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POLICY BRIEF

STRENGTHENING HIGHER EDUCATION STAKEHOLDER RELATIONS THROUGH TECHNOLOGY GENERATION & UPTAKE IN AFRICAN UNIVERSITIES

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Nkyinkyim

Adaptability, initiative, dynamism



ASSOCIATION OF AFRICAN UNIVERSITIES
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Executive Summary

Since the 1980s, governments around the world have been enlisting universities and harnessing public research and development (R&D) in their efforts to promote technological innovation in industry, and advances in national competitiveness and economic development. In a trend pioneered by unique institutions such as Stanford University and the Massachusetts Institute of Technology, policy makers seek to stimulate “entrepreneurial universities” that are deeply engaged in the generation of technology and the development of local industry. Universities are currently seen as critical to development efforts and are widely viewed as enablers of innovation. Their roles include performing R&D in cutting-edge areas with import for industry, providing technical assistance to local firms, educating highly skilled workers, and nurturing talent. Universities also contribute specifically to the commercial realm, through spin-off companies to commercialize technologies arising from academic laboratories, patenting and licensing inventions, and cooperating with industry. In this context, university-linked *science parks* and *business incubators* are increasingly common tools to foster partnerships, stimulate entrepreneurship, nurture innovative businesses, and commercialize academic inventions. While structures such as science parks and business incubators are not panaceas for all problems, they may be helpful in providing a setting for the development and uptake of technologies.

This project investigates science parks and business incubators in African universities. It identifies and assesses existing models in operation in light of extant knowledge and the international experience. Previous research suggested that there was limited involvement of African universities with science parks and business incubators. However, the overall findings reported in this study provide evidence of a growing interest in the creation and support of university-related science parks and business incubators in recent years. The evidence presented corroborates and extends previous studies suggesting an increasing interest in advancing an infrastructure to support entrepreneurship and innovation.

Background

Literature documents a series of obstacles that African universities and businesses experience in conducting collaborative R&D, as well as developing and commercializing science-based technologies. On the industry side, most of the continent lacks vibrant science-based technological industries, and a sustained R&D effort oriented to innovation. Despite the fact that corporate R&D is becoming more geographically disbursed in countries such as Brazil, Mexico, China, India, South

Korea, and South Africa due to public and private investment, most of the largest corporations in Africa are foreign multinationals with branch plans in the continent that draw on R&D elsewhere (Munyoki et al., 2011). On the academic side, African universities experience institutional constraints that limit their ability to develop relevant research programs and connect with the private sector. Weak research capacity and insufficient funding for R&D curb the ability of many African universities to advance their research mission. These fundamental issues make it hard for institutions to train scientists and retain research talent. Moreover, much of the research produced in universities is not relevant to industry. With limited government support to an expanding set of roles, academic institutions and staff are often strained in their ability to carry out research programs (Mohamedbhai, 2008; Mouton et al, 2008). Many African countries lack an enabling environment for universities to adopt a stance favorable to industry partnerships. Policy frameworks are critically important in harnessing the contributions of universities to innovation. Stable funding for R&D channeled through dedicated councils is still a recent and uncertain development (Nording, 2012). The role of foreign funding for academic research is still not completely equated with the development of national sources of support.

Finally, there are multiple barriers to technology-based entrepreneurship in Africa, including a skills shortage, insufficient financing opportunities for small firms, a persisting digital divide, and weak demand in several sectors. There is also consensus that both universities and firms face a series of challenges to engaging in the generation, adoption, and commercialization of research-based technologies.

There are some good examples of technologies and businesses that have been nurtured in universities in partnership with entrepreneurs and government at institutions including the University of Zambia and Jomo Kenyatta University of Agricultural Technology (JKUAT) as described in Figure 2. However, overall the literature indicates that there is limited involvement of universities with science parks and business incubators in the African context, and a demand for more knowledge about how such units currently operate or might optimally operate in the region. Thus, this project aimed at identifying informative cases of university engagement with science parks and business incubators that might help inform how universities have been able to circumvent the obstacles discussed above and advance local models suited to their environments.

Figure 1: Key Definitions

Science Park → a property-based organization managed by specialized professionals and designed to encourage the formation and growth of knowledge-based businesses. It supports technology transfer and has a management function that actively pursues the development of the Park by attracting and retaining public and private organizations.

Business Incubator → a facility that supports the formation of start-up companies. It offers services such as management assistance, access to finance, legal advice, operational know-how, networking opportunities and access to new markets. It may operate in the context of a Science Park or be a stand-alone organization.

Figure 2: Successful African university examples of technology generation & uptake

University of Zambia – Zambia
Company spin-offs including Zamnet Communications, the country's main internet service provider and York Farms, one of the country's largest exporters of horticultural products.
Jomo Kenyatta University of Agricultural Technology – Kenya
Developed tissue culture technology that has been widely used by cooperatives in Kenya and by the Ugandan company Agro-Genetics Technology.
Makerere University – Uganda
The Corporate Relations Office has supported the development of the internationally successful National Software Incubation Lab and the Mobile Computing Lab. Achievements include the student-led translation of Google and Mozilla Web Browsers into Luganda and 2 other local languages, and the development of low-cost mobile applications to conduct ultrasounds.

Methodology

The study involved desktop research and the collection of institutional data through a web-based survey. First, the researcher synthesized key principles and lessons learned regarding the operation of science parks and business incubators internationally. This synthesis provided a framework for the examination of such units in African universities. Second, systematic searches of major research databases were carried out. Last but not least, an online survey instrument was designed and administered.

The target population for the survey included higher education institutions identified by the Association of African Universities from its membership directory. A stratified random sample was drawn for the administration of the survey. Responses were received from public and private universities from across Africa. Countries represented include Botswana, Ethiopia, Ghana, Kenya, Madagascar, Nigeria, Senegal, Somalia, South Africa, Sudan, Swaziland, Tanzania, Tunisia, Zambia and Zimbabwe.

Conclusions

Overall, science parks and business incubators are an emergent phenomenon in Africa, concentrated in a few regions. There is an intersection between such units and the higher education sector. The cases identified provide insight into the experimentation occurring across the continent. Furthermore, the findings reported above provide evidence of a growing interest in the creation and support of university-related science parks and business incubators in recent years. The evidence presented corroborates and extends previous studies suggesting an increasing interest in advancing an infrastructure to support entrepreneurship and innovation.

- Through the multiple steps employed, several examples of science parks and business incubators were identified. Reflecting the conceptual and practical distinction made in this study, most business incubators identified operated independently from science parks, although there is certainly some overlap between the two classes of organizations. They represent a relatively recent wave of initiatives of African governments and universities to stimulate economic development through technology-based entrepreneurship. Such units have been established during the past decade, and many have been founded over the last five years.
- The science parks and business incubators identified exemplify multiple models. A focus on technology-based firms, both large and small, was usual among them. The R&D efforts pursued were varied, ranging from the search for novel technologies to the adaptation of products and services to local conditions.
- Universities usually established their science parks and business incubators in partnership with other stakeholders. Most science parks surveyed were operated directly by a university and the universities were playing a leadership role in running the unit. Universities also demonstrated collaboration with similar ventures created outside of the campus in their regions by other actors. This involvement with technology generation was observed in both public and private universities. Notably, commitment of university leadership and a good match between research strengths of university and tenant recruitment were viewed as very important factors shaping the success of science parks.



- Consistent with international trends around the stimulation of academic entrepreneurship, university faculty and students were key groups for science parks and business incubators. However, academic cultures and university environments were often viewed as sources of obstacles to industry linkages and commercial engagements.
- The science parks were focused on key technology-related industries, with ICT being the most usual among them. Other important sectors included advanced materials and engineering and business services/consulting. Interestingly, social services and community development appeared as an area of focus for most parks as well, denoting a shared concern with promoting regional development.
- Consistent with previous studies, multiple barriers remain to facilitating university-industry R&D collaborations through science parks. The most important issues identified include: an academic culture ambivalent to industry connections, a lack of funding/financial incentives for R&D partnerships, a lack of industry interest in university partnerships, a lack of industry R&D capacity, and a mismatch between university research strengths and regional industry sectors.
- Science parks and business incubators identified had relatively few tenants and small infrastructures. However, most units were operating under capacity, and as relatively new ventures, had room to grow. Reflecting their inchoate state, they experience multiple difficulties. First, obtaining access to resources to build and maintain parks and incubator facilities and programs was identified as a major challenge. Second, funding for entrepreneurs to start their businesses and develop technologies is scarce. Third, there is a need for well-trained, dedicated staff to support the commercialization and business development process. Other pressing challenges identified were the local/regional market for tenant technologies; identifying, supporting, and growing a sufficient tenant base; lack of an entrepreneurial culture; and retaining successful companies in the local area.
- Despite these difficulties, the science parks and business incubators generally shared the goals, orientation, and services of their peers internationally. A number of initiatives are in place to recruit, train, and assist potential entrepreneurs; build social capital in the region through associations, networks, and mentoring programs; broker linkages between researchers and firms; help inventors develop and commercialize technologies; and advising start-up companies on relevant business and legal issues. This suggests that given the availability of appropriate resources, such activities could be expanded.

Future Opportunities & Recommendations

The following recommendations are offered to the various stakeholders seeking to promote technological uptake in their regions.

1. Governments need to consider the basic conditions that enable vibrant R&D collaborations, and allocate resources in the best possible way to sustain those. First, they need to support a stable academic research system, with clear prospects with talented young scholars to pursue a scientific career. This includes appropriate, merit-based funding for academic research projects that allow university faculty to develop long-term research agendas and train graduate students; predictable opportunities for professional development and advancement; and university work conditions that enable research activities.

ii. Second, the logic of the academic research system needs to revolve around scientific merit as well as contributions to society. Professional incentive and reward systems that consider contributions to technological generation and knowledge transfer can help foster such activities. University regulations should recognize and clearly outline the conditions upon which such activities may be undertaken, recognized, and rewarded. Governments have a role to play in this in terms of the relevant legislation governing academic institutions and the academic profession, wherever university faculty are part of the civil service and universities fall under government purview. Research funding may also include expectations that projects include provisions to facilitate the uptake of research findings by external stakeholders, and that the latter have some degree of participation. Such provisions should be used with caution not to subvert the intrinsic scientific merit of research ideas and stifle academic freedom.

iii. Third, governments have an indispensable role to play in supporting R&D linkages through various inducements for industry to engage in such activities (e.g. tax incentives, project funding, seed funding) in partnership with universities. The availability of such opportunities underpins what goes on in science parks and business incubators. For entrepreneurs to successfully commercialize new technologies stemming from university laboratories, they usually need to develop embryonic inventions into marketable products. This requires time and resources to invest in design, business planning, and further R&D. Lack of funding for R&D projects and infrastructure has been identified in this study as a major barrier for such units to flourish.

iv. The physical, human, and IT infrastructure of science parks and business incubators requires investments that universities alone are hard pressed to afford. Specific programs to provide support for universities to acquire such resources, tied to business plans for the operation of such units, would be important.

v. Science parks and business incubators seek to provide access to networks and opportunities for entrepreneurs and R&D-based companies. As part of the development of science parks, in particular, co-locating government agencies, business associations, and economic development entities among other relevant organizations on or around the park can facilitate interactions. Working together with these stakeholders may be useful in ensuring that parks and incubators are able to meet the needs of tenants.

vi. Along with alliances with organizations involved in promoting economic development, science parks and business incubators are home to entities dedicated to social services and community development. Like their industry counterparts, such entities may better further their missions by cooperating with relevant community associations and government agencies that support the social sector. As such, universities should seek to broadly partner with the public, private, and philanthropic sectors when establishing Science Parks and Business Incubators. Combining the multiple perspectives, goals, and resources of these various stakeholders is critical to ensure that parks and incubators are well designed to existing needs, opportunities, and circumstances.

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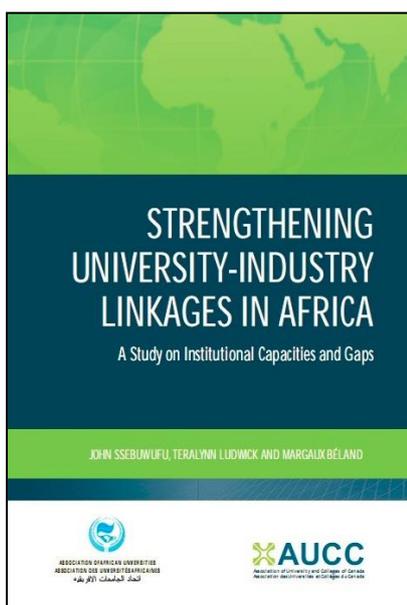
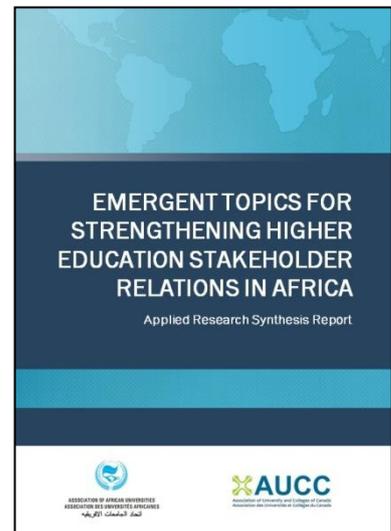
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Further reading available at www.aau.org

The *Emergent Topics for Strengthening Higher Education Stakeholder Relations in Africa* publication (to be finalised and released in 2013) is a resource for information on the logistical considerations of external relations between universities and industry in Africa. The report contains the full results of the study discussed in this policy brief. Other thematic topics discussed in the report include gender equity, intellectual property rights, graduate employability, and business ethics. Free copies of the report will soon be available at www.aau.org.



The *Strengthening University-Industry Linkages in Africa: A Study on Institutional Capacities & Gaps* (2012) report presents the findings of a scoping study on university-industry linkages in Africa to determine what interface structures, policies, positions, incentives, and funding avenues are currently in place for universities (or lacking). The scoping study determined what services or interventions African institutions themselves gauge to be most important for strengthening their efforts. Based on responses from a total of 133 universities and other higher education institutions across Africa, the findings show that African universities are indeed taking initial steps to stimulate and deepen linkages with industry and the productive sector. For a free copy of the report and more information, visit www.aau.org.