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Commercialization of Intellectual Property Rights at Universities as an Additional Revenue Stream

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Abstract

This paper investigates the commercialization of Intellectual Property (IPRs) at universities and the potential for universities in Kenya to leverage their Intellectual Property Rights (IPRs) as a vital revenue source. Even though they possess significant intellectual assets, many universities have failed to utilize IPRs and in turn, losing opportunities for income generation. The paper introduces the concept of IP commercialization and the legal IP framework in Kenya and proceeds to discuss how research conducted in institutions of higher learning can be commercialized through an analysis of best practices and case studies. The discussion outlines the relevance of Intellectual Property to universities, the strategies for universities to maximize the value of their IPRs and establish sustainable income streams. Drawing upon relevant literature and academic research, it provides insights into the commercialization process, legal considerations, and the role of technology transfer offices in facilitating successful IPR monetization. The paper concludes by establishing that by implementing proactive strategies and fostering a culture of innovation, universities in Kenya can unlock the full potential of their intellectual assets and achieve financial sustainability.

Keywords: IP commercialization, technology push, Tripple Helix model

1. Introduction

Universities in Kenya rely largely on appropriations from the Exchequer and on student fees for financing their operations. Financial allocations to universities have been on a steady decline from 66.4% in the financial year 2018/2019 to 48.11% in the financial year 2022/2023.[1] Fees from students are not easily forthcoming. To start with, only 201,133 (22.27%) of students who sat for university qualifying examinations in 2023 attained the minimum university entrance grade.[2] Of these, the government will fund 140,147, leaving a paltry 61,000 to pay fees.[3] Even of the 61,000, there is a likelihood that quite a number may go to foreign universities. This scenario applies to previous years as well. This leaves a very small proportion (61,000 students) that cannot go round the more than 70 universities as fee paying students under the 'self-sponsored' mode of study. This affects both

[1] Universities Fund, 'Graph 19: Universities Allocations.' At <https://www.universitiesfund.go.ke/universities-data/ > last accessed 5 Feb 2024.

[2] J Too, (2024, January 8). 'Machogu Releases 2023 KCSE Results.' Kenya News Agency, at <https://www.kenyanews.go.ke/cs-machogu-releases-2023-kcse-results/ > last accessed 9 Feb 2024.

[3] Kenya Yearbook Editorial Board, (2023 September, 11). 'Understanding the New Varsity Funding Model.' *Infobytes*, 43, at <https://www.universitiesfund.go.ke/download/university-funding/ > last accessed 3 Feb 2024.

public and private universities. Some of the consequences of this reduced income to universities is that the institutions cannot pay their staff on time, they cannot hire an optimum number of full-time staff — thereby relying on part-timers (adjunct faculty). Many institutions have not paid their part-time staff for over three years.[1] This situation undoubtedly impacts on the quality of learning in these institutions. This has forced many universities to cut down on their operations.

These universities and other tertiary institutions harbor many young creative and intelligent minds. Admission criteria to universities point to the best of the best. These are minds that can innovate and move the world with new products. Indeed, the Microsoft's operating systems and a social network platform known as Facebook were created by Bill Gates[2] and Mark Zuckerberg[3] respectively, when they were university students. Anecdotal evidence points to the invention of a now famous money transfer system known as MPESA by a student at Jomo Kenyatta University of Agriculture and Technology in Kenya.[4] Many other students have embraced emerging technologies to come up with products that are useful for humanity. Around 2011, two Stanford university students developed an artificial intelligence product to be used for spraying herbicides and fertilizer by farmers. They sold this to Deere & CO for USD 305 million (KShs. 49.41 billion).[5] Lots of innovations can still and are being made in various fields such as medicine, engineering, aviation and agriculture. Creative works such as books, films, music, drama, computer programmes and broadcasts continue to be made and improved upon. All these innovative activities require an environment that fosters research and development, and universities have the opportunity to harness this.

It is common ground that one of the core mandates of a University is to promote research.[6] Research is usually evidenced through development of scientific data, literary works and production of specific products that add value to the society.[7] The results of such research manifest themselves through publications such as journal articles, manuals, and textbooks, composition of new songs, recordings of music, design of computer applications, generation of computer programmes, invention of new methods of doing things in science and the business world, propagation of new plant varieties, production of new or modified machines like sheller for maize, new models of hospital beds, production of drama and broadcasts.[8] Indeed, universities in Kenya are engaged in all the above and many more. Some of the products are displayed at science fairs and at agricultural shows. However, none of them seems to have made a big breakthrough with commercialization. One area that is very vibrant is authorship of textbooks. Many professors in the more than 70 universities in Kenya have authored books. However, such an activity has been, to a large extent, a private arrangement between the author and a publisher, and to the total exclusion of the University. With respect to inventions in science and technology, many such inventions lie unexploited.

Despite this availability of brilliant minds and a lot of documented research happening in both public and private

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[1] A Aineah, (n.d.). 'The Agony of Being a Part-Time Lecuter in Kenya.' Standard Media, at <https://r.search.yahoo.com/_ylt=AwrErj26YMdlcQ4dEGNXNyoA;_ylu=Y29sbwNiZjEEcG9zAzYEdnRpZAMEc2VjA3Ny/RV=2/RE=1707594043/RO=10/RU=https%3a%2f%2fwww.standardmedia.co.ke%2farticle%2f2001289533%2fthe-agony-of-being-a-part-time-lecturer-in-kenya/RK=2/RS=rsXn__l4_vmgZFgtmVY5h1JW58g-> last accessed 7 Feb 2024.

[2] J Cowling, (2016, February 8). 'A Brief History of Microsoft — The Worlds Biggest Software Company.' At <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwimj8OY3KCEAxWIQaQEHbfwCOQQFnoECCQQAQ&url=https%3A%2F%2Fcontent.dsp.co.uk%2Fa-brief-history-of-microsoft-the-worlds-biggest-software-company&usg=AOvVaw0KsVWlHesefDBlLEzx4t1B&opi=89978449> last accessed 8 Feb 2024

[3] S Phillips, (n.d.). 'A brief history of Facebook.' At <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiMg7Ld3aCEAxUEg_0HHeOABWMQFnoECCwQAQ&url=https%3A%2F%2Fwww.theguardian.com%2Ftechnology%2F2007%2Fjul%2F25%2Fmedia.newmedia&usg=AOvVaw0zXHUYC0RqgPqN_kH1mUHd&opi=89978449 > last accessed 8 Feb 2024.

[4] Alvin Mutsoli, (2022). 'Who Invented MPESA?' *Tuko News*, at <https://www.tuko.co.ke/280391-who-invented-mpesa.html > last accessed 9 Feb 2024.

[5] Blue River Technology, at <https://bluerivertechnology.com/our-products/ > last accessed 7 Feb 2024.

[6] Universities Act No 42 of 2012 (Revd 2020), s3.

[7] UK Department for International Development, (2014). 'What Is the Evidence On The Impact Of Research On International Development?' <https://assets.publishing.service.gov.uk/media/57a089aced915d622c000343/impact-of-research-on-international-development.pdf > accessed 15 February 2024.

[8] WIPO, (2010). Learn from the Past, Create the Future: Inventions and Patents. <https://www.wipo.int/edocs/pubdocs/en/patents/925/wipo_pub_925.pdf > accessed 15 February 2024.

universities, the commercialization of intellectual property rights is under-exploited in Kenya. Universities are custodians of ground-breaking ideas that are eligible for patents, copyright and other forms of IP. However, the conversion of these Intellectual Property Rights (IPRs) into revenue streams is lacking. This paper seeks to show how universities can leverage (IPRs) as a vital income stream to finance their operations.

2. Definition and Types of Intellectual Property Rights

In Kenya, the term 'intellectual property rights' is used at article 11 which recognizes culture as a key aspect of society and obligates the state to promote and protect IPRs of the people of Kenya, art 40 (1) that establishes every individual's right to own property including Intellectual Property (IP) and art 260 of the Constitution which defines property to include IP.[1] There are many statutes that provide for protection of intellectual property rights in Kenya. These include but are not limited to the Industrial Property Act which deals with patents, utility models, industrial designs, and technovations;[2] Copyright Act dealing with creations of the mind such as literary, musical and artistic works, audio-visual works, sound recordings, and broadcasts;[3] Trade Marks Act which deals with registration of trademarks;[4] Seeds and Plant Varieties Act which protects persons discovering, developing or breeding new plant varieties;[5] Protection of Traditional Knowledge and Cultural Expressions Act which provides for protection and promotion of traditional knowledge and cultural expressions;[6] Science, Technology and Innovation Act which deals with scientific research, innovation and transfer of technology;[7] Environmental Management and Co-ordination Act which is concerned with biological diversity, biological resources and transfer of biological materials,[8] and the Wildlife Conservation and Management Act that seeks to protect species of wildlife — both fauna and flora which is endangered.[9]

The above-mentioned laws also provide for an institutional framework for better management of the IP in question. IPRs are therefore well anchored in the law in Kenya.

Protection of rights in traditional knowledge and expressions of culture was not initially provided for. Articles 8(j) of the 1992 Convention on Biological Diversity[10] as well as article 27 of TRIPS[11] allows nations who are so minded to exploit their genetic resources and register them in a *Sui generis* manner.[12] For a long time, African Nationals lost a lot of their genetic materials for lack of an appropriate form of protection.[13] The 2010 Swakopmund Protocol[14] on Traditional Knowledge gave impetus to many African countries to enact laws to protect traditional knowledge and expressions of culture.[15] This development shows the growing value attached

[1] Constitution of Kenya, 2010.

[2] Act No. 3 of 2001 (Revd 2018).

[3] Act No. 12 of 2001 (Revd 2022).

[4] Act No. 51 of 1955 (Revd 2007).

[5] Act No. 1 of 1972 (Revd 2016).

[6] Act No. 33 of 2016 (Revd 2018).

[7] Act No. 28 of 2013 (Revd 2022).

[8] Act No. 8 of 1999 (Revd 2022).

[9] Act No. 47 of 2013 (Revd 2019).

[10] 1992 UN Convention on Biological Diversity. At < https://www.cbd.int/doc/legal/cbd-en.pdf) last accessed on 9 April 2022.

[11] 1994 Agreement on Trade-Related Aspects of Intellectual Property Rights Annex 1C of the Marrakesh Agreement Establishing the World Trade Organization, signed in Marrakesh, Morocco on 15 April 1994. At < https://www.wto.org/english/docs_e/legal_e/27-trips_01_e.htm > last accessed on 9 April 2024.

[12] M Wekesa, (n.d.). What is Sui generis System of Intellectual Property Protection? (Nairobi, African Technology Policy Studies Network (ATPS) 2006). At <https://r.search.yahoo.com/_ylt=AwrEtfYre8dlQ2oEmz5XNyoA;_ylu=Y29sbwNiZjEEcG9zAzEEdnRpZAMEc2VjA3Nj/RV=2/RE=1708781612/RO=10/RU=https%3a%2f%2fatpsnet.org%2fwp-content%2fuploads%2f2017%2f05%2ftechnopolicy_brief_series_13.pdf%23%3a~%3atext%3dSui%2520generis%2520is%2520a%2520Latin%2520term%2520meaning%2520%25E2%2580%259Ca%2cregime%2520especially%2520tailored%2520to%2520meet%2520a%2520certain%2520need./RK=2/RS=nnboTyWUtcP7ezIr5YYZaCiAgpc>

[13] M Wekesa, (2009). Traditional Knowledge — The Need for Sui generis System of Intellectual Property Rights in Kenya, in M Wekesa & B Sihanya, eds: *Intellectual Property Rights in Kenya*. Nairobi-Konrad Adenauer Foundation/Sportslink Ltd, pp. 267-300.

[14] 2010 Swakopmund Protocol on the Protection of Traditional Knowledge and Expressions of Folklore (ARIPO). At <https://www.wipo.int/wipolex/en/treaties/text.jsp?file_id=201022 > last accessed on 9 April 2022.

[15] Protection of Traditional Knowledge and Cultural Expressions Act No. 33 of 2016 (Revd 2018).

to IP of all types in Kenya and Africa generally.

3. Commercialization of IP at Institutions of Higher Learning

Universities produce a lot of research, which can be used to generate revenue. Commercialization of research is considered to be the processing of new ideas into commercially viable products or services for the market.[1] Such products or services can be sold for a profit.[2] Commercialization entails research, product development process, and distribution of the commercial products.[3] Of these stages, research is the domain of a university. Product development involves skills that may be outside of a researcher such as conducting market research particularly demand for the product, designing and establishing processes and facilities to produce the product, determining a supply chain, establishing distribution channels, developing and implementing a marketing strategy. Once the above processes and requirements are satisfactorily met, a product, service or technology is ready for commercial distribution. Here, a university may have to collaborate with a suitable industry or set up its own special purpose vehicle (SPV).[4]

Commercialization can be measured using the number of research agreements, invention disclosures, patent applications, patent grants, licenses executed, income earned from commercialization and any spin-offs established[5]

Intellectual property, being intangible, it follows that it is inexhaustible. Therefore, it can be used by multiple parties at the same time, meaning it can be licensed or assigned to more than one person.[6] For example, rights in a book may be licensed to several booksellers in the same country or in different countries. A product can also be licensed to several companies to produce and sell in specified geographical regions.

Commercialization can be done through self-exploitation and where a party has no financial or industrial capacity to convert the research into a product or service, they can transfer the IP through assignment or licensing to a party that has capacity.[7] In assignment, the assignor (seller) surrenders all rights in the invention or creation to the assignee (purchaser). In other words, one sells the rights completely. This is comparable to selling a car or a piece of land. Licensing is where the licensor (the owner) 'rents' the rights in a product to a licensee (the temporary buyer) at a fee under certain conditions. Such conditions could relate to either the period of the license ('lease') or to a restriction in the geographical area, or both.

4. Requirements for Commercialization of IP

For an institution of higher learning to successfully engage in commercialization of IP, the following are prerequisites: availability of an institutional IP policy, general awareness of IP in the institution, transformation of the mindset of researchers, collaboration in sharing of research facilities, and collaboration with the industry.[8]

4.1 IP Policy

An IP policy guides an institution on how to develop, promote and commercialize IP. A policy sets out the steps to be followed and establishes an office for managing IP. Through the policy, members of an institution get sensitized on how to produce, protect and commercialize IP. Members get to know the benefits sharing ratio. The policy will also indicate how researchers can be assisted to move their inventions or creations to the market. Some institutions in Kenya are known to collaborate with others both internally and externally. For example,

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[1] European Commission, (2013). How to Convert Research into Commercial Success Story? 5. < https://era.gv.at/public/documents/1538/Part3.pdf> accessed 16 February 2024.

[2] M Khandelwal, (2022). 'Commercialisation of Intellectual Property: Alchemising Ideas into Income.' At < https://blog.ipleaders.in/commercialisation-of-intellectual-property-alchemising-ideas-into-income/ > last accessed 17 Jan 2024.

[3] USAID, (2017, November 30). 'Feed the Future Partnering for Innovation.' At < https://agrilinks.org/sites/default/files/success_factors_for_commercializing_agricultural_research.pdf > last accessed on23 Nov 2023.

[4] European Commission, (2013). How to Convert Research into Commercial Success Story? < https://era.gv.at/public/documents/1538/Part3.pdf> accessed 16 February 2024.

[5] UN Economic Commission for Europe, (2011). 'Intellectual Property Commercialization.' At < https://unece.org/fileadmin/DAM/ceci/publications/ip.pdf > last accessed on 10 Jan 2024.

[6] M Khandelwal, (2022). 'Commercialisation of Intellectual Property: Alchemising Ideas into Income.' At < https://blog.ipleaders.in/commercialisation-of-intellectual-property-alchemising-ideas-into-income/ > last accessed 11 Jan 2024.

[7] United Nations Economic Commission for Europe, (2013). Intellectual Property Commercialization: Policy Options and Practical instruments, 17. < https://unece.org/sites/default/files/2022-01/ip.pdf> accessed 16 February 2024.

[8] United Nations Economic Commission for Europe, (2013). Intellectual Property Commercialization: Policy Options and Practical instruments, 17 < https://unece.org/sites/default/files/2022-01/ip.pdf> accessed 16 February 2024.

Jomo Kenyatta University of Agriculture and Technology collaborates with National Board for Higher Education, Eritrea, which includes an item on the use of facilities.[1] South Eastern Kenya University (SEKU) has a MoU with Kenya Meteorological Department[2] and Kenya Forestry Research Institute that include sharing of and access to research facilities.[3] These collaborations run more smoothly where there is a clear IP policy guiding on ownership of resultant IP, trade secrets and laboratory data from experimentation. All stakeholders in an institution ought to know how to protect their IPs and why they should respect the IPs of others.

Where there are no IP policies, many university researchers are not aware how their research can lead to commercialization. It is a challenge to think of commercialization where the innovators are unaware of IP and the role they can play in moving research findings from the laboratory to the market. A poor relationship between inventors and the IP office breeds mistrust.[4] This can very easily happen where an institution has no robust policy on IP. Inventors will always be afraid that their ideas will be 'stolen'. This can seriously hamper efforts at commercialization. Absence of such a policy makes communication with such inventors very difficult.[5]

Some institutions may have an IP policy but the same has not been sufficiently publicized in the institution contrary to the provisions of article 10.[6] This article speaks to a mandatory nature of public participation. Public participation — involving membership of the University — ensures a 'buy-in' in such a policy.

4.2 General Awareness of IP

Research shows that awareness of IP in many research institutions in Africa is low.[7] Equally, Lemos & Cario found low levels of awareness of IP in academic and research institutions.[8] All stakeholders of an institution ought to know how to protect their IPs and why they should respect the IPs of others. Many universities still use the age-old mantra of 'publish or perish'. Little or no attention is paid to IP. Lack of awareness of IP is considered as a major barrier to commercialization of IP.[9] Universities in Kenya use teaching experience

[1] MoU between Jomo Kenyatta University of Agriculture and Technology, Kenya AND National Board for Higher Education, Eritrea Witnessed by Japan International Cooperation Agency. At http://www.eritreaembassy-japan.org/data/MOU_Oct_11Draft_JKUAT_1_Final.pdf last accessed on 12 April 2022.

[2] MoU between South Eastern Kenya University and Kenya Forestry Research Institute. < http://repository.seku.ac.ke/bitstream/handle/123456789/2039/Memorandum%20of%20Understanding%20between%20South%20Eastern%20Kenya%20University%20and%20Kenya%20Forestry%20Research%20Institute.pdf?sequence=1&isAllowed=y > last accessed on 12 April 2022.

[3] MoU between South Eastern Kenya University and Kenya Forestry Research Institute. At < http://repository.seku.ac.ke/bitstream/handle/123456789/2039/Memorandum%20of%20Understanding%20between%20South%20Eastern%20Kenya%20University%20and%20Kenya%20Forestry%20Research%20Institute.pdf?sequence=1&isAllowed=y > last accessed on 12 April 2022.

[4] Bansi.

[5] M Alessandrini, K Klose, K & MS Pepper., (2013). 'University Entrepreneurship in South Africa: Developments in Technology Transfer Practices.' *Innovation, 15*(2), 205-214.

[6] Constitution of Kenya, 2010.

[7] GM Sikoyo, E Nyukuri and JW Wakhungu, (2006). Intellectual Property Protection in Africa — Status of Laws, Research and Policy Analysis in Ghana, Kenya, Nigeria, South Africa and Uganda. ACTS, Nairobi. At < https://media.africaportal.org/documents/ecopolicy16_1.pdf > last accessed 20 March 2022; FR Bezuidenhout 'Identifying barriers to commercialization of intellectual property at selected South African Universities' MBA Dissertation, North-West University, 2018 at < https://dspace.nwu.ac.za/bitstream/handle/10394/30624/Bezuidenhout_FR_2018.pdf?isAllowed=y&sequence=1 > last accessed 18 Aug 2023.

[8] DC Lemos & SA Cario, (2016). 'University — Industry Interaction in Santa Catarina: Evolutionary Phases, Forms of Interaction, Benefits, and Barriers'. *RAI Revista de Administração e Inovação, 14*(1), pp. 16-29. At < http://dx.doi.org/10.1016/j.rai.2016.12.001 > last accessed on 11 Jan 2024.

[9] NS Suhaimi, MAS Abdul Halim & HA Hashim, (2020). 'Commercialization of Academic Research: Assessing the Perception of Academicians at a Public University in Malaysia.' *Journal of Applied Research in Higher Education*. At <https://www.semanticscholar.org/paper/Innovation-strategies-for-successful-in-public-Razak-Murray/7a2b9c3896078cd38040752c50d76c3783df0dca> last accessed 15 Sept 2023.

(number of years), publications (quantity), and community service as criteria for appointment and or promotion.[1] With the exception of creations of the mind (publications), innovations do not feature on the list of such criteria. There is no direct commercial incentive for staff to publish.

4.3 Transformation of Attitude

Many universities do not have an innovative and entrepreneurial culture.[2] If senior management cannot embrace an entrepreneurial spirit, they cannot promote commercialization[3]. Closely connected to this is management's lack of understanding of IP. The University environment could also be a hindrance to commercialization of inventions.[4] For decades, most research at our universities has been basic science. Facilities for more applied research are hard to come by.

Universities are said to thrive more comfortably with what they know best — teaching and research.[5] On research, universities place a lot of emphasis on pure science whereas the industry is interested in applied science.[6] There is also the question of conflict of interest — universities want to publish their results quickly for the sake of promotion. Such quick publication works against the non-obviousness rule for patents.[7] Also, industry is interested in keeping research findings and laboratory data 'confidential' either awaiting patenting (which could take up to four years after completion of the project) or as 'trade secrets', which means — no publication.[8] Results of a study in Malaysia involving academics showed that the academician's behaviour and University-Industry collaboration were the two key factors that positively influence commercialization of an academician's work.[9] In a related study at Sri Lankan universities, researchers arrived at a similar finding.[10]

4.4 Collaboration in Sharing of Research Facilities

Collaboration for research purposes is a worldwide practice. This is in recognition of the fact that no one

[1] Commission for Higher Education, (2011, October). 'Standards and Guidelines for Academic Degree Programmes.' At <https://r.search.yahoo.com/_ylt=AwrEtfZ3fsdlQ2oE89ZXNyoA;_ylu=Y29sbwNiZjEEcG9zAzEEdnRpZAMEc2VjA3Ny/RV=2/RE=1708782456/RO=10/RU=https%3a%2f%2fwww.cue.or.ke%2findex.php%3foption%3dcom_phocadownload%26view%3dcategory%26id%3d16%3astandards-and-guidelines%26Itemid%3d187/RK=2/RS=WdbtRfvSFB3jXV8Ac_cXnmn.2T4-> last accessed 7 Feb 2024.

[2] T Khademia and K Ismaila, (2013). 'Commercialization Success Factors of University Research Output.' *Jurnal Teknologi (Social Sciences), 64*(3), 137-141.

[3] G D Markman et al, (2005). 'Entrepreneurship and University-Based Technology Transfer.' JBV < https://www.researchgate.net/publication/223817994_Entrepreneurship_and_University-Based_Technology_Transfer> accessed 16 February 2024.

[4] NS Suhaimi, MAS Abdul Halim & HA Hashim, (2020). 'Commercialization of Academic Research: Assessing the Perception of Academicians at a Public University in Malaysia.' *Journal of Applied Research in Higher Education*. At <https://www.semanticscholar.org/paper/Innovation-strategies-for-successful-in-public-Razak-Murray/7a2b9c3896078cd38040752c50d76c3783df0dca> last accessed 8 Feb 2024.

[5] DC Lemos & SA Cario, (2016). 'University–industry interaction in Santa Catarina: Evolutionary Phases, Forms of Interaction, Benefits, and Barriers.' *RAI Revista de Administração e Inovação*, *14*(1), 16-29. At http://dx.doi.org/10.1016/j.rai.2016.12.001.

[6] IM Weerasinghe & HH Dedunu, (2019). 'Impact of Institution Factors to University-Industry Knowledge Exchange: A Study Based on Sri Lankan University System.' At <https://www.semanticscholar.org/paper/IMPACT-OF-INSTITUTION-FACTORS-TO-KNOWLEDGE-A-STUDY-Weerasinghe-Dedunu/5c5ecf7d6824344ce1e31ab88b86426d580241dd > last accessed on 20 March 2022.

[7] *Windsurfing International Inc* v *Tabur Marine (Great Britain) Ltd*, [1985] RPC 59.

[8] S Lhuillery & E Pfister, (2009). 'R & D Cooperation and Failures in Innovation Projects: Empirical Evidence from French CIS data.' *Research Policy*, 38, 45-57.

[9] NS Suhaimi, MAS Abdul Halim & HA Hashim, (2020). 'Commercialization of Academic Research: Assessing the Perception of Academicians at a Public University in Malaysia.' *Journal of Applied Research in Higher Education.* At <https://www.semanticscholar.org/paper/Innovation-strategies-for-successful-in-public-Razak-Murray/7a2b9c3896078cd38040752c50d76c3783df0dca> last accessed 20 March 2022.

[10] IM Weerasinghe & HH Dedunu, (2019). 'Impact of Institution Factors to University-Industry Knowledge Exchange: A Study Based on Sri Lankan University System.' At <https://www.semanticscholar.org/paper/IMPACT-OF-INSTITUTION-FACTORS-TO-KNOWLEDGE-A-STUDY-Weerasinghe-Dedunu/5c5ecf7d6824344ce1e31ab88b86426d580241dd > last accessed on 20 March 2022.

institution has it all. This applies to both developed and developing countries.[1] Some examples will suffice. The University of Texas at Austin ("UT"), Texas Nanotechnology Facilities ("TNF"), together "TNF-UT", have three centers namely Microelectronics Research Center (TNF) & Nanomanufacturing Systems for Mobile Computing and Mobile Energy Technologies (NASCENT) and Texas Material Institute (TMI) have a 'lab-user' protocol that enables scientists from the three institutions to access any of the labs in the consortium in respect of nanotechnology fabrication.[2] The University of Tokyo Information Technology Center and the University of California, as Management and Operating Contractor for Lawrence Berkeley National Laboratory have a MoU for research.[3] Cairo University collaborates with Georgia American College for Research and Academic Cooperation in Agriculture.[4] Cairo University and South Sudan's John Garang University (JGU) collaborate in the scientific research, education and training domains.[5]

Researchers from the Universities of Dar-es-Salaam and Makerere collaborated through a joint grant to come up with a technology for producing juice from bananas.[6] It has been reported that the University of Dar es Salaam has over 100 MoUs with several institutions within and outside of Tanzania.[7] Kenyatta University has about 274 MoUs with various institutions locally and abroad.[8]

Research facilities for the sciences are expensive to acquire. Furthermore, such equipment appears to be improving at a higher rate than an African country's economy can afford to acquire. This rapid improvement guarantees the existing technology a very short lifespan. Newer technologies are associated not only with higher efficiency but also high prices. In practice, different institutions in a country will acquire their facilities at different times. This means that some institutions will have newer facilities than others. All these facilities have a short shelf-life after which they become less efficient and eventually, they become obsolete. This calls in the need for cooperation involving institutions within a country, and collaboration with institutions in other countries. Collaboration could also take the form of capacity building.

Such a need for cooperation and collaboration is not unique to Africa. The Cohen-Boyer technology for recombinant DNA, was developed through collaboration of researchers Stanley Cohen (Stanford University) and Herbert Boyer (the University of California, San Francisco, UCSF).[9] Collaboration between Purdue University Entomology Department and the Cameroonian Institute for Agricultural Research for Development (IRAD) led to the development of special triple bagging technology that produces bags for storing grain. University of Tokyo, Information Technology Center, Japan, and the University of California, as Management and Operating Contractor for Lawrence Berkeley National Laboratory signed a three-year MoU for increased collaboration, cooperation and interaction for the further promotion and understanding of high performance computing (HPC),

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[1] Stanford, 'Managing Shared Laboratory Spaces — Guidance for Principal Investigators' https://ehs.stanford.edu/wp-content/uploads/17-100.pdf?1579647602; MoU between The University of Tokyo, Information Technology Center and The Regents of the University of California, as Management and Operating Contractor for Lawrence Berkeley National Laboratory at < https://www.nersc.gov/assets/About-Us/MOUUTokyoLBNL.pdf > last accessed on 21 April 2023; MoU between South Eastern Kenya University and Kenya Forestry Research Institute at < http://repository.seku.ac.ke/bitstream/handle/123456789/2039/Memorandum%20of%20Understanding%20between%20South%20Eastern%20Kenya%20University%20and%20Kenya%20Forestry%20Research%20Institute.pdf?sequence=1&isAllowed=y > last accessed on 25 Aug 2023; MoU between University of Addis Ababa, Sussex University and Brighton University https://cu.edu.eg/Cairo-University-News-11367.html; https://semonegna.com/aau-kings-college-london-university-of-brighton-signed-mou/https://semonegna.com/aau-kings-college-london-university-of-brighton-signed-mou/

[2] At < https://www.mrc.utexas.edu/sites/default/files/forms/MOU-Texas%20Nanofabrication%20Facility%20-UT_approved-Oct2017.pdf > last accessed 27 April 2023.

[3] At < https://www.nersc.gov/assets/About-Us/MOUUTokyoLBNL.pdf > last accessed on 9 April 2022.

[4] At < https://cu.edu.eg/Cairo-University-News-12331.html > last accessed on 3 Feb 2024.

[5] At < https://www.sis.gov.eg/Story/155628?lang=en-us > last accessed on 3 Feb 2024.

[6] IPP Media Room, 'Researchers produce high- tech clear banana juice for commercialization.' At < https://www.ippmedia.com/en/news/researchers-produce-high-tech-clear-banana-juice-commercialization > last accessed 29 Jan 2024.

[7] At < https://www.udsm.ac.tz/web/index.php/offices/internationalization/collaborations > last accessed on 20 Oct 2023.

[8] http://international.ku.ac.ke/mou/ last accessed on 20 Oct 2023.

[9] National Research Council, (1996, February 15-16). *Intellectual Property Rights and Research Tools in Molecular Biology: Summary of a Workshop Held at the National Academy of Sciences*. Washington, DC: The National Academies Press. doi: 10.17226/5758 at < https://www.nap.edu/read/5758/chapter/6#52 > last accessed 22 Nov 2023.

computational science and engineering.[1] One of the largest collaborations involving over 150 institutions globally with over 124 US universities is that between the Incorporated Research Institutions for Seismology (IRIS) and Global Seismographic Network (GSN).[2]

5. Best Practices

5.1 Commercializing Copyright

It is common knowledge that University Professors worldwide publish books, monographs and treatises in all fields of knowledge. This is also the case in Kenya. An author in Kenya will write a manuscript and shop around for a willing publisher. If a publisher accepts the manuscript, then the publisher incurs costs of printing, storage, marketing, distribution and other related costs necessary to bring the book to the bookstore. The publisher takes over the copyright. The author is compensated to the tune of 10% of all sales. Many authors are heard complaining that book writing does not pay. Some authors do not easily get willing publishers and are forced to let their manuscripts gather dust. Sometimes the publisher may commission a book. Other times, authors choose to self-publish. In such a case, the author will grapple with the necessary costs for converting the manuscript into a book and for landing such a book into a bookstore.

Most universities in Kenya have printing facilities. These include Pwani University, Strathmore University and several others. There however appears to be no focused strategy for using these facilities to commercialize copyright from an institution's employees.

The University of Wisconsin-Madison has a model of commercialization of copyright.[3] When a staff has a ready manuscript, the University pays for costs of publishing and avails the book at a relatively lower cost than the commercial publishers would. This price in turn attracts a wider market. In the long run, both the University and the author make money through large volumes of sales.

With over 70 universities and over 70 National Polytechnics accounting for a student population of slightly over three million. These institutions have replicated faculties of schools. For example, a faculty of Arts is to be found in all universities and polytechnics. Some specialized fields like engineering, architecture, law and medicine are not found at all these institutions. It is possible to author a book that can be used in all these Universities. In fact, most of the materials used in the specialized fields are largely foreign in nature and there is need to have materials with a local content.

Kenyan universities could make a lot of money from commercialization of copyright. To this end, the example of the University of Wisconsin-Madison would be worth emulating.

5.2 Commercializing a Trade Mark

Researchers at the University of Purdue (USA) and the Cameroonian Institute for Agricultural Research for Development (IRAD) observed that small scale farmers had a challenge with storage of their produce. Usually when a crop is harvested, it comes with insects. These insects destroy the harvested crop very fast, causing immense losses to farmers. This situation compels farmers to sell their crop quickly at a time when there is a glut in the market. So, farmers were not making much out of such sales. The researchers experimented and came up with a 'three-layered bag' which they referred to as an improved crop storage (PIC) technology.[4]

PICS bags have three layers: an outer layer of ordinary woven polypropylene and two inner liners of high-density polyethylene (HDPE) 80 microns thick. Insects have a high metabolic rate and when they are sealed in hermetic containers, they quickly use all the oxygen. Depending on the insect species, the insects either die or go dormant. Either way they do not cause storage damage. This invention was designed to solve a problem of grain storage to prevent destruction by insects in Cameroon and Nigeria. It is largely a technology for Africa. The researchers collaborated with local traders to buy and store the bags for purchase by farmers and established links with manufacturers and local traders as well. Initially, the bags were manufactured in USA. Later, PICs set up manufacturing facilities in many African and Asian countries. They chose to use a trademark as their preferred intellectual property. These trademarks were registered at the Africa Intellectual Property Institute (OAP), and in several countries in the rest of Africa and in Asia. These bags retail in Kenya for between USD 2 and 3 (KShs. 320-480) per bag. To date, hundreds of millions of such bags have been sold. Purdue University

[1] At < https://www.nersc.gov/assets/About-Us/MOUUTokyoLBNL.pdf > accessed on 19 January 2024.

[2] At < https://www.nsf.gov/geo/ear/if/guidelines2014.pdf > accessed 22 January 2024.

[3] https://research.wisc.edu/funding/book-subvention-for-scholarly-monographs/ accessed 9 Feb 2024.

[4] J Lowenberg-DeBoer and S Musa, (2017, February). 'University Licensing of Intellectual Property in Developing Countries: A Case Study of the Purdue Improved Crop Storage (PICS) Technology.' Working Paper #17-2, Dept of Agricultural Economics, Purdue University. At <https://econpapers.repec.org/paper/paewpaper/17-2.htm >accessed 6 Feb 2024.

makes money through licensing of the technology to manufacturers. Trademarks are therefore a viable form of commercializing an institution's intellectual property rights.

5.3 The Concept of 'Technology Push' to the Market

One of the challenges to commercialization is that researchers at universities operate in a 'silo' away from the industry.[1] Researchers come up with research questions of interest to them alone under the guise of 'academic freedom'. When, however, their research efforts come up with a possible product for commercialization, they then start 'chasing' after a willing partner in the industry to collaborate with. This was the case when researchers at the Universities of Dar es Salaam and Makerere collaborated and came up with a mechanical means of producing banana juice on a commercial scale.[2]

They had observed that communities in Burundi, Eastern Congo, Rwanda, Tanzania and Uganda consume lots of bananas.[3] As part of that consumption, they also make banana juice. This they do by mixing ripe bananas with grass and using either their hands or feet to squeeze the juice out.[4] Some process this juice further into alcohol. The researchers observed that such a method of processing could only produce juice on a small scale and for domestic consumption. They therefore sought to increase production through mechanization. They developed a technology that can produce a lot of juice within a very short time.[5] It is reported that they could produce over 500 litres a day. They thereafter needed an 'industry' to partner with and enhance production and marketing. They have struggled to 'push their technology to the market'. The potential remains under-exploited.

This approach to commercialization has been described as 'technology push'.[6] Researchers work on their own without the involvement of industry and later try to push their inventions to the market. Researchers come up with an invention without a commercial 'eye' and thereafter start running after the market.[7]

It is this approach that could be partly blamed for the numerous 'inventions' lying idle in our institutions. It is said that University Professors do not set out to innovate but that an innovation comes along rather 'accidentally'. Hence, the 'technology push'. Where there is good collaboration between a university and the industry, the industry could propose a problem that requires a technological solution. In such a case, the industry would have identified a gap in the market and therefore the resultant innovation can very quickly end up on the market.[8]

A near similar scenario had played itself out earlier at the University of Nairobi where researchers developed a special kind of fertilizer in the early 1980s.[9] This they called Biofix. This fertilizer was particularly useful in leguminous plants. The University chose to produce and market the product by itself in the hope of 'maximizing' the benefits. It had not nationwide network. Farmers travelled long distances to purchase the product from the University. In 2003, a company known as MEA developed interest in the product. After three years, the University agreed to grant an exclusive licence of their patent to MEA. MEA started production on a large scale. Still the demand outstripped supply. MEA improved on her technology and hired more staff to keep up with the demand. Soon, MEA was able to reach the product to markets in Eastern and Southern Africa. The University of

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[1] United Nations Economic Commission for Europe, (2013). Intellectual Property Commercialization: Policy Options and Practical instruments, 17. < https://unece.org/sites/default/files/2022-01/ip.pdf> accessed 16 February 2024.

[2] IPP Media Room, 'Researchers Produce High- Tech Clear Banana Juice for Commercialization.' At < https://www.ippmedia.com/en/news/researchers-produce-high-tech-clear-banana-juice-commercialization > accessed 6 Feb 2024.

[3] G Omulo, N Banadda and N Kiggundu, (2015). 'Harnessing of Banana Ripening Process for Banana Juice Extraction in Uganda.' *African Journal of Food Science and Technology, 6*(4), 108-117. At <http://www.interesjournals.org/AJFST, DOI: http:/dx.doi.org/10.14303/ajfst.2015.039> accessed 7 Feb 2024.

[4] G Kasozi & LL Kasisira, (2005). 'Design and Performance of a Banana Juice Extractor.' *African Crop Science Conference Proceedings, 7*, 1381-1384.

[5] C Reforum, M Kabahenda, MN Kapiriri & MM Kabahenda, (2010). 'Analysing Agricultural Science and Technology Innovation Systems: A Case Study of the Banana Sub-sector in Uganda.' Kampala, Uganda.

[6] C Lee, Y Cho, H Seol & Y Park, (2012). 'A stochastic Patent Citation Analysis Approach to Assessing Future Technological Impacts.' *Technological Forecasting and Social Change, 79*(1), 16-29.

[7] V Gilsing, R Bekkers, IMB Freitas & M Van der Steen, (2011) 'Differences in Technology Transfer Between Science-Based and Development-Based Industries: Transfer Mechanisms and Barrier.' *Technovation, 31*(12), 638-647.

[8] T Mets, A Kelli, A Mets & T Tiimann, (2016). 'From Patent Counting Towards the System of IP Strategic Indicators' *Engineering economics, 27*(3), 316-324.

[9] H Odame, (1997). 'Biofertilizer in Kenya: Research, Production and Extension Dilemmas.' 20-23. At < https://www.researchgate.net/publication/291916128_Biofertilizer_in_Kenya_Research_production_and_extension_dilemmas > accessed 5 Feb 2024.

Nairobi succeeded in 'pushing technology' to the market. This took over 20 years to happen. This is not the best approach.

What befell the Universities of Dar es Salaam, Makerere and Nairobi is a familiar story across the academic landscape. Year-in-year-out universities talk about 'University-Industry' linkages. Some have even set up directorates for this purpose. If these endeavours are to bear fruit, we submit that there is need for a change in approach.

5.4 The Triple Helix Approach

This is a model involving researchers, industry and government. It has been postulated that if universities, research institutes, and government bodies could work in harmony, this would remove obstacles that prevent cooperation and collaboration.[1]

This is best illustrated by what the State of Victoria in Australia. The State of Victoria purposed to promote innovation, bringing together science, industry and government. The government took a special interest in coordinating the venture. Although there were government institutions dealing with intellectual property rights, the state of Victoria set up a 'tripartite' committee comprising of universities, industry and government to oversee this project. This committee advertised for research grants, received proposals, vetted the proposals and allocated funds. The committee attracted researchers from all over the world. The committee kept a close eye on all her grantees of the research fund, thereby helping to tackle challenges as and when they arose. No project was abandoned or steered off course. Within four years of the start of this project, there were tangible results.[2] It is reported that many patents had been registered and many others were in the pipeline. Several spin-off companies had been formed and many jobs were created. There was a lot of technology transfer. Other results included increased scientific capacity, increased services and technology for commercialization. The industry also pumped in money. The State earned a lot of income through taxes. The economy improved tremendously.[3]

In Kenya, there are several government agencies set up by statutes such as the Kenya Industrial Property Institute (KIPI), Kenya Copyright Board, National Environment and Management Agency (NEMA), Kenya Wildlife Service (KWS), Innovation Agency,[4] Kenya Plant Health Inspectorate Service (KEPHIS) to name but some. These bodies are concerned with intellectual property in one way or another. However, they do not seem to talk to each other. It was probably in recognition of this fact that the State of Victoria decided to set up a special committee. None of them has the mandate to link the universities to the industry. It is not even clear who is responsible for creating awareness on intellectual property at universities. The current situation in Kenya is that universities are struggling to talk to the few industries available, all in a fairly disjointed manner.[5] The triple-helix model requires that government takes the lead and be closely involved in the University-industry interactions.

6. Conclusion

Universities and similar institutions of higher learning are currently underfunded. This applies to both public and private institutions. At the same time, these institutions harbour a very high concentration of intelligent people — the cream de la cream of society. These employees are capable of creating marketable works like books, music and films as well as commercially viable patents, industrial designs and utility models. In addition, there are others — especially in the plant and agricultural sciences — who have the know-how to develop and propagate new plant varieties. Society needs new technologies and products in order to improve. Inventions from such high calibre personnel can be protected through intellectual property rights and be commercialized. Commercialization of intellectual property rights can be a source of revenue to institutions of higher learning. To achieve this, there is need for a culture shift from 'publish or perish' to 'innovate and prosper'. Universities have tried for decades to engage with the industry without much success. There is need for a triple-helix approach

[1] AL Goh, (2005). "Promoting innovation in aid of industrial development: the Singaporean experience." *International Journal of Public Sector Management, 18*(3), 216-40.

[2] S Smith and RJ Pech, (2006). 'A Template for Commercializing Science and Facilitating Innovation — A Case Study of Victoria, Australia.' *European Journal of Innovation Management, 9*(3), 279-299. At < www.emeraldinsight.com/1460-1060.htm > accessed 15 January 2024.

[3] F Zhao, (2004). 'Commercialization of Research: A Case Study of Australian Universities.' *Higher Education Research & Development, 23*(2), 223-236. DOI:10.1080/0729436042000206672.

[4] Science, Technology and Innovation Act No. 28 of 2013, s29.

[5] FR Bezuidenhout, (2018). 'Identifying barriers to commercialisation of intellectual property at selected South African Universities.' MBA Dissertation, North-West University. At < https://dspace.nwu.ac.za/bitstream/handle/10394/30624/Bezuidenhout_FR_2018.pdf?isAllowed=y&sequence=1 > accessed 4 Feb 2024.

with government leading. Examples from around the world reveal a lot of collaboration amongst institutions — a worthwhile effort to promote technology transfer and commercialization. Indeed, Kenyan Universities can commercialize various forms of intellectual property and thereby diversify their sources of income.

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