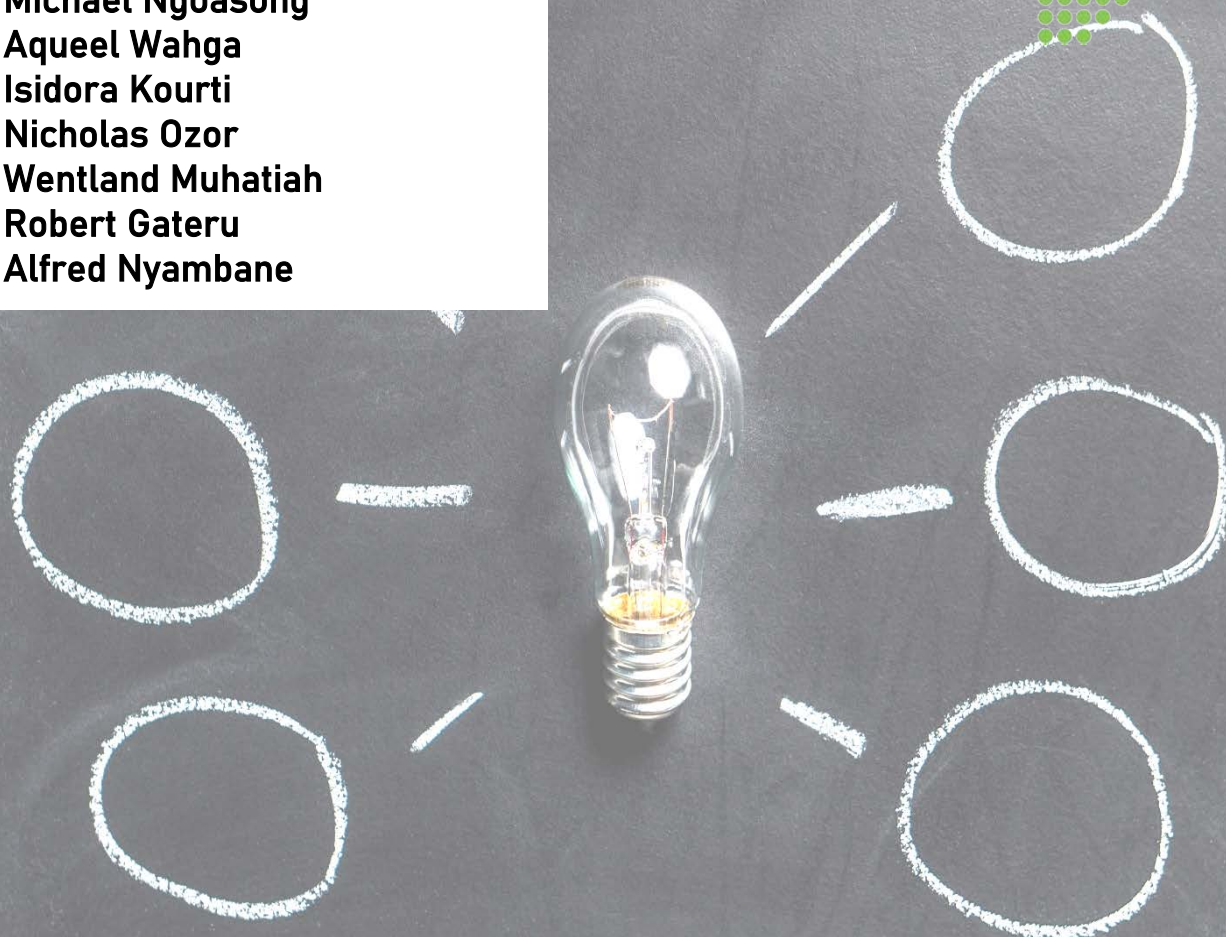




University-led ecosystems for sustained innovation and entrepreneurship development in Kenya

African Technology Policy Studies Network (ATPS) TECHNOPOLICY BRIEF NO. 62

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The African Technology Policy Studies Network (ATPS) is a transdisciplinary network of researchers, policymakers, private sector actors and the civil society promoting the generation, dissemination, use and mastery of Science, Technology and Innovations (STI) for African development, environmental sustainability and global inclusion. In collaboration with like-minded institutions, ATPS provides platforms for regional and international research and knowledge sharing in order to build Africa's capabilities in STI policy research, policymaking and implementation for sustainable development.



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About the Building Community Project

The University-led Ecosystems for a Sustained Innovation and Entrepreneurship Development (UESIED) community engagement project, funded by the British Council through the inaugural Innovation for African Universities (IAU) delivers on this commitment to co-create university-led ecosystems as collaborative spaces to prepare graduates for the job market and to strengthen the institutional capacity of universities through curriculum adaptation and entrepreneurship.

Many factors influence the decision of young student entrepreneurs to start a business. These can be either internal or external factors influenced by the risks and rewards of doing so. Fears and risks are more evident for university students with no prior business experience and entrepreneurship skill set. For this reason, universities should support entrepreneurial behaviour among students to encourage the creation of sustainable innovation start-ups and spin-offs between academic and business environments. This support is largely lacking in universities in Kenya. The UESIED project promotes university-led ecosystems as anchoring institutions for delivering self-sustaining innovation and entrepreneurship education specifically for the Kenyan universities participating in the Innovation for African Universities Programme.

The project has uncovered the university structures and operations that can inform policies relating to entrepreneurial universities in Kenya, with reference to the attainment of four UN SDGs, namely: (1) to strengthen the means of implementation of partnership for sustainable development (SDG 17); (2) multi-stakeholder dialogues explore how partnerships can be more impactful in influencing policies; (3) one-to-one consultations with representative stakeholders to inform a model depicting how the partnerships operating within Kenyan universities can be self-sustaining as regional innovation hubs that contribute to employment creation (SDG 8) and (4) propose innovative methods for reinforcing quality education by disseminating knowledge on how partnerships tackle the tensions that require cross-cultural learning (SDG 4).

About Africa Technology Policy Studies Network (ATPS)

The African Technology Policy Studies Network (ATPS) is a transdisciplinary network of researchers, policymakers, private sector actors and civil society promoting the generation, dissemination, use and mastery of Science, Technology and Innovations (STI) for African development, environmental sustainability and global inclusion. ATPS has over 1,300 members and 3000 stakeholders in over 51 countries in 5 continents with institutional partnerships worldwide. We implement our programs through members in national chapters established in 30 countries (27 in Africa and 3 Diaspora chapters in Australia, the United States of America, and the United Kingdom). In collaboration with like-minded institutions, ATPS provides platforms for regional and international research and knowledge sharing in order to build Africa's capabilities in STI policy research, policymaking and implementation for sustainable development.

About Open University

The Open University (OU) is a British public research university established in 1969. The university administration is now based at Walton Hall, Milton Keynes, in Buckinghamshire, but has administration centres in other parts of the United Kingdom. It also has a presence in other European countries. The university awards undergraduate and postgraduate degrees, as well as non-degree qualifications such as diplomas and certificates or continuing education units. It also offers unique Open Degrees, in which students may study any combination of modules across all subjects. Former UK Prime Minister Gordon Brown, astrophysicist Jocelyn Bell Burnell, broadcaster Anna Ford and actress Glenda Jackson are among a host of well-known names who have tutored for the OU.

About Riara University

The university is established under the Universities Act (2012), having been approved by the Commission for University Education to operate under a Letter of Interim Authority since 2 August 2012. The university is fully accredited by the Council of Legal Education. The university holds Full Accreditation status from the Kenya Accountants and Secretaries National Examinations Board (KASNEB) as a Training Centre as well as an Examinations Centre. The university runs Certified Public Accountant (CPA), Certified Secretary (CS), and Accounting Technicians Diploma (ATD) courses under this accreditation. Riara University nurtures innovators and exposes students to not only to international standards but offer students a great opportunity to great networks in education and other disciplines.

About Innovation for African Universities (IAU)

The Community Building Grant for undertaking the stakeholder consultations to produce this policy brief has been provided by the British Council as a policy engagement project through the inaugural Innovation for African Universities (IAU) Programme Community of Practice. Youths are Africa's greatest asset which is rapidly growing and is expected to double to over 830 million by 2050. If properly harnessed, this increase in the working-age population could support increased productivity and more robust, more inclusive economic growth across the continent. In response to this need, the British Council developed and designed the IAU Programme, part of the Going Global Partnerships programme. The IAU Programme aims to foster the culture of innovation and entrepreneurship within universities and facilitate the development of skills required to build industries, companies, products and services. In addition, the programme is designed to support the development of Africa – UK University Partnerships that build institutional capacity for HE engagement in entrepreneurship and innovation ecosystems in selected African countries. The IAU programme is implemented by a Centre of Excellence, a partnership between the City University of London, the University of Nairobi, and Change School UK. The programme comprises 24 partnerships of the UK universities, SSA universities and entrepreneurial ecosystem organisations and runs in Kenya, Nigeria, Ghana & South Africa.

Acknowledgement

This policy brief was co-produced by Open University Business School, African Technology Policy Studies Network (ATPS) and Riara University with funding from the British Council through the inaugural Innovation for African Universities Programme (IAU). The ATPS takes this opportunity to thank all the stakeholders from universities, industry and governmental agencies in Kenya, the lead researchers and facilitators for their efforts in contributing to the success of the research, especially amid continued restrictions posed by the COVID-19 pandemic. Special thanks to the members of the Accelerating Entrepreneurship Support in Universities (AESU) in Kenya, for their input and support throughout the study period. The OU and ATPS also thank the AESU managers at Riara University for their technical input and support throughout the study period.

Key Messages

- A university-led ecosystem refers to the collaborative network of universities, research institutions, industries, and government bodies working together to foster innovation, research, and knowledge transfer to develop solutions to societal challenges. The university-led ecosystem targets to drive economic growth, promote technological advancements, and address local and global issues through research, innovation, and entrepreneurship.
- Nurturing an entrepreneurial culture within universities and research institutions is vital. Providing training, mentorship, and networking opportunities to students and researchers encourages the commercialization of research outcomes, the establishment of startups, and the creation of job opportunities. If university-led ecosystems are to be sustainable, they must endeavor to capture the multiple identities of universities under the umbrella of innovation and entrepreneurship.
- The sustainability of university-led ecosystem in Kenya has been hampered by challenges such as insufficient collaboration between universities and industries, resulting in gaps between research outcomes and their practical applications. Furthermore, a lack of collaboration and coordination among universities and research institutions has limited the ecosystem's impact, which is critical for creating a vibrant and interconnected university-led ecosystem. To unlock the full potential of Kenya's university-led ecosystem and drive sustainable development and innovation, collaborative efforts by stakeholders will be crucial in addressing these challenges.
- Trust and accountability concerns amongst ecosystem stakeholders are derailing universities' ability to play an anchoring role in regional economic and social development due to the silo mentality and implementation of initiatives in isolation.

1. Introduction

1.1 Background

Sub-Saharan African (SSA) countries risk harbouring 87 percent of the world's poorest people by 2030 if economic difficulties are not solved (Ofori et al., 2021). Enhancing entrepreneurial activities in SSA is one of the most certain means of averting the potential calamity. The rapid growth in output of prospering economies such as the developing Asian Tigers has been driven more by entrepreneurial energy and government-backed small and medium-sized enterprise (SME) initiatives (Ahmed & Nwankwo, 2013). However, entrepreneurship has not had a pleasant ride in SSA. The slow expansion of entrepreneurial activity in SSA could be attributed to several factors, including a deplorable condition of education and support infrastructure, a hostile atmosphere for micro-entrepreneurship, and limited access to credit, to name a few (Ahmed & Nwankwo, 2013). The research of the Open University Business School on curriculum adaptation and digital entrepreneurship in the context of resource scarcity in African countries emphasizes the importance of strategic and operational commitment within universities in increasing access to entrepreneurship education and job creation (Ngoasong, 2022; Ngoasong, 2018).

Kenya has a development roadmap known as Vision 2030, which aspires to transform the country into a globally competitive and wealthy middle-income nation through industrialization. The Vision is built on three pillars: economic, social, and political, with science, technology, and innovation serving as the foundation for all three. The major drivers of the development strategy are competitiveness and industrialization. This places knowledge-generating institutions, such as universities and research institutes, squarely at the heart of Kenya's development strategy (Bolo et al., 2015). Industry executives are increasingly pressing for research that is relevant to the sector's requirements. Many universities have changed their governance structure in response to rising criticism, establishing high-ranking officials such as Deputy Vice-Chancellors (DVCs) to oversee university innovation, entrepreneurship, extension, and community engagement programs. In response to the piling pressure, many universities have altered their governance structure, appointing high-ranking officials such as Deputy Vice-Chancellors (DVCs) to oversee university innovation, entrepreneurship, extension, and community outreach programs.

University education is key to the development of a country's economy. The Kenyan educational system has over the years churned graduates prepared to be employed in various firms across the country. Every year about 50,000 students graduate across universities in Kenya ready to enter the job market (Kirui, 2019). However,

most of them remain unemployed because of the limited industries that are growing at an annual rate of 5% (Kenya National Bureau of Statistics [KNBS], 2016). This has seen the number of unemployed graduates in society soar every year.

As the Kenyan economy moves in the direction of entrepreneurial and technological development in a bid to fulfil Vision 2030, universities have been compelled to conform to the new shift by going beyond their traditional instructional and research approaches. A commercial approach has slowly been cementing itself in the universities over the years. Universities are playing a critical role in building linkages with various ecosystem partners to not only enhance their research but also give their students the necessary training that they need to be able to be self-reliant (Marwanga, 2009). Subsequently, universities have started establishing their university-based incubators, tech hubs and industrial parks. These are aimed at supporting students who have decided to start their entrepreneurial ventures to have their ventures up and running upon graduation. Some of the university incubator facilities available in the country include @iBizAfrica from Strathmore University, Chandaria Business Innovation and Incubation Centre from Kenyatta University, C4D Lab from University of Nairobi, Business Incubation Centre from Mount Kenya University, KCA Business Incubator from Kenya College of Accountancy University amongst many others (Wachira, 2017).

1.2 Rationale

Kenya faces a rising unemployment burden that is straining the university education system. Inadequate infrastructure, inadequate number and capacity of academic staff, inadequate research capacity, as well as weak collaboration between academia and industry have created a large gap between demand for, and access to relevant university education. Regionally, Kenyan universities are supported to develop entrepreneurship within local researchers, academic and industry circles. There are inadequate resources to cater for the mismatch between what universities teach (theory-driven) and what the industry needs (practical skills and experience). Kenya's 2019 policy framework for sustaining development shows commitment from the Kenyan government to create an enabling environment for public-private partnerships and centres of excellence in university education (Ministry of Education, 2019). This situation opens opportunities for new frameworks for university-industry-government partnerships to be effective as self-sustaining regional innovation hubs within their existing university structures (British Council, 2021).

Given the above background, this policy brief proposes a policy framework for creating and sustaining university-led ecosystems in Kenya with two interlinked features. First, ecosystems as inter-organisational collaborations bringing together

members that collaborate across organisational, professional, sectoral and sometimes national boundaries. There are inherent tensions that can be addressed by developing a professional identity (knowledge, disposition, and attitudes) that constitutes the critical enabler for achieving the collaborative aims (Kourti, 2021) that are characteristic of an entrepreneurial university (Audretsch & Belitski, 2022). This in turn enables universities to become anchoring institutions in collaborating with ecosystem partners to play a transformative role in uplifting local economies (Harris & Holley, 2016).

Considering our limited understanding of the impact of the processes and activities in the transformation of Kenyan universities into entrepreneurial universities, especially with respect to the influence of policy, we seek to address two key questions:

- a) How do partners within a university-led ecosystem bring forward different professional identities and how do these identities affect the network's success as self-sustaining innovation hubs in Kenya?
- b) How does Higher Education Institutions (HEI)-Industry-Government (policy) engagement enable universities to act as anchoring institutions whose professional identity enables them to function as entrepreneurial universities in Kenya?

Knowledge exchange within multistakeholder forums is a useful avenue for investigating and interrogating and addressing the above questions. Our investigation provides new insights into how university-ecosystem partnerships tackle administrative huddles with respect to contracts, collaborative working and complex tensions that require cross-cultural and professional learning in the way that universities are driving innovation. Through data-informed work, we can build strong collaborations that can achieve the best outcome of networks necessary can contribute to the upliftment of local economies. The evidence base strengthens engagement within academic and policy settings.

The findings in this study will contribute to the wider evidence base within the remit of the Kenya National Innovation Agency (KeNIA). KeNIA is a state corporation under the Ministry of Education, mandated to develop and manage the National Innovation System. At the time of producing this policy brief, KeNIA was coordinating the entrepreneurial and innovation potential of universities in Kenya with the vision of being a key enabler of socio-economic development through innovation.

2. Methodology

The collection of data was conducted using a mixed approach. Both primary and secondary data were collected and analysed. Secondary data and information were obtained through desk studies, where all relevant grey literature was reviewed and analysed while primary data were obtained through Surveys (questionnaires), Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs). The selected Key Informants and FGD participants were drawn from stakeholders in the academia and university ecosystem players. Policy dialogues and consultations were also conducted. They were unstructured in that they did not stick to a pre-defined set of questions, rather they were open-ended to allow stakeholders to discuss how universities in Kenya are innovative/entrepreneurial, how membership within a university-led ecosystem enables partners to bring forward different professional identities and the role of University-Industry-Government engagement in sustaining university-led ecosystems in Kenya.

3. Major Findings

3.1 Innovative and/or entrepreneurial capacities of Kenyan universities

Universities undertake several initiatives which demonstrate their entrepreneurial charter (**Table 1**): entrepreneurship education through incubation/acceleration centres, collaborations with local businesses, engaging business leaders as expert advisers (e.g., Board Membership), and income diversification through investing surplus funds and/or renting out fixed assets.

Table 1. *The entrepreneurial character of universities in Kenya*

Initiatives	Areas of concern
Teaching entrepreneurship	The theoretical aspect is dominant
Business incubation centres and accelerators	Not present in all HEIs The success of spin-offs is less known
University-owned enterprises	Limited evidence
Investments of funds in fixed deposits	Not every university does it
Rental income from assets	Every university did not benefit from this strategy – First mover advantage
Business leaders become members of governance bodies	Emerging trend but less evident in public sector universities
Partnering with businesses	Scale and scope are limited

Universities are finding new ways of generating economic and social impact on society. However, the scale and scope of existing initiatives are limited across the sector. Moreover, there is limited evidence of university-owned enterprises and faculty engagement with enterprise development. The evidence from the consultations revealed the following areas for consideration in strengthening the professional identity of university-led ecosystems:

- Entrepreneurship development programmes focusing on applied/practice-oriented ways of learning can be introduced. It is vital because entrepreneurship can be learned by doing and taking initiative rather than just gaining theoretical knowledge.
- Offering innovative products and services that can support agriculture, industry and service sectors to ensure the widening participation of all the sectors of the economy feeding into the local and regional economic development and strengthening the national innovation system.
- Limiting bureaucracy to seek approvals for undertaking entrepreneurial initiatives so that people make better use of their time and effort by working on innovative ideas and their commercialisation.
- Promoting all aspects of the enterprise – economic, social and ethical because a more responsible ecosystem should serve all three purposes protecting the people, profit and the planet.
- Funding, people (both faculty and students) and incentives to promote innovation and entrepreneurship because resource deficient contexts cannot allow for radical innovations to happen although they may partially help with incremental innovations.

3.2 University-led ecosystem in the Kenyan context

A university-led ecosystem is a network of stakeholders, anchored to a university. Within a university-led ecosystem, collaborative and entrepreneurial thinking creates innovative solutions to societal problems. This enables Kenyan universities to be anchoring institutions that confederate key stakeholders for socio-economic, political, technological, and cultural development of their region(s). This understanding of a university-led ecosystem has been derived from our analysis of the perspectives provided by our study participants. The stakeholders provided different definitions, but there were common themes, summarised in the representative quotations below:

'[...] an ecosystem centred on the University, with the right environment, structures, partnerships, people, and culture to spur innovation from diverse stakeholders of the university, both internally (students, staff, faculty, researchers) and externally (industry partners, and community)' [University Stakeholder 1]

'[...] a collaboration of different actors aimed at catalysing mind-sets change through creating platforms for ideation and nurturing innovations through knowledge/skills sharing [...] providing the practical approaches through the non-university partners' [University Stakeholder 2]

'[...] providing knowledge and skills to the students; [...] networking them with the industry practitioners; mentoring them; [...] equipping the practitioners with up-to-date research-based knowledge/skills; forging partnerships to spearhead creativity and innovation for holistic societal transformation [University Stakeholder 3].

'Involves providing for policy formulation and implementation; solving existential problems; creating technological products; and producing new knowledge that can be adapted for economic, political and social improvement' [University Stakeholder 4]

'[...] combinations of social, political, economic and cultural elements within a region, supporting the development of innovation and encouragement of nascent entrepreneurial activity and culture' [Industry Stakeholder 1]

'[...] a partnership of different actors aimed at transforming mindsets and creating platforms for innovation through knowledge/skills sharing. More importantly, providing the practical approaches via the non-university partners [...] [Industry Stakeholder 2]

[involves universities being recognized as partners, rather than competitors, who need each other because each partner has a niche and strengths that they bring into the mix ... universities will need strong institutional leadership with the most qualified people working in collaboration.] [Government Representative 1]

An appreciation of the importance of universities as anchoring institutions within the ecosystem is what emerges from the above definitions. The understanding of multiple Kenyan stakeholders (universities, industry, and government) about an entrepreneurial university also refers to the fact that the seeds for transforming conventional universities into entrepreneurial universities are there. However, the germination of these seeds is subject to active and responsible collaborations between the stakeholders allowing the universities to act as a nucleus and serve the role of an anchoring institute. Being the knowledge hubs, acting as anchoring institutions through their boundary-spanning activities, Kenyan universities can enter into local and international collaborations and develop their capacity to support innovation and entrepreneurship. It is only through successful collaborations with the key actors of the Kenyan ecosystem that universities can act as transformative and entrepreneurial universities. This will enable them to act as catalysts for addressing societal problems through knowledge sharing and skills

development and lead a positive transformation within their regional economies by shaping their economic, social, cultural, technological, and political dynamics.

3.3 Professional identity development in university-led ecosystems

Universities equate their professional identity with their scope of initiatives and projects. Examples of specialisations included Science and Technology University, Management University, Leadership and Governance Centre, and University of Agriculture and Technology. However, moving forward, some universities aspire to develop new identities such as the 'institution for industrialization and employment creation through entrepreneurship and innovation. (Both universities and industries in the university-led ecosystem suggest promoting innovations and entrepreneurship for supporting industrial development will become a top agenda for those universities aspiring to develop their identity as entrepreneurial universities.

Realigning their identity can enable universities to better cater for the emerging needs of their respective regions. However, the sustainable ecosystem will have to capture the multiple identities of universities under the umbrella of innovation and entrepreneurship. This can be achieved by making more effective use of some of the existing networks such as The Education Collaborative ¹ where universities can start the discourse on re-orienting their visions and missions for embedding innovation and entrepreneurship into their systems. Such impactful networks can lead to a change in the professional identities of universities transforming them into entrepreneurial universities and making them active seats of learning and knowledge exchange rather than staying as passive educational institutions playing no or limited role in societal development.

3.4 Strengthening University-Industry-Government (policy) engagements

The linkages are weak among University-Industry-Government therefore, hindering the development of an effective, impactful, and sustainable university-led ecosystem in Kenya. This limits the anchoring role of universities in regional economic and social development. Moreover, the goals of the tripartite initiatives are less clear and not hooked within defined ecosystems. There are some links established between the three actors, but they are very weak. These weak linkages are evidenced by instances where collaborations do not lead to the development of sustained ecosystems which limits the anchoring role of universities in the region's economic and social development. Also, some initiatives are taken in isolation, partly due to trust and accountability issues. As such, the goals of the tripartite initiatives are less clear and not hooked on the development of an ecosystem.

¹ <https://educationcollab.ashesi.edu.gh/>

There is a need to strengthen the National Innovation System through more effective engagement of universities, industry, and county councils at regional/country levels. For instance, Riara University is one of eight university leaders that are partners of the East Africa Hub, launched by Asheshi University-led Education Collaborative, in August 2021. Another good example that is currently ongoing is the programme run by the Economic Commission for Africa (ECA). ECA is the regional arm of the United Nations in Africa with a mandate to promote the economic and social development of Africa. As a foremost knowledge policy institution in Africa, ECA seeks to engage bright young Africans for skills and capacity development, training, and mentorship through a fellowship programme within ECA's work programme.

4. Conclusion

University, industry, and policy stakeholders, through active consultation, collaboration and partnership, can find common ground to greatly improve access to enterprise and innovation education while strengthening Kenya's universities as anchoring institutions for employment creation and sustainable development. The growing employability burden calls for urgent education and industry linkage to innovate and unleash the much-needed infrastructure and improve employability. This requires a multi-sectorial, multi-stakeholder approach that is anchored within universities and championed by committed leadership.

Through the community engagement project in Kenya, the following can be concluded:

- i) Many stakeholders know what needs to be done and where gaps are but lack mechanisms for capturing and disseminating the same to policymakers.
- ii) Stakeholders are ready to engage with institutions but lack the mechanisms/structures.
- iii) National and County governments in Kenya are keen to work with universities and other stakeholders and professionals to boost youth entrepreneurship, value-addition of products and services, and job creation.
- iv) There is a general lack of capacity for effective engagements between universities, governments, industry, and communities, despite the willingness of all to undertake collaborative work.

5. Policy Recommendations

For sustained innovation and entrepreneurship development in Kenyan universities, the following policy recommendations are proffered:

Recommendation 1: University-led ecosystem stakeholders need to develop a policy framework with clear implementation pathways in order to formalise inter-sectoral ecosystems to boost economic growth:

A policy framework with a clear path to implementation needs to be developed by actors from government, private sector and universities. This framework can turn informal ecosystems that are not well connected into formal ecosystems which work across sectors. Once the legal framework is in place, digital platforms can provide tools and services to speed up growth and cut costs through the synergy of multilateral interactions based on shared visions, rules, and principles of university-led ecosystems. However, two significant obstacles may hinder the turning of the sector-based ecosystems into an inter-sectoral ecosystem in boosting local economic growth: i) incorporating overlapping sectoral and functional roles of key stakeholders in economic development and integrating overlapping education-related initiatives run by university, industry, and government agencies into a centrally coordinated network, and ii) mobilizing resources (such as financial, technical, and operational) to allow private economic operators and local community groups to actively participate in university-led ecologies. A legal foundation with clear rules and principles of self-government, transparency, networking, and equality for all ecosystem partners is required to make unregulated relationships official. Secondly, using digital technology to improve the effectiveness of the inter-sectoral ecosystem by creating a way for an unlimited number of actors in the sectors and industries at the county and/or national level to interact freely with each other.

Recommendation 2: The government, private sector, and university actors need to work together to develop an entrepreneurial identity in the university-led ecosystem in order to create entrepreneurial and innovative solutions for economic development:

Structures and operational problems that make it harder for the university-led ecosystem and professionals to work together to solve societal problems are caused by the fact that professionals have different identities that are not always in line with their desire to be entrepreneurial or creative. Even though there is no fixed or pre-defined "entrepreneurial identity" that an entrepreneur could aim for, there are many factors in the ecosystem that could lead to the emergence, creation, and growth of a robust business environment. A university-led ecosystem could help entrepreneurs build their identities by accelerating interventions in many different

areas, such as financial support, knowledge building, networking, training, mentoring, and building communities. Depending on the entrepreneurial profile and needs of each partner, these interventions could be used in different ways to help develop the entrepreneurial identity and change the entrepreneurial profiles of the ecosystem partners.

Recommendation 3: The government needs to fortify ties between academia and industry to strengthen the National Innovation System in order to improve commercialization of innovations, technologies and products:

Stakeholders need to engage with government to strengthen the NIS in improving commercial success of innovations and technologies. Weak ties between universities and industry have hampered efforts to establish a robust and efficient NIS. As their core business, universities are uniquely positioned to be linchpins in innovative research. In terms of products and services, the industry, on the other hand, is eager to meet the needs of the growing population. Strong ties between these two sectors will help the National Innovation System keep up with the country's wealth creation, promote social welfare, and international competitiveness. These can only be achieved if universities and industry stop working in silos and instead look for areas where they can collaborate to capitalize on their synergies. If this is to be accomplished, an effective national innovation system will be prepared to tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new knowledge and technologies as appropriate for local communities.

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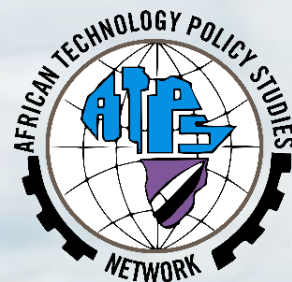
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