 61 of them were sampled. A total of 61 questionnaires were administered both online through Google Forms and in physical copies, and all of them were duly filled out and returned for analysis

Findings: Most universities in Kenya do not have a functional Intellectual Property (IP) office, and those that are present have insufficient capacity to enhance the IPs. The present study revealed low levels of awareness of the IPS and consequently low adoption rates, contributing significantly to low utilization of the IPS in IGUs at JKUAT.

Recommendations: JKUAT should not just view the IGUs as a revenue stream but primarily as a mechanism put forward to enhance utilization for IPS for societal benefits. Accordingly, there needs to be greater emphasis on sensitizing staff on the significance of the IPS, communicating the IP policy to staff and clients, setting up IP institutional infrastructure in the form of functional Technology Transfer Office (TTOs), and having a customized IP strategy suitable for all IGUs. In addition, the IP offices or TTOs should be linked to research activities, business incubation, industrial park and IGUs, where these exist.

Keywords: Intellectual property system, Income-generating units, Jomo Kenyatta University of agriculture and technology,

INTRODUCTION

Background of the Study

Over the years, universities in Kenya have had to innovate ways to cope with increased competition for resources and supplement government funding. Consequently, the cost of staffing, research, learning and accommodation has not been met in full by the Government of Kenya (Rodrigues et al., 2006). This has been coupled with rising inflation and the uptake of students by universities in the country (Jaramogi Oginga Odinga University of Science and Technology, 2013). In an actual sense, the need for higher education has since intensified, with the total number of public universities rising from 22 in 2010 to 31 in 2017 (Commision for University Education (CUE), 2017). The total number of students' enrollment in the university has also risen by 17.37% from 443,782in 2014 to 520,863 in 2017 (The Kenya Institute for Public Policy Research and Analysis, 2019). Since the growth of public universities has not been directly proportional to the increase in the number of students, public universities have since resorted to exploring alternative sources of revenue generation to supplement limited and stressed government capitation. This alternative source of revenue generation is referred to as IGUs.

Jomo Kenyatta University of Agriculture and Technology (JKUAT) launched its first IGU policy in 2000 (JKUAT, 2013). The objectives of the IGU policy includes provision of guidelines for establishment of IGUs, mobilizing resources for IGUs expansion, transformation of both IGUs and Research and Development (R&D) into profit centers, upscaling production of activities of IGUs, bringing products into the market through production and commercialization and provision of guidelines that business is conducted in accordance with high ethical standards, best practices in the industries in conformity with the government of Kenya's constitution.

Institutions of higher learning in developed nations have capitalized on IPS as an enhancement factor for income generation. Most universities in Europe and the USA have units such as Spin-offs to ensure the IP assets generated are well exploited (Payumo et al, 2014). Ideally, these universities have a functional technology transfer office (TTO) that aids in commercialization of IP assets generated within the university. In the USA, Massachusetts Institute of Technology (MIT) as at 2018, had 822 invention disclosures and 425 filing of new patents at United States Patent and Trademark Office (USPTO). Similarly, according to a report by MIT (2019) a total of 360 patents were issued and out of this executed 154 licenses and a total number of companies were formed out of intellectual properties was 32. From this, a total of $45.9 million was generated from licensing of IP.

Similarly, in Stellenbosch University (SU), South Africa, part of their key resources in their business model is on IPS through branding and innovation. Commercial activities have had significant value to SU, and as of 2018, they had 20 spin-out companies. In these spin-out companies, the university was able to create employment for 267 people in 2018 with an increased revenue stream of approximately USD 67,240. According to Stellenbosch Annual Integrated Report, (2018), the university experienced an increase in invention disclosure by 50% more than in 2017 and expedited 13 new licensing agreements on their technologies. As a result, SU has since been among the universities in South Africa that have successfully assigned some of its IP to its start-up, called Custos Media Technologies (Pty) Ltd.

In Kenya, utilization of IPS for commercialization of research outputs is slowly taking its course with the recent launch of the IP policy in JKUAT (JKUAT IP Extracts, 2020) . The objectives of the IP policy include encouraging identification, generation, protection and commercialization of IP created by staff, researchers, students, collaborators, visitors and partners. It also emphasizes ensuring research findings, innovations, inventions and creative works are used for public benefits and promote progress in research and development. The key

issues the IP policy addresses are commercialization of research works, giving incentives to inventors and promoting local development.

The Directorate of Intellectual Property Management and University Industry Liaison (DIPUIL) in JKUAT was set up in 2014 to enhance IPS in the university. As at 2020, the university had an IP portfolio comprising 30 patents,22 utility models, 1 industrial design, 33 trademarks and 3 copyright applications at the Kenya Industrial Property Institute (KIPI). Amongst the granted IP portfolio are 8 patents, 31 trademarks, 15 utility models, 3 copyrights and 1 industrial design (JKUAT IP Extracts, 2020). However, out of this IP portfolio, JKUAT has not yet exploited any of the IP assets that would have otherwise contributed to the revenue streams for the university (Atieno, 2019). If this were so, there would be spin-offs that have resulted in or have the potential to lead to additional revenue to the university and an opportunity for researchers to earn employment, and the end result is technological spillovers (Siegel et al., 2007).

Statement of the Problem

Underutilization of IPS in JKUAT has resulted in lost opportunities for the revenue stream. For instance, out of 58 protected IP assets in JKUAT, there is barely any form of exploitation of the assets as an alternative source of revenue generation for the university (JKUAT IP Extracts, 2020). Currently, 64% of R&D funds are drawn from the government, and most of the universities expect an increase of 11% of the funds for R&D (CPS, 2018). However, much of the research output goes out for publication and less registration for IP. In addition, most of the protected IP at these universities is underutilized, and JKUAT is no exception.

Purpose of the Study

This research sought to investigate the extent to which JKUAT is utilizing IPS in IGUs and evaluate the existing IPRs in the management of IGUs.

Specifically, the study sought:

i) To investigate IP existing in IGUs at JKUAT;
ii) To review the institutional framework of IPRs within the established IGUs at JKUAT

THEORETICAL REVIEW

Utilitarian theory of Intellectual property

The Utilitarian theory states that something is good or moral when it yields the greatest amount of good for the betterment of the greatest number of people. It's a theory of normative ethics that asks whether a specific action is bad or good, immoral or moral. According to Stuart (2014), an innovator is rewarded based on the incentive that comes from his/her work, while at the same time, society benefits from the creative works, hence creating a kind of self-independent system. According to Stuart and Cahn (2009), IP makes use of knowledge creatively by having what is non-exclusive become exclusive as a reward to the inventors and creators. In essence, IP creates a short-term scarcity, giving creators and inventors an economic incentive while at the same time opening up the knowledge to the public domain. The justification of the Utilitarian theory in IP is the fact that society would always want to draw maximum utility from works created and the IP developed. However, there is limited monopoly in terms of IPRs that are given to the creator or inventor for such products or goods. The exclusive rights are given to creators and inventors for a limited period to gain commercial benefit in return for disclosure to the public.

LITERATURE REVIEW

Income Generating Units

In 1994, the Kenyan government reduced its budget for higher education from 37% of the total budget to about 30% (Kiamba, 2004). This calls for universities to come up with alternative

sources of revenue diversification that are referred to as IGUs. The IGUs are special units that are meant to encourage innovation and commercialization of research outputs. IGUs can broadly be categorized as teaching or non-teaching (Ogada, 2000). In an attempt to set up IGUs, several approaches have since been proposed. One such is through technology transfer. According to Levinthal (1989), the argument lies in the degree of imitation and spillovers that are entirely dependent on the nature of acquaintance and the capacity to absorb technology by small firms. In so doing, institutions will have IGUs that are a typical expression of advanced institutions and companies that collaborate with universities. The development and setting up of IGUs has several ways, one such preposition is through consultancy and R&D. According to Ogada (2000), this concerns technology transfer, consultancy services, commercialization of R&D findings, IP exploitation, business incubation and provision of patent information services. Technology transfer is a result of the codification of knowledge from teaching, learning and research activities.

According to Siswanto et al. (2013), IGUs can also be developed through approaches of education services and teaching. Lecturers and non-teaching staff are capable of fully exploiting their experience and knowledge. In the process, academicians have since been changed to researchers other than just teaching (Kasim, 2011). Hence, the core mandate of teaching and learning is applied into research activities. The output of the research activities is not only published but exploited for alternative source of revenue for the university.

In developed most nations such as USA, IGUs are born out of technological spin-offs whereby new companies as a result of useful inventions are strategically commercialized. A study done by Estep and Daim (2013), reveals two factors which influence spin-off results. This includes federal laboratories/workshops which focuses on employee's management rules as well as entrepreneurial values of the university labs. These spin-offs that can be used by the university, in addition to normal licensing, to generate income (Estep & Daim, 2013).

Although this study targets IGUs in JKUAT, the model setup of IGUs in Kenyan universities is similar to Spin-offs in universities across the developed nations. According to Magnus (2000), a Spin-off is a new firm set up by a host institution to commercialize inventions from research work. On the other hand, IGUs are independent units set up by the university for revenue diversification (JKUAT, 2013). Therefore, it is sufficiently versatile that IGUs parameters in Kenyan Universities can be understood to be Spin-offs in the academic sector.

For universities to fully exploit research output and enhance entrepreneurial activity, the IPS should be set in a strategic manner for the benefit of IGUs. According to Mill and Cahn (2009), the IPS is a measure of the larger economic setting upon which the effects of human capital or a cohort of researchers and scholars are exploited. Studies by Gibbons (2000) show that IGUs set by the university that have a higher impact on the country's economy directly rely on IP that comes about from scholars. It is the researcher's opinion that JKUAT IGUs needs to incorporate the IPS as one of the strategies for the establishment and commercialization of research activities in universities.

IGUs in JKUAT

According to JKUAT IP Policy (2013), defines IGUs is defined as a unit that is established for the sole purpose of generating income for the university. Since 2000, JKUAT has established IGUs to supplement funding from the government of Kenya. The IGU establishment is governed by Research, Production and Extension (RPE) JKUAT. It is from RPE that the IGU policy is reviewed. Further, IGUs at JKUAT are categorized as Service IGUs, R&D IGUs, Direct Service Providers (DSP), Indirect Service Providers (ISP) and consultancies. Service IGUs include teaching programs such as Alternative Degree Programs (ADP), JKUAT

hospital, catering, farm crops and livestock, JKUAT library, JKUAT bookshop, nursery schools, printing services, sports and games.

The R&D IGUs come about from research-sponsored activities carried out by university departments. The activities are geared towards the development and realization of products and commercialization of R&D. Activities within R&D IGUs further include technology transfer. Technology transfer involves commercialization of research findings from the university to the industries and also the incorporation into new technologies to further research. According to JKUAT (2013), R&D IGUs include the Engineering workshop, horticulture nursery, Botany tree nursery, FOTEC, CPC, JKUATES, Botanical Garden, JKUAT-ITP and analytical services such as soil and water analysis.

In addition, IGUS are mandated to commercialize their products in line with the IP policy and IGU policy of the university. The IGUs can commercialize their products through licensing, franchising or outright sale (JKUAT, 2013). JKUAT, because of its brand name in the Kenyan market takes in essential actions necessary to achieve market entry and general market competitiveness of new innovative technologies, products and processes. This includes advertisement and acknowledging that the IGUs are indeed from JKUAT. Also, at early stages JKUAT takes lead in funding the IGUs and enhancing their management.

EMPIRICAL REVIEW

According to studies by Hoye (2006), there is a correlation between TTOs and IP policies at universities. Further, this relationship is multi-faceted to enhance the exploitation of IP in universities. The research design employed a mixed approach, had a target population of 48 universities and collected data using questionnaires and interviews. However, much of the results concluded that IP policies in universities are the main way to exploit IPRs. Even though the research had much emphasis on IP policies and university-industry liaison, this research proposes to utilize the methodology employed and further seek to address exploitation of IP assets in relation to institutional infrastructure, IP identification, adoption of IP and recommendation strategy for Kenyan universities.

In South Africa, as studied by Bansi (2016), it was revealed that universities lose a lot of revenue streams by failing to exploit IP. Notably, the knowledge gap in insufficient IP identification, carrying out research without putting into consideration commercial aspects, inadequate infrastructure and unfairness in decision making are the main impediments to innovation in South African universities. The research design employed was quantitative, qualitative and mixed methods with a target population of 23 universities. Further, the methodology applied purposive and convenience sampling, and the primary method of data collection employed were questionnaires (Bansi, 2016).

RESEARCH METHODOLOGY

The study adopted a qualitative and quantitative research paradigm. Qualitative design was employed for identification and institutional IPS infrastructure in IGUs at JKUAT. The target population were professionals in the IGUs, interns and students attached in the respective IGUs; a population of more than 600 people. The number of staff and students working on the IGUs is 600. Interviews were also conducted with managers and directors at JKUAT IGUs to obtain key information that may not be captured in the questionnaire. The study sampled 10% of the targeted population, giving a sample of 60. According to Saunders (2007), the smallest acceptable sampling size is 10%, and that is why the research focused on 10% of 600. This covered up to 61 different people who are working on the IGUs, plus those in DIPUIL. The target interviewees included key respondents among the IGUs. This included the managers of CPC, JKUATES and JKUAT-ITP. The researcher distributed the questionnaires in both an online Google platform and physical copies based on the preferences of the respondents. The

questionnaire consisted of closed and open-ended questions. Secondary data was collected from JKUAT's annual reports, books, journals, theses, research, dissertations, working papers, policies, articles and the JKUAT website. Both stratified and simple random sampling techniques were used. A stratified sampling approach was applied to individuals by putting them in strata based on the respective IGUs attached, i.e. staff of JKUATES and staff of JKUAT-ITP. Equally, a simple random sampling technique was used to pick the sample from the strata.

RESEARCH FINDINGS AND DISCUSSION

This study targeted all 600 students and staff members within JKUAT IGUs; 61 of them were sampled. A total of 61 questionnaires were administered both online through Google Forms and in physical copies, and all of them were duly filled out and returned for analysis. This indicated a 100% response rate. From the study results, there were more male (55.4%) than female (44.3%) respondents owing to the higher percentage of males employed in the IGUs. The majority of the participants belonged to JKUAT-ITP (45.9%) IGU followed by 26.2% from JKUATES. The least came from others (4.9%). 85.2% of the respondents were staff members of the IGUs in JKUAT, and only 1.6% were students. This response rate was since JKUAT-ITP had more staff than the other IGUs that the research investigated. In addition to this, the number of students was less since IGUs mainly engage employees and students are placed in for attachment. Lastly, the majority of the participants, 54.1%, had worked in the IGU section for 1-5 years, followed by 27.9% who had worked for 0-1 year. The least had worked for more than 10 years (4.9%). The reason behind this is that IGUs have been established in less than a decade and began staffing in recent years, resulting it has more staff working between 1- 5 years.

Identifiable IP existing in IGUs in JKUAT

The first research objective of the study aimed at finding out identifiable IPRs existing in IGUs at JKUAT. The participants were asked to indicate the regime of IP they were conversant with, whether they were aware of any of the IPs and IP policy within the institution, whether they had been sensitized on IP, and lastly, the procedure followed to protect IP within the IGUs.

Intellectual Property Regime

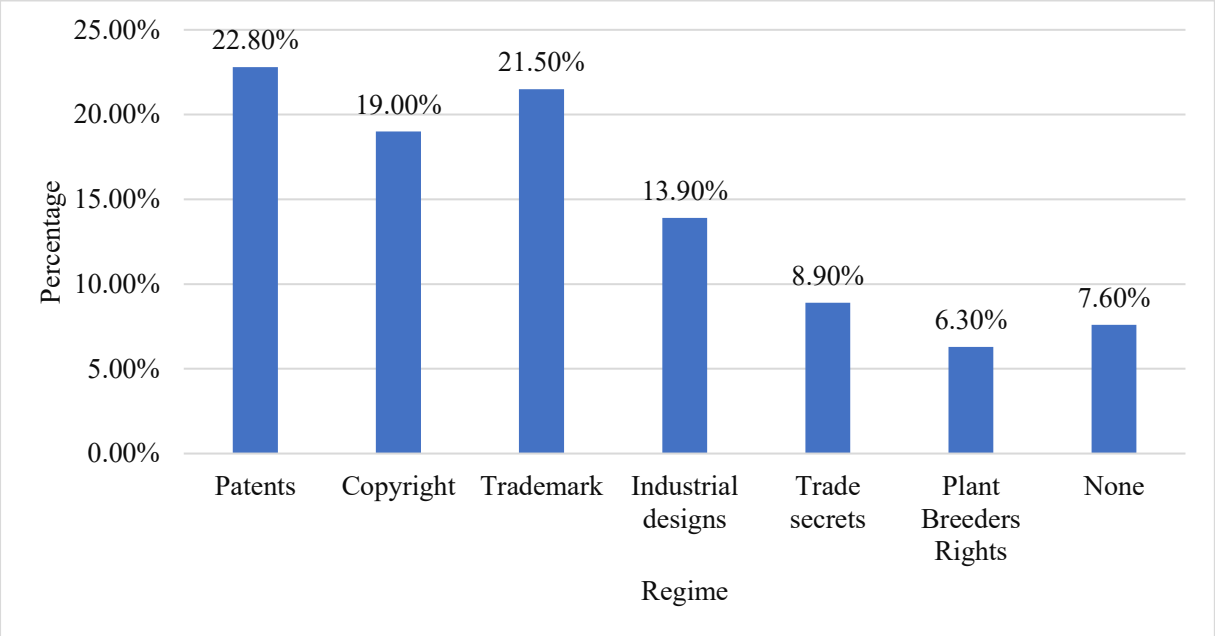

Figure 1 IP Regime

The majority were conversant with Patents (22.80%) followed by Trademark (21.50%), followed by copyright (19%). 13.9% were conversant with Industrial designs, 8.9% were conversant with trade secrets, 6.3% were conversant with plant breeder's rights while 7.6% were not conversant with any of them.

The study find out whether the respondents were aware of any IP mentioned above in their working section as well as IP policy in JKUAT.

Table 1: Awareness of any IP Policy in their working section across demographic information

		Yes		No	
		Frequency	**Percent**	**Frequency**	**Percent**
Gender	Male	22	61.1	12	48.0
	Female	14	38.9	13	52.0
	Total	**36**	**100.0**	**25**	**100.0**
IGUs	JKUAT-ITP	20	55.6	8	32.0
	DIPUIL	4	11.1	1	4.0
	Others	2	5.6	11	44.0
	JKUATES	5	13.9	4	16.0
	CPC	2	5.6	1	4.0
	FOTEC	3	8.3	25	100.0
	Total	**36**	**100.0**		
Status	Staff	9	25.0	8	32.0
	Students	21	58.3	12	48.0
	Intern	4	11.1	4	16.0
	Others	2	5.6	1	4.0
	Total	**36**	**100.0**	**25**	**100.0**
Period spent working in the IGU section	0-1Year	9	25.0	8	32.0
	1-5years	21	58.3	12	48.0
	5-10years	4	11.1	4	16.0
	More than 10 years	2	5.6	1	4.0
	Total	**36**	**100.0**	**25**	**100.0**

Majority of the male 61.1% were aware of the IP within their working section and 38.9% of the female were aware. JKUAT-ITP had its staff more aware of the IP in their working sections as compared to other IGUs. They also went ahead to indicate whether or not they were sensitized and trained on IP in their sections.

Table 2: Respondents' awareness of the existence of IP, IP policy and sensitization of IP in JKUAT

		Frequency	**Percent**	**Cumulative Percent**
Awareness of any IP mentioned above in the working section	Yes	36	59.0	59.0
	No	25	41.0	100.0
	Total	61	100.0	
Awareness of IP policy in JKUAT	Yes	31	50.8	50.8
	No	30	49.2	100.0
	Total	**61**	**100.0**	
Sensitization and training on IP	Yes	16	26.2	26.2
	No	36	59.0	85.2
	Not sure	9	14.8	100.0
	Total	**61**	**100.0**	

Most staff in IGUs in JKUAT, 59%, were found to be aware of the existence of an IP in their working sections, while a considerable number, 41%, indicated that they were not aware at all. Nearly half of the respondents (49.2%) indicated that they were not aware of any IP policy in

JKUAT. Again, the majority, 59%, indicated that they had not been sensitized or trained on IP. This analysis on IP identification gives an indication of a low level of awareness of the IPS in IGUs. Whereas IGUS acts as a spin-off and marketing of research products in JKUAT, the level of awareness of the IP is considerably low. Identification of IP, either through development programs or collaborative research, is not only in pursuit of justice but also a tool for smooth operation in the projects. In essence, for IGUs to continually grow and make a significant impact on society, the staff need to be sensitized to IP (Camarinha-Matos & Afsarmanesh, 2001). To effectively utilize the IPS, first, awareness is key. Providing university spillovers to the market in general comes as the third pillar, apart from research and education. JKUAT setting up IGUs to increase revenue generation should be coupled with a deeper understanding and awareness of IP in order to enhance a knowledge-based economy (Baron & Econ, 2017).

Further, the respondents had the majority of them being aware of patents (22.8%) within the section where they work. The rise in understanding of patenting has occurred against a wider policy framework where universities in Kenya accredit points to those who invent and get a patent (CUE, 2014). In this guideline, a patented invention guarantees 16 points against one reviewed conference paper of 4 points. However, there is a danger in ensuring there is a greater interaction between innovations in the IGU to what society needs. This will in turn, escalate the private and social returns from public support to R&D. In developed nations for instance, MIT in the USA, all the regimes of IP have been made known to the university fraternity.

IP Institutional Infrastructure

The second study objective sought to investigate the IP institutional framework of IPRs within the established IGUs at JKUAT. To meet this objective, the researcher asked about proper IP management within sections, proper internal control and written procedures put in place, the existence of IP clauses within the terms of contract and service and remuneration/incentivizing for innovating staff members.

Proper IP management within sections and proper internal control and written procedures

Table 3: Proper IP management within sections and proper internal control and written procedures

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std Dev
	%	%	%	%	%		
There is proper IP management within the section I work in.	13.1	16.4	36.1	23.0	11.5	3.03	1.183
Internal control and written procedures have been put in place to encourage continuous innovation.	6.6	13.1	34.4	34.4	11.5	3.31	1.057

The respondents were undecided on whether there was a proper management of IP within their working sections (M=3.03, SD = 1.183) with majority being neutral (36.1%). They also remained undecided to whether internal control and written procedures had been put in place to encourage continuous innovation (M=3.31, SD=1.057). A considerable good number of the respondents agreed (34.4%) and remained neutral (34.4%).

IP clauses within the terms of the contract and service

Table** Error! No text of specified style in document.**: IP clauses within the terms of the contract and service

	Frequency	Percent	Cumulative Percent
Yes	13	21.3	21.3
No	22	36.1	57.4
Not sure	26	42.6	100.0
Total	**61**	**100.0**	

For majority of the respondents, 42.6% were not sure whether there were IP clauses within their terms of contract and service. 36.1% indicated that there was no and only 21.3% indicated that there was IP clauses within their terms of contract and service. In essence, this finding suggests that JKUAT needs to review employment contracts for such clauses and create awareness amongst staff through workshops and other means on the implications of such clauses for staff.

Remuneration/incentivized for innovative staff members

Table 5: Remuneration/incentivized for innovative staff members

	Frequency	Percent	Cumulative Percent
It is part of my work	10	16.4	16.4
No	32	52.5	68.9
Yes	19	31.1	100.0
Total	**61**	**100.0**	

Most members of staff were not remunerated/incentivized for innovating (52.5%), 31.1% were while 16.4% indicated that it was part of their job. IP is fundamentally an asset for the university. The institutional infrastructure is a key factor in managing IP assets. Therefore, there is a need for IP institutional infrastructure to be well known by staff and anyone interacting with the IGUs. Furthermore, the valuation of IP relies on the infrastructure established for organisational management. For an IGU, the IP infrastructure should be clearly communicated to customers, collaborators, and staff to avoid controversy in the event of disputes.

In the findings, most respondents were undecided about the proper management of IP within their working sections, with the majority being neutral. In developed world universities such as MIT, there is an elaborate structure that ensures the protection of IP at the university. For instance, MIT has a policy that outlines ownership, protection, use, and commercialization, such as licensing or other contractual arrangements. Users are required to abide by contractual obligations and any restrictions imposed (Technology Licensing Office, 2019). JKUAT IGUs serve as the center for disseminating research outputs. If the staff are uncertain about the institutional infrastructure governing IP, it poses a significant challenge to utilizing IP in the IGU and the university as a whole.

The respondents also remained undecided about whether internal control and written procedures had been implemented to encourage continuous innovation. According to Halilem, Amara, & Mohiuddin (2017), most university inventors have their behavior influenced not only by ownership of the rights but also by the internal controls and procedures that have been established. These controls govern the need to further research and seek rights with the university. Therefore, for the IGUs in JKUAT, the institutional infrastructure, including but not limited to institutional policies, is among the fundamental bases for increasing research and encouraging continuous innovations.

Whereas most of the respondents were undecided on their understanding of the written procedures and controls, according to Fu, Mathisen, and Wright (2017), workers within the university must be fully aware of the procedures, as the changes in the institutional framework at the university level determine the creation of Spin-offs. This implies that IGUs require a more comprehensive institutional infrastructure that has been well communicated from top-level managers up to low-level managers. The staff and other clients seeking services from the IGUs must be made aware of the IP institutional infrastructure. The written procedures and internal controls enhance further innovation. Hence, the effect of such infrastructure on the economic impact of the universities becomes more substantive than symbolic.

CONCLUSION

This study is a unique endeavor to reveal how the IPS is utilized in JKUAT IGUs based on the perspectives of students, researchers, staff, managers and directors within the IGUs and IP office in JKUAT. Most of the IGUs were found to have a low level of IP awareness, which affected the level of adoption of the IPS. The main reasons emerging from the study for this low level of IP awareness are insufficient institutional infrastructure and lack of a customized strategy in the protection, generation and commercialization of IP. The IGU and IP policies in JKUAT were found not to be synchronous.

RECOMMENDATIONS

JKUAT should not just view the IGUs as a revenue stream but primarily as a mechanism put forward to enhance utilization for IPS for societal benefits. Accordingly, there needs to be greater emphasis on sensitizing staff on the significance of the IPS, communicating the IP policy to staff and clients, setting up IP institutional infrastructure in the form of functional TTOs, and having a customized IP strategy suitable for all IGUs.

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