

Effective Innovation Policies for Development: The Case of Kenya

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Over the past 10 years Kenya has made a stunning innovation journey in which the country's youths have played an important role. The government has responded to the clear desire of Kenya's youth to engage in innovation with new policies and increased funding for research and development (R&D) as a strategy for creating jobs and supporting innovation.

Pressure from a rapidly growing population, scarce resources, and soaring unemployment are driving the government to seek new avenues of job creation. Kenya's Vision 2030,¹ a long-term blueprint for development, estimated that the economy would need to grow at a rate of 10 percent for 20 years in order to effectively mitigate social, economic, and political problems. The country's economic growth rate has, however, been slowed by political instability and a host of international factors such as high oil prices and declining tourism.

This chapter focuses on recent innovation policies and systems in Kenya intended to address these issues, paying special attention to what has worked and what has not in relation to the Global Innovation Index (GII). The chapter begins by explaining Kenya's focus on innovation, followed by a review of innovation policies in the country. It reviews Kenya's position in the GII rankings and examines which policies have been effective, and

which have not. Challenges at both the policy and operational levels are evaluated and used to inform a review of educational reforms in the country. To reinforce the conclusions presented, lessons are drawn from the United States of America (USA) and the Republic of Korea, and Kenya's own strengths in innovation are highlighted.

Kenya's path to recovery

In spite of Kenya's many challenges, there are some indications that the economy may be on a recovery path towards its 10 percent target growth rate. The 2015 World Bank's *Global Economic Prospects* report raised Kenya's economic growth forecast to 6 percent in 2015 and 6.6 percent in 2016, up from previous projections of 4.6 percent and 5 percent, respectively.² These projections are higher than Sub-Saharan Africa's average projected growth rate of 5.1 percent. The World Bank report indicates that higher spending on infrastructure, recovery of the agricultural sector, and falling oil prices are key to Kenya's economic expansion. The economy will remain strong in the near term as a result of the country's strong private sector and market-friendly policies.

On the socio-political front, a constitutional dispensation implemented in 2010 has brought several important reforms.³ The new constitution provides Kenyans with a bill

of rights guaranteeing fundamental freedoms and equal opportunity for all—including women, who had previously experienced diminished legal status. The country is improving access to social services—such as education and healthcare—for both urban and rural populations, as a way of combating inequality. With devolved governance and a fairly stable political environment compared with many other African countries, Kenya is in a better position to leverage innovation.

Unemployment is perhaps the country's greatest threat to stability, especially with the recruitment of idle youth into terror groups such as Al Shabaab. But, ironically, the need for jobs is precipitating innovation. *The Guardian* reports on an innovative project called 'LivelyHoods' that began in Nairobi's Kawangware slum. The project creates employment opportunities by training youths to sell products tailored to the needs of their communities. The scheme's iSmart brands include fuel-efficient cookstoves (more than 3,233 of which had been sold by 2014), as well as solar lamps and reusable sanitary products for women. All the products are vetted for their suitability by LivelyHoods representatives and potential customers.⁴

Similar innovative products are being developed in other sectors, including the quickly expanding information and communication technology (ICT) field. Kenya is

becoming a leader in ICT innovations in Africa.⁵ For example, the successful commercialization of mobile money in Kenya such as M-PESA has led to increased understanding of the potential for innovation to deal with local problems. Many youths have sought to duplicate the success of mobile money products and platforms. This large, educated, tech-savvy but unemployed youth population has attracted global multinational corporations to Kenya. A number of these multinational firms have set up research facilities in the country, which will continue to drive innovation.

Innovations, especially in the agricultural sector, have also led to greater productivity and contributed to the country's growth. For example, applications such as iCow (an agricultural information service) and M-Farm (a market information service) have greatly improved productivity in the livestock and agricultural sectors, respectively.⁶ A recent rebasing of the economy established that the size of Kenya's economy was 25 percent larger than previously believed, making it the 5th largest economy in Sub-Saharan Africa—behind only Nigeria, South Africa, Angola, and Sudan. Some studies attribute Kenya's growing economy largely to ICTs.⁷

Innovation policies in Kenya

Kenya's first innovation policy was launched in 2006 with the implementation of the Vision 2030 initiative. The policy declared that Kenya would break from the past and start doing things differently. The Vision 2030 discourse centred on institutional reforms, human resource development, and enhanced R&D as well as improved science and technology infrastructure. An emphasis was also placed on pursuing more

and better collaborations and partnerships. The Ministry of Education, Science and Technology was created to spearhead capacity building and innovation.

The creation of this ministry led to the development of several institutions that support innovation, including the National Commission for Science, Technology and Innovation; the Kenya National Innovation Agency; and the National Research Fund. Another key institution within the innovation ecosystem is the Kenya Education Network, which facilitates the sharing of educational and research resources through a government-subsidized national broadband network; it also serves as the National Research and Education Network.

In 2009, a comprehensive policy on Science, Technology, Innovation Policy and Strategy (STIPS) was developed. STIPS sought to mainstream the application of science, technology, and innovation in all sectors and processes of the economy to ensure that Kenyans benefit from all available capacities and capabilities in order to achieve the objectives of Vision 2030. STIPS prioritized several areas for intervention, including agriculture and rural development; health and life sciences; trade and industry; human resource development; physical infrastructure; energy, environment, and natural resource management; and ICTs.

The 2010 constitution also recognizes the role of indigenous innovations in development. Article 11, Section 2b and c of the constitution reads: '... recognise the role of science and indigenous technologies in the development of the nation; and promote the intellectual property rights of the people of Kenya.'⁸ To operationalize the constitutional requirement for the recognition of indigenous knowledge, a sessional

paper on science and technology was published and, in 2012, the Science, Technology and Innovation Act was enacted.⁹

Since the progress that has been made in both policy and institutions, research and innovation have begun to advance in Kenya. Universities are competing to set up software and hardware incubation centres that would link them to industry. The University of Nairobi and Strathmore University have track records of successful incubation programmes that have led to the commercialization of their research outputs. And, for the first time, corporate Kenya has begun investing in some of these incubation programmes.

After success with Ushahidi, an open source software developed in Kenya for information collection, visualization, and interactive mapping,¹⁰ the premier innovation hub I-Hub has branched off from software to hardware and is coming up with their first product, a connectivity device called 'BRCK'. BRCK was designed and prototyped in Nairobi. It was meant to solve local problems of erratic electricity and Internet in both rural and urban areas, but it has also found its way to new markets in much the same way that the mobile money transfer innovation M-PESA has found its way into markets beyond its original target. The success of BRCK has led to the establishment of a prototyping technology shop in Nairobi, the first of its kind in Kenya. This will help small and medium-sized enterprises (SMEs) create new products and introduce them to the market.

The most innovative products in different sectors are being facilitated by ICTs, with examples in agriculture, manufacturing, health, and financial services. Most of these products seek to improve productivity. For example, the service iCow,

which provides livestock farmers with information, aimed to—and succeeded in—greatly improving dairy production in Kenya. Whereas in the past it was difficult to even explain terms such as ‘productivity’ to farmers, these new applications have made it possible to do so.

Perhaps the most important development in research and innovation is the fact that all universities now have a senior staff member, at the level of deputy vice-chancellor, who is in charge of research. This has resulted in the development of supporting infrastructure. For example, Jomo Kenyatta University of Agriculture and Technology has put up an Industrial Technology Park for research output. Kenyatta University has its Manu Chandaria Incubation Centre; the University of Nairobi started C4DLab (a software incubation centre) and will soon start its own science park, which will focus more on its fab lab, in conjunction with the Massachusetts Institute of Technology (MIT). Konza City Technology Park is also underway and will harmonize university research activity with industry and government.¹¹ Most universities are collaborating with international partners to enhance knowledge transfer while, at the same time, providing new solutions.

Multinational corporations are also setting up research labs in Kenya to expand their own research reach, while getting closer to the source of unique problems. For example, IBM is collaborating with the Kenyan government to create innovations around big data and the next generation of government.

Kenya in the Global Innovation Index

Kenya climbed up the rankings in the GII, rising from 99th position in 2013 to 85th in 2014. The

Table 1: Gross domestic expenditure on research and development (GERD), 2010

Country	Survey year	GERD (PPP\$ millions)	GERD (% of GDP)	GERD per capita (PPP\$)
Burkina Faso*	2009	38.10	0.20	2.38
Egypt* [†]	2011	2,223.35	0.43	26.94
Ethiopia [†]	2010	208.74	0.24	2.51
Ghana	2010	150.20	0.38	6.16
Kenya	2010	652.00	0.98	16.09
Senegal	2010	130.50	0.54	10.50
South Africa	2010	4,021.3	0.76	80.21
Uganda	2010	237.80	0.50	7.11

Source: Adapted from NPCA, 2014; data from ASTII R&D surveys 2010 or latest year available; GDP, PPP, and population data sourced from the African Development Bank.

* Data not disaggregated by sector; [†] GERD does not include private non-profit R&D expenditure.

country’s efficiency levels also greatly improved, leaping from 71st position in 2013 to 26th in 2014. These improvements can be attributed to innovative applications of ICTs in various sectors. The financial sector is about to experience a tremendous transformation as a result of the 2015 partnership between Kenya Commercial Bank (KCB), the largest bank in the country, and Safaricom, the largest mobile network operator and the owner M-PESA. These partnerships will enable mobile customers to access credit of up to 1,000,000 Kenyan shillings (US\$11,000) without actually having to go to the bank or provide security. Equity Bank, another large bank, has also acquired a mobile virtual network operator license to compete with the Safaricom/KCB partnership. Such initiatives contribute to Kenya’s stellar performance within its region in the GII, especially in market and business sophistication, which is measured in credit availability, investments, trade, and competition.

The GII 2014 ranks Kenya 1st among the 17 low-income Sub-Saharan economies at different levels of development included in the sample. Table 1 shows that what

Kenya spends on R&D (as a percentage of GDP) is higher than all other Sub-Saharan Africa countries. In terms of absolute expenditure, it ranks 3rd after South Africa and Egypt.

The last few editions of the GII have shown the great progress that Kenya has made in using innovation to boost its potential. To take advantage of the progress it has already made, Kenya—as well as other African countries—need to improve institutions, build human capital, invest more in innovation infrastructure, create an enabling environment for knowledge and technical and creative output, and continue to embrace a free market economy to encourage greater market and business sophistication.

What has worked and what has not?

The innovation witnessed in Kenya has largely taken place outside official innovation policy, which was crafted after some sectors had already begun considerable innovation efforts. In many ways, the policy framework is catching up to what is already a work in progress.

The agricultural and health sectors in Kenya have a long history

of R&D as well as of creating new products. The ICT sector came late to innovation, but it has had a greater impact than other sectors. Innovation in Kenya is driven by pockets of institutions that either have a history of R&D or are led by individual risk takers. Institutions such as the Kenya Agricultural Research Institute, the Kenya Industrial Research and Development Institute, and the Kenya Medical Research Institute, as well as research into tea and coffee development, all have great traditions of research and innovation.

The emerging ICT innovation hubs, however, are driven by a few individual risk takers, both in government and industry. The success of the crisis-mapping software Ushahidi and the mobile money platform M-PESA, for example, has attracted other innovators. A group of young developers going by the name 'skunkworks' began to organize BarCamps around Nairobi to share their innovations; this eventually led to the creation of development hubs. Later, corporations joined in by financing the development of some applications for the mobile platform. Aid agencies also began to fund Hackathons, which attracted large numbers of youths keen on showcasing their innovations. But these rapid innovations, encouraged by greater capacity for technology diffusion, occurred before the country had a relevant policy framework in place, and in fact, the emerging innovation community did not pay attention to these developments when they did finally happen. Although it was a policy framework intended for all sectors, awareness of it has largely remained within the Ministry of Science and Technology and a few research institutions.

The ICT sector did benefit from the government's launch of the Kenya

OpenData initiative and the willingness of the Ministry of Information and Communication (MOIC) to work closely with the developer community. These relationships have produced various innovation hubs—including I-Hub, I-Lab, and A-Lab—from which flowed innovations beneficial to a cross-section of economic sectors. Through their mentoring programmes, events, and training, and by providing Internet access and office equipment, the hubs are supporting innovative local developments not only in the ICT and creative industries, but also in other sectors such as renewable energy (for example, with Negawatt Challenge, a competition aimed at finding new energy solutions) and agriculture (with market information applications such as M-Farm, noted earlier).¹²

The MOIC also adopted public-private partnerships as a strategy to ensure knowledge transfer and modernize Kenya's industrial sector. Consequently, multinational companies such as IBM have set up research labs in Kenya to exploit big data and develop new applications that would run the next generation of government. Through the Vision 2030 objectives, the MOIC started to encourage start-ups and accelerator programmes through incubation at various institutions of higher learning. This approach has already borne fruit: it was through this incubation programme that the idea of the Konza City Technology Park, discussed earlier, was conceived.

Through its Ministry of Industrialization and Enterprise Development (MOIED), the government has set up a Micro and Small Enterprise Authority (MSEA) aimed at restructuring the sector by mainstreaming small businesses and encouraging entrepreneurship. The MSEA began operating in 2013, but

has yet to have its desired impact. The MOIED is critical, as it is responsible for facilitating tax incentives at technology parks. Volunteer academics encourage entrepreneurship in the innovation hubs, helping start-ups to move their ideas to the market.

In 2013 the Government of Kenya, through the Ministry of Labour, Social Security and Services came up with a policy document (Sessional Paper No. 3) to operationalize productivity improvement programmes initiated by the government in order to achieve Vision 2030.¹³ This policy document contains specific and targeted interventions. Key proposals include the establishment of a National Productivity Council to facilitate inter-sectoral coordination of policy and programmes, initiatives of the public and private sectors, and enactment and implementation of a Productivity Management Act to guide productivity management efforts in the country.

Challenges

Key challenges to the Kenyan innovation system appear on two levels: policy and operational. This section evaluates these challenges and then uses this evaluation to inform a review of Kenya's educational reforms.

Policy level

Despite the existence of a policy framework, challenges hindering adoption of innovation as a key driver for economic growth still exist. In the period 2007–12, resource allocation to R&D was prioritized as a basis for achieving Vision 2030. However, that momentum has since dissipated as a result of the lack of a national commitment to leverage innovation for greater economic expansion. Resource allocation to

R&D is often not guaranteed, and the little that is allocated to research institutions is spent on recurrent expenditures.

Serious coordination gaps continue to undermine innovation. These include a lack both of central coordination of R&D and of advocacy for multidisciplinary research. Even within the government, research is undertaken largely in silos, leading to capacity underutilization. This lack of coordination means that SMEs do not have the R&D support necessary to bring new products to market. The situation is further complicated by the fact that technical, industrial, and vocational education training institutions (TIVETs) are declining, as some have been converted into universities. There is now, however, a policy initiative to create a TIVET Authority and build new institutions.¹⁴

A report on the Kenya National Systems of Innovations (KNSI) by the United Nations Industrial Development Organization (UNIDO) confirmed these challenges and arrived at the following conclusions:

- connectivity between the core actors of the KNSI is fragile;
- the KNSI has an asymmetric distribution of actor links;
- certain imbalances are present in the directionality of actor relationships;
- significant latent barriers to innovation are uncertainty avoidance, risk, unsophisticated markets, and skills capacity; and
- extant policy instruments face limitations in overcoming the constraints of the barriers to innovation.¹⁵

UNIDO's conclusions are not new, but Kenya is beginning to have the capacity to address them, as can be seen in the country's rise in the GII rankings.

Operational level

At the operational level, the disconnect between industry and research institutions undermines innovation. While industry complains that graduates from local universities are not ready for industry, universities complain that they are not getting enough feedback from industry. Some leading firms, especially in the ICT sector, are filling the ICT skills gap of workers by providing bridging courses and offering internships. Some universities have also begun incubation centres to nurture emerging entrepreneurs.

Often the main challenge for incubation hubs is determining ways to make potential beneficiaries aware of the opportunity and how to take advantage of it.¹⁶ This requires specialized skills and experience in order to understand the demand patterns, business models, and market intelligence. Unfortunately, those in Kenya with this skill set are older-generation Kenyans who tend to dislike the tech-savvy youths. But for these hubs to succeed, both groups must find a way to work together. Having been in the midst of the creation of incubation centres, I have observed this first-hand.

Educational reforms

Over the past 20 years, tertiary education in Kenya has been reduced to almost nothing. Most TIVET colleges were converted to universities without building new institutions. The education system needs to place more emphasis on science, technology, engineering, and mathematics (STEM) disciplines and to build a network for manufacturing

innovations similar to the USA's Educate to Innovate programme.

In Kenya the policy framework of 2009 has created a Technical Education and Vocational Training Authority to coordinate tertiary education in the country. A National Observatory for science, technology, and innovation is to be created to enhance sharing of knowledge, policy formulation and policy implementation. Unfortunately, this multiplicity of new institutions may, in the end, be Kenya's greatest barrier to innovation: other countries have tried this model and failed.

Lessons from Kenya and beyond

This section draws lessons from the USA and the Republic of Korea, and concludes by highlighting Kenya's own strengths in innovation. The USA provides great lessons because partnerships already exist between US universities such as MIT and local universities for developing new products using the fab lab technologies. The Republic of Korea too has had a very close technical relationship with Kenya; many Kenyans have gone through the Korean Institute of Science and Technology, which has played a key role in the country's development.

The United States of America

Kenya can learn a lot from the USA's TechShop concept. This new approach to building a community of innovators is increasingly becoming the playground for innovation in the USA. TechShop centres, sometimes referred to as 'hackerspace' or 'learning centres', provide tools and space for fabrication and prototyping, as well as classes. They are equipped with comprehensive tools and software and participants can make virtually anything.

Dickel et al., in their 2014 study of TechShops, concluded that:

... by applying the concept of real-life laboratories to the analysis of shared machine shops and the developments that emerge in this context, this article considers the subject of this special issue as a promising example that embodies significant properties of a reflexive innovation society. It provides evidence for novel modes of innovative and creative action that is based on hybrid forms of collaboration, the bottom-up coordination of collective action and a strong notion of accessibility and openness.¹⁷

I-Hub has begun to test the TechShop concept to enhance innovation capabilities in the realm of hardware, which has not yet been exploited in Kenya. The University of Nairobi's collaboration with MIT and other similar arrangements provides the best chance for Kenya to successfully transfer knowledge from the USA. Kenya is poised to apply this new and innovative concept.

The Republic of Korea

The Organisation for Economic Co-operation and Development (OECD), in its 2014 evaluation of industry and technology policies in the Republic of Korea, noted that the country has one of the best and more comprehensive R&D programmes in the world. The programme itself enables the government to accept greater risk in publicly supported R&D, and the country's higher tolerance for risk continues to pay off.

As in Kenya, Korean SMEs and research institutions tend to shy away from intense collaborations with academic institutions. To overcome this problem and enhance the commercialization of research, the Republic of Korea is establishing a more business-friendly education system that addresses cultural and other barriers to start-ups. The education system also aims to address issues of collaboration between businesses and research institutions,

giving systematic support for public-private innovation partnerships and inspiring the development of highly trained students to support industrial innovation and to encourage students to join innovation-oriented companies, SMEs in particular. Furthermore, the Republic of Korea is encouraging more start-up creation and SME growth through tax credits to enhance radical innovation.

As Kenya considers reforms to its education system, it might look at the example of the changes made to the Korean education system coupled with their military service perhaps fosters a culture of risk taking and innovation. There is need for Kenya to emulate Korea and more importantly R&D and encourage innovation.

Kenya

Although the country is just beginning its innovation journey, other emerging economies can still learn something from Kenya, including the benefits of using deliberate policy interventions; of leadership in government with an appetite for risk taking; of the construction of collaborations and partnerships with the private sector including multinational corporations; of increasing funding research; and of the development of incubation centres across universities to foster innovation. Relative to other African countries, some of Kenya's strengths lie in its current expenditure on education, relatively easy access to credit for individuals, increasing R&D spending, and intensity of local competition (Kenya is a free market economy where competition is encouraged). These variables positively influence innovative capacity.

Research by Koria et al. shows a comparative analysis of determinants of the effectiveness and efficiency

of the Ghana National System of Innovation (GNSI) and the Kenya National System of Innovation (KNSI).¹⁸ Two regression analyses were performed of the innovativeness of business enterprises and of the strength of linkages between research institutes and the production system with respect to an array of independent variables of the countries' national systems of innovation. The research established that actor linkages and ICT affect the GNSI positively, while they affect the KNSI negatively. Ghana presents a good case study of the impact of these linkages.

Conclusions

Relative to other countries in Africa, Kenya is making solid progress in innovation—but a great deal more needs to be done. It has developed a comprehensive innovation policy framework, but the relationships between research institutions and industry remain disjointed. The government has played an important role in creating an effective triple helix that will eventually harmonize innovation programmes for greater economic growth, but the communication of policy to innovation actors must be enhanced. Kenya should also learn from countries such as the USA, where the concept of the TechShop is helping to develop communities of innovation, and the Republic of Korea, where R&D activities are supported by the government to enhance greater risk taking, producing great benefits.

Furthermore, extending tax credits to research activities by the private sector would facilitate greater innovative capabilities. There is also a need to review the education system, to encourage the establishment of more TIVETs and business-friendly educational programmes, and to

foster greater collaboration between industry (specifically SMEs) and research institutions.

Notes

- 1 Government of Kenya, 2007. For details about Kenya's Vision 2030, see <http://www.vision2030.go.ke/>.
- 2 World Bank, 2015.
- 3 Sihanya, 2012.
- 4 Roopnarne, 2014.
- 5 Saine innovation network, 2013; World Bank, 2010.
- 6 For details about iCow, see <http://icow.co.ke/>; for information about M-Farm, see <http://www.mfarm.co.ke/>.
- 7 For example, see World Bank, 2010.
- 8 Government of Kenya, 2010.
- 9 Government of Kenya, 2013a.
- 10 For more information about Ushahidi, see <http://www.ushahidi.com/product/ushahidi/>.
- 11 Information about these industrial and incubation centers can be found at the following websites: <http://www.c4dlab.ac.ke/>; <http://www.ku.ac.ke/chandaria-biic/>; <https://www.fablabs.io/universityofnairobi/>; http://media01.24hrstech.com/PDFs/10A-Review_of_UoN_Science_and_Tech_Park.pdf; <http://www.jkuat.ac.ke/industrial-park-to-foster-industrialization/>; and <http://www.konzacity.go.ke/>.
- 12 Information about Negawatt is available at <http://www.negawattchallenge.com/about/>; information about M-Farm is available at <http://www.mfarm.co.ke/>.
- 13 Government of Kenya, 2013c.
- 14 Government of Kenya, 2013b.
- 15 UNIDO, 2014.
- 16 Having been in the midst of the creation of incubation centres, I have observed this firsthand.
- 17 Dickel et al., 2014, p. 16.
- 18 Koria et al., 2014.

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