

Research Application Summary

Strengthening higher education for socio-economic development in Africa

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Abstract

Higher Education Institutions (HEIs) have the responsibility of building the human capital required to drive socio-economic growth in many countries. It is the mandate of HEIs to carry out training, research, and innovation for development. The right of access to higher education is described in UN International Covenant on Economic, Social and Cultural Rights of 1966, Article 13, that states that “higher education shall be made equally accessible to all, on the basis of capacity, by every appropriate means, and in particular by the progressive introduction of free education.” In Europe, Article 2 of the First Protocol to the European Convention on Human Rights, adopted in 1950, obliges all signatory parties to guarantee the right to education. In Africa, tertiary education is still at its infancy unlike primary and secondary school education. The number of persons with PhD is low and brain drain is a reality in most countries. Despite a surge in the number of students in Tertiary Education institutions, the number of members of staff that hold a PhD degree is low, teaching infrastructures are old and overcrowded and the capacity to carry out cutting edge research is a problem. Besides universities are being accused of producing graduates that do not match the needs of the industry. To counter these problems, universities are urged to reengineer their training to ensure enhanced access to quality and relevant education. Student mobility and adequate funding should play a major role in the reengineering process. Research and innovation should increasingly become an integral part of postgraduate training programmes particularly in fields that are priority to specific country programmes or regional agendas. This should be strengthened by building in systems that encourage intellectual property rights and that motivate staff. Commercialization of research outputs and dissemination using the relevant communication channels is critical if the benefits of the research will trickle down to communities and industries. More importantly, HEIs should become more entrepreneurial through establishment of programmes that support job creation. This could be through curricula review to embed business training courses in all programmes. This can be twinned with establishment of business incubation centres for nurturing graduate business start-up companies. Dependency on government capitation should decrease by embracing diverse mechanisms of resource mobilization such as establishment of spin off companies and industrial parks. The problems of Africa need a local solution and this can only be realized if HEIs primarily deliver on their core mandates of training, research, and innovation for development.

Key words: Africa business incubation, higher education, human capital development, innovation, job creation

Résumé

Les établissements d'enseignement supérieur ont une responsabilité de développer et de renforcer des capacités humaines nécessaires pour promouvoir la croissance socio-économique de nombreux pays. Il est du ressort des établissements d'enseignement supérieur de mener des activités de formation, de recherche et d'innovation pour le développement. Le droit d'accès à l'éducation et plus précisément à l'enseignement supérieur est décrit dans l'article 13 du Pacte international relatif aux droits économiques, sociaux et culturels de 1966, qui stipule que «l'enseignement supérieur doit être rendu accessible à tous, sur la base des capacités, par tous les moyens appropriés, et en particulier par l'introduction progressive de l'éducation gratuite». En Europe, l'article 2 du Premier Protocole de la Convention européenne des Droits de l'Homme, adoptée en 1950, oblige toutes les parties signataires à garantir le droit à l'éducation. En Afrique, l'enseignement supérieur en est encore à l'étape embryonnaire, contrairement à l'enseignement primaire et secondaire. Les personnes titulaires de doctorat sont en minorité, et la fuite des cerveaux demeure une réalité dans la plupart des pays. Malgré l'augmentation du nombre d'étudiants dans les établissements d'enseignement supérieur, le nombre de personnels titulaires de doctorat est faible, les infrastructures d'enseignement vieilles et surpeuplées, et les opportunités de mener des recherches de pointe demeurent un problème. Par ailleurs, les universités sont accusées de former des diplômés qui ne correspondent pas aux besoins de l'industrie. Pour faire face à ces problèmes, les universités sont vivement invitées à restructurer leur système formation, afin de garantir un accès à une éducation de meilleure qualité et pertinente. Les mécanismes de mobilité et d'échange des étudiants et de financement adéquat devraient jouer un rôle majeur dans ce processus de restructuration. La recherche et l'innovation doivent faire partie intégrante des programmes de formation de second cycle, en particulier dans les domaines qui sont prioritaires aux programmes spécifiques nationaux et régionaux. Ceci devrait être renforcé à travers l'intégration des systèmes encourageant les droits de propriété intellectuelle et motivant le personnel. La commercialisation des résultats de recherches et leur vulgarisation à l'aide des canaux de communication pertinents sont essentielles si les avantages de ces recherches parviennent aux communautés et aux industries. D'une façon plus importante, les établissements d'enseignement supérieur devraient devenir plus entreprenants en établissant des programmes stimulant la création d'emplois. Ceci pourrait se faire à travers l'examen et la révision des curricula pour permettre l'intégration des cours de formation professionnelle dans tous les programmes. Ceci peut aussi être jumelé avec la création de centres d'entreprise à vocation d'incubation pour encourager les idées d'entreprises des diplômées. La dépendance vis-à-vis du gouvernement devrait être réduite en adoptant des mécanismes de mobilisation des ressources, tels que la création de sociétés dérivées et de parcs industriels. Les problèmes en l'Afrique doivent être résolus au niveau local et cela ne peut se réaliser que si les établissements d'enseignement supérieur remplissent pleinement leurs principaux mandats que sont la formation, la recherche et l'innovation pour le développement.

Mots clés: Centres africain d'incubation, enseignement supérieur, renforcement du capital humain, innovation, création d'emplois

Introduction

The term knowledge-based economy is commonly used to refer to the contribution of research in a nation's development. University enrolment in Africa stands at 6% compared to the global 26% (Montenegro and Patrinos, 2013; Mukhwana *et al.*, 2017). Besides the low enrolment rate, there are serious imbalances on the basis of gender and regions (Sifuna and Sawamura, 2010). Due to less favourable socio-economic and cultural influences and settings in girls' secondary schools access, persistence and achievement of female students to university education is impaired. On the other hand persons from marginalized communities and conflict zones suffer from lower access levels. The promising news is that universities in many African countries are experiencing a surge in their enrollment. Between 2000 and 2010, higher education enrollment more than doubled, increasing from 2.3 million to 5.2 million. In 2008, about 223,000 students from sub-Saharan Africa were enrolled in tertiary education outside of their home countries, representing 7.5 percent of the total global number of students who study outside of their home country. Private higher education is one of the fastest growing education sectors in Africa. In 2009, there were around 200 public universities and 468 private higher education institutions on the African continent. Comparatively, there are 1700 public universities and nearly 2500 private universities (4- and 2-year universities) in the U.S. alone. Overcrowding in lecture halls at some Africa universities is becoming all too common. Statistics show that on average there are 50 percent more students per professor at African universities compared to the global average.

On the other hand, Technical and Vocational Education and Training (TVET) has declined in many African countries. In Kenya for example, many technical and vocational education institutions have been transformed to universities. In 2012, technical and vocational programs accounted for only 6 percent of total secondary enrollment in the Africa, a slight drop from 7 percent in 1999 (Kajuju, 2015). This has led to a big gap in developing the skill set required for technical support and operationalization of many institutions and the industry. Industries are increasingly complaining that university graduates do not have the skills and knowledge required to grow their businesses.

For Africa to grow sustainably there is need to shun importing human capital by training its own people. It is estimated that a one-year increase in average tertiary education levels would raise annual GDP growth in Africa by 0.39 percentage points, and eventually yield up to a 12 percent increase in GDP. Investment in quality and relevant training programmes that resonate with the needs of Africa is needed. This should be coupled with research and innovation within key thematic areas of interest. African governments need to commit more funds to tertiary education while universities need to increasingly become entrepreneurial. It is well established that returns to investment of higher education is 21% in Africa which makes it attractive for the African governments to invest in higher education (Montenegro and Patrinos, 2013). Science, Technology and Innovation (STI) has been recognized as the epicenter of Africa's socio-economic development by the AU agenda 2063 and the Science Technology and Innovation Strategy for Africa 2024 (STISA 2024). This needs to be actualized. The next section discusses some key issues that are considered important for

catapulting Africa to a pedestal growth ‘The Rise of Africa’.

Training under Higher Education Institutions

Training in HEIs is increasingly changing in Africa with more students registering for graduate and postgraduate training programmes. Traditional teaching approaches are now being blended with new models of learning that allow flexibility and hands on training. Students increasingly are looking for convenience, accessibility, and 24 hour service from their educational providers. The current status of training in HEIs will be discussed with reference to access, quality and relevance and student/staff mobility.

Access: There has been effort to increase enrolment of students in higher education institutions in Africa. According to the 2015 State of Education in African report, between 2000 and 2010 enrolment in African Universities increased from 2.3 million to 5.2 million (AAI, 2015). This effort is reflected by the initiation of African Union’s Pan Africa University and the World Bank Centers of Excellence. Through the Pan African University concept “institutions of excellence in science, technology, innovation, social sciences and governance” have been established in five regions of Africa. It is envisaged that these institutions will produce “new generation of leaders properly trained to take the best advantage of African human and material resources.” The five institutions include the Pan African University Institute for Basic Sciences, Technology and Innovation (PAUSTI) based in Kenya, Pan African University Institute for Life and Earth Sciences- including Health and Agriculture (PAULESI) in Nigeria, Pan African University Institute for Governance, Humanities and Social Sciences (PAUGHSS) in Cameroun and Pan African University Institute for Water and Energy Sciences -including climate change (PAUWES) in Algeria. The Institute for Space Sciences (PAUSS) will be based in South Africa. More recently (2014), the World Bank has initiated the African Higher Education Centers of Excellence. Through the initiative, 19 centers of Excellence in seven countries in West and Central Africa were funded in 2014 and another 24 centres of excellence in Eastern and Southern Africa were established in 2016. The World Bank (ACE) project seeks to equip young Africans with new scientific and technical skills.

Quality and Relevance: The quality of education in Africa is generally low due to a variety of factors. Firstly, inadequate numbers of teaching staff that has resulted in heavy teaching load is a big problem. Examples of student per lecturer ratio are:, 11.7 for University of Cape Town (South Africa), 12.7 for Suez Canal University (Egypt), 26.5 for Mansoura University (Egypt), 26.5 for Makerere (Uganda) and 47.3 for University of Nairobi (Kenya). In some countries like Kenya, increase in enrolment has not been matched with increase in teaching and learning resources(Mukhwana *et al.*, 2017). According to Sifuna and Sawamura (2010), libraries stock very old books and are often overcrowded. In addition, most libraries cannot afford to subscribe to current journals and other scholarly publications from outside Africa. According to the 2015 State of Education in Africa report (AAI, 2015), there is a serious mismatch between skills required by industry and those offered by the higher education. This situation results in many graduates failing to get employment after graduation. To address the mismatch, there is need to reengineer

curricula, retool teachers, enhance infrastructure and strengthen partnerships between universities and industry as well as universities in the South and the North.

Mobility: Increasingly student mobility is seen as an important component in the education system and many Universities have prioritized it. Student mobility in Africa is largely very low. This can be attributed to language barriers, lack of harmonized programmes, inexistent credit transfer systems, among others. Within the continent, initiatives such as Intra Africa mobility scheme, RUFORUM scholarship schemes, World Bank African Higher Education Centres of Excellence and Pan Africa University initiatives can be considered as some of the main avenues for student-staff mobility. A report to the Higher Education Funding Council for England (HEFCE) co-funded by the British Council, noted that UK origin graduates with foreign experience bring greater human capital to the knowledge economy (HEFCE, 2010). In Scotland, the University of Glasgow included student mobility as a strategic priority in its Strategic Plan of 2010-2015 and committed to provide opportunities for all students to engage with the global citizen agenda and to equip them for international career opportunities. Such initiatives are needed to build the human capital in Africa. Africa needs to empower its citizens through capacity building in order to fully exploit her enormous resources. Due to challenges envisaged for students studying in new environments, support structures need to be established to ensure that the students benefit from the mobility schemes.

Research and innovation

In the 21st century, the balance between knowledge and resources has shifted towards the former. Knowledge has become by far the most important factor determining standards of living—more important than land, capital, or labour. Today's most advanced economies are fundamentally knowledge-based (Dunning, 2000) and value so much the aspects of research and development. While industrialized nations have embraced research for social-economic development and global competitiveness, in Africa, the political and policy leadership has not adopted the culture of research and innovation for development. In 1995, African institutions published 5,839 academic papers; South Asia produced 15,995 published papers, and Latin America and the Caribbean, 14,426. This depicts the poor research culture in the region. Only the Middle East and North Africa produced fewer papers than Sub-Saharan Africa, yet the former's total had doubled since 1981, while Sub-Saharan Africa's had risen by one third. However, based on Times Higher Education World University Rankings which is an annual research publication based university ranking, African HEI did not feature in top 100 from 2010-2017. In a more encompassing webometric ranking only five African HEIs were ranked among the top 1000 in 2017. The African Union (AU) through her midterm strategies developed the AU Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024) to ensure research supporting infrastructure and policies to enable professional and technical competence, and entrepreneurial capacity. This has not yet borne fruit. The establishment of Centers of Excellence supported by the World Bank is an effort to enhance the culture of research in Africa. Additionally, a few African countries established Research Chairs in various thematic areas borrowing largely from the Canadian example. This targets concentrating

resources on focal thematic areas as spelt out by national blue prints, but it is anticipated that it will build strong research networks at the national level. Research mobility within the African Region should be encouraged and institutionalized to promote exchange of ideas. For example, limited HEIs in African Countries have established post-doctorate positions. This would act as a catalyst that will form the next generation of Scientists to spur African growth.

For research to thrive, there is need to invest in research infrastructure. This includes modern laboratories equipped with state of the art equipment, libraries, effective systems of information storage, retrieval, and utilization, as well as appropriate management systems and policies that facilitate and support the research enterprise. This should be coupled with incentives that recognize and reward high-calibre research.

Since the problems faced by most African countries are similar, Africa needs to prioritize its research agenda. This could borrow largely from the Africa We Want (Agenda 2063). Agenda 2063 clearly stipulates that we need a prosperous, peaceful and an integrated Africa. Therefore, multidisciplinary research approaches traversing the fields of Agricultural Sciences, Biotechnology, Water Resources, Engineering, Mining, Health, ICT, Economics, among others, are important. Bringing together a pool of likeminded research individuals will enhance the generation of valuable intellectual assets that will impact the larger society significantly. This is premised in the knowledge that development is driven by scientific and technological innovations. For this to happen, Africa needs to exploit her indigenous knowledge and resources using its human capital to spur growth.

Currently, Africa ranks among the lowest in the world's regions in scientific research and development, contributing just 1.1% of global research output. This means that Africa lags in its pace of innovation. Its reliance on commodities remains its weakest link. Apart from South Africa which experiences innovation rates comparable to the rates observed in developed countries, most sub-Saharan African countries remain relatively slow to adopt innovations. Transitioning to an innovative, knowledge-based economy is necessary for sustainable progress. This will only happen with the development of more local innovations which will in turn play an essential role in catalyzing sustainable development. With improved capacity for Africa to processing its raw materials, internal trade will improve and local manufacturing companies will get more opportunities to grow. For this to happen, the continent will need to start enforcing property rights laws, respecting land rights so as to encourage companies of the future.

In many African countries, intellectual property (IP) protection is undeveloped, ineffective, expensive and unenforced. In some African countries, there is uncertainty on protection of IP and the threat of innovation being stolen away from inventors, which makes Africa to be referred to as an IP desert (Table 1). The volume of patents filed in Africa is very low and all the more so because most of these are made by non-residents (Table1). This low patent production is consistent with the weak percentage of R&D expenditure in African countries which is on average well under one per cent. To spur innovation, African governments should create strong incentives for innovation through policies such as legal protection of

Table 1. Intellectual psroperty patents in different parts of the world

Country	Year	Total patent applications (residents + abroad)	Patent applications by residents	Patent applicationns by Non-residents	Patent applications abroad	Total patent granted (residents + abroad)	Grant patents by residents	Grant patents by Non-residents	Grant patents granted abroad
Kenya	2015	179	137	56	42	25	1	23	24
Kenya	2014	160	132	75	28	30	4	49	26
Kenya	2013	181	127	114	54	8	1	70	7
South Africa	2015	2,076	889	6,608	1,187	1,226	453	4,046	773
South Africa	2014	2,317	802	6,750	1,515	1,334	445	4,620	889
South Africa	2013	2,211	638	6,657	1,573	1,439	474	4,282	965
Egypt	2015				118	48			48
Egypt	2014	883	752	1,384	131	130	66	349	64
Egypt	2013	760	641	1,416	119	129	86	379	43
UK	2015	53,302	19,904	7,934	33,398	21,503	4,934	2,626	16,569
UK	2014	52,605	19,922	7,844	32,683	21,203	4,388	2,671	16,815
UK	2013	51,300	19,552	7,966	31,748	20,939	4,528	2,771	16,411
USA	2015	529,632	288,335	301,075	241,297	257,108	140,969	157,438	116,139
USA	2014	509,521	285,096	293,706	224,425	255,934	144,621	156,057	111,313
USA	2013	501,162	287,831	283,781	213,331	245,424	133,593	144,242	111,831
China	2015	1,010,448	968,252	133,612	42,196	279,501	263,436	95,880	16,065
China	2014	837,817	801,135	127,042	36,682	176,382	162,680	70,548	13,702
China	2013	734,096	704,936	120,200	29,160	154,500	143,535	64,153	10,965
Japan	2015	455,005	258,839	59,882	196,166	271,138	146,749	42,609	124,389
Japan	2014	463,971	265,959	60,030	200,012	297,239	177,750	49,392	119,489
Japan	2013	473,141	271,731	56,705	201,410	340,440	225,571	51,508	114,869

intellectual property. Such protections, which include patents and product standards, are critical for technology development at firms of all sizes and at all levels. Similarly, efforts to attract and retain highly skilled workforce are necessary. Availability of jobs with higher rewards and an environment suitable for career development, are at the center of retaining employees for longer periods of time.

Entrepreneurships and funding in Higher Education Institutions

Traditionally, most public HEIs are funded by government. In Kenya, capitation from government has been declining while student numbers increased 3-5 fold over the last decade. This has strained service delivery as exemplified by declining teaching quality and limited time being devoted to research. To stay afloat financially, universities compete for students to raise income through tuition fees (Ishengoma, 2017; Mukhwana *et al.*, 2017). To improve teaching and teaching quality, they have to identify alternative mechanisms of fund raising to supplement tuition fees. The most common approach is donor funded projects. However, donor funded projects are very specific and time bound. More recently, Kenyan universities have been challenged to go out of the traditional funding loops and create their own incomes streams. This has brought in the concept of entrepreneurship. The entrepreneurial culture is conceived to be two pronged: on the one hand, universities need to engage in Income Generating Units (IGUs) while on the other they need to train graduates who will be job creators and not job seekers. Jomo Kenyatta University of Agriculture and Technology (JKUAT) has established JKUATES (JKUAT Enterprises) as the commercial wing of the university. Similar concepts can be found in other Kenyan universities. For it to crystalize in the minds of her graduates, entrepreneurship is currently being taught to all final year undergraduate students at JKUAT as a way of equipping them with the knowledge and skills of starting and managing businesses. It is envisaged that most curricula will be reviewed to embed more entrepreneurial elements in most course units. Agribusiness courses have been developed from undergraduate to postgraduate level.

Commercialization of research outputs and innovations is increasingly being and should be encouraged. This could be through royalties derived from Intellectual Property Rights or Spin off companies. One such example is the JKUAT-Nissin company that is owned by JKUAT (Kenya) and Nissin Company Ltd (Japan) at the ratios of 30% to 70%, respectively. This company makes noodles from sorghum and local flavours such as 'nyama choma' and chicken. JKUAT is also the home for Shujaa tractor, a 10 Horse Power tractor which is locally assembled and that runs at a cost of 10% of most commercial tractors. This is targeted towards elimination of the hand hoe by 2025, as indicated in Agenda 2063. JKUAT has also tapped on its prowess in ICT to establish a Computer Assembly Centre. This was in a bid to assist the Government of Kenya in delivering its flagship projects. The plant is now operational supplying computers to primary schools in 21 Counties. In addition, business incubation has been embraced to support interns who have excellent business ideas. Incubation has been extended to small, medium and large scale industries as indicated by Sorghum Value Chain Development Consortium. Here in, incubatees pay for every service they are offered. University staff provide the technical skills required by the incubatees. More importantly, the incubation centres can be converted to Industrial

Parks further increasing the financial base of universities. This has worked for Asian and Western universities.

Dissemination and outreach

Higher Education Institutions (HEIs) should increasingly develop communication strategies that resonate with their clients. This could be through websites, media coverage or publication of their research outputs. This can be complemented by exhibitions and participation in national and international fora. Social media is increasingly becoming a strong tool for communication particularly in the youth. Multiple mechanisms need to be employed to increase the visibility of African HEIs particularly in showcasing technological innovations and strengthening partnerships with industry.

Conclusion

Training in most African HEIs needs to be contextualized to fit within national government priorities and regional agendas. Agenda 2063, which is a 50 year vision of the African Union Commission, stipulates some of the key ingredients for 'The Africa We Want'. This can only be realized if African countries can devote more effort in training its citizens. Universities are increasingly being challenged to review their curricula and embed innovative training programmes and revise their teaching methods. The culture of research and innovation should increasingly be encouraged within HEIs leading to more publications, IPs, internally generated funds and research outputs that have socio-economic impact. Entrepreneurship, business incubation, establishment of industrial parks and spin off companies are seen as some of key directions that will lead to 'The Rise of Africa'. Africa needs Africans to develop.

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