

# Intellectual Property And Knowledge Transfer Between Universities And Industries In Africa: The Case Of Botswana

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## I. Introduction

As in other nations, knowledge transfer is central to the policy objectives of African countries. To this end, intellectual property (IP) is often mentioned as a strategy intended to facilitate the production and transfer of knowledge. As Africa is an enormous and diverse place, it is unwise to overgeneralize the situation across the continent. Nor is it practicable to canvass the practice in the continent within this piece. Hence, we have chosen Botswana as an illustrative country in Africa to examine IP's relevance for knowledge creation and transfer between universities and industries. Given the major similarities in the situations of most universities in Africa and the limited role of IP for their contribution, our choice of Botswana is intended to reflect the dominant practice across most countries in the continent. Further, our analysis builds upon a prior study that explores the relevance of IP for universities in the country under consideration. Taking into account the contexts for collaborative innovation and knowledge transfer through the active role of universities, this article seeks to highlight Botswanan universities' contribution to the stock of knowledge, the university-industry linkage for the knowledge transfer and the mode of the linkage in the country. In view of the analysis, the article concludes with relevant policy recommendations, including strategies for open collaborative innovation through university/industry partnerships

## II. The Contribution of Universities to the Stock of Knowledge

The contribution of African universities to the stock of knowledge and innovation lacks a concrete evidence and a comprehensive set of indicators. Although some of the global indicators are irrelevant to African context, the pertinent indicators include human capital, research outputs, and technologies generated. There are few relevant studies that highlight the level of contributions of African universities. Nonetheless, this section is confined to examining the practical role of IP in Botswanan universities' contribution to knowledge creation and innovation.

Botswana is among developing countries from the Sub-Saharan Africa. With a population of 2.3 million, Botswana has recorded a high-ranking human development index that takes into account, *inter alia*, educational achievements.<sup>1</sup> Its education's policy objective is intended to promote the country's overall goal to build a modern and sustainable knowledge-based economy.<sup>2</sup> In 2018, Botswana's gross enrollment ratio constitutes 23 percent of its tertiary school-age population. In view of its high expenditure on

1. See "UNDP Human Development Indices and Indicators: 2018 Statistical Update" (New York: *UNDP*, 2018) [UNDP Human Development 2018]. Botswana's rank in 2018 is 110. That falls within the category of high human development index (60-112). *Ibid.*, 55.

2. Republic of Botswana, "Ministry of Education and Skills Development, Botswana Education and Training Sector Strategic Plan" (ETSSP 2015-2020) (*Gaborone: Ministry of Education and Skills Development*, 2015), 5.

education,<sup>3</sup> its overall education quality is somehow rated very low.<sup>4</sup> Yet, its tertiary education is rated better than that of few other countries in the Sub-Saharan region.<sup>5</sup>

On top of their contribution to the national human capital and research output, the universities in Botswana have made a significant contribution in terms of graduates in science and engineering.<sup>6</sup> In addition to its few public universities with an exclusive emphasis on training students in science and technology, Botswana's universities largely focus on an applied research<sup>7</sup> while the country's overall expenditure on research and development (R&D) is as little as 0.5 percent of its GDP.<sup>8</sup> Nonetheless, Botswana has taken positive steps towards boosting research, innovation and technology. For instance, one such positive step is its recent creation of a national innovation fund to support relevant innovative projects.

Like many African countries, Botswana has put in place both legal and institutional frameworks for IP protection in order to promote creativity and innovation in the country. In this regard, its Copyright and Neighboring Act (2000)<sup>9</sup> and Industrial Property Act (1996, as amended in 2010)<sup>10</sup> are the major legal frameworks that are designed to incentivize the production and dissemina-

3. Its overall expenditure on education is 9.6 percent of its GDP (US \$39.6 billion). Compared to most African countries' GDP per capita (e.g., Ethiopia with US\$1,800 & South Africa with US\$13,165), Botswana's GDP per capita is also very high (US\$17,828). See Soumitra Dutta, Bruno Lanvin & Sacha Wunsch-Vincent, eds., "The Global Innovation Index 2018: Energizing the World with Innovation" (Geneva: *WIPO/Cornell University*, 2018), 232.

4. See UNDP Human Development 2018, 75.

5. According to Global Innovation Index 2018, the overall value of Botswana's human capital and research is 29.8 (32 in 2017) with a score of 16.1(24.1 in 2017) for its tertiary education. Global Innovation Index 2018, 232. For instance, this fares better in contrast to countries such as Ethiopia. The value of Ethiopia's human capital and research in 2017 was 14.8 out of which a value of 14.6 was given for its tertiary education. See Soumitra Dutta, Bruno Lanvin & Sacha Wunsch-Vincent, eds., "The Global Innovation Index 2017: Innovation Feeding the World, 10th Ed" (Geneva: *WIPO/Cornell University*, 2017), 199 & 222.

6. According to Global Innovation Index 2017, the value registered for the graduates in science and engineering was 17.5 and Botswana was ranked 70. See *Global Innovation Index 2017*, 199.

7. For instance, a study conducted in 2014 indicates 57.8 percent of applied research from the types of research. See Njoku Ola Ama, "Perspectives on Intellectual Property from Botswana's Publicly Funded Researchers," in de Beer et al eds., *Innovation and Intellectual Property*, *supra* note 3, 357.

8. Global Innovation Index 2018, 232.

9. See Copyright and Neighboring Act No.8 of 2000, Republic of Botswana.

10. See Industrial Property Act No. 14 of 1996, Republic of Botswana; Industrial Property Act No.8 of 2010, Republic of Botswana [Industrial Property Act of 2010].

tion of knowledge through the acquisition and protection of IPRs. Operating under the auspices of the Ministry of Investment, Trade and Industry (MITI), the Companies and Intellectual Property Authority is the institutional framework responsible for the promotion and protection of IPRs.<sup>11</sup> Further, Botswana has been a member to several regional and international IP treaties and related agreements, including the TRIPs Agreement.<sup>12</sup>

As regards ownership of IPRs, Botswana's Industrial Property Act of 2010 has incorporated a doctrine of work-made for hire that entitles employers such as universities to the ownership of patents generated in the course of employment unless agreed otherwise.<sup>13</sup> Accordingly, Botswanan universities such as the University of Botswana have adopted an IP policy that enables them to claim the ownership of IP generated by their employees in the execution of employment.<sup>14</sup>

Despite the existence of legal and institutional frameworks for IP, the role of IP to facilitate knowledge production and innovation in Botswana is quite limited. For instance, over a period of two years (2016-07), a total of 11 patents applications were filed in Botswana with a single application by its residents.<sup>15</sup> In the same period, only a total of 8 utility model application were filed by residents in the country.<sup>16</sup> Not a single university does appear in the list. Thus, the negligible figure registered for patents at a national level holds true for the contribution of Botswana's universities and colleges to IP-driven knowledge production and innovation. In contrast to their greater emphasis on applied research,<sup>17</sup> universities research output generates few patents, if any.<sup>18</sup>

In fact, there is no recent data that indicates the acquisition of patents or applications for same by universities in Botswana. Nonetheless, the GII highlights the universities' modest contributions in terms of scientific and technical publications as well as citable documents' H-index.<sup>19</sup> Although it is not disaggregated to indicate the contribution made by universities, the value given for the knowledge impact in Botswana is also not that bad.<sup>20</sup> Save for possible copyright protection over the publications, it is plausible to conclude that universities' contribution to IP-driven

innovation remains insignificant. Similar to the scenario in other African countries, universities' significant contribution to the stock of knowledge in Botswana lies outside the conventional patent-based metrics.

### III. The Level and Mode(s) of Collaboration Between Universities and Industries

In Botswana, the collaboration or linkage between universities and industries for knowledge transfer and innovative activities is facilitated by the Human Resource Development Council (HRDC). Established pursuant to Act No.17 of 2013,<sup>21</sup> the HRDC is mandated to "co-ordinate, promote and support tertiary education industry linkages, research and innovation activities."<sup>22</sup> The HRDC is also expected to "formulate human resource development plans for key sectors of the economy through linkages with employers in the public and private sectors."<sup>23</sup> In addition to the

Ministry of Infrastructure, Science and Technology with the primary mandate to promote innovation and facilitate collaboration, a national technology transfer office (TTO) has been established in cooperation with Botswana innovation hub and the University of Botswana in order to promote public-private partnership for innovation through research and development.

Indeed, the need for technology transfer through research collaboration and the commercialization of the research output was long underscored in the National Research, Science, and Technology Plan (NRSTP).<sup>24</sup> For the intended public-private partnership, the NRSTP endorsed four models of collaboration: (a) technology linkup grants—for raising awareness about and facilitating access to technology, (b) technology fellowship—for boosting industries' human capital, (c) grants for private sector R&D, and (d) public-private research consortia.<sup>25</sup> The latter two models were envisaged to promote investment in R&D and the consequent commercialization of the research outputs.<sup>26</sup> In all the endorsed models of partnership, collaborative research and innovation were identified to be crucial through innovation fund and the active role of both universities and industries.<sup>27</sup> Noting the insignificant role of IP and the limited capacity to harness its potential, the NRSTP also emphasized the need for awareness creation, and building an institutional capacity ignored for universities and industries to leverage IP for commercialization and to facilitate knowledge transfer.<sup>28</sup>

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11. See Companies and Intellectual Property Authority Act No. 14 of 2011, art.5.

12. Ama, "Perspectives on Intellectual Property," 340. As a member to the WTO, Botswana ratified the Trade-Related Aspects of Intellectual Property Rights (TRIPs) Agreement on May 31, 1995.

13. Industrial Property Act of 2010, *supra* note 61 at art.10 (4). See also art.51 (4) of the Act for Industrial Designs.

14. Ama, "Perspectives on Intellectual Property," 342.

15. See World Intellectual Property Indicators 2017 (Geneva: WIPO, 2017), 85[WIPO IP Indicators 2017]; WIPO IP Indicators 2018, 78.

16. See WIPO IP Indicators 2017, 95; WIPO IP Indicators 2018, 84. According to the GII issued in 2017, Botswana was accorded a zero value for patents and utility models. See Global Innovation Index 2017, 199.

17. Ama, "Perspectives on Intellectual Property," 353. Conducted few years back, the study shows that around 53 percent of the research in the academic institutions was constituted of applied research. *Ibid.*

18. *Ibid.*, 357. Based on data collected in 2014, the study indicates that only around 1 percent of patent was developed annually from the research output. *Ibid.*

19. In 2017 & 2018, Botswana has been ranked among the first 100 countries with a score of 8.2(5.6 in 2018) for scientific publications and a constant value of 4.7 for citable documents H-index. See "Global Innovation Index 2017," 199; *Global Innovation Index* 2018, 232.

20. Botswana has been consecutively ranked 73rd and 100th with respective scores of 29 and 27.5 in 2017 and 2018. See "Global Innovation Index 2017," 199; *Global Innovation Index* 2018, 232.

21. See "Human Resource Development Council Act," 2013, No.17 of 2013, *Botswana Government Gazette*, 18 October 2013[HRDC Act 2013].

22. *Ibid.*, art. 3(2) (h).

23. *Ibid.*, art.3 (2) (i).

24. See "Republic of Botswana, Ministry of Communications, Science and Technology, Botswana National Research, Science and Technology Plan: Final Report" (*Gaborone: Ministry of Communications, Science and Technology*, 2005), 8-18, 39-40 & 48-50.

25. *Ibid.*, 17.

26. *Ibid.*

27. *Ibid.*, 17, 47.

28. *Ibid.*, 48-50.

From among the universities in Botswana, the University of Botswana has a TTO that is responsible for the management of IP, technology transfer to industries and commercialization of the research outputs.<sup>29</sup> Intended to operate in collaboration with the national TTO, the establishment of the University's TTO is a step in line with the policy direction that was long envisaged in the relevant national plans. Nonetheless, it is not well developed to play a significant role. The same holds true for related offices of other universities and colleges entrusted with similar mandates.

With regard to the actual role of IP for collaboration, a study focusing on universities shows that most researchers have little awareness about their institutions' IP policies on the dissemination, utilization and commercialization of the research outputs.<sup>30</sup> Further, the study evidences the existence of a weak collaboration between universities and industries for knowledge transfer and innovation.<sup>31</sup> Botswana's low ranking in the GII 2018 on university-industry research collaboration confirms the existence of weak linkages.<sup>32</sup> The same is evident from its latest ranking in the Global Competitiveness Index (GCI).<sup>33</sup> In particular, Botswana's rank in the GCI indicates a limited technology transfer, very low innovation capacity of industries and low firm-level technology absorption.<sup>34</sup> Indeed, these are the major ones among several factors for the weak university-industry collaboration in Botswana. Despite the low level of absorptive capacity and the tenuous link, universities' production of skilled human capital and scientific publications and industries' absorption of the outputs remain the major modes of knowledge transfer and collaboration. This seems to be the case for most universities across Africa.

#### IV. Conclusion

Universities' contribution to the *IP-related* stock of knowledge is quite limited in Botswana. Given their resource constraints and limited capacity in research and development, the universities in the country generate little IP. In particular, universities make an insignificant contribution in terms of patent acquisitions and commercialization. Nonetheless, very significant is universities' contribution to skilled manpower that constitutes an essential

input for innovation and technological outputs. Despite their inadequate accommodation in the global publication metrics, important is universities' contribution in the form of scientific publications. Indeed, the two are the major modes for knowledge creation and transfer in Botswana and elsewhere in Africa.

Therefore, for innovations that occur in Botswana, patent or a narrow conception of IP remains both inappropriate and incomplete metric to measure the contribution of its universities and the latter's collaboration with industries. Further, there is a weak collaboration between universities and industries for knowledge transfer. Although most universities have their own TTOs, the offices are ineffective to promote technology transfer and collaboration.

It is thus recommended that with work on awareness raising and capacity building, a context-specific IP legal regime might be useful to facilitate a better collaboration for knowledge transfer and innovation. Given that universities' TTOs are not effectively obtaining or commercializing IP rights in respect of employees' inventions, policies that transfer ownership of such rights from employees to their institutions should be reconsidered. Further, publicly funded research outputs should be free for public use and collaborative innovation. This approach is worth adopting across Africa to enhance a better access to scientific knowledge for development.

Universities may play a more valuable role encouraging and supporting employees' entrepreneurship, rather than pretending to be the commercial ventures they are not. As opposed to the commercial orientation, universities' role should be noted within a broader metric of innovation that encourages and values the investment in training skilled manpower and other activities.<sup>35</sup> A set of indicators and multiple modes of collaboration within and outside the confines of IP regime offer a better picture of universities' contribution. ■

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29. Ama, "Perspectives on Intellectual Property," 342-43.

30. *Ibid.*, 347-49.

31. *Ibid.*, 366. Instead, the universities' primary priority is to improve an enabling academic environment for academic and research excellence. *Ibid.*

32. Botswana is ranked 79th with a value of 38. See *Global Innovation Index 2018*, 232.

33. Botswana's rank in 2018 is 82nd out of 137 countries. See "World Economic Forum's Global Competitiveness Index (GCI)," in *The Global Competitiveness Report 2017-18*, ed., Klaus Schwab (Geneva: World Economic Forum, 2017), 69.

34. *Ibid.*

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35. See Samuel Trosow, "Technology Transfer and Innovation Policy at Canadian Universities: Opportunities and Social Costs," *Library and Information Science Publications*, 2012: 23-28; Samantha Bradley, Christopher Hayter & Albert Link, "Models and Methods of University Technology Transfer" (*Hanover, MA: Publishers*, 2013), 51-72.